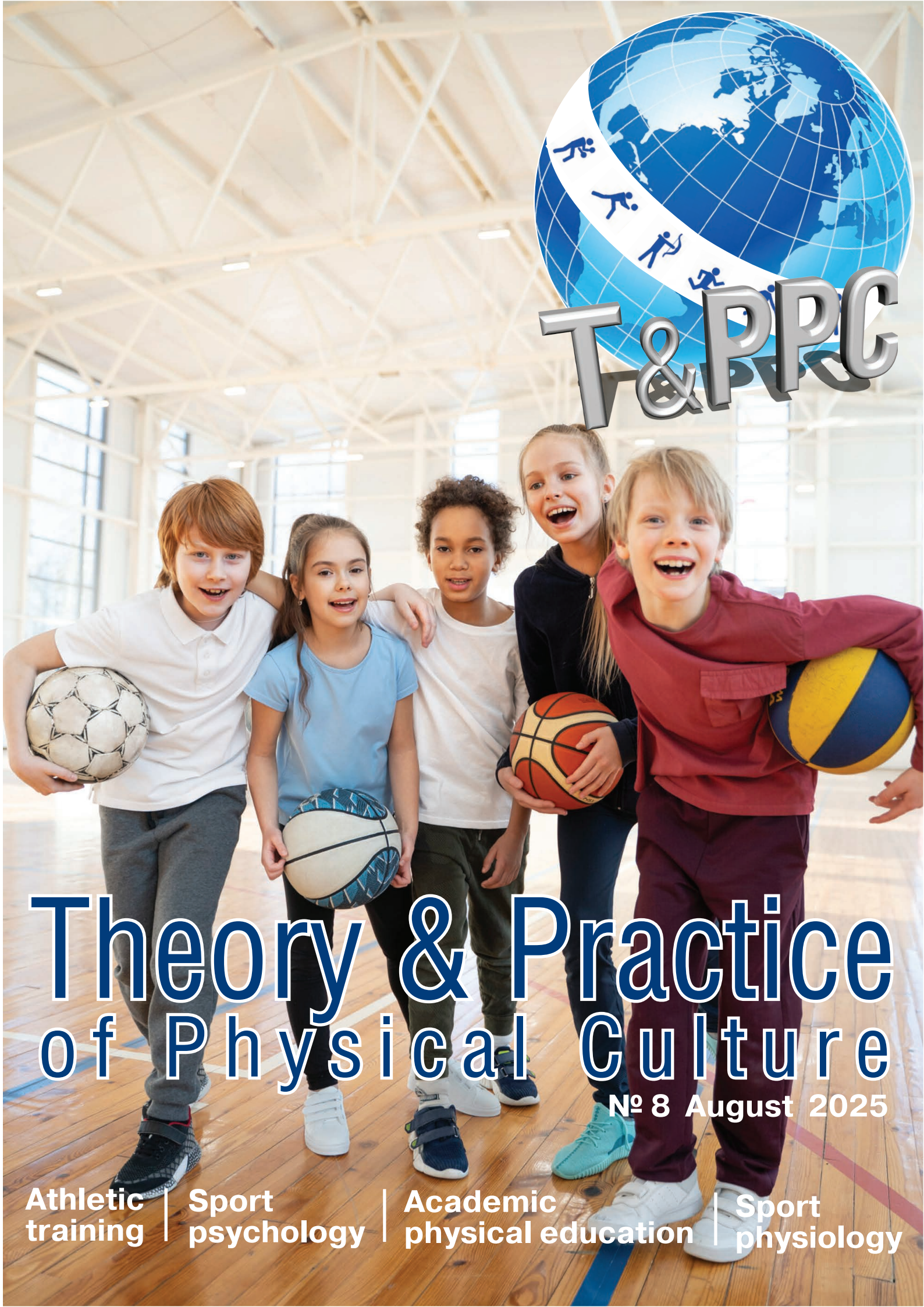

Theory & Practice of Physical Culture

№ 8 August 2025

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

Personal sports culture is a factor in reducing the negative impact of the media environment on an athlete's values

For an athlete striving for athletic achievements, the values of success can be negatively affected by various factors, in particular, the media environment. One of the characteristics of modern media content is the subjectivity of assessments of events that are presented in information messages. The media environment contains a large amount of content, and excessive public display of commercials featuring athletes leads to a substitution of values for both beginners and leading athletes, for whom the desire for athletic achievements fades into the background. Often, many media reports about competitions focus the viewer's attention on the scenes of violence and aggression of athletes during competitions, as a result of which other participants in sports competitions may form a misconception about sports spirit and fair play. Constant information flows can reinforce negative stereotypes among athletes regarding ethnicity, gender, age, or physical characteristics of athletes, which contributes to increased discrimination and prejudice against competitors.

Thus, mediation can lead to negative consequences for an athlete with unstable values. In sports activities, the formation of an athlete's value system is conditioned by the influence of a cultural approach. The sports culture of a personality is formed in the process of the interiorization by a personality of the cultural and educational potential, values and technologies of sports, as well as as a result of the accumulation of experience in physical culture and sports activities and filling it with personal meaning. The space of personal sports culture orients students to improve and effectively realize their motor abilities, which as a result leads to the formation of stable personal qualities and value attitudes.

The values of sports culture can become an effective mechanism for eliminating the negative impact of medialization on an athlete's values. The formation of a stable value system based on the principles of respect, fair play, team spirit, patriotism and the desire for self-improvement allows an athlete to resist the negative effects of mediation, preserve their individuality and moral principles. The development of a personal sports culture requires the combined efforts of the family, the coach, the sports organization and the athlete himself. Only in this case, it is possible to ensure the formation of a harmoniously developed personality capable of successfully performing in the sports arena and adequately representing his country.

Reducing the negative impact of medialization occurs when, in the context of broadcasting various content, an athlete with a high level of sports culture remembers and realizes his own values and goals for which he is engaged in sports. Focusing on training, developing skills, and achieving personal bests in sports helps an athlete maintain positive motivation. One of the aspects of full-fledged protection from negative media content is the development of critical thinking and media literacy among athletes, who must understand the mechanisms of influence, ways of manipulating public opinion, and know the differences between constructive and destructive criticism.

The sports culture of an individual, formed on the principles of media literacy, professionalism and the inner values of an athlete, is a powerful tool for protecting athletes from the negative effects of mediation.

A healthy society is far from indifferent to what values young athletes profess, to what extent their morality corresponds to universal human positions and contributes to the progress of social relations. In this regard, it is especially important that the formation of a value system for sports youth in the media space takes place on the basis of attitudes towards fair competition and fair struggle.

We invite scientists to publish the results of scientific research aimed at finding and studying the value meanings of physical culture and sports.

Editor-in-Chief of TPPC, Honored Worker of Physical Culture of the Russian Federation
Dr. Hab., Professor L.I. Lubysheva

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Theory and Practice of Physical Culture

Contents

Latest trends in training martial arts athletes: a study of the contents of articles published in the journal «teoriya i praktika fizicheskoy kultury»

UDC 796.8

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Abstract

Objective of the study is to identify current trends in the training of martial artists based on the content analysis of publications in the journal TiPFK.

Methods and structure of the study. The study included a content analysis of sixty issues of the journal "Teoriya i praktika fizicheskoy kultury". (TiPFK) for the period from 2020 to 2024. Two hundred and fifty-seven articles on martial arts were identified. The selected materials were used to study the quantitative and qualitative indicators of the authors' publication activities in various fields and sports disciplines. The goal was to analyze the authors' activity in different sports.

Results and conclusions. Current trends in the field of training martial artists are manifested in the emphasis on the physiological aspects of sports (37 works), monitoring the level of athletes' readiness (33), practicing technical and tactical skills (28), studying the history and evolution of sports disciplines (24), psychological training (23) and general physical training (21). However, the study revealed a deficit of publications devoted to the use of information technology in sports (only 4 articles), which contrasts with the importance of this area in the current realities. In total, 15 areas of publication activity of authors in the field of martial arts were identified with a range from 4 to 37 articles, which is clearly visualized in the presented diagram.

Keywords: *martial arts, content analysis, modern trends, training of martial artists, articles on martial arts, publication activity.*

Introduction. In the modern conditions of active work of specialists and versatility of scientific research in the field of martial arts, it is very important to have information about the features of the latest developments and trends reflected in the publications of journals in the field of physical education and sports. One of such journals is "Teoriya i praktika fizicheskoy kultury" (TiPFK), which is a popular scientific platform for publications of researchers, teachers, coaches and other specialists in the field of martial arts. The scientific and theoretical journal, founded in 1925, is included in the Scopus database, the Russian Science Citation Index (RSCI), and the EBSCO database of English-language periodicals. This journal has a high status, unique information content, and its 100-year historical archive of publications contains knowledge and practices that reflect the current needs of sports science [5, 3].

Martial arts are constantly evolving, which is accompanied by a search for new solutions in various directions. Therefore, it is important to identify modern trends that play an important role in the development of martial arts. In this regard, conducting a content analysis of publications on martial arts for the period from 2020 to 2024 will allow us to identify publication activity in various sports, the main current areas of research and trends in change [1, 2, 4, 6, 7].

Objective of the study is to identify modern trends in the training of martial artists based on the content analysis of publications in the TiPFK journal.

Methods and structure of the study. A content analysis of publications in the TiPFK journal from 2020 to 2024 was conducted. The journal is published once a month, so all 60 issues over the past 5 years were analyzed.

A total of 257 articles on martial arts were identified to analyze the quantitative and qualitative parameters of the publication activity of authors on various topics and sports.

Results and conclusions. An analysis of publication activity over the past five years showed that, on average, 51.4 articles were published annually in the TiPFK martial arts journal, which is 4.3 articles in a monthly issue. The dynamics show a smooth increase in the number of articles per year from 39 in 2020 to 61 in 2024 (Fig. 1), which indicates an increase in the publication activity of authors on martial arts by 56.4%.

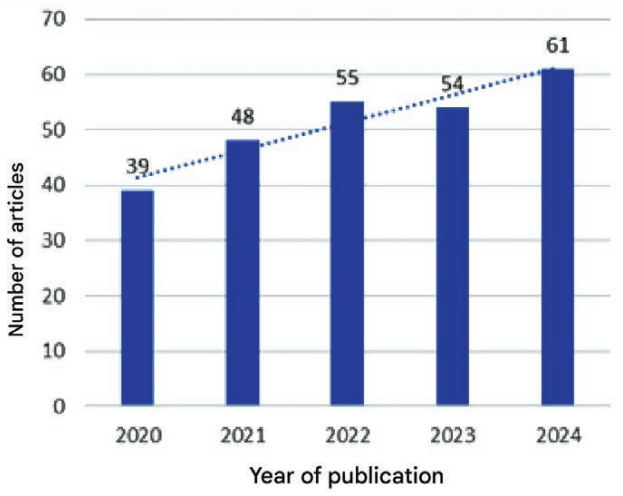

Fig. 1. Dynamics of the number of articles on martial arts in the TiPFK journal for the period 2020-2024

Publications in the TiPFK journal over the past five years have been written on 19 types of martial arts (Fig. 2). The distribution of articles by types of martial arts varies from 1 to 38. The largest number of publications were made, in general, on all types of martial arts (42 articles). The most popular martial arts in the scientific journal are all 6 Olympic sports: judo (38 articles), wrestling (29), boxing (26), fencing (17), taekwondo (14) and karate (12). Also, two domestic types of martial arts have high rates of publication activity: sambo – 26 articles, hand-to-hand combat – 12 articles. The following martial arts have average ratings: kickboxing (9 articles), muay thai (8), wushu (7), mixed martial arts (MMA) (5). The lowest ratings are for army hand-to-hand combat (3 articles), aikido (3), other types of wrestling (belt wrestling – 2, jiu-jitsu – 1, kurash – 1, kazakhsha-kures – 1) and oriental martial arts (1).

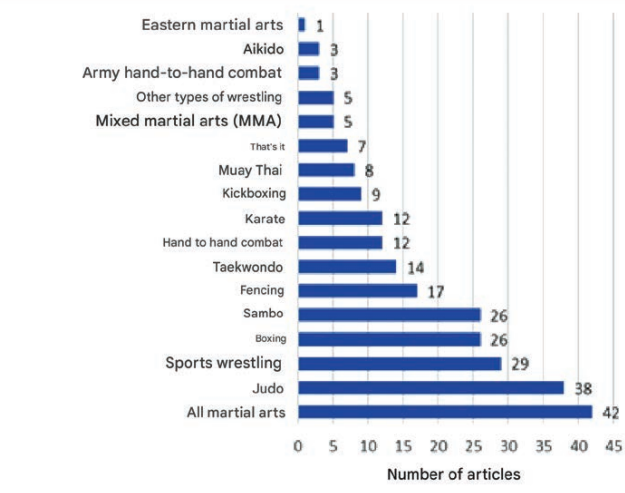

Fig. 2. Number of articles by martial arts in the TiPFK journal for the period 2020-2024

By type of martial arts, the largest share falls on wrestling martial arts - 98 articles, which is 38% (Fig. 3). Striking martial arts make up 30% (76 articles). There are 42 articles (16%) devoted to all martial arts. The smallest values for the number of publications are for mixed martial arts and martial arts with weapons, 24 (9%) and 17 (7%) articles, respectively.

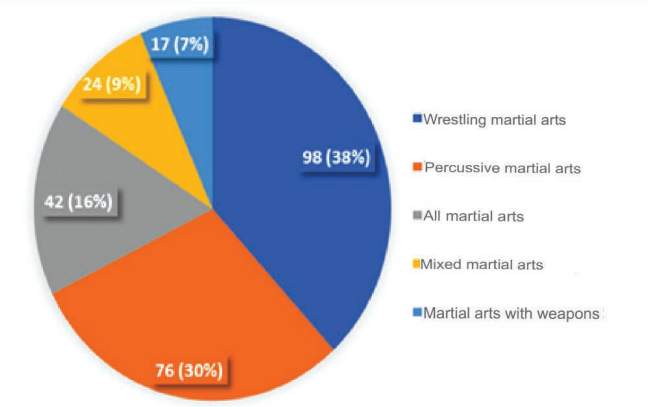

Fig. 3. Number of articles by types of martial arts in the TiPFK journal for the period 2020-2024

The analysis allowed us to identify 15 areas of publication activity of authors of articles on martial arts in the TiPFK journal (Fig. 4). The largest number of articles (more than 20 in each area) were published on sports physiology (37 articles), fitness control (33), technical and tactical training (28), history and development of sports (24), sports psychology (23) and physical training (21). The areas with average ratings (from 10 to 20 articles): biomechanics of sport – 19 articles, health-improving physical culture – 14, modeling in sport – 11, and training planning – 10. The lowest ratings (less than 10 articles) are for the topics of service-applied sports (9 articles), integrated training (9), sociology of sport (8), adaptive sports (7), and information technology (4).

Conclusions. Thus, the results of the content analysis of publications in the TiPFK journal over the past five years show that the interest of authors in pub-

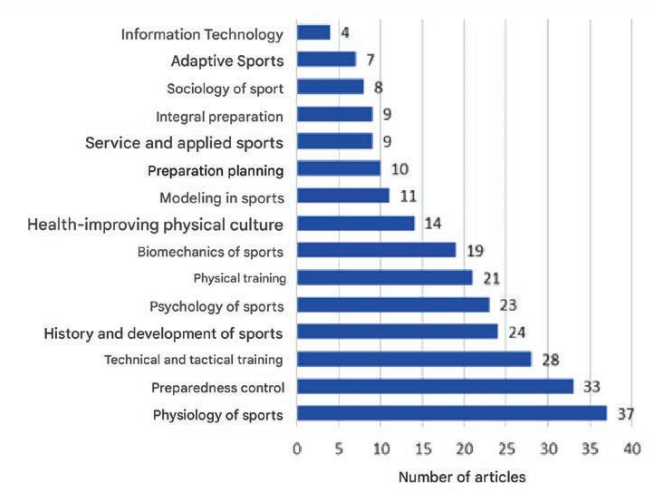

Fig. 4. Number of articles on martial arts in the TiP-FK journal for the period 2020-2024

lishing articles on martial arts is increasing every year, as evidenced by the positive dynamics of the number of articles from 2020 to 2024. At the same time, the publication activity of authors is more focused on wrestling martial arts (38%), such as judo, wrestling and sambo. The publication activity on striking martial arts (30%), such as boxing, taekwondo and karate, is slightly lower. 16% of publications were completed without highlighting a specific type of martial arts. The smallest number of publications are on mixed martial arts (hand-to-hand combat, mixed martial arts (MMA), army hand-to-hand combat) – 9% and martial arts with weapons (fencing) – 7%.

Modern trends in the training of martial artists are revealed, expressed in the greatest interest among researchers in areas related to the physiology of sports (37 articles), training control (33), technical and tactical training (28), history and development of sports (24), sports psychology (23) and physical training (21). At the same time, the analysis showed that an insufficient number of publications is observed in the areas of information technology in sports (4 articles), which is quite relevant in modern conditions. A total of 15 areas of publication activity of authors on martial arts were identified in the range from 4 to 37 articles.

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Comparative analysis of modern methods for teaching swimming to adults

UDC 797.212

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Abstract

Objective of the study is to determine the methodological features of teaching swimming to adults based on theoretical analysis.

Methods and structure of the study. An analysis of scientific, methodological and Internet sources was performed to identify an effective methodology for teaching swimming to adults, where the criterion is the time of training or the time period of training. The sample consisted of scientific publications presented on the websites of the library systems library and cyberleninka for the period 2006-2024.

Results and conclusions. In the course of the study, it was determined that the main distinctive feature in teaching swimming to adults is the emphasis on the psychological side of the educational and training process. At the same time, special attention is paid to teaching correct breathing. From all the diversity presented in the literature and the Internet, two main methods of teaching swimming stand out: the traditional method – teaching swimming 1-2 styles, and the complex method – teaching swimming all four styles.

Keywords: *swimming, swimming courses, swimming teaching methods, front crawl, breaststroke, back crawl, sports swimming techniques, modern swimming schools.*

Introduction. Modern research has shown that swimming affects relaxation and stress relief. Water has a calming effect, swimming improves mood, reduces symptoms of depression, anxiety, and prevents the development of professional burnout [11].

Objective of the study is to identify the methodological features of teaching swimming to adults based on theoretical analysis.

Methods and structure of the study. An analysis of scientific, methodological and Internet sources was carried out to identify the most effective methods of teaching swimming to adults (the criterion is the time of training or the time period of training), studying under the guidance of a trainer in fitness centers or in online schools offering support for the process of mastering various swimming techniques. The sample consisted of scientific publications presented on the websites of the library systems library and cyberleninka for the period 2006-2024.

Results and conclusions. In their works, most authors recommend taking into account not only age and psychological characteristics when teaching adults, but also paying attention to the essence of the pedagogical impact exerted on an adult during the learning process [5, 1].

As a rule, a deterrent to learning to swim is the presence of fear of water in mature people. One of the reasons for fear may be psychological trauma received in childhood as a result of a personal unsuccessful experience of swimming and the experienced fear of drowning, or fear of being in the water in an unsupported position, that is, without touching the bottom or the sides of the pool with your feet. In this case, experts suggest combining physical training with psychological work to overcome fear when teaching adults to swim [5].

To relieve stress, relax, and distract yourself from thoughts about the upcoming immersion in water, it is

recommended to begin training with mastering proper breathing, first on land and then in water. In this case, breathing exercises are used before performing basic water exercises, such as "float", "star", etc. This sequence further increases readiness to perform subsequent exercises [5, 3]. Having conducted a theoretical analysis of scientific and methodological research on teaching swimming over the past decade (2014-2024), we have to state the absence of works related to teaching swimming to adult students. Experts have presented experimentally substantiated approaches to teaching swimming in different ways to children or student youth during the development of elective courses in physical education and sports at a university.

In particular, the methodology of integrated swimming training has been developed for students of any age and assumes that a person will be able to simultaneously learn all sports swimming techniques (freestyle (or front crawl), breaststroke, backstroke, butterfly) from the first lesson. According to the methodology, this training option shortens the period of psychological adaptation to water: no more than 3 lessons are allocated for tactile connection with water, learning how to breathe correctly and lie on the water, and then the technique of swimming in a certain way is mastered. When using the traditional method of teaching swimming, accustoming to water occurs only after the 12th lesson [6].

The following approach presented in the literature has also been tested in the process of teaching students and assumes simultaneous mastering of all non-sports and sports swimming techniques. Non-sports swimming techniques are understood as a combination of elements of two sports styles. For example, a combination of elements of the swimming technique of backstroke and breaststroke; front crawl and breaststroke; butterfly and breaststroke, etc. The use of "non-sports swimming techniques" (e.g. legs crawl + arms breaststroke; legs crawl + arms butterfly; backstroke – stroke with both arms at the same time, etc.) allows you to quickly understand how the arms and legs work separately in each sport swimming technique, and also helps to improve the functional capabilities of the body and the level of swimming fitness. At the Kuban State Agrarian University, such a program for teaching students to swim was implemented over 18 lessons, the result of which was: 90% of students who knew how to swim mastered the front crawl, 98% - backstroke, 87% – breaststroke and 10% – dolphin [12].

Swimming training for primary school children is offered in accordance with the laws and principles of biomechanics. It is necessary to take into account the energy consumption and coordination complexity of each of the four swimming methods [10]:

- when learning to swim the front crawl, the main difficulty lies in the cyclical and constant control of breathing – inhaling for a certain number of strokes;
- to master the breaststroke, it is necessary to master a large number of technical elements, using preparatory exercises on land;
- the back crawl is similar to the front crawl: breathing is easier to master, however, the method seems difficult due to limited visibility, where the only landmarks will be wave breakers and flags at the 5-meter mark;
- the butterfly is the most energy-consuming swimming method, since the dynamic load falls on the upper body.

Based on this, it is believed that for the successful formation of swimming skills for children of primary school age, it is necessary to begin swimming training with the front crawl and back crawl due to the similarity of technique and economy in performing movements [10].

The study by Kozlova N.Yu. presents experimental data on teaching swimming to primary school children using all sports methods simultaneously. The training begins with mastering arm movements, which as a result contributes to a faster period of mastering a certain sports method compared to the traditional approach (first forming the correct leg work). The training includes 5 stages: introductory (getting used to the aquatic environment); creating an image of swimming technique using all methods; improving swimming technique over short distances (25 meters); teaching the coordination of arm and leg work using all sports swimming methods; improving swimming technique using all sports methods [7].

Kurganova E.N., using the holistic-separate method of teaching swimming, recommends dividing exercises into separate elements, performing each movement first on land and then in water when studying a certain swimming method. In addition, the importance of maintaining the correct sequence during training is indicated: demonstration of the element; explanation of the technique of execution; methodical instructions with setting motor tasks; execution on land and in water [8]. Recently, various short-term

online courses and programs for teaching swimming to adults have become especially popular. With a trainer, basic skills can be mastered in 6-12 lessons. For a beginner, it is advisable to study 2-3 times a week [3]. Table 1 provides a comparison of modern schools and their courses/programs for teaching swimming to adults:

An analysis of the training content of the courses in the above-mentioned schools shows that in order to master 1-2 sports swimming techniques, as well as to swim a distance of 100 to 500 meters, it is necessary to practice 2-3 times a week for one month. However, the authors point out that it is better to increase the training to five times a week to achieve the best result, and for this it is necessary to practice at least three times a week.

Conclusions. The study found that the main distinctive feature in teaching swimming to adults is the emphasis on the psychological side of the educational and training process. In this case, special attention is paid to teaching correct breathing. Among all the diversity presented in the literature and on the Internet, two main methods of teaching swimming stand out: the traditional method – teaching swimming 1-2 styles, and the comprehensive method – teaching swimming all four styles.

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Table 1. Content aspects of courses (programs) for teaching swimming to adults, presented on the official websites of swimming schools on the Internet

Name of the school (write ONLINE or CITY if in person)	Course/program features	Duration of the course/ program	Result of mastering the course/program
Swimming laboratory «SwimLab» swimlab.pro	Course «Beginner» Deep video analysis of swimming technique	12 workouts (1 month)	Mastering the basic skill of swimming using the front crawl method
Healthy swimming school.RF	Course «HEALTHY SWIM COMPLEX» Comprehensive health training in all swimming techniques	16 lessons (2 months)	Basic swimming skills (breathing, lying on the water) and two swimming styles (breaststroke + crawl/ breaststroke + backstroke/crawl + backstroke)
I Love Swimming perm.ilovesupersport.ru	Course «Level 1» The training is conducted according to Terry Laughlin's "TotalEmersion" method. After each lesson, the student receives additional training materials	12 lessons (1 month)	Ability to swim using the front crawl and the ability to swim 500 meters without stopping
Swim Serafim swimserafim.ru	Course «from 0 to 400» Trainings are held online. The student trains independently	3 workouts per week (from 1 to 6 months)	Ability to swim in one of the four swimming styles and the ability to swim a distance of 400 meters without stopping
Born4Swim born2swim.ru	Course "Swimming from scratch". Training takes place with a trainer in the water. Video analysis of swimming technique	12 lessons (1 month)	Ability to swim in one of the four swimming styles and the ability to swim a distance of 100 meters without stopping

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Effects of pre-competition activation on outcome performance in swimming sprinters

UDC 797.21

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Abstract

Objective of the study is to identify the influence of warm-up intensity and duration predictors on the competitive results of sprint swimmers.

Methods and structure of the study. During the work, three warm-up options of similar content were analyzed: long (3000 m), short (1500 m) and high-intensity (1000 m). The swimming time for 100 m and the intermediate swimming time of the first 50 m segment were recorded. The duration and intensity of the warm-up varied.

Results and conclusions. It was found that in order to achieve high athletic results in sprint swimming, it is possible to use both long and short (up to 1500 m) warm-up in water – any of the options can be successful. A high-intensity warm-up and a short rest period before the start (10 min) have a decreasing effect on swimming results.

Keywords: *swimming, sprint swimmers, intensity, warm-up duration, different warm-up options, athletic performance.*

Introduction. The question of the optimal duration and volume of swimming during the warm-up of sprint swimmers in water remains open to date. The generally accepted time duration of the warm-up before the start is considered to be a time range from 20 to 45 minutes [7].

The content of the warm-up for swimmers includes preliminary exercises for flexibility and increasing joint mobility [2]. Exercises in water begin with an intensity of 20-40% of the maximum. Most of the warm-up should be performed with an intensity of 30 to 50% of the athlete's VO2max [4]. Warm-up exercises in water should include swimming in elements and in full coordination to warm up all muscle groups. The warm-up ends with starts and turns [5].

To date, there is no standard universal warm-up that could be recommended for swimmers of any specialization. Warm-up is selected individually for each athlete. Moreover, different types of competitive programs in swimming require special warm-up exercises [3]. There are no precise ideas about the content, volume and intensity of pre-start warm-up for sprint swimmers. There is also no consensus on the rest time between warm-up and start [1, 6].

Objective of the study was to identify the influence of predictors of warm-up intensity and duration on the competitive result of sprint swimmers.

Methods and structure of the study. The study involved 12 qualified sprint swimmers aged 22.5±1.5 years with over 10 years of swimming experience.

Three warm-up options with identical content were studied: long, with a total volume of 3000 m; short, with a total volume of 1500 m; high-intensity, with a total volume of 1000 m. After the warm-up, the swimmers competed in the 100 m freestyle. The swimming time for 100 m and the intermediate swimming time of the first 50 m segment were recorded. The duration and intensity of the pre-start warm-up of sprint swimmers were analyzed as predictors of athletic performance.

Statistical data processing was performed using repeated measures analysis of variance (ANOVA). The significance of differences was set at $p<0.05$.

Results and conclusions. After a long warm-up (LW), the average result of sprint swimmers in 100 m swimming was 60.15 sec (σ=6.88); after a short warm-up (SW) – 60.26 sec (σ=7.21), after an intensive warm-up (IW) – 61.83 sec (σ=6.87).

Evaluation of effects within the sample of subjects showed that there are significant differences between the results shown after different warm-up options. Pairwise comparisons revealed that the differences in the results shown after a long and short warm-up are not statistically significant. The results shown after a long and intense warm-up, as well as after a short and intense warm-up, are identified as statistically significant (Table 1).

The average swimming time of the first 50 m at a distance of 100 m after a long warm-up (LW) was 28.45 sec (σ=3.27), after a short warm-up (SW) – 28.64 sec (σ=3.35), after an intensive warm-up (IW) – 28.88 sec (σ=3.42).

Analysis of variance by the method of paired comparisons revealed statistical insignificance of differences in the results in sprint swimming after a long and short warm-up, as well as after a short and intensive warm-up. Significant differences were found between the results of swimmers shown after a long and intensive warm-up (Table 2).

It was found that there were no significant differences in the competitive results after a long and short warm-up of the same intensity (p=0.20).

The differences in the swimming time of the first 50 m were also not significant (p=0.32). It can be argued that low-intensity swimming initiates the processes of working in the body of sprint swimmers with the same efficiency, compared to a long warm-up. It follows from this that before sprint swims, a warm-up of more than 1500 m is inappropriate.

When comparing the effectiveness of a long and high-intensity warm-up, a high significance of differences was found (p=0.02). The differences were also significant when comparing the effects of a short and high-intensity warm-up (p=0.03).

The data obtained indicate that a high-intensity warm-up and a short rest period before the start (10 min) have a decreasing effect on swimming results. This is due to the fact that it takes a certain amount of time to remove lactic acid from the blood, during which it is better to perform low-intensity swimming or massage.

The most creative task is to find a balance between the intensity of the warm-up and the duration of the recovery period before the start. It can be argued that a high intensity warm-up was reflected in the decrease in results. The swimmers showed the best time for the first 50 m of the 100 m distance after a long, low-intensity warm-up. After a long warm-up, swimmers swam the first 50 m much faster, compared to the first 50 m after a high-intensity warm-up. The results in swimming the first 50 m after a short and long warm-up are approximately the same.

Considering that no significant differences were found between the results after a low-intensity and high-intensity warm-up, it can be emphasized that the last 50 m were covered significantly better after a short, low-intensity warm-up. The decrease in the swimming time of the last 50 m after a high-intensity warm-up is apparently caused by a significant increase in the level of lactic acid in the blood.

Table 1. Pairwise comparison matrix of 100 m swimming results

Warm-up option	MD			SE			p		
	P	K	I	P	K	I	P	K	I
P	x	-0,07	-0,64	x	0,101	0,207	x	0,55	0,02
K	-0,07	x	-0,59	0,101	x	0,187	0,55	x	0,03
I	-0,64	-0,59	x	0,207	0,187	x	0,02	0,03	x

Table 2. Matrix of paired comparisons of results in swimming the first 50 m

Warm-up option	MD			SE			p		
	P	K	I	P	K	I	P	K	I
P	x	-0,15	-0,26	x	0,094	0,081	x	0,47	0,04
K	-0,15	x	-0,09	0,094	x	0,087	0,47	x	0,02
I	-0,26	-0,09	x	0,081	0,087	x	0,04	0,02	x

Conclusions. To achieve high athletic results in sprint swimming, both long-term (3000 m) and short-term (up to 1500 m) warm-ups in water can be used with equal success. In the 100 m swim, with an insufficient recovery period after a high-intensity warm-up, a decrease in results is observed compared to low-intensity warm-up swimming. High-intensity swimming as a warm-up exercise before the start is advisable only for selecting a rational tempo of rowing movements, provided that the rest period before the competitive swim is at least 20 minutes.

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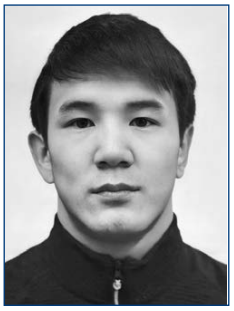
Analysis of the performances of the 2024 Olympic champion in freestyle wrestling in the category up to 57 kg

UDC 796.81



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Abstract

Objective of the study is to analyze the competitive activity of freestyle wrestler Rei Higuchi.

Methods and structure of the study. Pedagogical studies of competitive activity have been carried out, as well as an analysis of video recordings of freestyle wrestlers based on the results of their participation in the Olympic tournament in Paris.

Results and conclusions. A study of wrestler Ray Higuchi's competitive practice revealed that at the 2024 Olympic Games he was active in the stand 63.6% of the time, and in the stalls 36.3%. At the same time, his arsenal of technical actions was mainly reduced to 2-3 techniques. Despite the limited set of techniques, Higuchi is highly effective in applying proven combinations, varying them during the match. Key techniques include a side pass with a switch to the other side when an opponent resists, or a transfer to the left hand with a pass to the right side leg, a two-leg pass, as well as deceptive maneuvers preceding a technical action. Characteristic features of the Higuchi style are: disorientation of the opponent due to sudden movements in different directions, a stable stance, active work with the hands to prevent seizures and head control, as well as dominance in determining the pace and nature of the fight. The information about technical actions obtained as a result of the analysis forms a valuable methodological database that can assist coaches and athletes in optimizing the training process.

Keywords: *freestyle wrestlers, competitive activity, technical and tactical training, highly qualified wrestlers, analysis of technical actions, methodological database.*

Introduction. The first historical evidence of the existence of wrestling dates back to 2600 BC. More than 400 drawings demonstrating techniques similar to modern wrestling techniques were found on the walls of the Egyptian tomb of Belad Gasal. Wrestling was included in the modern Olympic Games in 1896 in Athens under Greco-Roman wrestling. In 1904, freestyle wrestling games were held for the first time in St. Louis and since then this sport has been one of the historical sports at the Olympics, but in 2013 wrestling was on the verge of being excluded from the Olympic sport [1, 5], but this did not happen.

In Yakutia, freestyle wrestling began to actively develop in the mid-50s of the 20th century thanks to the work of Nikolai Nikolaevich Tarsky (1924-1962). He played a key role in the popularization of this sport, being not only the ideological inspirer, but also an active participant in the process as a judge, coach and representative. His students achieved significant success: Dmitry Danilov became a master of sports in 1960, and Nikolai Alekseevich Gogolev won the title of champion of the RSFSR in 1962. The further development of freestyle wrestling in the region is associated with the names of such famous coaches as N.N. Volkov, D.P. Korkin [7]. Thanks to their work and dedication, the Yakut school of freestyle wrestling took a strong position in the Russian and international arenas.

Improving, this sport has reached our times. And today, the current growing generation of wrestlers strives to achieve sports peaks, developing the legacy of those who began this path. And for this, young people must develop their sports training in every possible

way. One of the ways to improve the training of wrestlers is to analyze the competitive actions of leading wrestlers of our time [3, 4]. We chose the weight of 57 kg, since it is the most competitive in the Republic of Sakha Yakutia [6]. There are famous wrestlers from the Sakha Republic in this weight category: V. Lebedev, A. Tyutrin, V. Egorov and others. Therefore, we decided to study in depth the technical and tactical methods of outstanding wrestlers (world leaders) in this weight category.

The leader in this weight category according to the results of the 2024 Paris Olympic Games is Japanese Rei Higuchi, where he won gold, he is also a silver medalist at the 2016 Rio de Janeiro Olympic Games. The Paris Olympic Games were different in that due to the political situations in the world, our Russian national team did not take part in the games. But our legionnaires representing other countries, such as Uzbekistan, Bulgaria, Bahrain and others, performed. In this regard, we conducted a study of the competitive activities of the winner of the Olympic Games in the 57 kg weight category.

Objective of the study is to analyze the competitive activities of freestyle wrestler Rei Higuchi.

Methods and structure of the study. Pedagogical observations of competitive activity were conducted and an analysis of video materials of competitive activity of a freestyle wrestler based on the results of performance at the Olympic Games in Paris was presented. The object of observation was the 2024 Paris Olympic Games in freestyle wrestling. Four bouts of the wrestler were analyzed: 1/8, 1/4, 1/2, final. The analysis used the method and tables proposed by V.V. Efremov and M.G. Kolodeznikova [2].

Results and conclusions. We present an analysis of the technical actions of

Analysis of technical and tactical actions of freestyle wrestlers. Name of the competition: Olympic Games. Stage: . Place and date: Paris (France) 09.08.2024. Weight category: 57. Score of the fight 12:2 (10:1; 2:1). The opponent of the Japanese Darian Cruz fights from a distance and constantly jerks his opponent, making deceptive passes to the legs. This is inconvenient for the Japanese and he tries to reduce the distance by resting his head, he starts in his manner – fighting for the wrist, and in this position he has prepared actions when the opponent takes the wrist or holds it himself. The Japanese has a left stance. The first move of the Japanese is a pass to the legs, Cruz meets, takes a headlock and makes a "light bulb" move, the Japanese defends himself, covers his opponent and takes 2 points, takes his legs and makes a "cross" – the score is already 4:0, the wrestlers are in a standing position, the fight continues, the Japanese shows his signature side pass, Darian throws his legs back and at that moment moves his hand to the other

Table 1. Analysis of the technical and technical characteristics of freestyle wrestlers in the quarter finals in the weight category up to 57 kg

Technical actions (TA): Total number of TA		Red corner (full name): Rei Higuchi (JPN), born in 1996						Blue Corner (Full Name): Darian Cruz (PUR), born in 1995					
		Evaluated by judges in opponent's points			Not rated	Efficiency for the period (V %)	Total number of TA	Evaluated by judges in opponent's points			Not rated	Efficiency for the period (V %)	
		1	2	4				1	2	4			
Protective		1 period											
	In the rack	1		1(0:54)			100	1				1(0:21)	
	On the ground												
		2nd period											
	In the rack	1				1(0:06)	0						
	On the ground												
		TOTAL											
Total for 1 period		1		1			100	1				1	0
Total for period 2		1				1	0						
Total for the fight		2		1		1	50	1				1	0

side, thereby transferring the wrestler to the ground, lifts the opponent's left leg and takes his right leg in scissors, rolls the opponent and the fight stops outside the mat area, the score is 10:0. Cruz does not agree with the score and protests – the score is revised. The protest is satisfied, 1 point is awarded to Cruz. The first period ends with a score of 10:1. The second period Cruz passes to the legs, the Japanese meets, takes a headlock and makes a "light bulb" move for 2 points, Cruz covers, goes behind the back and takes 1 point. The fight ends with a score of 12:2 in favor of the Japanese.

The semi-final fight of the athlete from Japan took place with the wrestler from India. In this fight, Ray wins against the opponent in the first period with the score 10:0, the fight begins from a distance, Ray does not give the opponent led holds, the fight is for the hold of the wrist. If the opponent tried to break the distance and go for a hold, then Ray made a feint in the leg pass and thus, when the opponent threw back his legs, took the distance and began the fight with the wrist. The first technical action is a 4-point technique "Poker" performed by the Japanese. Then the signature side pass and he takes another 2 points. The wrestlers stand in a stance, the fight for the wrist continues and Ray makes a false transfer, thus letting the opponent know about a possible technique, the fight continues, the Indian takes the hold of the wrist and at this moment the Japanese makes a false transfer, and when the opponent countered, makes a side pass to the leg and transfers to the ground, taking the opponent's hand, makes a roll for 2 points, goes to the final. Ray understood his opponent's strong point (stamina) and correctly developed a tactical plan for the fight.

The final fight between the Japanese wrestler and the American wrestler, with a score of 4:2. American Spencer Lee is a wrestler with physical strength and a tough attacking style. The first two minutes, Rey tries to make an action, shows activity. The American is well prepared for the Japanese's signature side pass, three attempts to pass were unsuccessful. Activity time is given to Lee, the first attempt at action is a pass to the legs, Rey throws his legs away, Lee switches to a hold from under the arm and pushes him out of the mat, earning 1 point. Standing position, the fight continues, in the last seconds, another pass from Higuchi, but Lee again throws his leg away and on a counterattack pushes his opponent out for another point. The first period ends with a score of 2:0. The second period, Higuchi does not intend to stop and does not allow the hold to his opponent, realizing that the opponent is well defending against the side pass, Rey passes with both legs and in a strap rolls the opponent onto his shoulder blades – earns 2 points. The fight continues, Rei does not fight passively, he pulls, makes deceptive actions, thereby breaking the onslaught of the opponent. He gives up his head twice and, having chosen the right tactics, goes out of the mat on his knees, and the action is not assessed. The American takes a risk in the last seconds, tries to make a throw and gives 2 points. The fight ends with a score of 4:2 in favor of Rei Higuchi.

The described fights are an interesting example of freestyle wrestling, where technical techniques, tactics and physical training play a key role. In the first fight, the Japanese showed mastery in defense and execution of techniques, which allowed him to dominate the opponent. In the second fight, Rei demonstrated good technique and the ability to use the weaknesses of the opponent, which led him to victory. In the final, Rei faced a strong American who was well prepared for his attacks. However, thanks to activity, correct tactics, as well as the ability to reveal the opponent, Rei was able to win.

Key points to note:

1. Technique: The Japanese wrestler demonstrated high technical preparation, especially in the area of defense and performing complex techniques such as the "poker" and refined "side passes to the legs".

2. Tactics: In each bout, the wrestlers used different strategies to counter their opponents. For example, Rei used escape techniques, feints, and false attacks to disorient his opponents and create opportunities for attacks.

3. Physical preparation: Physical strength and endurance also played an important role. This was especially noticeable in the final bout, where both wrestlers demonstrated a high level of physical preparation.

All these elements together make wrestling an exciting and dynamic sport, where each match is unique and requires maximum concentration and skill from the athletes.

Conclusions. By analyzing the wrestler's competitive activity, it was determined that at the 2024 Olympic Games, wrestler Rei Higuchi performed technical actions in a standing position – 63.6% of the technique, on the ground – 36.3%, and that 2-3 technical actions prevail in the composition of the competitive technique. Rei does not have many technical actions, but he has clearly honed techniques that he uses, al-

ternating during the fight: a side pass, if he is defending himself, a transfer to the other side, or a transfer to the left hand and a pass to the right side leg. And a pass to two legs. Deceptive actions plus a technique. Disorients the wrestler, jerking in two directions. The wrestler's stance does not change. Does not allow a hold, always works with the wrist, controlling the head. And dictates his own manner of conducting the fight.

Analysis of technical actions allowed us to collect a good methodological database that will be useful to coaches, athletes, for improving the training process.

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Relationship between neurophysiological characteristics and efficiency of personal tactical manipulations of basketball players of different skill levels

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Abstract

Objective of the study is to establish the influence of psychophysiological abilities on the effectiveness of individual tactical actions of basketball players of various qualifications.

Methods and structure of the study. During 2024-2025, using pedagogical observations of competitive activities, quantitative and qualitative characteristics of individual tactical actions and psychophysiological abilities of young and qualified basketball players were studied, using the hardware and software complex "NS-Psychotest". Using correlation analysis, the matrix of relationships between the indicators under consideration was substantiated and their influence on each other was established.

Results and conclusions. A strong (at the level of r=0.800 and more) relationship between psychophysiological abilities and the effectiveness of individual tactical actions of young and qualified basketball players was established. An effective way to improve individual tactical skills is the use of training tools that ensure the development of cognitive abilities of young and qualified basketball players.

Keywords: *sports games, basketball, young and skilled athletes, individual tactical actions, psychophysiological abilities, methods of current and stage control, special training equipment.*

Introduction. Long-term training of sports reserves and qualified athletes in basketball is constantly associated with the search for the most effective approaches to ensure the successful development of sports skills. Individual tactical actions are the component that determines the effectiveness of the game of both young and qualified basketball players during competitions [1, 3]. According to a number of experts [4, 5], the effectiveness of individual tactical actions of athletes in basketball is influenced by many factors, including psychophysiological abilities that determine the cognitive sphere of activity, which are of decisive importance.

To determine the degree of influence of the level of development of psychophysiological abilities on the effectiveness of individual tactical actions of basketball players of various qualifications, it is necessary to conduct special studies with the involvement of modern instrumental methods, pedagogical observations and mathematical analysis [2]. Generalization of literary sources showed that to date, such studies have not been conducted by domestic specialists.

Objective of the study is to identify the relationship between psychophysiological indicators and the effectiveness of individual tactical actions in young and qualified basketball players.

Methods and structure of the study. The scientific work was carried out over the course of one year, from June 2024 to May 2025. Young basketball players of the MBU DO "Sports School No. 2" (Smolensk) aged 14-15 years took part in the study. Qualified players were represented by the student basketball team "Akademsport" (Smolensk) of the Federal State Budgetary Educational Institution of Higher Education "Smolensk State University of Sports (SSUS)". Registration of quantitative and qualitative indicators of in-

dividual tactical actions in attack and defense among young and qualified basketball players was carried out using pedagogical observation, which was carried out during the games of the championship of the central federal district of the School Basketball League "KES-BASKET" among young men's teams (Smolensk, March 10-14, 2025) and the regional cup of the ASB Championship (Saratov, April 25-27, 2025). Psychophysiological abilities were assessed in laboratory and training conditions of the above subjects using the hardware and software complex "NS-Psychotest", which allows determining the time of simple and complex visual-motor reactions, attention, perception, memory and thinking, determined by the cognitive capabilities of the players.

All the obtained indicators were subjected to paired correlation analysis using the Pearson method. This method made it possible to establish relationships and determine the degree of influence of variables from two different sample populations representing individual tactical actions and psychophysiological abilities of young and skilled basketball players. The established relationships determined the directions for choosing training tools that ensure an increase in the skills of basketball players.

Results of the study and their discussion. Correlation analysis revealed that psychophysiological abilities determine the achievement of high performance of individual tactical actions of young and skilled basketball players (see table). It was found that high speed of simple (SVMR) and complex (CVMR) visual-motor reaction ensures high efficiency of performing a feint with an accelerated jerk to the side in competitive activity when performing a throw-pass-throw combination with aggressive resistance of the opponent (FRKAS) – r=0.943 and 0.892, respectively.

A strong relationship between the SVMR and CVMR indicators was established with the efficiency of performing an accelerated average pass of the ball with one hand from the shoulder to the side during movement (UPD) – r=0.883 and -0.829, as well as an accelerated average pass forward in a static position (UPS) – r=0.717 and -0.786, respectively. It should be noted that high values of volume (OV) and distribution (DD) of attention have a positive effect on achieving high performance in the implementation of UPD – r=0.837 and 0.901, as well as UPS r=0.873 and 0.739, respectively, in the process of competitive activity of young and qualified basketball players.

High speed of attention switching (AS) determines the achievement of maximum performance in competitive conditions of accelerated dribbling to the right and left with the dribbling of an aggressive resisting opponent (UVOA) – r=0.782 and one-handed throw from the shoulder from the middle distance at an angle to the shield in a jump with the inert resistance of the opponent (BPIS) – r=0.774.

It should be noted that attention switching greatly affects the performance of accelerated average pass of the ball with one hand from the shoulder to the side while moving (UPD) – r=-0.809 and accelerated average pass forward in a static position (UPS) – r=-0.783. The speed of perception (SV) of young and skilled basketball players determines the achievement of high efficiency in executing an accelerated one-handed jump shot after moving from a close distance near the backboard with aggressive resistance from the opponent (UBPBA) – r=0.833, a feint with an accelerated jerk to the side when executing a throw-pass-throw combination with aggressive resistance from the opponent (FRKAS) – r=- 0.722 and an accelerated pick-up of the ball from a place with a push of two feet at an angle to the backboard of a ball that has bounced close and quickly off the backboard with direct aggressive resistance from the opponent (UPBA) – r=0.784.

The speed of perception greatly affects the efficiency of execution in competitions of young and skilled basketball players – accelerated dribbling to the right and left with dribbling an aggressive resisting opponent (UVOA) – r=- 0.917. A strong correlation was established between the indicators of short-term memory (STM) and the performance of uniform forward dribbling with dribbling and transferring the ball in front of oneself at a short distance (RVB) – r=0.727 by young and skilled basketball players during competitions.

Also, short-term memory and mental operations of analysis (MOA) determine the achievement of high performance in competitions of young and skilled basketball players of the FRKAS – r=0.882 and -0.793, respectively. It was revealed that short-term memory greatly affects the effectiveness of the UPBA indicators – r=-0.793, and mental operations of analysis on UBPBA – r=0.805 in the competitive activity of young and skilled basketball players.

Conclusions. The effectiveness of individual tactical actions in attack and defense in young and skilled basketball players is determined by achieving

a high speed of simple and complex visual-motor reactions, volume, distribution and switching of attention, speed of perception, short-term memory and mental operations of analysis. Thus, it is necessary to introduce a methodology of current and stage control into the training process of basketball players, as well as include special training tools that ensure the effective formation of individual tactical actions of athletes taking into account the psychophysiological component.

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Optimization of speed qualities in sprinters in the sensitive period of 14-17 years

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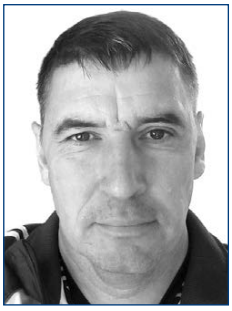

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Abstract

Objective of the study is to substantiate a training methodology that takes into account age-related characteristics for maximum potential of athletes.

Methods and structure of the study. The methodology includes an analysis of modern approaches, such as the development of explosive strength (squats, lunges), improvement of running technique (correction of posture, step rhythm) and reaction training (variable starting signals). Physiological aspects are considered, including hormonal changes (testosterone in boys, estrogen in girls), development of the nervous system and genetic predisposition to fast muscle fibers, as well as psychological factors – motivation and stress resistance.

Results and conclusions. The analysis showed that the sensitive period opens up wide opportunities for the development of speed qualities due to the high adaptability of the neuromuscular system. A combination of strength exercises, technical work and starting training significantly improves the indicators. It is necessary to balance loads and recovery, individualize programs and integrate psychological preparation for stress management.

The implementation of adapted plans should be combined with alternating phases and monitoring of the physical condition. Thus, an integrated approach that combines physical development, technical improvement and psychological support is essential for the successful preparation of sprinters and can be used in youth sports to optimize training and minimize the risk of overload.

Keywords: *speed, sprinters, sensitive period, speed training, running technique, age-related characteristics, revealing the potential of athletes.*

Introduction. In modern sports, the age of 14-17 years is a critical period for the preparation of young athletes, characterized by significant physiological and psychological changes. This sensitive period provides unique opportunities for the development of physical qualities, especially speed of movement, which is critical for sprinters [6].

The relevance of the study lies in the high ability of the body to adapt and master complex motor skills during this age period. Developing training methods taking into account the age characteristics of athletes allows us to maximize their potential. Errors in the training process can have long-term negative consequences for athletic development [8].

Objective of the study is to substantiate the training methods for developing speed in sprinters aged 14-17 years, taking into account their age characteristics.

Methods and structure of the study. The study is based on a theoretical analysis of scientific and methodological literature in four types of training methods: traditional strength (TTG), functional coordination (FTG), combined (CTG) and aerobic endurance (VO_{2max}), age physiology and sports psychology [1], and also includes an experimental study that provides for pedagogical observation of the training process, testing of athletes' physical qualities, analysis of running technique and monitoring of functional state. Theoretical methods include analysis of scientific literature, generalization of best practices and modeling of the training process. Empirical methods cover pedagogical testing, chronometry, video analysis of running technique and methods of mathematical statistics [2].

The organization of the training process is based on several key areas. Particular attention is paid to the

development of explosive strength through the performance of squats, lunges and deadlifts. An important component is the improvement of running technique, including work on posture and step rhythm. Training of starting reactions and development of coordination abilities are also an integral part of the program. Periodization of loads provides for alternation of intensive training with recovery periods, gradual increase of load taking into account individual characteristics of athletes [4].

The control and assessment system includes several components. The physical condition of athletes is assessed through testing of speed qualities, assessment of strength indicators, monitoring of flexibility and coordination. Technical improvement is monitored through video analysis of running technique, correction of motor actions and assessment of the effectiveness of exercise performance. Psychological preparation is monitored through assessment of the level of motivation, stress resistance and emotional stability [5].

The study is conducted in three stages. During the preparatory stage, subjects are selected, initial testing is conducted, and training programs are developed. The experimental sample included adolescents aged 14 to 17 years, divided into four groups (12 people in each): TTG, FTG, CTG, and a control group (CG) that did not undergo special training. The duration of the experimental cycle was 8 weeks. The main stage is characterized by the implementation of the experimental methodology, regular monitoring of the results, and adjustments to the training process. The final stage includes final testing, analysis of the data obtained, and the formulation of conclusions and recommendations [7].

The criteria for evaluating the effectiveness cover several areas. Physical indicators are assessed by the reaction time to the starting signal, speed over short distances, and explosive strength indicators. Technical parameters are analyzed through the quality of the starting movement, the stability of the running technique, and the efficiency of the arms and legs. Psychological characteristics are assessed by the level of motivation, ability to concentrate, and emotional stability [3]. The developed research methodology allows for a comprehensive study of the process of speed development in young sprinters, taking into account their age characteristics and individual characteristics, which ensures reliable results and the possibility of their practical application in the training process.

Results and conclusions. The conducted studies allowed us to identify key features of speed development in sprinters aged 14-17 years. Analysis of the dynamics of indicators during an eight-week training cycle allowed us to evaluate the effectiveness of functional, strength and combined programs presented in the table below [9].

Main results of the analysis of training results

Group	Δ Time 30 m (%)	Δ Explosive power (%)	Δ Coordination (%)	Δ VO_{2max} (%)
CTG	–4.71	+8.93	+4.10	+4.32
FTG	–0.92	+1.10	+4.40	+1.85
TTG	–2.18	+1.43	+1.02	+0.74
CG	–0.15	+0.11	–0.04	+0.10

Physiological aspects have shown that this period is characterized by increased excitability of the nervous system and significant hormonal changes: testosterone levels increase in young men, and estrogen levels in young women. These factors directly affect the development of speed qualities.

The introduction of a comprehensive training method has demonstrated high efficiency, the average time to run a 30-meter distance from a low start has decreased by 4.71%. The combination of strength exercises with stretching and flexibility has significantly improved explosive strength, this indicator has increased by 8.93%. Start reaction training using variable signals has significantly reduced the reaction time to the start signal.

Working on running technique through correcting posture and step rhythm has minimized energy loss. The use of video analysis to correct technical errors has shown high efficiency.

Research has confirmed the important role of psychological factors: motivation and stress resistance significantly influenced the results. Alternating intensive training with recovery periods ensured optimal adaptation of the nervous system and muscles. Taking into account genetic predisposition when developing programs allowed us to achieve better results in athletes with a high percentage of fast muscle fibers.

Conclusions. Based on the obtained research results, practical recommendations were formulated for the implementation of adapted training plans taking into account the age characteristics of athletes, periodization of loads and recovery, regular monitoring of physical condition, the use of video analysis of

running technique and the integration of psychological training.

The study confirmed that an integrated approach to developing speed in young sprinters, taking into account physiological, technical and psychological aspects, is the most effective. The sensitive period of 14-17 years provides unique opportunities for forming the basis of physical fitness, including the development of strength, coordination and reactions.

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Analysis of the biomechanics of muscle activity of the lower limbs using a contact LED platform

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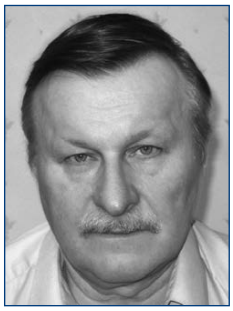

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Abstract

Objective of the study is to evaluate the biomechanical characteristics of the lower limb muscles using a contact LED track.

Methods and structure of the study. The study involved 215 high-level athletes (both genders, from masters of sports to masters of sports of international class), as well as young football players aged 16 to 18. The subjects performed three types of vertical jumps, pushing off with both feet: a jump from a half-squat position; a jump with a preliminary squat; a jump with a squat and using a swinging motion of the arms.

Results and conclusions. The analysis of the relationship between the height of jumps from a half-squat position and the indices of isokinetic dynamometry revealed that the correlation indices (r) between the height of jumps and the specific moments of force of the quadriceps femoris muscle, measured at an angular velocity of knee extension of 60 degrees/sec, vary from 0.5 to 0.9, depending on the specifics of the sport. The use of elastic properties of muscles by means of a preliminary squat and a reactive impulse from arm swing movements provides an increase in the height of jumps by an average of 30.4±8.6% compared to jumps performed from a half-squat position.

The highest values of the coordination coefficient (CC) are noted in athletes involved in cycling (CC> 15%). In football players and cyclists, the coefficient of elasticity (CE) exceeds the similar indicator in speed skaters and skiers (among men) by 2-3 times. In female athletes, the potential for elastic energy accumulation does not exceed KE<7%.

Keywords: *biomechanics of vertical jumps, elastic forces, reactive forces, coordination, reactivity index, biomechanical characteristics of lower limb muscles, contact LED track.*

Introduction. Vertical jumps are the most commonly used tests to assess lower limb muscle strength (LEM) and anaerobic power in various sports [4]. Jump height is used to assess the physical fitness of various population groups that differ in age, gender, and training [7]. In some sports, vertical jump is used to predict results [6, 9], and also allows determining the explosive power of the LEM muscles, the state of the elastic corset of the LE muscles, coordination abilities, speed-strength endurance, and the reactivity index [1, 5, 8]. The main methods for assessing the height of vertical jumps are calculations based on the force impulse recorded on a force platform or on the flight time [2].

Objective of the study is to assess the biomechanical characteristics of the lower limb muscles using a contact LED track.

Methods and structure of the study. The study involved 215 highly qualified athletes (MS-MSMK), as well as youth football players from various Moscow clubs (Table 1). The vertical jump height (H) was estimated by the flight time. Contact mats of the MuscleLab system (Ergotest Innovation AS, Norway) and an experimental sample of the contact LED track (ES-CDT) were used. The 90 cm wide bars were installed at a distance of 3 m from each other so that there were no foreign objects in the LED field [8].

Jump tests were conducted at training camps, as well as at the Federal State Budgetary Institution Federal Scientific Center of Physical Culture. During testing at the Federal State Budgetary Institution Federal Scientific Center of Physical Culture, the speed-strength manifestations of m. quadriceps were additionally estimated on the Biodex System 4 Pro dynamometer (Biodex Medical Systems Inc., USA) in the angular velocity range of 300-60 deg/s. The vertical jump height was estimated using the formula:

$$H = g\frac{t_{ПОЛ}^2}{8} = 1{,}226 * t_{ПОЛ}^2$$

where g is the acceleration of gravity, g=9.81 m/s^2; is the flight time (s).

The athletes performed three types of vertical jumps with a push-off with both legs: 1) from a half-squat position - knee joint angle of 90° - hands on the waist (PP); 2) vertical jump with a squat with hands on the waist (PSP); 3) vertical jump with a squat with arm swing (PSMR). The recovery of potential energy by the "elastic corset" of the NK muscles (elasticity coefficient - EC) was determined by the formula:

$$КЭ = \frac{(H_{ПСП} - H_{ПП})}{H_{ПП}} * 100$$

where Нпсп – height ПСП, cm; Нпп – height ПП, cm.

The coordination coefficient (CC) was determined by the formula:

$$КК = \frac{(H_{ПСМР} - H_{ПСП})}{H_{ПСП}} * 100$$

where $H_{псмр}$ – height ПСМР, cm; $H_{псп}$ – height ПСП, cm.

Results and conclusions. Five phases can be distinguished in the vertical jump: 1) the vertical component is equal to the body weight (initial position); 2) squat, when the subject flexes the NK at the joints - the vertical component (Rz) is less than the body weight; 3) push-off, when Rz initially increases and then decreases to zero upon separation from the support; 4) flight phase; 5) landing – Rz upon contact with the support increases sharply and exceeds the body weight by 2 or more times [1]. The second phase of the jump (squat) is performed in the eccentric mode, when due to rapid flexion in the NK joints, the parallel and sequential elastic structures of the muscles are lengthened ("elastic corset"). Additional elastic forces appear, as a consequence of this – the height of the PSP is on average higher than the height of the jump from the PP in men by 4.7±2.5 cm, in women by 1.9±0.8 cm (Fig. 1).

The maximum increase in the height of jumps with a squat in relation to the height of the jump from the PP position in male skiers is 9 cm and in female skiers – 2.8 cm. The highest height of the PSP is recorded in speed skaters 51.4±7.4 cm, the lowest in rowers and football players 39.3±4.4 and 36.2±4.7 cm, respectively. Similarly, in female speed skaters, the height of the PSP is 43±7.8 cm, the lowest value of the PSP height in female skiers is 26.5±3.5 cm (Fig. 1). If the jump is performed with an arm swing, the vertical support reaction in the push-off phase increases not only due to the elastic forces of the NK muscles in the squat phase, but also due to the reactive forces that arise during the arm swing, which contributes to the recruitment of additional motor units and, as a consequence, an increase in the push-off force impulse

Table 1. Subjects

Sport	Qualification	Gender, number of subjects, n	Age, years	Body length, cm	Body weight, kg
Cycling (track sprint)	HMS MSMK	M (n=6)	26±3	176±3,5	85,3±7,6
BMX cycling	MSMK MS	M (n=12)	23±4	182,4±6,3	81,0±5,5
		Ж (n=9)	22±5	164,4±3,8	62,3±7,7
Cross-country skiing	HMS MS of International Class MS	M (n=10)	23±4	179,8±6,2	72,5±6,7
		Ж (n=27)	17,7±4	168,0±3,4	60,6±4,7
Skating	HMS MS of International Class MS	M (n=37)	24±6	182,1±5,2	79,2±6,9
		Ж (n=33)	23±7	169,0±6,1	63,3±7,7
Rowing academic	MSMK MS	M (n=30)	22±6	192,3±8,2	89,2±11,2
Football	U16	M (n=51)	16±1	177,9±7,0	71,4±1,3

and jump height [1]. The highest VSR height was recorded in cyclists (BMX discipline) 59.8±10.0 cm, the lowest – in rowers and football players 45.0±5.4 and 43±5.7 cm, respectively. In women, the maximum VSR height is 48.1±7.9 cm (speed skaters), the lowest VSR 31.0±3.5 cm in ski racers (Fig. 1).

The vertical jump from the PP is performed with an amplitude in the knee joint of 85-90° (the initial angle is about 90°, the final angle is 175-180°). The jump height

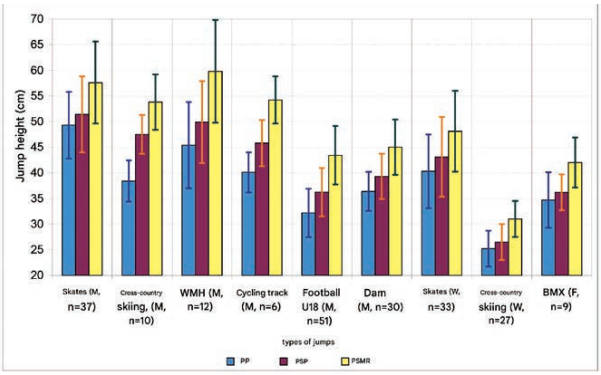

Fig. 1. Average value of the jump height in different sports

depends on the initial takeoff speed – the point at which the feet are torn off the support. Since the initial position of the subjects is standardized, the impulse of the repulsion force depends on the maximum force of the NK and the force gradient, the faster the athlete performs extension in the joints, the greater the vertical acceleration, and therefore the repulsion force. According to the electromyographic study, the main extensor muscles of the NK joints are involved in the PP: the gluteal group, the muscles of the anterior and posterior surfaces of the thigh and lower leg [1].

The univariate analysis of variance revealed reliable differences in the height of the jumps of the PP, PSP and PSMR depending on the type of sport. Therefore, for each sport, regression equations were calculated between the height of the jumps and the moments of m. quadriceps, recorded on an isokinetic dynamometer at angular velocities of 60-90 deg/s (M60 and M90, presented in Table 2). The type of regression equation was selected taking into account the coefficient of determination (R2). The highest statistical relationship was found between the moments of m. quadriceps, normalized to body weight and the height of the jump from a half-squat position. For example, for female speed skaters, the R2 values between the height of the jumps of the PP, PSP and PSMR and the moment of m. quadriceps are: 0.50; 0.43; and 0.45, respectively.

Fig. 2 shows the results of calculating the KE and CC using formulas (1), (2) and (3), respectively. The calculated coefficients of KE and CC in football players are 2 times higher than in speed skaters, which reflects the biomechanical features of the functioning of the NK motor apparatus in football conditions (the muscle "stretching-contraction" cycle): acceleration, changes in the direction of movement, martial arts and jumps. In speed skaters, the NK muscles work in the "isometry-concentric" mode with minimal accumulation of elastic forces (KE < 7% in both men and women) [3].

The NK muscles of football players work in the "stretching-contraction" mode, which has a positive effect on the ability to store elastic energy by the NK tendon-ligament apparatus, KE = 13.2% (Fig. 2). The ability to store elastic energy in women does not exceed KE < 7%. The highest level of coordination was recorded in male cyclists (BMX discipline). Compared to other sports, BMX cyclists use reactive forces arising during the PSM better than other athletes, which is confirmed by the high coefficient of CC = 20% (Fig. 2). In women, the maximum CC> 15% was recorded in cross-country skiing and BMX (Fig. 2).

Table 2. Regression equations for calculating normalized moments on the body weight of the knee extensor muscles depending on the height of the jump from a half-squat

Sport	Type of equation	Height, cm; M±m (median)	Correlation coefficient (r)
Cycling, sprint track (n=6), M	M60/ weight =1,2435*exp (0,0231**H*)	39,9±4,0 (38,5)	0,92
Cycling BMX, (n=12), M	M60/ weight =1,7619*exp (0,0121**H*)	40,8±8,9 (42,0)	0,72
Cycling BMX, (n=9), W	M60/ weight =2,0304*exp (0,008**H*)	41,1 ±8,8 (42,0)	0,56
Cross-country skiing (n=10), M	M60/ weight =0,701*exp (0,0037**H*)	38,0±3,5 (38,3)	0,77
Football (n=51), M	M90/ weight =1,8683*exp (0,0142**H*)	32,5±3,8 (31,9)	0,57
Speed skating, (n=37), M	M60 =120,1*exp (0,0161**H*)	49,3±6,5 (49,0)	0,65
Speed skating, (n=33), F	M60/ weight =1,5669*exp (0,0174**H*)	40,3±7,2 (40,4)	0,71

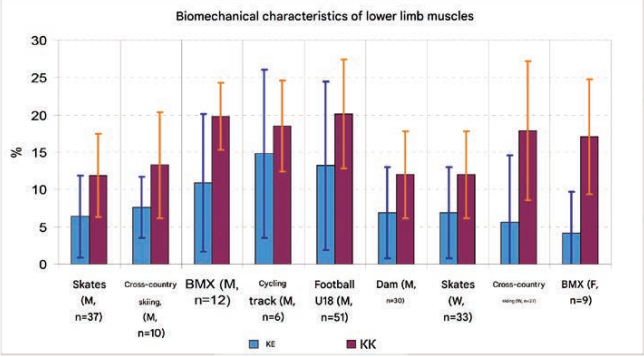

Fig. 2. Biomechanical characteristics (coefficients CE and CC) of the muscles of the lower extremities, calculated for vertical jumps

Conclusions. The contact LED track, which allows recording the height of upward jumps, is an accessible, inexpensive and informative tool that allows assessing various biomechanical characteristics of the NK muscles, for example, the maximum strength of the knee extensor muscles, the storage of elastic energy by the elastic corset of muscles, the level of coordination.

Comparison of the height of jumps from a half-squat with the results of isokinetic dynamometry showed that the correlation coefficients between the height of jumps and the normalized moments of m. quadriceps at an angular velocity of 60 deg/s in various sports are in the range of $0.5<r<0.9$.

In men, the jump height when using the elastic properties of muscles (due to the squat) and reactive forces (due to the arm swing) in relation to jumps from a half-squat increases by 16.8%, 40.1%, 31.7%, 35.2%, 34.9%, 23.7% (speed skaters, cross-country skiers, cyclists, football players, rowers, respectively).

In women, the elastic and reactive forces that arise when squatting and swinging arms increase the jump height by: 19.4%, 23.0% and 21.0% (speed skaters, cross-country skiers and BMX cyclists, respectively).

High CC>15% were recorded in cyclists (men and women, Fig. 2). The “stretch-contraction” mode of muscle-tendon complexes has a positive effect on the ability to store elastic energy. Thus, in football players and cyclists (track and BMX disciplines) this potential is 2-3 times higher than in speed skaters and skiers (men). In women, the potential for storing elastic energy in the muscles of the lower extremities is <7%.

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Methods of control of vertical jump distance in sports

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Abstract

Objective of the study is to evaluate the degree of reliability and appropriateness of using methods for determining the jump height of athletes based on theoretical analysis and generalization of practical experience.

Methods and structure of the study. A theoretical review of the available literature was conducted, as well as pedagogical testing: measuring the vertical jump height of forty athletes specializing in various team sports. In addition, dynamometric measurements of jump characteristics were carried out using a computerized data processing system synchronized with high-speed video recording.

Results and conclusions. The variety of existing methods for determining jump height indicates their applicability in various sports disciplines, since each of them meets the needs of a specific sport. However, comparing the results obtained in different sports areas seems unjustified without unifying the measurement methods. The difference in accuracy due to the use of different methods can reach 30-40%.

Due to the lack of uniform standards for determining jump height, in practice jumping ability is often assessed as a specific skill characteristic of a certain sports specialization, and not as a general physical characteristic. The most accurate and objective way to determine the true jump height is dynamometry, which allows excluding the influence of specific skills and abilities inherent in specific sports.

Using only age, gender and qualification standards is insufficient due to the significant variability of this indicator within homogeneous groups of athletes. When monitoring and assessing jumping ability, it is advisable to take into account the anthropometric data of athletes, in particular their height, as well as their playing role, as is customary in some team sports.

Keywords: *jump height assessment, agility, speed-strength abilities, standardization of measurement method.*

Introduction. The “Upward Jump” test is included in the Federal Standards in many sports. Considering the importance of monitoring speed-strength abilities, a number of sports theorists, in particular, Yu.V. Verkhoshansky, more than 50 years ago proposed to consider jumping ability as an independent sixth physical quality, compatible with the five generally accepted in the theory and methodology of physical education [3, 5].

In practice, most often it is not the height of the rise of the GCM (general center of mass) of the human body that is measured, which follows from the definition of potential energy in classical physics, but the ability to reach the highest point in a jump is assessed. In this version of measurement, in addition to speed-strength abilities, special jumping agility also acquires special significance.

Even in track and field, where the problem of standardizing the measurement of jump height has been solved today, and is determined by the height of the bar that the athlete has overcome, it is impossible to attribute the abilities of an athlete only to speed-strength, since the special gift of the jumper to “flow around” the bar plays a huge role. A striking example of this is the Fosbury Flop jump, where the trajectory of the athlete’s body center of mass passes below the height of the bar.

In most cases, when determining the “jump height”, the measurement method is not specified, but only the

regulatory requirements for the test results are given, which does not allow for an objective comparison of the test results of athletes, especially for different sports specializations. Many researchers have drawn attention to this problem, and the discrepancy in the measurement results associated with the use of different methods reaches 30% [6].

The complexity of the situation is that sports theorists do not have a consistent understanding of the most important characteristics of athletes' jumping ability, especially in different sports. In addition, the standards do not provide uniform requirements for the methods of measuring the most important characteristics of a jump. As a result, jumping ability, in our opinion, should be interpreted as a complex specific skill that is qualified by the ratio of a number of components in a complex interaction: strength, speed, endurance and special agility.

The purpose of the study is to evaluate the degree of reliability and feasibility of using methods for determining the height of jumps of athletes based on theoretical analysis and generalization of practical experience.

Methodology and organization of the study. Theoretical analysis of information sources, pedagogical testing (assessment of the height of jumps of 40 athletes involved in various types of sports games), dynamometric studies of jumps using a computerized information processing system with accompanying high-speed video filming were conducted.

Results of the study and conclusions. The considered variety of methods for measuring jump height indicates that they all have a right to exist, since they reflect the needs of a particular sport, but conducting a comparative analysis of test results in different sports specializations becomes incorrect without standardization of methods for measuring jump height. The fundamental measurement error by different methods can reach 30-40%. The lack of standards for the method of measurement leads to the fact that in sports practice jumping ability is most often measured as a special skill inherent in a certain sports specialization, and not what is called "jump height". The most reliable and fundamentally correct method for determining the jump height is the dynamometry method, which allows you to exclude specific skills and abilities of various sports specializations.

The height of the rise of the GCM from the standpoint of classical physics is an indicator reflecting the reserve of potential energy of the body. According to this classical definition, the jump height is estimated by the value of the change in the vertical coordinate of the GCM of the athlete's body from the position of the main stance to the highest point of the trajectory of its movement.

The obvious difficulty with this approach is due to the fact that the human body cannot be modeled by a point mass, and the GCM of the body is a virtual point, the position of which depends on the pose and on the mass-inertial characteristics of the links of the human body when performing a jump.

Today, depending on the technical support and preferences of sports practitioners, at least seven approaches or methods are used to determine the jump height, which have their own characteristics.

Video recording. Allows to determine the value of vertical movement of a certain reference point (marker). The method is labor-intensive, requires qualified personnel and compliance with a number of conditions for high-quality video filming. The fundamental disadvantages of this method can be considered the displacement of markers due to the mobility of the skin of the body or clothing of the athlete, and the main disadvantage is the impossibility of accurately determining the true position and corresponding movement of the body's CM, which is only indirectly related to the position of the markers on the body.

Abalakov's method (mechanism). A widely known method based on the use of a measuring tape and a device for unwinding/holding it. The fundamental disadvantages of this method include: low measurement accuracy, possible displacement of the fixing belt on the athlete, to which one end of the measuring tape is attached, the need to control the verticality of the jump, and most importantly - the impossibility of determining the true vertical movement of the body's CM.

"Marking on the wall". A fairly simple and well-known method based on measuring the distance between marks left by an athlete on the wall with an arm extended upwards, while in the basic stance and at the top of the jump. The method is characterized by low accuracy, dependence of the result on the flexibility of the body, the tilt of the body towards the wall, and the impossibility of determining the true vertical movement of the body's CM.

Stance with shifting plates (Vertek's method). This is a specific testing method widely used in team sports. The method is characterized by low accuracy, dependence of the result on the degree of joint mo-

bility, the tilt of the body and the professional skills of the athlete, therefore, the possibility of determining the true vertical movement of the body's CM is also excluded.

"Light crossbar" (Meskin's method). The testing method resembles "marking on the wall", but the measurement process is automated due to vertically located optocouplers, for example, OptoJump-next rails. The athlete jumps in the crossbar between the emitter and the receiver. The method is characterized by low measurement accuracy determined by the discreteness of the optocouplers' arrangement. The test result depends on the mobility of the joints and the professional skills of the athlete, and also excludes the determination of the true vertical movement of the body's CM.

Measuring the flight phase time. The measurement method is widely known and is characterized by high efficiency, allows testing not only single jumps, but also measuring jumping endurance by the parameter of decreasing the height of continuous jumps as fatigue occurs. The fundamental disadvantages of the measurement method include the requirement to land strictly on straight legs, and this testing method does not take into account the individually variable height of the rise on the toes, which does not allow monitoring the true vertical movement of the body's CM.

Dynamogram of the support reaction when performing an upward jump from a stationary platform. The method is also widely known and has been developed in detail in sports pedagogy. This is the only method that allows objectively monitoring the jumping ability of an athlete, since the testing measures the true vertical movement of the athlete's body's CM regardless of any external factors.

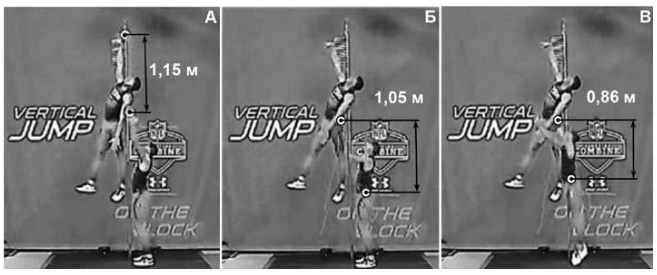

Illustration of different ways to measure jump height [2]

Evaluation of possible methods for monitoring jump height. The difference in measurement results is clearly illustrated by the analysis performed by A. Bulakhov [2], where the author describes in detail the "errors" in measuring the jump height of the NBA league leader, basketball player Byron Johnson, during the course of the next pre-draft tests.

The figure shows the following options for measuring jump height:

A – the athlete reaches for the plates installed on the stand with an outstretched arm (Vertek method); the movement of the arm from the position of the main stand to the highest point of the arm's movement trajectory is measured;

B – the athlete performs a jump similar to option A, but the movement of the marker installed on the point of the conventional CM of the human body is measured, which eliminates the additional error (10 cm) associated with the mobility of the shoulder girdle;

B – the athlete performs a vertical jump, and the time of the flight phase is measured, which begins with the "raised toes" position, which conditionally reduces the jump height by another 19 cm.

How can the true jump height be measured and how can the resulting fundamental errors be eliminated?

It was noted above that the only fundamentally correct way to determine the magnitude of the displacement of the human body's CM from the basic stance position to the point of maximum rise of the CM's trajectory is to analyze the repulsion dynamometer, which allows one to determine the maximum potential energy characterizing the jump height. This method is significantly complicated by the fact that the human body cannot be represented as a point mass, since it is a multi-link system with variable elastic connections and the presence of internal forces that change the configuration and shape of the body [1].

Any vertical component of the repulsion force, which according to the third law of mechanics is registered by the dynamo platform as a vertical component of the support reaction force, increases the jump height. The mechanisms of the increase in the height (vertical displacement) of the body's CM lift above the support are different: lifting the head, shoulder girdle and arms in the push-off phase "raises" the CM position relative to the vertical coordinate in the main stance by 10-15 cm, lifting the body onto the toes at the end of the push-off "shifts" the CM even higher up to 20 cm, therefore the flight phase of the jump begins with an "elevation" caused by a change in the configuration and shape of the human body, which we called the pedestal [4].

The dynamometer chart gives a more reliable accuracy of determining the vertical coordinate of the CM departure before the body's take-off (the height of the pedestal) than the previously discussed methods, where there were many more random causes. In flight, a freely flying body is taken as a point mass and the vertical displacement is calculated in accordance with the laws of classical physics for uniformly accelerated motion in the Earth's gravitational field.

Conclusions. Based on the analysis of possible methods for assessing jump height, significant discrepancies in the indicators (up to 40%) were revealed depending on the measurement methods.

In order to optimize the control of athletes' jumping ability and increase the accuracy of assessing this quality, which is important for many sports, it is necessary to standardize the procedure for measuring jump height.

It seems advisable to take into account not only the age, gender, and qualification characteristics of athletes, but also the methods for assessing jump height when developing regulatory requirements for various groups.

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Swimming training using fins as a method of developing physical fitness of students studying in preparatory educational institutions of the Ministry of Defense of the Russian Federation

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Abstract

Objective of the study is to experimentally confirm the effectiveness of a specialized set of exercises for swimming with fins. This complex is aimed at improving the physical fitness of students studying in pre-university educational institutions under the jurisdiction of the Ministry of Defense of the Russian Federation.

Methods and structure of the study. To solve the problems, the following research methods were used: theoretical analysis and generalization of literary sources, survey, pedagogical observation, pedagogical experiment.

Results and conclusions. The analysis of the results showed that the average values of the exercises performed in the experimental group exceeded the similar indicators of the control group. Consequently, there is a positive trend in improving the strength and speed-strength characteristics of the experimental group participants, which indicates the effectiveness of the applied set of exercises in swimming training with the inclusion of finswimming elements. The conclusions made confirm the rationality of using elements of underwater swimming in practical classes on physical training of cadets within the framework of the discipline "Swimming". This is considered as an additional way to improve overall physical fitness, increase the level of development of speed, endurance, strength and coordination, as well as the formation of moral, ethical and volitional qualities necessary for the development of a sporting character in students in pre-university educational institutions of the Ministry of Defense of the Russian Federation.

Keywords: *swimming with fins, methodology, general physical training, special complex, development of physical qualities, improvement.*

Introduction. As of 2023, there were 32 educational institutions in the pre-university education system of the Russian Ministry of Defense: 11 Suvorov military schools; Nakhimov Naval School and four of its branches; 7 presidential cadet schools; 9 cadet corps. All pre-university educational institutions of the Russian Ministry of Defense are equipped with very good educational and material base for physical training, including flat structures, swimming pools, various sports complexes, etc. Since January 1, 2005, the Instructions on physical training and sports for Suvorov military, Nakhimov naval, military music schools and cadet, naval cadet, music cadet corps of the Russian Ministry of Defense have been approved and put into effect. In accordance with the instructions, physical education of students in pre-university general education institutions of the Ministry of Defense of the Russian Federation is an integral part of their education and upbringing. It includes: physical training, sports and health and recreational activities [3].

Much attention is paid to the physical training of students in pre-university institutions, because the graduates of these institutions in the overwhelming majority are candidates for admission to military educational institutions of higher education. Military applied swimming is one of the sections of physical training of military personnel. Swimming classes are aimed at developing the skills of competitive swimming, diving and providing assistance to a drowning person; developing general endurance; cultivating courage and determination, and for Nakhimov cadets additionally - the skills of diving in length and depth.

Teaching swimming, developing on its basis general and speed endurance, coordination, improving health indicators are an important task of the educational process of pre-university educational institutions of the Ministry of Defense of the Russian Federation. At the same time, underwater sports are becoming increasingly popular today. Underwater swimming, in turn, is a component of military-applied swimming. The variety of underwater swimming directions makes it attractive for systematic training.

One of the basic directions of underwater sports is swimming with fins. An important advantage of swimming with fins is the ability to significantly reduce the time of learning classical swimming without fins. The swimmer's ability to use his strength abilities in swimming can be significantly expanded with the help of various methodological techniques, which are based on the desire to bring strength training exercises as close as possible to swimming exercises, both in terms of the direction of impact and in time [2]. The inclusion of new elements of physical exercises in the program can contribute to the increase and improvement of the general physical qualities of students.

Objective of the study is to experimentally substantiate a special set of exercises for swimming with fins, which allows for a systematic impact on increasing the level of development of physical qualities of students of pre-university educational institutions of the Ministry of Defense of the Russian Federation, to prove its effectiveness and to introduce it into the educational process.

Methods and structure of the study. The study was conducted for 30 days at the Naval Cadet Military Corps. The experimental group (EG), consisting of 10 young men aged 15-16, trained 6 times a week for 90 minutes (40 minutes in the gym and 50 minutes in the water). Classes were carried out using the proposed set of exercises at the stage of the general preparatory period.

The complex was based on exercises in pairs, exercises with weights, exercises on exercise machines, swimming in different ways for different distances using separate fins, swimming with a board in separate fins, swimming in the basic position with a load using separate fins, swimming with weights, swimming using separate fins with resistance, swimming in competitive conditions using separate fins. The control group (CG) also consisted of 10 young men of the same age, trained 6 times a week, the duration of classes was 90 minutes. Classes were held according to the traditional method in accordance with the training program.

At the beginning of the experiment, preliminary testing was carried out in the control and experimental groups. For the study, the method of control exercises was used, selected according to the following principles: accessibility, compliance with the basics of the theory and methodology of physical education, high information content of the results of exercise performance [1].

Results and conclusions. Comparative results of the preliminary testing of the control and experimental groups are presented in Table. 1 and 2, formed on the basis of the statements of verification of the indicators of physical fitness of pupils.

Statistical processing of the experimental data of the initial testing did not show reliable differences between the results of the control and experimental groups. This proves that initially the pupils of the EG and CG were on average equal in the level of physical fitness.

After the experiment, final testing was conducted, which showed positive dynamics in the growth rates for all tests in the experimental group. The growth rate for the exercise "Squat" is 4.8% and the growth rate for the exercise "Long jump from the spot" is 0.5%, which indicates positive dynamics in the development of strength and speed-strength physical qualities of

Table 1. Results of preliminary testing of the experimental group

Exercises	Experimental group										Average value
	Luzin A.A.	Parinov D.R.	Parinov N.R.	Teslenko M.V.	Fomich B.S.	Shchablev N.V.	Terekhov D.D.	Urusov A.R.	Tsependa M.P.	Poludnitsyn I.P.	
Squat	56	58	48	71	59	53	59	73	59	69	**60,5**
Shuttle run 10x10 m	26,7	25,6	27,0	25,7	26,3	26,9	25,8	25,1	26,5	27,1	**26,3**
3 km run	12,12	12,58	12,56	12,35	13,2	11,51	12,0	12,17	12,41	12,44	**12,33**
Long jump from a standing position	225	216	220	232	214	225	229	231	225	230	**224,7**

Table 2. Results of preliminary testing of the control group

Exercises	Control group										Average value
	Bobrovsky D.A.	Buyanov N.M.	Byankin D.N.	Grigoriev V.V.	Gubin A.A.	Gurov V.D.	Ermolitsky D.S.	Kalinin I.D.	Kislukhin A.V.	Kravtsov D.S.	
Squat	70	58	53	50	61	58	69	55	72	63	**60,9**
Shuttle run 10x10 m	25,9	26,3	27,4	26,9	25,6	26,1	25,7	27,3	25,8	25,8	**26,3**
3 km run	12,25	12,37	13,1	13,27	12,1	12,47	12,21	12,38	11,5	12,05	**12,37**
Long jump from a standing position	230	217	226	220	227	222	228	218	230	225	**224,3**

Table 3. Comparative analysis of the results of checking the physical fitness of the experimental group after the experiment

Exercise	Experimental group Mean value	Control group Mean value	Difference in EG and KG indicators, %
Squats	63,4	61,2	**3,6**
Shuttle run 10x10 m	26,1	26,2	**-0,6**
3 km run	12,14	12,36	**-1,8**
Long jump from a standing position	225,9	224,5	**0,6**

the pupils of the experimental group. The growth rate for the exercise "Shuttle run 10x10 m" was -0.8% and the growth rate for the exercise "Run 3 km" was -1.6% (a negative indicator means an increase in the average value by 0.8% and 1.6%, respectively). It can be concluded that there is a positive dynamic in the development of such physical qualities of the pupils of the experimental group as endurance and speed.

The highest growth rate in the experimental group occurred in the exercise "Squats" (4.8%). A comparative analysis of the results of checking the physical fitness of the control group before and after the experiment indicates the absence of significant differences in the performance indicators of practical exercises.

A comparative analysis of the physical fitness indicators of the experimental and control groups was conducted after the experiment (Table 3).

The analysis showed that the average indicator for all exercises in the experimental group is higher than in the control group. Thus, positive dynamics of development of strength and speed-strength physical qualities of the pupils of the experimental group was registered, which confirms the effectiveness of the introduced set of exercises in swimming classes using elements of finswimming.

Conclusions. The results of the pedagogical experiment indicate that the use of a special set of finswimming exercises contributes to an increase in the indicators of the level of development of physical qualities of pupils in the experimental group.

All of the above indicates the advisability of using elements of underwater swimming in practical classes on the section of physical training of cadets "Swimming" as an additional means of improving general physical fitness, increasing the level of development of speed, endurance, strength and coordination capabilities, fostering moral and ethical and volitional qualities, forming a sports character in pupils of preuniversity educational organizations of the Ministry of Defense of the Russian Federation.

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The impact of physical education classes on the psychological and emotional well-being of students of higher education institutions

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Abstract

Objective of the study is to determine the degree of influence of classes in the discipline "Physical Education" on the psycho-emotional state of students.

Methods and structure of the study. The analysis of the psycho-emotional state of students was carried out in three directions. The first direction is a comparison of the results of the SAN test during the training process (after practical classes) with the period without classes. The second direction is during the training process: 2 hours before the practical class and after 1 hour after the class. The third direction is a comparison of indicators during the training process (2 hours before the class) with the indicators of the period without classes.

Results and conclusions. Most students consider practical classes in the discipline "Physical Education" to have a positive effect on their psycho-emotional state. The results of the study confirmed that classes in the discipline "Physical Education" are an important factor in improving the psycho-emotional state of students.

Keywords: *psycho-emotional state, well-being, activity, mood, discipline "Physical Education".*

Introduction. According to the Coordination Council under the Government of the Russian Federation, on issues of planning and distribution of admission targets to universities, the ratio of budget places to fee-paying places in higher education institutions as a percentage in 2024-2025 is estimated at 40 to 60%. Educational practice shows that 60% of students studying on a fee-paying basis prefer to pay for their education in full or in part, and about 30% (they are included in the 60%) are forced to do so. In addition, most young people are focused on personal financial independence. This situation leads to the fact that many students work in their free time, and often during school hours. Irregular attendance of classes is also facilitated by the point-rating system of education, which allows students to selectively attend classes.

The consequence of this situation is the high workload of a significant part of students, their lack of time for rest and recovery. As practice shows, no more than 5% of students have the opportunity to visit fitness centers, and no more than 4% of students from non-physical education universities regularly engage in sports. In addition, many students, due to their age and lack of necessary knowledge, regularly violate the work and rest regime. As a result - poor health, low activity, bad mood, which leads to a negative psycho-emotional state, decreased concentration, performance, quality of assimilation of educational material by students, the development of various chronic diseases, deterioration of health.

The relevance of the study is due to the need to increase attendance of classes in the discipline "Physical Education" in order to improve the psycho-emotional state.

Objective of the study is to identify the degree of influence of classes in the discipline "Physical Education" on the psycho-emotional state of students.

Methods and structure of the study. The impact of physical education classes on students' well-being, activity, and mood was assessed using the SAN (well-being, activity, mood) test, which reflects the degree of physiological and psychological comfort of a person's condition and determines the intensity and volume of a person's interaction with the physical and social envi-

ronment [2, 3]. The SAN test is represented by 30 pairs of words of opposite meaning, with each category (C, A, and H) characterized by 10 pairs of words. The assessment of the feature is recoded into a row from 10 to 70. In this case, a score of 3, corresponding to a bad mood, low activity, and poor health, acquires a value of 10, and a score of 3, reflecting good health, high activity, and good mood, acquires a value of 70 [4]. The analysis of the psychoemotional state of students was conducted in three directions. The first direction is a comparison of the SAN test results during the training process (after practical classes) with the period without classes. The second direction is during the training process: 2 hours before the practical class and 1 hour after the class. The third direction is a comparison of indicators during the learning process (2 hours before the lesson) with indicators during the period without lessons.

Results and conclusions. Results of the analysis of the first direction. The analysis of the results of the SAN test clearly showed that the indicators of all three of its components during the training period after practical classes in the discipline "Physical Education" are significantly higher, compared to the period without classes (on average by 15.7%), which undoubtedly indicates a positive impact of classes in the discipline "Physical Education" on the psycho-emotional state of students. The academic discipline "Physical Education", mandatory for all specialties, is one of the means of forming a comprehensively developed personality, optimizing the physical and psychophysiological state of students in the process of professional training [1].

Results of the analysis of the second direction. The analysis of the results of the SAN test in the tested students on the same day 2 hours before the class and an hour after it also shows that after the practical class in the discipline "Physical Education" all its indicators are significantly higher by an average of 4.4 units. When analyzing the first direction – comparing the SAN indicators on different days, there was a possibility that the difference in indicators could be due to the characteristics of the study days, in particular, the meteorological conditions of the days (magnetic storms, low or high atmospheric pressure, uncomfortable air temperature) on which the studies were conducted. The results of the analysis of the second direction completely exclude the possibility of the unreliability of the study for the above reasons, once again emphasizing the positive effect of physical activity on the psycho-emotional state of students.

Results of the analysis of the third direction. It was found that on the day of the lesson, 2 hours before it began, the SAN test showed a 2.6-unit higher score than in the period without classes. The reasons explaining this fact may be the following:

- for most students in higher educational institutions, since high school, the anticipation of physical education classes improves their mood, which, in general, affects other indicators, encouraging activity, improving mood;

- a positive attitude of students to practical classes in the academic discipline "Physical Education"; - their awareness of the positive impact of physical education classes on human health;

- positive mood during classes, based on the game and competitive teaching methods that prevail in physical education classes, is maintained by students after classes.

Conclusions. Most students assess the impact of practical classes in the discipline "Physical Education" on the SAN indicators as "positive". The SAN test indicators of students are significantly higher during practical classes in the discipline. The study clearly showed that classes in the discipline "Physical Education" are an important factor in improving the psycho-emotional state of students. The academic discipline "Physical Education" contributes to the effective solution of educational problems, high-quality training of university graduates by improving the psycho-emotional state of students during practical classes.

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A model for teaching students' sports training within the framework of physical education in a higher education institution

UDC 796

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Abstract

Objective of the study is to theoretically substantiate and develop a pedagogical model for student athletic training in physical education at a university and recommend it for practical use.

Methods and structure of the study. In 2024, the study was conducted at the K.A. Timiryazev Russian State Agrarian University – Moscow Agricultural Academy. The study utilized a variety of data collection approaches, including the study of theoretical and methodological sources, thematic surveys, interviews, monitoring of the educational process, engaging experts, classifying data, creating models, and identifying key aspects. The integrated application of these methods allowed us to collect and organize the necessary scientific and methodological material for the subsequent creation of an experimental model for developing athletic training in physical education for university students.

Results and conclusions. The conducted scientific and theoretical analysis, systematization of the studied material, and abstraction facilitated the development of an experimental model for student athletic training in physical education at a university.

Keywords: *students, physical education, university, pedagogical model, sports training model.*

Introduction. The current physical education process for students at non-physical education universities focuses on the physical fitness of young people and the development of general physical education competencies, which generally fails to motivate students to engage in systematic physical education and sports. Overall, a "generalized" physical education process is organized, aimed at minimally supporting physical activity, without taking into account the individual abilities of those involved. Furthermore, there is a decline in the number of practical hours for physical education at universities across the country, where up to 70% or more of classes are conducted only in the first and second years, and in the third year, they are, at best, electives. It is also worth noting that up to 20% of physical education classes are relegated to lectures, which do not provide students with the necessary physical activity.

The best theory in physical education is practice. The need to introduce a sport-specific approach to student physical education will help increase student motivation, realize their individual motor potential, and develop a sustainable sports culture, enabling young people to cultivate their chosen sport in their future professional and social lives. At the same time, Russian Sports Minister M.V. Degtyarev identified one of the main objectives for improving the physical education and sports movement in the country as developing a sports-focused approach to student physical education at Russian universities.

Objective of the study is to theoretically substantiate and develop a pedagogical model for student athletic training in physical education at a university and recommend it for practical use.

Methods and structure of the study. In 2024, the study was conducted at the K.A. Timiryazev Rus-

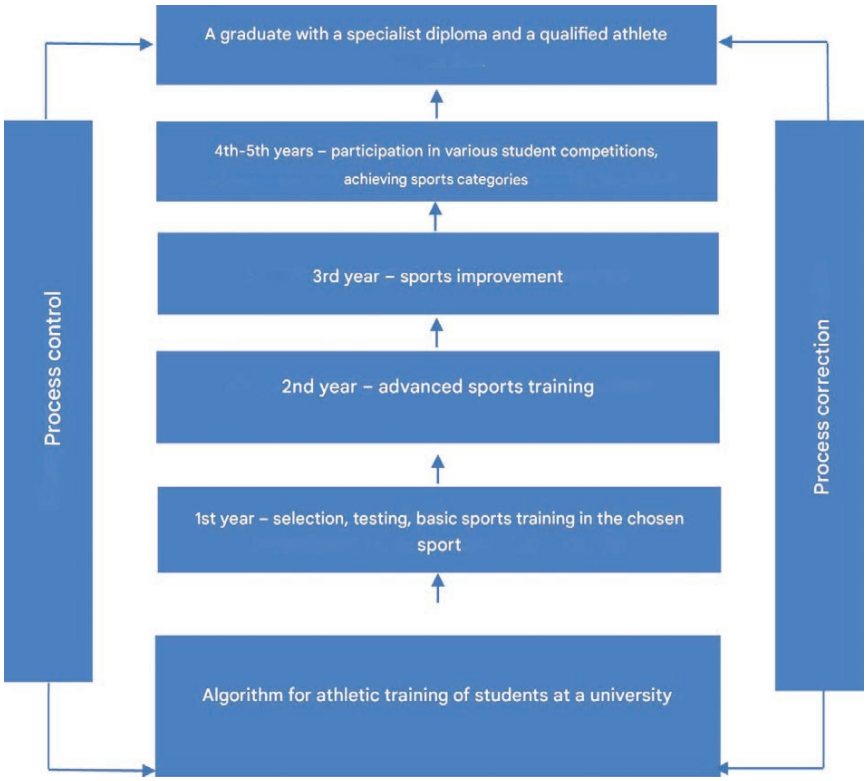

Fig. 1. Theoretical model of students' sports training in physical education at the universit

sian State Agrarian University – Moscow Agricultural Academy. The study utilized a variety of data collection approaches, including the study of theoretical and methodological sources, thematic surveys, interviews, monitoring of the educational process, engaging experts, classifying data, creating models, and identifying key aspects. The integrated application of these methods allowed us to collect and organize the necessary scientific and methodological material for the subsequent creation of an experimental model for developing athletic training in physical education for university students.

Results and conclusions. The conducted scientific and theoretical analysis, systematization of the studied material, and abstraction facilitated the development of an experimental model for student athletic training in physical education at a university.

As shown in Figure 1, the experimental model includes four sequential functional blocks of student athletic training in physical education at a university: basic specialization, advanced training, advanced development, and participation in student athletic competitions.

Conclusion. The developed theoretical model of student athletic training at a university is optimal and compact, consistent with the general methodological principles of the athletic training system, and can be recommended for testing at universities across the country.

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Evolution of the physical education system through the prism of history

UDC 796.011.1

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Abstract

Objective of the study is to determine the place and role of physical education and sports in the system of agricultural education in the USSR and the Russian Federation, carrying out their comparative analysis.

Methods and structure of the study. The following methods were used in the work: included and non-involved observation of physical education teachers, interviews with physical education teachers and sports coaches, a sociological survey of first-year students. The example of the leading agricultural university of the country – Timiryazev Academy – shows the evolution of approaches to teaching physical education in the USSR and the Russian Federation.

Results and conclusions. Data on the teaching of physical education at Timiryazev Academy in different periods of its history are provided. The results of a sociological survey among students of Timiryazev Academy are highlighted, according to which the overwhelming majority of students have a positive attitude towards the GTO standards, which were the normative basis of the Soviet system of physical education. The University has a Physical Education and Sports Development Program for 2021–2030, one of the areas of which is the popularization of the All-Russian Physical Education and Sports Complex "Ready for Labor and Defense". The main scientific result: the timeliness of turning to the positive developments of the Soviet era is substantiated, but taking into account modern realities. This is the approach implemented at the Timiryazev Academy.

Keywords: *physical education, agricultural education, USSR modern education system, sociological survey, comparative analysis.*

Introduction. It is impossible to overestimate the importance of physical culture in the process of socialization. And yet it is of particular importance for specialists in the agricultural profile, since without professional and applied physical training it is impossible to develop the professional qualities necessary in the countryside.

N.Yu. Borisova draws attention to the recreational function of physical culture, considering it the most significant [2, p. 138]. G.A. Ivakhnenko and V.V. Kuzmina propose to transfer university physical culture from a practical to an educational discipline [3, p. 111]. G.V. Astratov and M.A. Kocheryan [1, pp. 18-31] put forward the idea of applying the categories of institutional marketing to the study of physical culture. T.L. Dyachenko and V.V. Vucheva rightly note that there are contradictions "between the increased requirements for physical culture ... and the lack of necessary information on the dynamics of their development" [6, p. 2]. Some aspects of teaching physical education are considered by foreign researchers [5, pp. 74–85; 7, pp. 59–70]. The authors of this article, in turn, offer a retrospective view of the problem, believing that it would be very useful to turn to the Soviet experience of forming a student's personality in the process of physical education classes.

Objective of the study is to determine the place and role of physical education and sports in the system of agricultural education in the USSR and the Russian Federation, having carried out their comparative analysis.

Methods and structure of the study. In the course of preparing the article, included and non-involved observation of physical education teachers, in-

terviews with physical education teachers, and a sociological survey of students studying at the Timiryazev Academy were used.

Results and conclusions. The Timiryazev Academy, the flagship of agricultural science and education since the times of the USSR, was chosen as the subject of the study. Here alone in the first year more than 3 thousand students study, representing all federal districts of the Russian Federation, which makes sociological surveys as representative as possible. The curriculum of all implemented training areas includes the academic discipline "Physical Education", the university also operates sports sections in 38 sports.

Physical education classes at the Timiryazev (Petrovskaya) Academy began long before the October Revolution. In 1910, the first competitions in various sports were held [4, p. 22].

Physical education classes reached a new level in the 1930s, when the Soviet government considered physical education as a means of strengthening the combat power of the Red Army. Membership in Osoaviakhim and participation in sports sections became mandatory. Particularly distinguished students received the "Voroshilov Sharpshooter", "Voroshilov Horseman", "Ready for Labor and Defense" badges. Auto-moto, parachute, flight, mountaineering and other clubs were created. As an incentive, participants were given food coupons, vouchers to health centers and rest homes. In 1936, a physical education department was created at the academy, headed by V. M. Marakuev, and all further sports activities at the university were carried out by this department.

In the post-war period, priorities changed. The main thing for the Soviet government was to prepare workers for agriculture with maximum labor productivity. An important component here was physical training.

In the Russian Federation, the focus of physical education has changed. The priorities have become raising the general level of physical fitness, developing a love for sports and raising a healthy nation. However, commercialization has not bypassed physical education: the number of sports facilities has decreased, and the cost of physical education and sports services has increased significantly, becoming inaccessible to most students from rural families, who form the basis of the contingent of agricultural universities.

Since the mid-2010s, a tendency to return to the experience of the USSR has emerged. On March 24, 2014, a decree was signed on the revival of the GTO standards, which was the normative basis of the Soviet system of physical education. The question arose about the revival of the "Leather Ball", "Golden Puck", "White Rook" – competitions that had the status of all-Union. The training process itself has also changed. Some Russian trainers have begun to view the "warm-up" known since Soviet times as a separate training system, which can be seen in the example of the Timiryazev Academy.

In March 2025, two sociological surveys were conducted among first-year students of the Timiryazev Academy, in which more than 350 students took part. Their results clearly showed the popularity of the GTO standards: 37% of respondents were "definitely positive" about them, 30% were "rather positive". An extremely small number of respondents were "rather negative" about the GTO standards – only 3%, even fewer were "definitely negative" – 0.5%. And only 1% of respondents have no idea about the GTO.

It should be emphasized that 44% of students have already passed the GTO (apparently, even before entering the university). Of the rest, only 3% plan to pass the GTO. It can be assumed that one of the motives for passing the GTO standards was the desire of applicants to get additional points when entering a university. However, students no longer have this motive, although their attitude towards the GTO is generally positive. Hence the task of motivating the remaining part of respondents (23%) to pass these standards. In this regard, the inclusion of a clause on the popularization of the All-Russian physical education and sports complex "Ready for Labor and Defense" in the Timiryazev Academy's Physical Culture and Sports Development Program for 2021-2030 seems justified and timely.

Conclusions. The main difference between the physical education systems in the USSR and the modern Russian Federation was its focus. If in the pre-war period the priority was to prepare well-trained defenders of the Motherland, then after the war the main attention was paid to physical training as the basis for labor productivity. In post-Soviet Russia, priorities changed again: increasing the general level of physical training was put at the forefront. And only since the mid-2010s, our country has once again begun to use Soviet experience.

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Efficiency of students passing the GTO standard "16 kg kettlebell snatch" after the introduction of advanced specialization in kettlebell sport

UDC 371.134

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Abstract

Objective of the study is to evaluate the effectiveness of students' performance of the GTO standard "16 kg kettlebell snatch" after the introduction of the specialization "Kettlebell lifting".

Methods and structure of the study. The following research methods were used in the work: literature review, mathematical processing of research results, data collection. Using the example of data on passing the GTO standards for snatching a 16 kg kettlebell, an analysis of the dependence of the results on the introduction of the specialization is carried out.

Results and conclusions. The obtained achievements indicate a positive impact of the strategy of introducing the specialization "Kettlebell lifting" on increasing the level of physical quality "strength" of students.

Keywords: *kettlebell lifting, students, strength training, snatch, passing standards, gamma distribution, data extrapolation.*

Introduction. Currently, kettlebell lifting is one of the most actively developing sports disciplines. A distinctive feature of kettlebell lifting is its relative cheapness and convenience of training - it can be done outdoors, in a forest belt, indoors, in a gym or even in a student dormitory room. Research on kettlebell lifting as a specialization of the discipline “Physical Education” in higher education institutions is especially relevant, which is due to the significant role of this discipline as one of the factors in maintaining and supporting the physical, mental and social health of students [1].

Kettlebell lifting can be especially useful and recommended for people suffering from back problems or leading a sedentary lifestyle. This is due to the fact that kettlebell lifting training has a high level of intensity, which allows you to burn a large number of calories in a short time, as a result of which weight loss occurs [2].

Objective of the study is to evaluate the effectiveness of students in fulfilling the GTO standard “kettlebell snatch 16 kg” after the introduction of the specialization “Kettlebell lifting”.

Methods and structure of the study. In this paper, using the example of data on passing the GTO standards for snatching a 16 kg kettlebell for the fall of 2022, 2023 and 2024, an analysis is made of the dependence of the results on the introduction of specialization. It is assumed that with the introduction of the specialization “Kettlebell Sport” in 2023, students will more often and more successfully perform a kettlebell snatch as an exercise to determine strength when passing the GTO standards. Classic statistical methods of data processing taken from probability theory and mathematical statistics are used as research methods.

Results and conclusions. The table presents aggregated data with the total performance of the kettlebell snatch by all students in the fall of a particular year.

It clearly shows that the introduction of specialization has significantly increased students’ interest in fulfilling this standard. For a more detailed presentation of the data, we will divide the results into ranges of 5 units: from 10 to 110. Taking into account all of the above, we will present the data for 2022-2024 in the form of histograms (Fig. 1).

Results of passing the standard for snatching a 16 kg kettlebell

Year	Number of students	Number of lifts
2022	56	2376
2023	122	5414
2024	183	8681

Fig. 1 gives a clear idea of the dynamics of changes in passing the standard. As the total number of students passing this standard increases, the scales along the ordinate axis also change. In the first histogram, corresponding to the period before the introduction of the Kettlebell Lifting specialization, the data are grouped to a greater extent around the snatch values less than the median - 40, but there are also values significantly greater than 40, which indicates an a priori presence of students interested in kettlebell lifting. In the next two histograms, the distribution pattern takes on a more "average" character: the values are grouped around the median (40), while the number of students passing the standard for high values remains approximately the same, but the number of students passing the standard for a value less than the median has significantly decreased, which allows us to judge the averaging of the results. Below are the mathematical expectations and standard deviations of the specified samples: m_{22} = 43,1250, m_{23} = 45,9426, m_{24} = 4 8,9208, σ_{22} = 21,8162, σ_{23} = 16,7685, σ_{24} = 18,5662, где m_{2i} ,σ_{2i} , $i=2...4$, – are the mathematical expectations and standard deviations, respectively, for the autumns of 2022, 2023, and 2024.

Let us agree that now and in the future the level of statistical significance will be equal to 0.05. Let the hypothesis consist in fulfilling condition (1), $M(X_{22}-X_{23})=a_0=0$ (1), where $M(...)$ – is the designation of the mathematical expectation, are $X_{22,}$ X_{23} – random average values from the samples of the 22 nd and 23 rd years, respectively; while H_1 the hypothesis is expressed as follows: $M(X_{22}-X_{23}) <0$.

Substantially, (1) and the competing hypothesis mean checking whether the introduction of specialization in 2023 is statistically significant, i.e. whether it significantly affected the results of passing the standards. To check (1), we find the critical value of the left-hand critical region using the table of critical points of the Student's distribution. The significance level is 0.05, the number of degrees of freedom is $n=20-1=19$. Then $t_{kp=}2,09$ – If $t^*> - t_{kp}$ то H_0 then the hypothesis is accepted, otherwise – rejected. Let's calculate the values, D = – 0,7416, S_d= 2,9639, we get t^*=–2,3604 < – 2,09, H_0 the hypothesis about the statistical insignificance of introducing specialization is rejected – i.e. the hypothesis is accepted.

From the mathematical expectations calculated above, it is easy to see that the dynamics of change in results is positive – i.e. the indicators are increasing, therefore, taking into account the acceptance of this hypothesis, it can be argued that the introduction of specialization in 2023 had a positive effect on students' results in passing the 16 kg kettlebell snatch standard at the GTO. Similarly, we examine the statistical significance of changes in the results of 2024, relative to the results in 2023. Calculated value In this case, the hypothesis about the statistical significance of changes is also accepted. This means that in 2024, the changes relative to the year of introduction of the specialization are also significant and, we note again, positive.

As can be seen, for the gamma distribution, the hypothesis can be accepted with accuracy up to statistical significance for all years.

Fig. 2 shows the graphs of the gamma distributions corresponding to the samples shown in Fig. 1, respectively, and supplemented with a linear forecast for 2025.

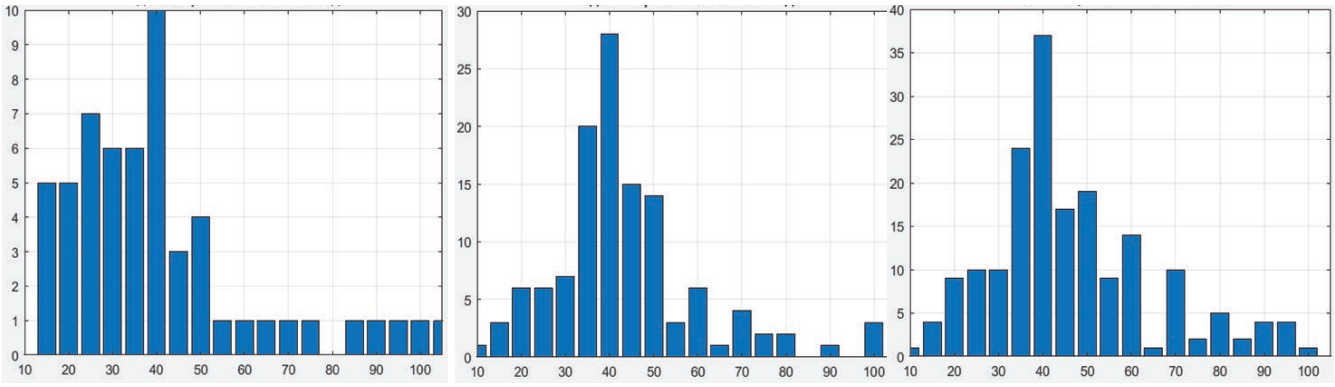

Fig. 1. Histogram of passing standards among students in 2022-2024

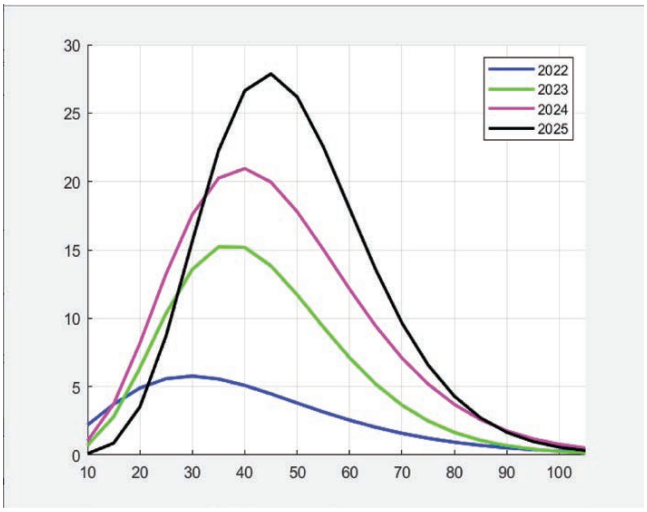

Fig. 2. Gamma distributions that best approximate the results of standard measurements

Each of the distributions differs from the previous ones in the overall sample size, as well as the position of the maximum: over time, it shifts to the right. Over time, the mathematical expectations, variances, and the total number of students participating in passing the standard change. All the conclusions described in Fig. 1 also apply to Fig. 2, which allows us to see the improvements in the quantity and quality of passing the standard in a more visual form. Let us now solve the problem of predicting the results of passing the standard in 2025. For simplicity, we will approximate the following value of the mathematical expectation according to the linear law, characteristic of the first few years of dynamics: m_{25}=51,7919 .

We will calculate the dispersion based on extrapolation by a periodically decaying exponential function: σ_{25} = 15,8698.

To calculate the total number of students in the Kettlebell Lifting specialization participating in the GTO standards, we will use extrapolation using the logistic function: n_{25} = 213 .

The final extrapolation is shown in black in Fig. 2. It is clear that the graph has shifted to the right as before, while the number of students passing the standard with low values has decreased even more, while the overall level of physical fitness has increased even more, so that on average each student in 2025 should be able to perform 51 snatches with a 16 kg kettlebell in peak condition, while the spread of values has become even smaller.

Conclusions. On average, all students pass the standard significantly better, and the number of students passing it has also increased significantly over time, which allows us to judge the positive dynamics of interest in kettlebell lifting. Let us also note the dynamics of the number of students passing the kettlebell snatch test with a gold medal: 33 out of 56 students in 2022, with P(x)=0.5893, 99 out of 122 in 2023, with P(x)=0.8115, 149 out of 183 in 2024, with P(x)=0.8142, the forecast for 2025 is 184 gold out of 213 students, with P(x)=0.8638.

As can be seen, over time, not only the total number of students passing the snatch test increases, but also the number of students passing this test with a gold medal, and even the percentage of such students, which is quite consistent with the dynamics and strategy for introducing the specialization presented above.

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The Impact of the Digital Economy on Population Health

UDC 796

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Abstract

Objective of the study is to assess the level of physical fitness of the population in the digital economy.

Methods and structure of the study. The scientific work involved 140 men and 140 women aged 25 to 59 years. The study participants belong to two areas of work with different levels of physical activity. All are admitted to physical education and sports and live in the Vladimir, Moscow, Smolensk regions and the city of Moscow.

Results and conclusions. The study did not reveal any significant differences between the morphofunctional indicators, physical activity and the level of physical fitness in people who mainly use IT technologies in the process of work and everyday activities, and people who do not identify themselves with digital processes. Therefore, when developing programs to improve the physical fitness of the population, in the digital economy, it is necessary to take into account the trends towards an increase in general physical activity in the context of automation of all aspects of life, including indicators of physical fitness that ensure a person performs basic social functions without risk to health.

Keywords: *working-age population, physical activity, motor activity, digital economy, physical fitness, electronic games, modernization of society.*

Introduction. The current geoeconomic reality raises the issue of sustainable development of the state based on large-scale technological modernization in order to ensure dynamic growth of labor productivity, which requires the most efficient use of human capital [6, 8]. Human health, as the main actor in the economy, acting as a producer of goods and services, a consumer of created goods and a manager of social production, is considered the main economic resource. Individual diversity of values, priorities, beliefs and stereotypes, along with education, qualifications and experience, determines the boundaries and possibilities of technological, economic and social modernization of society [2, 7].

Digitalization of the economy transforms the type of labor from physical to mental (operator profile of labor activity), minimizing muscle effort, increasing the load on human sensory systems [3]. Physical education, as a motor activity, the implementation of which is ensured by interaction and promotes the activation of the neuromuscular, cardiorespiratory, endocrine and other body systems, is the most effective and universal mechanism for preventing the negative consequences of decreased physical activity. Accordingly, identifying the characteristics of physical development and motor activity of the population involved in the digital economy, taking into account the nature of work, serves as the basis for developing scientifically sound proposals to improve the physical fitness of the working-age population, which is the relevance of our study.

Objective of the study is to assess the level of physical fitness of the population in the digital economy.

Methods and structure of the study. 140 men and 140 women aged 25 to 59 years took part in the scientific work. The study participants belong to two areas of work with different levels of physical activity. All are admitted to physical education and sports and live in the Vladimir, Moscow, Smolensk regions

and the city of Moscow. The group was divided into two subgroups: the first – confident users of digital services, mainly use digital technologies in the work process (operators of automated systems and forms of employment associated with the use of personal electronic devices) (hereinafter – group 1); the second – uncertain users of Internet technologies, mainly use components of the production economy in their work (hereinafter – group 2). The participants in the experiment were characterized by normal resting heart rate values (74±6.9 bpm for men and 75±7.1 bpm for women) with elevated body mass index values (29.5±2.1 kg/m2 for men and 27.7±2.9 kg/m2 for women).

The study included a comparative analysis of morphofunctional parameters (body length and weight, BMI, heart rate, vital capacity). The motor regime (number of steps) and the body's response to physical activity based on heart rate were studied. The time spent using electronic devices in work and leisure activities was recorded. To assess physical fitness, the physical fitness level index (hereinafter referred to as PLI) and the physical quality development level index (hereinafter referred to as PHQLI) were calculated using the modernized VNIIFK scale [4, 5]. Registration of physical activity indicators (number of steps per day, heart rate indicators during physical training) was carried out using individual fitness gadgets. The adaptation potential (AP) of the cardiovascular system was calculated using the method of R.M. Baevsky [1]. The obtained data were processed in the mathematical and statistical program Stadia 6.0. (RF).

Results and conclusions. A comparative analysis of representatives of the 1st and 2nd groups of the population demonstrated that the indicators of physical development do not have statistically significant differences (p> 0.05) depending on the predominant use of digital technologies in the work process (Table 1). The BMI of men in the studied groups indicates overweight with a statistically insignificant predominance in men of the first group with complete identity in the female groups. Heart rate at rest and vital capacity correspond to normal values, not statistically different in the groups of men and women.

The response of the cardiovascular system (HR) to physical activity in most groups is in the zone of 130 bpm, indicating low-intensity physical activity, highlighting a statistically insignificant higher HR value in women of the 2nd group. Accordingly, physical development is not criterion-significant for differentiating the population based on the use of digital technologies, which is also true for a similarly low level of fitness in both sexes.

Analysis of physical activity indicators also indicates the absence of clearly expressed intergroup differences (p> 0.05) (Table 2).

The average daily number of steps per day for men approaches 10,000 steps, for women – 9,000 steps. The time spent on physical exercise per week is statistically insignificantly higher for representatives of the 1st group than for those in the 2nd group. The revealed amount of time spent on exercise does not allow us to classify either men or women in these samples as systematically engaged in physical activity. Men in the 1st group use electronic devices 50 minutes more per week than men in the 2nd group, and women in the 1st group – 1 hour 10 minutes more than women in the 2nd group. Presumably, the time spent on electronic devices can be considered as a factor limiting physical activity.

Physical fitness corresponds to the average (base) level for the population of the corresponding age, without revealing reliable differences in the groups under consideration (p>0.05), with a tendency towards a higher level of fitness in representatives of both sexes of the 1st group (Table 3).

The least developed physical quality is endurance in both groups, strength and flexibility are developed more evenly, with a pronounced, but statistically insignificant advantage in the 1st group. Thus, physical

Table 1. Morphofunctional indicators in groups of the working-age population with different levels of use of digital technologies in professional and everyday activities (n=280)

Contingent	Gender	BMI according to Quetelet, (kg/m²)	Resting heart rate (bpm)	HR max after exercise (bpm)	Vital capacity of the lungs (ml)
		X±σ	X±σ	X±σ	X±σ
Group 1	Men	28,9±3,6	73,6±6,7	128,6±12,3	3957,2±335,7
	Women	27,6±2,0	72,8±7,4	133,5±9,7	3243,2±118,7
Group 2	Men	26,1±2,2	74,0±7,0	128,6±12,3	3905±413,4
	Women	27,7±3,7	76,5±6,7	143,9±16,8	3257,5±312,9

Table 2. Physical activity indicators in groups of the working-age population with different levels of use of digital technologies in professional and everyday activities (n=280)

Contingent	Gender	Physical activity (number of steps per day)	Time of contact with electronic devices outside of work (min per week)	Time for physical education and sports classes (min per week)
		X±σ	X±σ	X±σ
Group 1	Men	9726,9±3082,6	300±60,0	90±36,0
	Women	8899,0±3298,5	340±72,0	70±18,0
Group 2	Men	9601,0±3465,4	250±84,0	80±18,0
	Women	9318,6±2859,5	270±78	60±19,0

Table 3. Physical fitness indicators in groups of the working-age population with different levels of use of digital technologies in professional and everyday activities (n=280)

Contingent	Gender	Endurance (URFK index in points)	Strength (URFK index in points)	Flexibility (URFK index in points)	Index UFP (points)
Group 1	Men	2,9±0,8	3,6±0,3	4,1±0,8	3,5±0,5
	Women	3,0±0,6	3,9±0,6	3,8±0,8	3,6±0,4
Group 2	Men	3,2±0,9	3,1±0,8	3,4±0,8	3,2±0,6
	Women	3,0±0,9	3,0±0,7	3,2±0,9	3,1±0,7

fitness corresponds to the average level regardless of the use of digital technologies in the daily routine, with a tendency towards a higher level of development of strength and flexibility in men and women of the 1st group.

The level of adaptive potential (hereinafter referred to as AP) of the circulatory system to physical activity (according to R.M. Baevsky) indicates that the motor regime in groups of men and women can be characterized by functional stress with increased activation of adaptation mechanisms, which corresponds to the second health group (Table 4).

Thus, the indicators of morphofunctional status, motor activity and physical fitness do not have statistically significant differences between groups with different levels of use of digital technologies in professional and everyday activities. At the same time, there is some disproportion in the differences in the time of using electronic devices (higher in men and women of group 1 by 17-21%) and the time of physical exercise (higher in men and women of group 1 by 11-13%). The data obtained indicate the need to increase control over the unlimited use of digital technologies in everyday life and the formation of motivation to use the freed up time for doing "sports".

Conclusions. Thus, the study did not reveal significant differences between the morphofunctional indicators, motor activity and the level of physical fitness in individuals who mainly use IT technologies in the process of work and everyday activities, and individuals who do not identify themselves with digital processes in the economy, with a low level and do not play. Accordingly, when developing programs to improve the physical fitness of the population, in the context of the digital economy, it is necessary to focus on measures to increase overall physical activity in the context of automation of all aspects of life, including indicators of physical fitness that ensure a person performs basic social functions without risk to health.

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Table 4. Adaptive potential of the cardiovascular system in groups of the working-age population with different levels of use of digital technologies in professional and everyday activities (n=280)

Contingent	Gender	Adaptation potential (AP) in conventional units (c.u.) according to R. M. Baevsky
Group 1	Men	2,9±0,2
	Women	3,0±0,2
Group 2	Men	2,9±0,3
	Women	3,1±0,3

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Improving coordination skills in 10-11 year old students using simulation technologies

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Abstract

Objective of the study is to develop coordination skills in primary school children using the imitation aid "coordination ladder".

Methods and structure of the study. The pedagogical experiment involved 104 students, students in the 2nd grades of a comprehensive school, aged 10-11 years. The study was conducted during the school year, the children attended physical education lessons twice a week, the duration of the lessons was 40 minutes. Children from the control group (grades 2A and 2B) were engaged in physical education at school according to the standard school program for physical education. And children from the experimental group (grades 2B and 2G) during the physical education lesson additionally performed a set of physical exercises on the coordination ladder for 5-6 minutes.

Results and conclusions. At the end of the study, the indicators in the "jumping in place" test in the control group improved from 14.3±1.9 to 15.6±2.0, the increase in indicators was 9.1% ($p>0.05$). This is due to the duration of the pedagogical experiment, the effectiveness of the standard program and a favorable period for the development of coordination abilities in primary school age. In the experimental group, the indicators of the ability to connect movements improved from 13.1±2.1 to 16.9±1.8, the increase in indicators was 29.2% ($p<0.05$). This proves the effectiveness of using the coordination ladder in the educational process of students aged 10-11 years.

Thus, the effectiveness of using the coordination ladder in physical education lessons at school with children aged 10-11 years has been proven. A set of physical exercises on the coordination ladder is recommended for use in each physical education lesson at school as a supplement to the standard school program.

Keywords: *coordination abilities, physical inactivity, obesity, physical education, "coordination ladder" in physical education class.*

Introduction. The topic of school-age children's health is quite relevant [1, 2]. There are many studies that touch upon a variety of problems of growth and development of school-age children [1]. For example, one of the acute problems is obesity [2]. Along with metabolic disorders, the obvious lack of physical activity, in other words, a sedentary lifestyle, comes to the fore [3].

One of the first steps in overcoming this problem is physical education classes, especially physical education lessons at school. The main goal of such physical education is the comprehensive harmonious development of children, increasing the level of physical fitness, satisfying mental, motor and motivational needs [6]. In Russian schools, the program for the discipline "Physical Education" is formed with minor differences, but its main content, goals and objectives are unchanged [7]. An important aspect in the process of physical education of schoolchildren is a favorable period for the development of a particular physical quality [8].

The same rule applies to methods of influencing students, for example, the use of a game method or competitive exercises in primary school, the use of a differentiated or individual approach in middle or senior school.

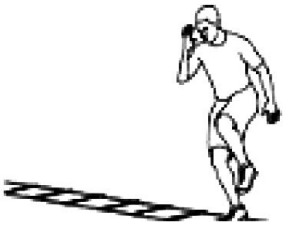
It should be noted that coordination abilities (CA) are best developed in primary school age in both boys and girls [3, 8]. A good level of development of CA is the basis for the development of other physical qualities and the key to the rapid development of technical abilities of children in the future in various sports [4, 5].

CA is understood as the ability of a person to quickly and accurately analyze and perform motor tasks in a wide variety of situations, especially those that arise suddenly [4, 5]. Today, there is a certain classification of all CA. Separately, one of the specific CA should be noted - this is the ability to coordinate (combine into a single whole) movements - this is the ability to combine individual movements and actions into integral motor combinations [5].

Objective of the study is to develop coordination ability in primary school children using the imitation auxiliary tool "coordination ladder".

Methods and structure of the study. The pedagogical experiment involved primary school children aged 10-11 years, who studied in the 2nd grade of comprehensive school No. 623 (Moscow). Of the total number of second-graders (118 children), 104 schoolchildren who were healthy and cleared by a doctor for physical education lessons at school took part in the study. The study was conducted during the academic year from September 10 to May 20, 2024. All schoolchildren were engaged in physical education twice a week for 40 minutes in each lesson. Over the nine months of the study, 72 physical education lessons were held in every second grade. Children from the control group (grades 2A and 2B), 52 students in total, were engaged in physical education at school according to the standard school physical education program [7].

The main objectives of the physical education program: strengthening health, promoting normal physical development of children; teaching vital motor skills and abilities; development of motor skills; acquisition of necessary knowledge in the field of physical education and sports; education of the need and ability to independently engage in physical exercises, consciously use them for rest, training, increasing efficiency and strengthening health; contribute to the education of moral and volitional qualities, development of psychological processes and personality traits. Children from the experimental group (2B and 2G classes), 52 students in total, studied according to the same program, but additionally for 5-6 minutes during the lesson they performed a set of exercises on a special coordination ladder (see figure).



Coordination ladder exercises

Approximate set of exercises on the coordination ladder:

1. Jumping on the cells. Starting position – facing the stairs. Jump into each cell from start to finish, without touching the floor with your heels.

2. Legs apart – feet together. Starting position – facing the stairs. Jump, spreading your legs apart, then jump into the cell, feet together.

3. Jumping on one leg. Starting position – standing on one leg facing the stairs, jump into each cell on one leg, without touching the floor with your heel. Then jump on the other leg.

4. Jumping sideways on one leg. Starting position – standing on one leg, sideways to the stairs. If the jump is performed on the right leg, then you need to stand on the right side of the stairs. Jump into each cell on one leg, without touching the floor with your heel. Then jump on the other leg.

5. Running with high hips. Starting position – face the ladder. Run with high hips and place your foot in the center of the cage.

6. Running with high hips to the sides. Starting position – stand sideways to the ladder. Run with your right side, raising your hips high. Each leg should enter each cage of the ladder. Then do the exercise on the opposite side.

7. Running into each cage. Starting position – stand sideways to the ladder. Run, stepping on each cage with your foot.

8. The same as exercise #7, but in the opposite direction, without touching the floor with your heel. It is also necessary to follow the basic rules when performing exercises on the coordination ladder:

- 1. Run into each cage.

- 2. Several coordination ladders are used, and no more than 7-8 people are engaged in each coordination ladder at the same time in order to maintain the dynamics of the exercise.

- 3. Each physical exercise must be repeated 2-3 times.

- 4. At each lesson, change the sequence of exercises and supplement the complex with new exercises.

- 5. When performing exercises, focus not only on the technique of performing the exercises, but also on maintaining a high pace of movement for each student.

At the beginning of the pedagogical experiment and after the end of the school year, all children took the control test "Jumping in place", which determined the level of development of the ability to coordinate (connect) movements.

Starting position – legs together, arms along the body.

On the count of "1" – legs apart, arms along the body;

On the count of "2" – starting position;

On the count of "3" – legs apart, arms to the sides;

On the count of "4" – starting position.

If the student makes a mistake, he returns to the starting position and continues to perform the exercise. The result is the number of movements performed in 30 seconds [7].

Student's T-test was used to process the research results. The level of statistical significance was at $p < 0.05$.

Research results and their discussion. It should be noted that before the start of the pedagogical experiment, no reliable differences between the groups were found ($p>0.05$), which means that the groups were homogeneous. The table shows the average results in both groups from the beginning to the end of the pedagogical experiment.

The table shows that children from the control group who studied according to the standard program were able to improve their performance by 9.1%. Such an increase in results can be associated with three factors:

1. Long duration of the pedagogical experiment.

2. Effectiveness of using the school program for the development of the KS.

3. The sensitive period for the development of the KS is primary school age, which corresponds to the age range of 10-11 years.

However, the increase in indicators in the control group, although positive, is not statistically significant ($p> 0.05$). As for the experimental group, the average indicator from the beginning to the end of the study significantly and reliably improved by 29.2% ($p<0.05$).

Thus, children who additionally used the coordination ladder in physical education lessons at school were able to significantly improve their ability to combine movements. This proves the effectiveness of introducing the coordination ladder into the general educational process of children aged 10-11 years.

A literature review has shown a pressing health problem for schoolchildren [1], primarily obesity [2], which results from a sedentary lifestyle [3]. The solution to this problem is, to a large extent, a physical education lesson at school and, of course, additional physical education and sports classes. A physical education lesson at school is mandatory and is based on the laws of physical education [6]. In primary school age, KS should be purposefully developed, otherwise an omission at this age will be unattainable.

The standard physical education program at school has proven its effectiveness in developing KS in primary school age, namely the ability to combine movements in children aged 10-11. Despite the fact that during the school year, children in the control group failed to achieve reliable differences in the "jumping in place" test, they were able to improve their performance by 9.1%.

The use of the coordination ladder made adjustments to the standard program, but did not change its essence. However, by using a set of exercises on the coordination ladders to develop the ability to combine movements, it was possible to significantly improve the KS in the "jumps in place" test by 29.2%, which is a reliable increase.

Conclusions. The results of the pedagogical experiment have proven the effectiveness of using the coordination ladder in physical education lessons at school with children aged 10-11 years. It is recommended to use a set of physical exercises on the coordination ladder in each physical education lesson at

Average indicators of both groups during the period of the pedagogical experiment

Groups	To	After	%	p
Control (n=52)	14,3±1,9	15,6±2,0	9,1	p>0,05
Experimental (n=52)	13,1±2,1	16,9±1,8	29,2	p<0,05

school as a supplement to the standard school curriculum.

Conflict of interest. The authors declare no conflict of interest.

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Value system of cyber athletes representing various game archetypes

UDC 159.99

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Abstract

Objective of the study is to determine the value orientations of cyber athletes and identify relationships with the dominant gaming psychotype.

Methods and structure of the study. Diagnostics included filling out a portrait questionnaire of the structure of value orientations, a questionnaire of hardiness, a test to identify the dominant player psychotype. The obtained empirical data were subjected to correlation analysis.

Results and conclusions. Cyber athletes with the dominant psychotype of "careerist" show an orientation toward external achievements and a low level of involvement in terms of hardiness, "researchers" are focused on the process of cognition, "dominators" prefer to achieve superiority over other players, "socialists" are focused on local interpersonal interactions, with minimal emphasis on positive changes in society.

Keywords: *computer sports, cyber athletes, player psychotype, value orientations, dominant gaming psychotypes.*

Introduction. Preservation and protection of traditional spiritual and moral values are the most important task of strengthening national sovereignty [1]. Formation of high moral ideals and education of modern youth in the context of rapid digital transformation of society act as a complex and multi-component task of national scale. One of the urgent problems is also the assessment of the degree of formation of spiritual and moral qualities, which is especially relevant in the field of computer sports, where competitive activities are mainly implemented on foreign software in a virtual environment.

The need for an individualized approach to the education of e-sportsmen sets the task of finding criteria for assessing their spiritual and moral characteristics. In the framework of the study, the player's psychotype was proposed as a criterion, determined on the basis of Richard Bartle's theory, according to which players are divided into four psychotypes: "socialists", "researchers", "careerists" and "dominators" [2].

Each of the identified psychotypes is characterized by a set of behavioral patterns: for "careerists" this is the achievement of high results and the accumulation of achievements; For "researchers" – a detailed study of the mechanics of the game world; For "socialists" – a tendency to build social connections; For "dominators" – a desire for superiority over other participants in the game process. Each player can combine a certain ratio of different psychotypes. Some researchers emphasize that gaming behavior patterns are not limited to the virtual environment and can be reflected in everyday life [3]. Which emphasizes the importance of studying these characteristics for the development of an individualized approach to the spiritual and moral education of cyber athletes based on gaming psychotypes.

Objective of the study is to determine the value orientations of cyber athletes and identify relationships with the dominant gaming psychotype.

Methods and structure of the study. The study involved 10 men involved in computer sports (disciplines "combat arena" and "tactical three-dimension-

al battle"). The average age was 19.5±0.2, average MMP 5890±192, number of elo 1990±71.4, no significant outliers or deviations in distribution were found, which allows us to characterize the sample as homogeneous. The set of diagnostic measures included filling out a portrait questionnaire for diagnosing the structure of value orientations (methodology by S.S. Bubnova, 1995), S. Maddy's vitality questionnaire (adapted by D.A. Leontyeva) and a test to identify the dominant psychotype of a player according to R. Bartle's classification. The empirical data obtained were subjected to correlation analysis.

Results and conclusions. The results of the diagnostics of value orientations of 19-20 year old cyber athletes are presented in Figure 1. The studied contingent showed a low level of values of "social activity for positive change in society", "searching for and enjoying the beautiful", "learning new things in the world, nature, man", which may indicate the need to develop humanistic values of cyber athletes through an increase in the number of interactions with nature and society.

Figure 1. Results of diagnostics of value orientations of cyber athletes aged 19-20

Note: IP – indicators under study; MRZ – maximum reference values.

Table 1 presents a fragment of the correlation matrix of the results of diagnostics of the structure of value orientations of representatives of various psychotypes.

The value of pleasant pastime is more typical for "dominators" (0.572), a negative correlation is typical for "researchers" (-0.559).

Also, "researchers" showed average positive relationships with such values as "high social status and people management" (0.563) and "social activity for positive change in society" (0.514). For "socialists", an average negative correlation with "social activity for positive change in society" (-0.648) was found. Representatives of the game type "careerist" showed a positive relationship with value orientations related to communication (0.562), while "researchers" showed a negative relationship with this indicator (-0.625).

Differences in the value orientations of players can be explained in terms of their motivation for games. For "careerists", the high importance of communication is probably due to their desire to form and maintain a social status necessary for achieving career goals. At the same time, "researchers" demonstrate a negative correlation with communication indicators, since they focus on individual exploration of game worlds, minimizing social interaction.

The pronounced orientation of "dominators" to "pleasant pastime" may be associated with their desire for pleasure from domination and the competitive process, while for "researchers" this value gives way to cognitive processes. The opposite trend among "socialists" may reflect their focus on interpersonal connections and local initiatives, which are not always focused on solving social problems.

Statistical analysis revealed a negative average relationship (-0.565) for "careerists" with the "involvement" indicator in accordance with the method of assessing the resilience of S. Maddi. The motivational and value structure of "careerists" is characterized by

Table 1. Fragment of the correlation matrix of diagnostics of the structure of value orientations and psychotype of cyber athletes

Psychotype	Have a nice time and relax	High social status and management of people	Social activism for positive change in society	Communication	Engagement
Careerist				0,562*	-0,565*
Researcher	-0,559*	0,563*	0,514*	-0,625*	
Social worker			-0,648*		
Dominator	0,572*				

*Note: * – differences are reliable, at the significance level of p<0.05.*

a high focus on external achievements and social recognition, focusing on their own goals, which probably reduces the level of involvement, especially if the process does not bring immediate results.

Conclusions. Cyber athletes with the dominant "careerist" psychotype demonstrate an orientation towards external achievements and a low level of involvement in terms of resilience, "researchers" - on knowledge, "dominators" - on superiority over other players, "socialists" are focused on local interpersonal interactions, with less emphasis on positive changes in society.

The revealed level of development of value orientations of cyber athletes and the relationships between various indicators and the dominant game psychotype indicate the existence of a problem that requires a comprehensive solution and development of correction tools. Further in-depth studies can allow us to develop both general practical recommendations and those aimed at individualizing the spiritual and moral trajectory of development of cyber athletes, taking into account their current psycho-emotional characteristics.

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The likelihood of developing hypoglycaemic states may be an individual risk factor in elite canoeists

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Abstract

Objective of the study aims to establish the significance of possible hypoglycemia in a complex of risk factors that have a negative impact on the functional state of the body of highly qualified athletes involved in canoeing and kayaking.

Methods and structure of the study. This study analyzes scientific publications proving the importance of maintaining adequate carbohydrate reserves during intense physical activity. The study monitored venous blood glucose levels in elite canoeists. 73 male rowers (age range 18-37 years) of various skill levels (18 HMS, 21 MSIC, 34 MS) were examined 40 hours after the end of the last workout. Blood samples were taken and analyzed again in 35 people. Venous blood samples were analyzed at the Consultative and Diagnostic Center of the Research Institute – Regional Clinical Hospital No. 1 named after S.V. Ochapovsky (Krasnodar). A total of 166 measurements were taken.

Results and conclusions. The centile levels of hematocrit were determined, and significant differences in glucose concentrations corresponding to hematocrit values above and below the 75th centile were revealed. The study of the glucose level in venous blood 40 hours after the end of the workout demonstrated that the maximum values (95th centile) were below the upper limits recommended by WHO for healthy people (5.5 mmol/l). At the same time, in 28.4% of cases, the blood glucose level was below 4.1 mmol/l, and in 52.0% of them it was below 3.9 mmol/l.

In the context of sports medicine, it is advisable to introduce the concept of "potential hypoglycemia", which can be an individual risk factor affecting not only the effectiveness of training, but also contributing to the development of various clinical signs of non-functional overexertion, including risks for the cardiovascular system. In order to prevent potential hypoglycemia syndrome in athletes, it is imperative to add blood glucose level determination to the list of indicators monitored during ongoing medical and biological monitoring.

Keywords: *highly skilled canoeists and kayakers, glucose concentration, hematocrit index, centile gradations, risk factor for functional disorders of the body.*

Introduction. In 2014, a group of experts from the International Olympic Committee first considered the concept of “relative energy deficit in sport” (REDs) – a condition caused by the negative effects of low consumption and availability of carbohydrates [12, 16]. However, most likely, the multidisciplinary nature of the recommended REDs markers [10] will most likely lead to the fact that this syndrome will become the subject of extensive discussion and will cause the emergence of a large number of its opponents in the near future.

Objective of the study is to determine the degree of relevance of potential hypoglycemia in the system of risk factors for functional disorders of the body of highly skilled kayakers and canoeists.

Methods and structure of the study. The work summarizes the data from literary sources substantiating the need for stable maintenance of carbohydrate reserves under conditions of intense muscular activity, and also analyzes the results of monitoring the glucose index in venous blood in highly skilled kayakers and canoeists. The study involved 73 male rowers aged 18 to 37 years (18 HMS, 21 MSIC, 34 MS; 35 people were re-examined). Venous blood samples were taken in the morning on an empty stomach (40

hours after the end of the last training session). Blood tests were performed at the consultative and diagnostic center of the Research Institute-KKB No. 1 named after S.V. Ochapovsky (Krasnodar). The total number of measurements was 166.

Results and conclusions. According to the literature, the required level of carbohydrate reserves in the body is one of the important factors determining and limiting performance when performing high-intensity (2.5 min to 10 min) and moderate-intensity (10 min or more) exercises [2]. However, as a rule, studies devoted to this topic focus on muscle glycogen content, not blood glucose content [8, 13, 14].

Muscle glycogen and blood glucose are different components of carbohydrate metabolism. Skeletal muscles are not able to release glucose (since there is no glucose-6-phosphatase in muscles), and muscle glycogen is mainly a local source of energy for physical exercise, and not a source of energy for maintaining blood glucose concentration [11].

Recurrent non-critical hypoglycemia, i.e. a decrease in blood sugar, has its own spectrum of serious negative consequences, which is quite wide and has almost never been analyzed as a specific risk factor in the field of sports medicine. Only in some studies [3, 5] it was emphasized that a repeated decrease in blood glucose in athletes <4.1 mmol / l is a reflection of either depletion of liver glycogen reserves or intensive use of glucose by body tissues and can serve as one of the etiological factors of states of overfatigue / non-functional overstrain.

At the same time, according to the coding according to the International Statistical Classification of Diseases and Related Health Problems (E15/E16, 0/E16, 1/E16, 2/E16.9), within the framework of diseases or conditions classified as non-diabetic hypoglycemia, potential hypoglycemia is distinguished, the characteristics of which are as follows: glucose level ≤3.9 mmol/l, but ≥3 mmol/l in venous blood and/or ≤3.9 mmol/l, but>2.8 mmol/l regardless of the presence of neuroglycopenia symptoms [4]. When it occurs, a number of neuroglycopenic symptoms arise [9, 17], some of which coincide with those in two types of overtraining [1].

Particular attention should be paid to hypoglycemia in the pathogenesis of cardiovascular risks [6]. According to the results of the study by O. Rana et al. [15], during hypoglycemia in both type 1 diabetes patients and healthy individuals, coronary blood flow reserve decreases, which may serve as one explanation for the discovered link between hypoglycemia and an increased risk of cardiovascular death. It has also been established that at low plasma glucose concentrations, electrocardiograms (ECGs) show prolongation and increase in QT interval dispersion, which are proarrhythmic factors.

This is clearly seen in the analysis of ECGs recorded during spontaneous nocturnal hypoglycemia, when the unreplaced carbohydrate content leads to an even more pronounced decrease in blood glucose levels, especially against the background of additional risk factors (alcohol, quinine-containing foods and drinks, and a number of pharmacological drugs). In such cases, even emergency conditions may occur, which may explain some cases of sudden cardiac death in athletes at night in the absence of cardiac pathology.

When analyzing the results of our own observations, the following tasks were solved:

- to develop centile gradations of the hematocrit index in a selected group of athletes and to establish the relationship between the glucose concentration in venous blood and the hematocrit index (a similar approach is required when analyzing all parameters of the biochemical composition of blood);

- in the presence of a significant positive relationship between these parameters, to develop ap-

Table 1. Centile gradations of the hematocrit index and the reliability of differences in the glucose content in venous blood with a hematocrit index above and below 47%

Indicator	Number of measurements	Centile gradations						
		P5	P10	P25	P50	P75	P90	P95
Hematocrit, %	116	41,00	42,00	43,00	45,00	47,00	48,00	49,25
		Reliability of differences						
		Hematocrit level 47% and above (M±m)		Hematocrit value below 47% (M±m)	Critical value of t-test		The obtained value of the t-criterion	
Glucose, mmol/l	88	4,75±0,14		4,31±0,04	2,026		2,97	

Note: the reliability of differences was determined by the t-criterion value corresponding to a smaller number of measurements.

proximate centile gradations of the current glucose concentration in venous blood, having previously excluded the values corresponding to the 75th centile and above;

- to establish the number of measurements with venous blood glucose values below 4.1 mmol/l of blood and ≤3.9 mmol/l (the latter corresponds to potential hypoglycemia [4, 7].

The results of the studies showed that the correlation coefficient between the concentration of glucose in venous blood and the hematocrit index is below significant, but at the same time reliable differences were established between the values of glucose concentration corresponding to the hematocrit index above and below the 75th centile (Table 1).

The estimated centile gradations of the current glucose concentration in venous blood after excluding the values corresponding to the hematocrit value equal to and exceeding the P75 centile are given in Table 2.

Table 2. Calculated parameters and estimated centile gradations of glucose content in venous blood with a hematocrit value below P75

Indicator	Meaning
Coefficient of variation, %	9,53
Average value, mmol/l	4,31
Standard deviation mmol/l	0,41
Mean Error of the Mean, mmol/l	0,04
Number of measurements	88
P5	3,65
P10	3,80
P25	4,05
P50	4,35
P75	4,60
P90	4,72
P95	4,92

Analysis of venous blood glucose levels 40 hours after the last workout showed that its upper values (P95 centile) in highly skilled canoeists were below the upper values recommended by WHO for healthy individuals (5.5 mmol/l). At the same time, in 28.4% of measurements, the blood glucose level was below 4.1 mmol/l, and in 52.0% of them it was below 3.9 mmol/l. In addition, in three athletes, blood glucose levels were repeatedly recorded in the range of 3.88 and 4.04 mmol/l over two years.

It should be noted that we are talking about venous blood samples, in which the glucose level is higher than in capillary blood, and under the influence of psychological stress (fear of having blood taken), the blood glucose concentration may increase.

Conclusions. In relation to sports medicine, it is quite reasonable to introduce the concept of "potential hypoglycemia", which can be one of the individual risk factors not only for a decrease in the effectiveness of the training process, but also for the occurrence of a number of clinical manifestations of non-functional overstrain, including cardiovascular risks. In order to eliminate the syndrome of potential hypoglycemia in athletes, it is necessary to include in the list of parameters recorded as part of current medical and biological control, the determination of blood glucose levels.

A promising direction for further scientific research in this regard is daily monitoring of blood glucose levels and testing as part of staged examinations of glycated hemoglobin levels.

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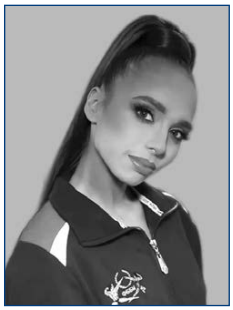
Unbalanced nutrition as a factor causing disruptions in the menstrual cycle and ovarian function in young women involved in bodybuilding

UDC 796.03



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Abstract

Objective of the study is to identify the relationship between nutritional deficiencies in female athletes specializing in bodybuilding and disorders of their ovarian-menstrual cycle (OMC).

Methods and structure of the study. A rational method for reducing caloric intake by reducing fat intake was developed and a survey of girls specializing in bodybuilding was conducted.

Results and conclusions. It was found that disorders (absence) of the OMC mainly occur due to a decrease in carbohydrates and fats to a critical level. The worst effect on the ovarian-menstrual cycle is a decrease in the percentage of fat in the diet to 10-15%. Those girls who maintained their OMC followed a diet containing 30-35% fat.

Keywords: *hormones, bodybuilding, menstrual cycle, proteins, fats, carbohydrates, competitions, rational method for reducing caloric intake.*

Introduction. Currently, there is a trend towards the development of women's sports. To achieve high levels of physical fitness, a female athlete needs to do a greater total amount of work than a male athlete. Often, such loads are disproportionate to the capabilities of the female body [1, 2, 3]. This phenomenon is explained by the anatomical and physiological characteristics of the female body, the main function of which is bearing and giving birth to a child. Professional sports place high demands on a woman's condition.

One of the components of training female athletes is a special diet. In some sports, such as wrestling, gymnastics, acrobatics, bodybuilding, etc., it is necessary to bring the body's condition to certain parameters [1, 2, 3]. The competition is considered an event on the day of which the athlete must show her "peak" form. At the same time, the preparatory period cannot be greatly extended in time, especially if the interval between starts is less than a week. Time constraints require the use of the most effective methods that give a guaranteed result. The above factors give grounds to say that the diets tried in the pre-competition period are not always gentle. The body regards any deficiencies as stress. Often, exhausting physical activity in combination with a caloric deficit in the diet that does not cover the energy expenditure of the athlete leads to ovarian-menstrual cycle disorders [3-6].

Objective of the study is to identify the dependence of deficiencies in the nutrition of female athletes specializing in the bodybuilding category on ovarian-menstrual cycle disorders.

Methods and structure of the study. This scientific observation was carried out at the Department of Biochemistry and Bioenergetics of Sports named after N.I. Volkov RUS "GCOLIFK", as well as in fitness clubs. The scientific experiment involved female athletes specializing in bodybuilding, aged 21-35 years (n = 30), from whom informed consent was taken to participate in the experiment. A method for reducing the caloric content of food by reducing the fat consumed was developed and a survey of those involved was conducted. The results obtained were processed using Microsoft Excel 2019.

Results and conclusions. The diet of an athlete in the pre-competition period can almost completely exclude fats of both plant and animal origin, while the total caloric content of the diet can either greatly decrease or be maintained by increasing the amount of protein food consumed. It is worth noting that the amount of carbohydrates is often also greatly limited.

For example, in one case in our experiment, to maintain body weight (55 kg), the athlete consumed 2500 kcal, of which 660 kcal came from proteins (165 g (2.5 g / kg)); 594 kcal – fats (66 g (1.2 g / kg)); 1246 kcal – carbohydrates (311 g (5.6 g / kg)). To reduce body weight, the diet could consist of 297 kcal – fats (33 g (0.6 g / kg)); 623 kcal – carbohydrates (155 g (2.8 g / kg)); the amount of proteins is maintained: 660 kcal (165 g (2.5 g / kg)). Thus, 297 + 623 + 660 = 1580 kcal. Here you need to calculate the percentage of calorie deficit: 2500 - 1580 = 920 kcal (38.6% of the calorie content needed to maintain weight).

In the second case, the calorie content of the diet was maintained due to protein: the amount of carbohydrates and fats is reduced in the same way as in the first case, and proteins are added in such a way that the daily calorie intake is maintained, as for weight maintenance: 297 kcal – fats (33 g (0.6 g / kg)); 623 kcal – carbohydrates (155 g (2.8 g / kg)); The amount of proteins can be calculated as follows: 2500 kcal – (297 + 623) kcal = 1580 kcal. Then 1580 kcal / 4.3 kcal = 367 g (6.6 g / kg). Such nutritional deficiencies put the body into a state of stress. Stressful situations provoke excessive production of cortisol and prolactin. Prolactin activity leads to a slowdown in the functioning of the thyroid gland, while the connection with the pituitary gland is also disrupted. As a result, the level of thyroid-stimulating hormone produced by the brain structure increases. This phenomenon leads to menstrual cycle disorders.

Another situation that requires attention is a decrease in the percentage of subcutaneous fat to a minimum. In this case, there is a decrease in the level of female sex hormones – estradiol. The level of sex hormones in the blood determines the nature of the distribution of adipose tissue, since accumulation, intense aromatization of sex hormones and their secretion also occur in it. Low estradiol in women causes a long absence of menstruation, dry skin and mucous membranes, brittle bones. The longer the period of an athlete's stay in this condition, the greater the risk of infertility. Today, the problem of maintaining the reproductive health of female athletes is very relevant. Girls participating in bodybuilding competitions are especially susceptible to reproductive health disorders. The fact is that the categories of this sport require maintaining large muscle volumes with a low percentage of subcutaneous fat (≈5-7%).

To confirm this assumption, a survey was conducted among girls participating in bodybuilding competitions n=30.

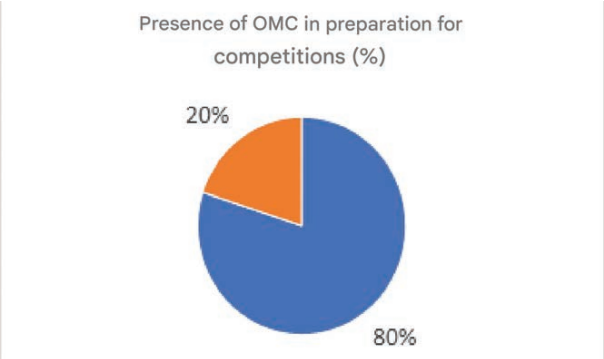

Fig. 1. The presence of the ovarian-menstrual cycle during preparation for competitions in girls specializing in bodybuilding

According to the survey, only 20% of the girls surveyed did not encounter the problem of menstrual cycle disorders during the competitive period (Fig. 1).

The described results can indeed indicate a direct dependence of the presence and functioning of the OMC on the nutrition of athletes.

As described above, the ovarian-menstrual cycle ceases to function normally due to low caloric content. However, it is worth noting that the caloric content of the diet of girls who did not experience OMC disorders was not significantly higher than that of the rest. Then, it was decided to conduct a survey aimed at identifying the ratio of proteins, fats and carbohydrates in the diet of athletes (Fig. 2).

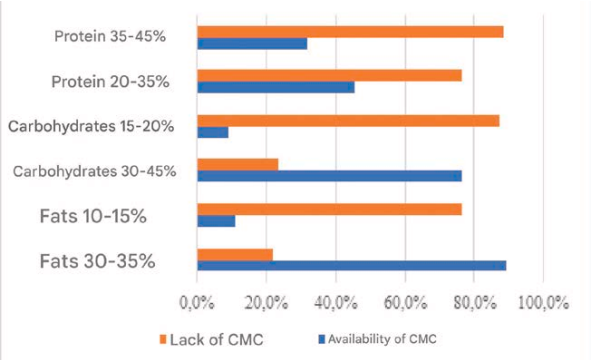

Fig. 2. Content of nutritional components in the diet of female athletes

It has been shown that the most detrimental factor to the ovarian-menstrual cycle is the reduction of the percentage of fat in the diet to 10-15%; girls who managed to maintain the OMC followed a diet containing 30-35% fat.

Conclusions. Analyzing the results of the questionnaire, we can draw the following conclusions:

1. The caloric content of the diet is not a determining factor in the presence or absence of the ovarian-menstrual cycle.

2. The most detrimental factor to the ovarian-menstrual cycle is the reduction of the percentage of fat in the diet to 10-15%; girls who managed to maintain the OMC followed a diet containing 30-35% fat.

3. Disturbances (absence) of the OMC largely occur due to a reduction in carbohydrates and fats to a critical level.

4. Athletes who managed to maintain normal ovarian-menstrual cycle functioning followed a diet containing an adequate amount of fat (to a greater extent) and carbohydrates (%).

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Specificity of the response of the body of children with motor limitations and cerebral palsy when performing active physical exercises using exercise equipment

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Abstract

Objective of the study is to identify the features of functional adaptation of the body of children with cerebral palsy when performing physical activity using exercise equipment in rehabilitation sessions.

Methods and structure of the study. The study involved children with cerebral palsy of primary school age. Exercise machines and other methods of physical exercise included in the rehabilitation session were used. Heart rate (HR) (a total of 211 observations) was measured using a Polar RS 800 chest heart rate monitor continuously during one session.

Results and conclusions. The highest average HR values were found in children of GMFSC level III in seven (out of eight) types of physical activity. The highest average HR results were shown in "Jumps" in children of all levels: in children of levels I-II (135±13.3 bpm), level III (142±14.6 bpm), performed independently or with the help of the "Gross Simulator", in the group of levels IV-V - (139±8.2 bpm), performed only in the "Gross Simulator". The maximum indicators from the ranges of HR values were noted in the group of children of levels I and II - (166 - 85) bpm. The highest HR values were noted in the physical activity in children of level III "Jumps independently or in the Gross Simulator" 142±14.6 bpm and on the "Ellipse Simulator" – 134±5.2 bpm; in children of I and II levels "Walking on knees in the "Gross Trainer" – 138±8.7 beats/min; work. The results of the experiment open up prospects for understanding the processes of functioning of the body of a disabled child when using training devices. They can become a guideline for taking into account the sequence of arrangement of "Training devices" in order to avoid overtraining of the child's body, for the accumulation of data characterizing the functional response to physical activity using training devices.

Keywords: *children with cerebral palsy, selection of physical activity, exercise machines, functional capabilities of the body, GMFCS levels, heart rate.*

Introduction. One of the factors that can improve the level of development of motor and functional abilities of children with cerebral palsy is the use of exercise machines that, in a gym, allow for physical activity that is similar in nature to the main movement, regulate the direction of the impact, take into account the body's reaction to the load being performed, and correct the movement technique. Active exercises increase the body's resistance not only to physical, but also to everyday and social stress, and are aimed at improving the functional development of the body as a whole [1, 3, 5].

To develop functional capabilities, it is necessary to correctly select the physical activity that is adequate to the characteristics of the child's condition and motor abilities. If the selected exercises using exercise machines are consistent with the physiological capabilities of the body, then the load contributes to a favorable restructuring of the muscular and functional state in children with cerebral palsy. Inadequate loads lead to various pathological changes in the body, which emphasizes the importance of monitoring the functional state, reflecting the dynamics of the adaptation processes of a child with cerebral palsy [2, 4, 6, 7].

Objective of the study was to identify the specific reactions of children with motor impairments and cerebral palsy to active physical activity using exercise machines.

Methods and structure of the study. The study involved primary school-age children with cerebral palsy, grouped according to the level of development of gross motor functions of the international GMFSC scale. The first group included children of levels I and II who could walk independently. The second group included children of level III only, who could walk using additional devices (canes, pushchairs). The third group included children of levels IV and V of the GMFSC scale who could not walk independently.

Heart rate measurements during standard physical activity were taken continuously during the lesson using a Polar RS 800 chest heart rate monitor. Exercise machines: "Electric Treadmill", "Ellipse" Exercise Machine, "Gross Exercise Machine" Multifunctional Exercise Machine (to enable children from levels III to V of the GMFSC scale to perform dosed physical activity on the musculoskeletal system) were used in different sequences depending on the lesson plan. A total of 211 observations were conducted.

Results and conclusions. The influence of physical activity is revealed in the conditions of comparison with the initial state, which preceded the performance of these activities. To determine the characteristics of the body's reaction in children with cerebral palsy when performing active physical activity using exercise machines, the results of the heart rate (HR) after performing eight types of physical activity were analyzed. The results were considered from two positions: 1st – comparison of average HR values relative to the GMFCS scale levels, 2nd – comparison of average HR values between types of physical activity.

Comparison of HR values depending on the GMFCS scale levels showed that the highest average HR values for seven types of physical activity (except for the eighth – walking on knees) were noted in children of GMFCS level III, who can move independently with the use of additional devices (sticks, canes, pushchairs).

The maximum HR value was observed in children of level III (142 beats / min.) after jumping load, which can be considered a good result, since it indicates sufficient adaptation of the cardiovascular system to physical activity. In the group of children of levels IV and V (who cannot move independently) and in the group of children of levels I and II (who can move independently), the average HR values were slightly lower than in children of level III, but close to each other – 139 and 135 beats / min., respectively. Children of levels IV and V have serious limitations in motor activity. Their HR of 139 bpm may be associated with lower physical activity and adaptation to the load, which explains the lower value compared to children of level III. Children of levels I and II have minimal motor limitations and can perform physical activity almost as well as their healthy peers. Their HR of 135 bpm may be associated with better adaptation of the cardiovascular system to physical activity.

The specified HR values were detected when performing the same type of motor activity – "Independent Jumps and in the "Gross Simulator" and were the highest among the other seven types of physical activity, as indicated by the large values of their percentage ratios relative to the initial level: in the group of levels I and II – 53%, level III – 48% and the combined group of levels IV and V – 60%. High values of HR increase are not unexpected for disabled children. In the study of D.A. Afanasyeva and L.M. Kiel v inen, confirmed the ability of children to walk on the "Treadmill" in the "Gross Trainer" in the aerobic mode from 125 to 163 beats / min, which was equal to 50-55% of the maximum heart rate [1].

Comparison of the ranges of maximum-minimum heart rate values in the GMFCS levels showed that the highest values were in the group of children of levels I and II (166-85 beats / min). Close to them, values were noted in children of level III (160-121) beats / min, in the group of children of levels IV and V (147-129) beats / min.

Comparison of the average heart rate values in each type of physical activity showed that the highest intensity value was noted in the "Independent Jumping or in the Gross Trainer" option: 142±14.6 bpm in children of level III. The values of 139±8.2 and 135±13.3 bpm corresponded to the combined groups of levels IV and V and the group of levels I and II of the GMFCS scale. Next, in descending order of the highest values, comes "Walking on the knees in the Gross Trainer" with the maximum indicator in children of levels I and II - 138±8.7 bpm and work on the "Ellipse Trainer" – 134±5.2 bpm in children of level III. The same values of 124±11.6 were noted in "Walking on a treadmill" and "Walking on knees" performed independently or using the "Gross Trainer" by children of level III.

The highest percentage values of the increase in heart rate values relative to the initial level were re-

vealed in the following types of physical activity: 60% – "Jumps in the Gross Trainer" in the group of children of levels IV and V of the GMFCS scale; 57% – "Walking on knees in the Gross Trainer" in the group of children of levels I and II; 53% – "Jumps in the Gross Trainer" of children of levels I and II; 48% – "Jumps in the Gross Trainer" of children of level III; 40% – work on the "Ellipse" trainer of children of level III.

The maximum increase of 60%, noted in the group of children of IV and V levels of the GMFCS scale, is associated with the high coordination complexity of performing jumping movements in this category of children. The increase values of 57 and 53%, noted in the group of children of I and II levels, indicate a high intensity of physical activity even for more mobile children, but at the same time, it allows to increase the level of development of functional capabilities. At the same time, it is necessary to emphasize the importance of adhering to an individual approach to dosing physical activity and the need to monitor the body of children with cerebral palsy during its implementation.

The least intense types of physical activity include "Gymnastics", "Stretching", Pose "Heron", where the obtained percentages of increase in heart rate ranged from 4 to 14%, relative to the initial level. Thus, the results of the study allowed to highlight a little-studied area – the peculiarities of the reaction of the body of children with cerebral palsy when performing active physical activity using exercise machines. Active physical exercise is a rather unusual regime for the body of children with cerebral palsy, which reacts with an increase in heart rate to specific exercises using exercise equipment. The results of the study made it possible to identify exercise equipment, the use of which contributes to an increase in the intensity of physical activity due to their high energy consumption, which contributes to functional adaptation with a focus on individual capabilities.

Conclusions. The average HR values in children with different levels on the GMFCS scale vary depending on the type of physical activity and their level of motor abilities:

- Children of GMFCS level III, when performing jumping movements from eight types of physical activity in the Gross Simulator, recorded the highest average HR values - 142 bpm.

- In children of levels IV and V (unable to move independently) and in children of levels I and II (able to move independently), the average HR values were lower than in children of level III, but close to each other: 139 and 135 bpm, respectively.

- The highest percentage increase in HR values relative to the initial level were found in the following types of physical activity: "Jumps in the Gross Simulator" in the group of children of levels IV and V – 60%, levels I and II – 53%, level III – 48%. "Walking on the knees in the Gross Trainer", in the group of children of levels I and II – 57%. Work on the Ellipse Trainer for children of level III – 40%.

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Optimization of the national system of physical training and sports GTO through a comparative study of the results of tests of persons with musculoskeletal disorders

UDC 796.83

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Abstract

Objective of the study is to determine ways to improve the All-Russian Physical Culture and Sports Complex GTO for people with disabilities and individuals with limited health capabilities, taking into account the specifics of fulfilling the standards of tests for people with musculoskeletal disorders.

Methods and structure of the study. Analysis of the results of testing people with disabilities and individuals with limited health capabilities with musculoskeletal disorders in the Russian Federation based on statistical reporting from the Federal Operator of the All-Russian Physical Culture and Sports Complex GTO for the period from 2019 to 2023.

Results and conclusions. Based on the results of the work carried out – an analysis of the results of participation of persons with musculoskeletal disorders in the All-Russian Physical Culture and Sports Complex GTO for the period 2019-2023 – it is recommended to develop separate tests and introduce relative standards based on a comparison of their current level of physical fitness and initial indicators, using an individual approach to each participant.

Keywords: *ways to improve the All-Russian Physical Culture and Sports Complex GTO, testing disabled people and people with disabilities, people with musculoskeletal disorders, testing standards (tests).*

Introduction. Since the introduction of the state requirements of the All-Russian Physical Culture and Sports Complex Ready for Labor and Defense (GTO) for persons with musculoskeletal disorders to the present day, the number of participants has increased threefold, from 1,043 to 3,000 or more people.

Objective of the study is to identify ways to improve the All-Russian Physical Culture and Sports Complex Ready for Labor and Defense for persons with disabilities, taking into account the specifics of fulfilling the standards for testing persons with musculoskeletal disorders.

Methods and structure of the study. The analysis of the testing results of persons with disabilities and persons with disabilities with musculoskeletal disorders in the Russian Federation based on statistical reporting from the Federal Operator of the All-Russian Physical Culture and Sports Complex Ready for Labor and Defense for the period from 2019 to 2023 was carried out as part of the work on scientific and methodological support [1, 2].

Results and conclusions. Analyzing the data in Fig. 1, we can conclude that the number of participants in the All-Russian Physical Culture and Sports Complex GTO with musculoskeletal disorders has positive dynamics.

Fig. 2 shows the results of the implementation of the standards of tests of distinction by persons with musculoskeletal disorders for the period from 2019 to 2023. The data obtained also indicate an increase in the number of participants who fulfilled the standards of the All-Russian Physical Culture and Sports Complex GTO for distinction.

Further, Fig. 3 presents statistical data on the results of testing of male and female individuals with unilateral or bilateral amputation, or other lesions of the

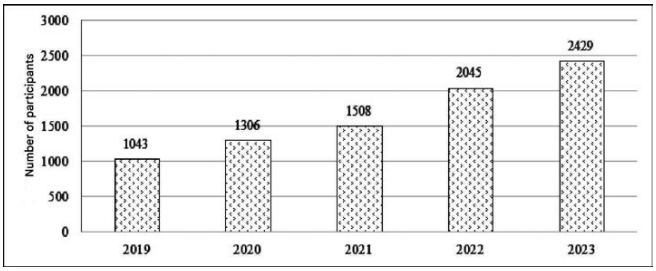

Fig. 1. Number of persons with musculoskeletal disorders who took part in the implementation of the standards of tests of the All-Russian Physical Culture and Sports Complex GTO (from 2019 to 2023)

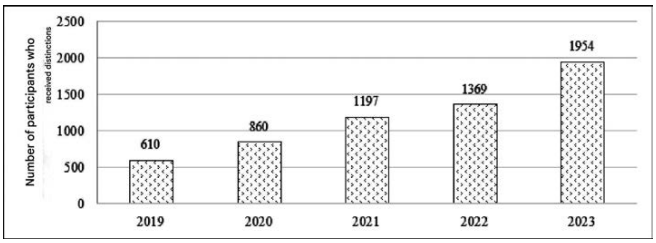

Fig. 2. Number of persons with musculoskeletal disorders who have passed the All-Russian Physical Culture and Sports Complex GTO (VFSK) test standards for distinction badges (from 2019 to 2023)

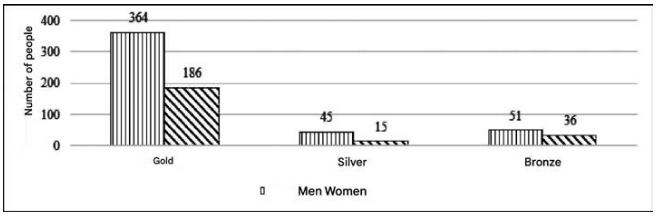

Fig. 3. Total number of persons with unilateral or bilateral amputation or other upper limb impairments, male and female, who passed the All-Russian Physical Culture and Sports Complex GTO (VFSK) test standards for distinction badges for the period (2019 to 2023)

upper limbs, who received distinctions (gold, silver, bronze) for the period 2019-2023.

Analysis of the results of testing persons with unilateral or bilateral amputation or other upper limb impairments according to the All-Russian Physical Culture and Sports Complex GTO (VFSK GTO) standards for distinction badges for 2019-2023 (Fig. 3) shows that a total of 697 distinction badges were received, of which 460 were received by males and 237 distinction badges by females.

When generalizing the data, there is a confident positive trend in the number of GTO participants and the receipt of distinction badges. However, it is advisable to consider the data on the number of male and female participants who received gold, silver, and bronze distinction badges for each year separately (Tables 1, 2).

The provided data on the number of male and female participants who received gold, silver, bronze badges of distinction for each year separately indicate that the majority of participants met the standards of the test (tests) of the All-Russian Physical Culture and Sports Complex GTO for the gold badge of distinction (Tables 1, 2).

The established fact can be interpreted as follows:

- the GTO complex is attended by persons with minor lesions of the upper limbs, for whom the proposed standards of the test (tests) are easily accessible for fulfillment;

- the standards of the test (tests) for silver and bronze badges of distinction are fulfilled by persons with severe forms of damage to the musculoskeletal system, which may be biased for assessing the level of their real physical fitness;

Table 1. Generalized results of participation in the implementation of the standards of tests of the All-Russian Physical Culture and Sports Complex GTO with unilateral or bilateral amputation, or other lesions of the upper limbs of males for the period from 2019 to 2023

Year	The number of persons with unilateral or bilateral amputation or other lesions of the upper limbs of the male gender who took part in the All-Russian Physical Culture and Sports Complex GTO and fulfilled the standards of the test for the badges of distinction								
	Those who took part	Those who completed the tests (number of people)				%			
		For insignia			NNZ	Received insignia			NNZ
		ЗЗ	СС	БЗ		ЗЗ	СЗ	БЗ	
2019	115	41	2	3	69	35,7	1,7	2,6	60
2020	165	59	8	7	89	35,8	4,9	4,2	53,9
2021	116	72	5	1	38	62,1	4,3	0,9	32,7
2022	155	78	17	26	34	50,3	11,0	16,8	21,9
2023	186	114	13	14	45	61,3	7,0	7,5	24,2
Total	737	364	45	51	275	49,3	5,8	6,4	38,5

Note: NNZ - below the standard of badges; BZ - bronze badge of distinction; ZZ - gold badge of distinction; SZ - silver badge of distinction

Table 2. Generalized results of participation in the implementation of the standards of tests of the All-Russian Physical Culture and Sports Complex GTO with unilateral or bilateral amputation, or other lesions of the upper limbs of the female sex for the period from 2019 to 2023

Year	The number of females with unilateral or bilateral amputation or other upper limb lesions who took part in the All-Russian Physical Culture and Sports Complex GTO and completed the test standards for distinction badges								
	Those who took part	Those who completed the tests (number of people)				%			
		For insignia			NNZ	Received insignia			NNZ
		ZZ	CC	BZ		ZZ	CZ	BZ	
2019	46	17	1	1	27	36,9	2,2	2,2	58,7
2020	71	34	0	3	34	47,9	0	4,2	47,9
2021	47	34	2	3	8	72,3	4,2	6,4	17,1
2022	96	47	8	20	21	49	8,3	20,8	21,9
2023	88	54	4	9	21	61,4	4,6	10,2	23,8
Total	348	186	15	36	111	53,5	3,9	8,8	33,8

Note: NNZ - below the standard of badges; BZ - bronze badge of distinction; ZZ - gold badge of distinction; SZ - silver badge of distinction

- results below the standard for the distinction badges are achieved by persons with the most severe and mixed forms of musculoskeletal disorders.

The above analysis of the participation of persons with musculoskeletal disorders in the All-Russian Physical Culture and Sports Complex GTO for 2019-2023 determines ways to improve the All-Russian Physical Culture and Sports Complex GTO for persons with disabilities with motor disorders. Based on statistical data on the participation of persons with musculoskeletal disorders in the GTO complex, it can be argued that the number of participants increases annually, as well as the interest of this category of the population in fulfilling the standards of tests.

However, at present, the state requirements of the All-Russian Physical Culture and Sports Complex GTO for persons with musculoskeletal disorders include tests where participants experience difficulties in fulfilling the standards for one of the distinction badges [3].

In order to increase the number of participants in the GTO complex with complex forms of musculoskeletal disorders, it is necessary to develop separate tests and implement relative standards based on a comparison of their current level of physical fitness and initial indicators, using an individual approach to each participant [4].

Conclusions. Thus, today, in order to attract a larger number of potential participants in the physical culture and sports complex with musculoskeletal disorders, as well as to increase the number of people who could meet the standards for distinctions, it is necessary to improve the regulatory framework of the GTO complex.

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Realization of individual and personal development potential of students of a special medical group in the process of adaptive physical education

UDC 796.011.3

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Abstract

Objective of the study Adaptive physical education exerts a positive influence on students with flat-valgus foot deformity and other special needs. Regular training sessions contribute to significant improvements in physical parameters. Furthermore, positive changes in psychological state are observed: heightened self-esteem, increased self-confidence, and enhanced motivation. The training also promotes the development of social skills, improving interactions with others and reducing stress levels. An individual's personal potential encompasses the totality of personal qualities, abilities, interests, and motivations that facilitate their development and successful self-realization in various spheres of life. For individuals with special health needs, realizing this potential can be challenging due to their specific circumstances; however, adaptive physical activity can assist in both realizing and accepting oneself.

Methods and structure of the study. is to examine how adaptive physical education influences the realization of individual personal potential of students of a special medical group with flat-valgus foot deformity. The study involved 15 students aged 18 to 25 years, assigned to a special health needs group and diagnosed with flat-valgus foot deformity. The experiment revealed that adaptive physical education sessions have a positive impact on students with special needs, including those with flat-valgus foot deformity, encompassing various aspects of their lives. Physical improvements include increased strength, flexibility, and endurance, along with reduced pain sensations. Psychological outcomes demonstrate heightened self-esteem, increased self-confidence and motivation, and decreased stress levels. Emotional state also improves, evidenced by elevated mood and reduced anxiety. Social skills are strengthened through enhanced interaction with other students and increased comfort in the social environment.

Keywords: *people with special health needs; flat-valgus foot deformity; adaptive physical education; individual personal potential.*

Introduction. In the modern world, physical health and activity play a crucial role in the quality of life for every individual, particularly for people with special needs (or people with special health needs / disabilities). Students with flat-valgus foot deformity constitute one such group requiring a specialized approach to physical activity. Regular practice of specialized exercises contributes to significant improvements in physical parameters. Furthermore, positive changes in psychological state are observed: heightened self-esteem, increased self-confidence, and enhanced motivation. The training also fosters the development of social skills, improving interactions with others and reducing stress levels. During the classes, using the integration of knowledge, skills and abilities from the field of IT technologies and the field of physical education and sports, within the framework of which, along with obtaining theoretical information, students of the special group master the skills of developing digital content, designing lesson programs, performing sets of exercises aimed at developing physical qualities and maintaining a healthy lifestyle. Physical education is of great importance for students of special medical groups. During classes, students develop not only their physical activity and body ca-

pabilities, but also have the opportunity to socialize in society. It is very important that physical education helps students develop teamwork skills, and with it communication skills [1, 5, 6].

The author analyzes the role of health systems for students of special medical groups. The article examines the indicators identified by students for addition to the health system to improve physical and mental health, and also examines adaptive methods of physical activity for special medical groups. [3, 7].

A 2018 study conducted by Lyudmila and Soslan Adyrkhaev demonstrated the positive impact of adaptive physical education on students with special needs. The authors' multi-year experimental research into methodologies showed improvements in students' physical health and fitness, along with their successful integration into the student environment. The obtained results prove that the presence of diverse illnesses, impairments, and/or a lack of motivation for physical activity necessitate a personalized approach for individuals with special health needs, requiring the selection of individualized conditions for their physical development. The results also provide evidence of students living within the student community where they feel comfortable and confident [2, 4].

Expert opinions indicate that the objectives of adaptive physical education can assist people with special needs, including students diagnosed with flat-valgus foot deformity, in improving their quality of life across various aspects, promoting their comprehensive development and social integration.

Objective of the study To examine how adaptive physical education influences the realization of the individual personal potential of students diagnosed with flat-valgus foot deformity.

Methodology and Research Design. The study involved 15 students aged 18 to 25 years, assigned to a special health needs group and diagnosed with flat-valgus foot deformity. The primary condition for participation was the regular performance of adaptive physical exercises over the course of one academic semester. These sessions incorporated a variety of techniques and methodologies aimed at preventing progression and improving the condition of the feet:

Strengthening Exercises: Calf raises, heel walking – improves muscle tone and stabilizes the feet. Achilles Tendon Stretching and Mobilization Techniques: To increase flexibility. Massage and Self-Massage: Foot massage and use of massage balls to relax muscles and improve blood circulation. Special Footwear and/or Orthopedic Insoles: Utilization of specialized footwear and/or insoles to ensure correct load distribution across the feet.

The study was conducted via an anonymous questionnaire survey. The questionnaire comprised 20 questions, divided into four sections: Physical Abilities, Psychological Qualities, Social Skills, and Emotional State. This questionnaire was designed to investigate how adaptive physical education sessions impact various aspects of the personal development of students with flat-valgus foot deformity.

The individual and personal potential of a student includes a set of personal qualities, abilities, interests and motivations that contribute to his development and successful self-realization in various spheres of life. For people with disabilities, it may be difficult to realize their potential due to their characteristics, but adaptive physical activity can help in self-realization and acceptance.

Results of the study and their discussion. Survey data confirms the positive impact of adaptive physical education (APE) on physical abilities.

The first section addressed the following questions:

"How do you rate your strength since starting APE?" Responses: Significantly improved - 9 students; Moderately improved - 4 students; Unchanged - 2 students; Worsened - 0 students. "Have you noticed improved flexibility since starting classes?" Responses: Significant improvement - 40%; Moderate improvement - 33%; Unchanged - 27%. "Has endurance increased since starting classes?" Responses: Significantly increased - 40%; Slightly increased - 33%; Unchanged - 20%; Decreased - 7%. "How often do you experience foot pain after classes?" Responses: Never - 20%; Rarely - 40%; Often - 27%; Constantly - 13%. "Do students feel an overall improvement in physical condition due to regular classes?" Responses: Yes, significant - 6 students; Yes, moderate - 5 students; No change - 3 students; Condition worsened - 1 student.

The second section evaluated the impact of APE on students' psychological qualities. "How have APE classes affected your self-esteem?" Responses: Significantly increased - 3 participants; Moderately increased - 4 participants; No change - 7 participants; Decreased - 1 participant. "Do you feel more

self-confident due to the classes?" Responses: Yes, significantly - 5 participants; Yes, somewhat - 6 participants; No change - 4 participants; Confidence decreased - 0 participants. "How have the classes affected your motivation for studying and other activities?" Responses: Unchanged - 40%; Moderately increased motivation - 33%; Significantly increased motivation - 20%; Motivation decreased - 7%. "Have you noticed reduced stress levels due to the classes?" Responses: Yes, significantly - 46%; Yes, somewhat - 27%; No change - 27%; Stress increased - 0%. Summary Question: "Do you feel more positive and emotionally stable due to the classes?" Responses: Significantly - 6 participants; Somewhat - 5 participants; No change - 4 participants; Condition worsened - 0 participants.

The next group of questions aimed to determine the influence of classes on participants' social skills.

"Interaction with other students?" Responses: Significantly improved - 5 participants; Slightly improved - 6 participants; Unchanged - 4 participants; Worsened - 0 participants. "Do you feel more comfortable in social settings due to the classes?" Responses: Yes, significantly - 6 participants; Yes, somewhat - 4 participants; No change - 5 participants; Comfort decreased - 0 participants. "How have classes affected your ability to form friendships?" Responses: Significantly improved - 3 participants; Slightly improved - 5 participants; Unchanged - 7 participants; Worsened - 0 participants. "Have you noticed increased social activity due to the classes?" Responses: Significantly increased - 9 participants; Slightly increased - 5 participants; Unchanged - 1 participant; Decreased - 0 participants. Summary Question: "Do you feel more integrated into the student community due to the classes?" Responses: Yes, significantly - 4 participants; Yes, somewhat - 6 participants; No change - 5 participants; Integration decreased - 0 participants.

Additional Questions: "How have APE classes affected your emotional state?" Responses: Significantly improved - 8 students; Moderately improved - 4 students; Unchanged - 3 students; Worsened - 0 students. "Do you feel less anxious due to regular classes?" Responses: Yes, significantly - 20% of respondents; Yes, somewhat - 47%; No change - 33%; Anxiety increased - 0%.

Conclusions. Based on the student survey, the following findings were identified:

Significant improvements in strength can be attributed to the regular physical exercises included in the adaptive physical education (APE) program, which target foot muscle strengthening. This contributes to enhanced overall physical fitness. Improved flexibility is linked to leg muscle strengthening and stretching exercises. The reduction in frequency of pain symptoms may result from specialized exercises designed to strengthen foot muscles, improve support, and promote better blood circulation. The overall physical improvement observed in most participants is likely due to APE's holistic approach to addressing their specific needs.

Increased self-esteem and self-confidence may stem from successful achievements and progress in physical exercises, fostering a sense of accomplishment and personal capability. Enhanced motivation for academic and other activities, along with reduced stress levels, is explained by tailored physical activities that prevent functional limitations and mitigate the impact of pain/discomfort on daily life.

APE positively impacts social skills in students with special needs. Participants reported improved peer interaction, greater comfort in social settings, increased social activity, and better integration into student life. These changes may be associated with growing self-assurance among students from specialized groups.

Enhanced emotional well-being and reduced anxiety in most participants may correlate with endorphin release during physical activity, which simultaneously alleviates stress. Increased relaxation likely results from exercises targeting the relief of physical and mental tension.

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Assessment of the physical condition and standard of living of elderly people

UDC 613.71

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Abstract

Objective of the study is to assess the physical functioning and quality of life of senior citizens based on the monitoring results.

Methods and structure of the study. Testing was conducted in accordance with the technical specifications of the research work on the stated topic and included: analysis of regulatory documents on the problem of active longevity; monitoring the level of physical functioning and quality of life of senior citizens aged 60 to 78 years to identify the main approaches that can create conditions for the formation of an interested attitude of senior citizens to systematic physical education (PE) classes and motivation for active longevity.

In order to determine the level of physical functioning, a battery of tests was used, including an assessment of walking speed, balance and a test with rising from a chair (The short physical performance battery, SPPB). To determine the level of quality of life, the SF-36 Health Status Survey quality of life assessment questionnaire was used.

Results and conclusions. The conducted testing allows us to state that PE classes significantly improve the physical functioning of older people and increase their quality of life. In particular, subjects involved in physical culture demonstrated higher rates of walking speed, balance, and lower limb strength. They do not have signs of frailty syndrome, unlike those not involved in physical culture.

The results of the survey using the SF-36 Health Status Survey questionnaire showed that those involved in physical culture perform everyday activities (walking, climbing stairs, etc.) more easily, and their subjective health assessment is higher than that of those not involved in physical culture.

Therefore, conditions should be created to develop interest in physical culture, health-preserving behavior, and motivation for active longevity in elderly people by means of adaptive physical culture, taking into account age restrictions on health in the contingent. Particular attention should be paid to the development of motivation for active longevity in the age groups of 65-69 years and 70-74 years, where the maximum spread of physical functioning indicators and quality of life (general physical component) was recorded.

Keywords: *older people, physical functioning, motivation formation, prolongation of active longevity, health and quality of life, adaptive physical education.*

Introduction. At present, the state policy in Russia is aimed at prolonging the active and healthy longevity of citizens of our country. A number of regulatory documents and national projects, in particular the National Project "Long and Active Life", are aimed at solving this problem.

Objective of the study is to assess the physical functioning and quality of life of older citizens based on the monitoring results.

Methods and structure of the study. As part of the implementation of the National Project "Long and Active Life", employees of NSU named after P.F. Lesgaft, St. Petersburg organized research work to fulfill the 2nd stage of the state assignment for conducting research work on the topic: "Development of scientifically based proposals for the formation of motivation in older citizens (taking into account sensory, motor and mental disorders) for active longevity by means of adaptive physical culture."

The study involved monitoring the level of physical functioning of elderly people aged 60 to 78 years and questioning senior citizens to determine the quality of life of the contingent, both those involved in physical education (PE) and those not involved. Since this age

range of the senior generation is quite large and by the age of 78 a person's psychophysical capabilities are significantly reduced, the elderly subjects who took part in the study. The group of subjects was divided into four age subgroups: 60-64 years; 65-69 years; 70-74 years; 75-78 years. Elderly people (n=219) took part in the testing. Of these, 118 were involved in physical education at Sports Centers, Comprehensive Social Service Centers, and fitness clubs; 101 were not involved in physical education.

The following were used in the study: a method for testing the physical functioning of elderly people aged 60 to 78 years using a short physical performance battery (SPPB); a survey method in the form of a questionnaire among elderly people to determine the level of quality of life using the SF-36 Health Status Survey; mathematical and statistical methods (using the Mann-Whitney U-test).

To determine the level of physical functioning, a battery of tests adopted in geriatrics was used, which includes three tests: the 1st test evaluates walking speed; the 2nd test is aimed at determining the level of balance; the 3rd test (rising from a chair) evaluates the condition of the joints and the strength of the lower limbs. All tests are focused on the functional state of the lower limbs of elderly people, since it is the decrease in this indicator that leads to an increased risk of falls [1].

Results and conclusions. The results of testing their physical functioning are presented in Fig. 1.

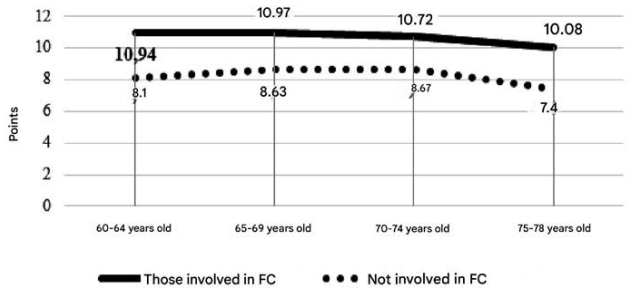

Fig. 1. Physical functioning indicators of elderly citizens engaged and not engaged in physical culture using the short physical performance battery, SPPB

The graph shows the difference in the physical functioning (PF) indicators of subjects who are engaged in FC and who are not engaged in FC, in favor of those engaged in FC. In all age periods, elderly people leading an active lifestyle do not have the syndrome of senile asthenia. People not engaged in FC have a state of preasthenia syndrome. By the age of 78, there is a tendency for PF indicators to decrease in representatives of all age ranges, both engaged and not engaged in FC, but in those engaged in FC in the corridor of the absence of signs of asthenia syndrome, in those not engaged in FC – in the corridor of the presence of signs of asthenia syndrome.

The differences in PF indicators are reliable ($p<0.05$), except for the data in the age period of 65-69 years, where the results are insignificant. In this age period, the subjects show a wide range of FF data. The greatest differences in the FF indicators of those involved and not involved in physical culture are observed in the age periods of 60-64 and 70-78 years. This may be due to the fact that in early old age people are still quite energetic and continue their professional activities, which ensures a fairly high level of FF. By the age of 78, most representatives of the older generation retire and lead a less active lifestyle, the number of chronic diseases that limit the physical capabilities of an elderly person also increases, and the risk of falls increases.

To determine the level of quality of life of elderly people, the questionnaire "SF-36 Health Status Survey" [2] was used. The elderly person's subjective perception of his quality of life, health and well-being were studied. The indicators of the general physical health component (PH) were determined, reflecting the degree to which the physical condition of an elderly person limits his performance of physical activity, everyday manipulations; role functioning, and also shows the presence and intensity of pain, general health [2].

The survey involved elderly citizens (n=241 people). Of them: those involved in physical training in Sports Centers, Comprehensive Social Service Centers, fitness clubs – 118 people; those not involved in physical training – 123 people. The survey results are presented in Fig. 2.

The obtained empirical data allow us to state that physical training improves the quality of life of an elderly person. Thus, Fig. 2 shows that elderly people who are not involved in physical training have a lower subjective perception of their health than those involved in physical training in all age ranges. It is more difficult for them to perform everyday manipulations, walk, climb stairs, carry heavy objects, etc. Moreover, the most significant reliable differences in PH indicators were recorded in the age range of 60-64 years ($p<0.05$), smaller and insignificant in the age range of 70-74 years. Perhaps this is due to the large spread of

PH indicators of the subjects of this age. Just as in the indicators of physical functioning (Fig. 1), by the age of 78 there is a tendency for indicators to decrease in representatives of all age ranges involved in physical culture.

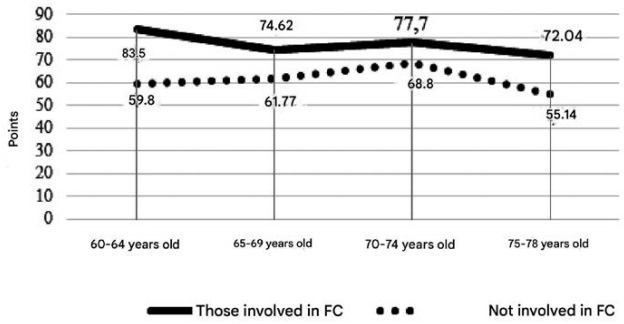

Fig. 2. Physical health (PH) indicators according to the SF 36 quality of life scale for older people who do and do not do physical exercise

Conclusions. The study suggests that physical education significantly improves the physical functioning of older people and increases their quality of life. Thus, subjects who do physical education demonstrated higher indicators in the short physical performance battery (SPPB) tests of walking speed, balance, and lower limb strength in all age groups (60-78 years). And they do not have signs of frailty syndrome, unlike those who do not do physical education.

The results of the survey using the questionnaire "SF-36 Health Status Survey" showed that those involved in physical culture perform everyday activities (walking, climbing stairs, etc.) more easily, and their subjective health assessment is higher (physical component of health (PH) than those not involved in physical culture. Age dynamics of PH indicators on the quality of life scale "SF 36" were also revealed. Thus, in both groups after 70 years there is a decrease in indicators, but in those involved in physical culture it is less pronounced. The largest gap between the groups was recorded in the categories of 60-64 years and 70-78 years, which in the first case is most likely associated with the preservation of physical activity in working elderly citizens, in the second – with the increase in involutional processes in the body by 78 years and the accumulation of chronic diseases and their progression, especially in inactive elderly people.

Thus, it can be concluded that when forming motivation in older people for active longevity, it is necessary to create conditions for involving older people in regular physical culture classes. taking into account their age restrictions on health, paying particular attention to the age groups 65-69 years and 70-74 years, where the maximum variation in indicators of physical functioning and quality of life (general physical component) was recorded.

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The role of media literacy of young athletes in the process of formation of their value system

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Abstract

Objective of the study is to study the level of media competence indicators of athletes from the sports reserve (hereinafter referred to as athletes) with signs of deviant behavior in the context of the formation of value orientations.

Methods and structure of the study. An analysis of literary sources on the criteria of media competence was carried out, a survey, observation, and a pedagogical experiment were conducted. The parameters and indicators of media competence (Fedorov A.V.) were selected, according to which a questionnaire survey of athletes was conducted (2023-2024). The results of pedagogical observation in the process of educational activities to form value orientations were analyzed and summarized. A correlation analysis was performed between the level of motivational indicators of media competence and value orientations of athletes (n=14, by sports: orienteering, handball, volleyball, rowing and sailing, age 16-17 years).

Results and conclusions. The levels of motivational indicator of media competence of athletes were established. A survey was conducted at the beginning and at the end of the pedagogical experiment. The motives and genre preferences for consuming media content were studied: for self-affirmation and gaining knowledge about life outside the sports environment; the desire to learn to distinguish false (negative propaganda) information from truthful information; interest in the media space in the communication of athletes and youth artistic groups. The results of the study revealed an overestimation of the athletes' capabilities in interpreting content. The importance of media competence increased due to a change in genre preferences and motives for contacts with the media.

Keywords: *deviant behavior, value orientations, media competence, genre and thematic motives for contacts with media texts, overestimation of athletes' capabilities.*

Introduction. One of the priority areas of the state's work in the field of physical culture and sports is "improving the propaganda and communications system" [5]. Mass media "have become transmitters of cultural achievements and, undoubtedly, actively influence the acceptance or denial of certain cultural values by society" [2]. Mass media, "on the one hand, help the younger generation adapt to the social environment, on the other hand, make them susceptible to manipulation" [6], form socially disapproved values, and lead to manifestations of deviant behavior. "Consumption of media information is becoming an independent type of activity" [1, p. 48] of a person, requiring the development of media competence skills. We consider media competence of an individual as "a set of his or her motives, knowledge, skills, and abilities that facilitate the selection, use, critical analysis, evaluation, creation, and transmission of media texts in various types, forms, and genres, and the analysis of complex processes of media functioning in society" [7]. For a person with a high level of media competence, the following indicators are characteristic: motivational, contact, informational, perceptual, interpretive / evaluative, creative [7].

Objective of the study is to study the level of media competence indicators of athletes from the sports reserve (hereinafter referred to as athletes) with signs of deviant behavior in the context of the formation of value orientations.

Methods and structure of the study. The study of the use of media communications by athletes was carried out as part of a pedagogical experiment. Based on the analysis of theoretical and practical studies (M.V. Zhizhina [1], Fedorov A.V. [7]), on the criteria of media competence, as well as studies conducted by the authors (expert survey [4], observation, pedagogical experiment), media competence indicators were identified, according to which a questionnaire survey of athletes was conducted in 2023 and 2024. A correlation analysis of preferences in genre motives of contacts with media texts and value orientations of athletes was conducted (n=14, by sports: orienteering, handball, volleyball, rowing and sailing; age 16-17 years) [3].

Results and conclusions. The levels of the motivational indicator of media competence of athletes were identified by means of a questionnaire at the beginning and at the end of the pedagogical experiment. Genre and thematic motives of contacts with media texts were studied. The dynamics of the studied indicators were recorded (2023, 2024).

The study examined genre preferences of contacts with media texts in the press, radio and television programs, in films/TV series on Internet sites. The answer options chosen by every fifth respondent are presented (Table 1).

A change in genre preferences in the press has been recorded: studying texts about the heroes of the Great Patriotic War and the Soviet Military District, a decrease in interest in games. A change in genre preferences in radio broadcasts: a decrease in interest in interviews, an increase in interest in political reviews, in the poems of patriotic poets. A change in genre preferences in television broadcasts: an increase in viewing of information genres.

Table 1. Respondents' answers to the question: "What genres attract you when working with media texts?" (respondents were asked to select multiple answers), 2023, 2024, n=14

No	Genres	2023, %	2024, %
1	In the press:		
1.1	Informational	28,6	28,6
1.2	Analytical, journalistic	0	21,4
1.3	Literary	7,1	21,4
1.4	Games/competitions	21,4	14,3
1.5	None	7,1	28,6
2	In radio broadcasts:		
2.3	Analytical, journalistic	7,1	14,3
2.4	Literary and dramatic	0	21,4
2.5	Musical (classical music)	7,1	21,4
2.6	Musical (jazz music)	14,3	14,3
2.7	Музыкальные (поп-музыка)	28,6	42,9
2.8	None	7,1	28,6
3	In TV shows:		
3.1	Informational	0	21,4
3.2	Literary, dramatic, cinematic	7,1	21,4
3.3	Musical (pop music)	7,1	21,4
3.4	Games/competitions	28,6	21,4
4	On internet sites		
4.1	Informational	35,7	85,7
4.2	Analytical, journalistic	28,6	28,6
4.4	Television and cinema	42,9	64,3
4.5	Musical (with jazz music)	14,3	28,6
4.6	Musical (with pop music)	50,0	42,9
4.7	Games/competitions	28,6	64,3
4.8	Advertising	21,4	57,1
5	In movies/TV series		
5.1	Western	7,1	28,6
5.2	Fairy tale	14,3	35,7
5.3	Synthesis of genres	28,6	50,0

Table 2. Respondents' answers to the question: "Name the main motives for your contacts with the media" (respondents were asked to select several answer options), 2023, 2024, n=14

No	Motives	2023, %	2024, %
1	Get new information	7,1	42,9
2	Recreation, rest (virtual escape from problems)	21,4	14,3
3	Learn to create media texts yourself	14,3	21,4
4	Occupy free time	14,3	21,4
5	Materials for educational, scientific, research purposes	21,4	28,6
6	Confirmation of one's own competence in various spheres of life and media culture	14,3	35,7
7	Listen to your favorite music	28,6	21,4

Table 3. Results of the correlation analysis between genre motives of contacts with media texts and value orientations of athletes (n=14), 2024

No	Indicators	Correlation coefficient (rs)
1	Genres: analytical, journalistic and cheerful (optimism, sense of humor)	0,632*
2	Genres: analytical, journalistic and performance (discipline)	0,629*
3	Genres: games/competitions (crosswords, etc.) and courage in defending your opinion	0,615*
4	Musical genres (classical music) and efficiency in business	0,593*
5	Musical genres (classical music) and cheerfulness (optimism, sense of humor)	0,562*
6	Musical genres (jazz music) and efficiency in business	0,593*
7	Musical genres (jazz music) and cheerfulness (optimism, sense of humor)	0,562*
8	Music genres (pop music) and courage in defending one's opinion	0,544*

*Note – significance of differences: ** – $p \le 0.01$, *– $p \le 0.05$.*

On Internet sites – an increase in interest in information genres (interest in live reports from the scene, viewing short documentaries and sports competitions, an increase in interest in advertising), a decrease in interest in low-quality literary works. The increase in interest in viewing content on Internet sites is due to the possibility of feedback. The most preferred genres in films/TV series: Russian detectives, modern interpretations of fairy tales, new film forms. Also equally interesting (21.4%) are: detectives, musicals, thrillers, science fiction, disaster films. Thematic motives of contacts with media texts were studied. The most popular answers are presented (see figure). There is an increase in interest in historical, youth, spiritual and moral topics, which is associated with the growth of interest in the history of Russia, moral problems in modern Russian society.

Respondents' answers to the question: "What topics attract you in the press, radio/TV programs, Internet sites, computer games, social networks?" (respondents were asked to select several answer options), 2023, 2024, n=14

The main motives for athletes' contacts with the media press, television, cinema, radio, and the Internet were studied. The answer options chosen by every fifth respondent are presented (Table 2).

A decrease in the desire for entertainment content was established. An increase in interest in studying information about the socio-political situation and educational content was recorded.

During the experiment, a study of value orientations was carried out (according to the method of M. Rokeach) [4]. The obtained materials were subjected to correlation analysis (rs-Spearman). An analysis of the relationship between genre motives of contacts with media texts and value orientations of athletes was carried out. The most significant positive relationships are presented (Table 3).

The highest correlation was recorded between the indicators of "preference for analytical, journalistic genres" and "cheerfulness" (rs=0.632*), the second place in the ranking is occupied by the indicator of "preference for analytical, journalistic genres" and "executiveness" (rs=0.629*), the third place is occupied by the indicator of "genres: games/competitions" and "courage in defending one's opinion" (rs=0.615*).

Conclusions. Mass media today play a significant role in constructing public consciousness, being a tool for forming socially significant values of athletes.

The genre and thematic motives of contacts with media texts were studied: for self-affirmation and gaining knowledge about life outside the sports environment; the desire to learn to distinguish false (negative propaganda) information from truthful information; interest in the media space in the communication of athletes and youth artistic groups. An overestimation of the capabilities of athletes in interpreting content was established. The dynamics of the studied indicators (2023-2024) were recorded. A positive relationship was revealed between the indicators of media content consumption and the value orientations of athletes.

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Strategies for popularizing the Media League within the Russian sports media environment

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Abstract

Objective of the study is to identify and characterize key practices in promoting the Media Football League (MFL) in Russia.
Methods and structure of the study. In the course of working on the study, five semi-structured in-depth interviews were conducted with representatives of the media league management, media football teams, and sports journalists covering MFL competitions. All interviews took place from September to November 2024. The interview guide included three blocks of questions covering the MFL activities from different angles. The interviews were conducted anonymously.
Results and conclusions. It was found that the main media tools for promoting the MFL are YouTube and Telegram. In addition, cooperation with traditional sports media is practiced. An important factor in promoting MFL content is its focus on its target audience. Team representatives actively interact with their audience both offline and online, talking about the lives of MFL team players in various media formats and organizing meetings with fans. Thus, individual elements of the media football promotion strategy can be used in developing media strategies for professional football teams.

Keywords: *professional football teams, sports media communications, media football league, media sports, social media, MFL clubs, promotion specifics, popularity phenomenon.*

Introduction. Growing interest in sports in our country contributes to the emergence of new actors in sports communication – “advanced amateurs” who, thanks to social media, often become the main popularizers of certain sports, since “sports stars cannot compete in terms of demand with representatives of show business, politics and some other spheres” [1]. Also, according to M. Danilova, “modern sports depend on entertainment” [3, p. 533], and in this context, the emergence of the Media Football League (abbreviated media league, MFL) as an amateur competition of teams consisting of famous “media” players seems quite justified. The phenomenon of the media league allows us to talk about “a successful example of adapting sports to the realities of the digital environment” [4].

The MFL format is quite creative. The competition contains elements of an entertainment show: live broadcast, the presence of "challenges" in which teams compete for bonus points in the overall standings, an unlimited number of reverse substitutions, microphones on the referees, shootouts instead of penalties, blitz interviews during breaks, "clean" playing time, as well as the presence of "media" players, which "aims to form a new view of the sports system, making it attractive to fans" [2, p. 216].

The first season of the Russian Media League took place in 2022 and, in terms of views on the YouTube platform, managed to bypass the Russian Premier League (RPL). The methods of interaction between the MFL and the audience demonstrate "a variety of approaches aimed at increasing engagement and retaining the interest of subscribers" [4]. Due to the originality of the format, interest in the tournament is steadily growing, which makes it necessary to take a more detailed look at the phenomenon of the popularity of media football. The purpose of the study is to identify key practices in promoting the Media Football League (MFL) in Russia.

Methods and structure of the study. During the study, five semi-structured in-depth interviews were conducted with representatives of the media league management, media football teams, and sports journalists covering MFL competitions. All interviews were conducted between September and November 2024. The

Table 1. Data on the interviews conducted

Informant's code	Informant status	Format of the event	Duration
I 1	Creative Producer of the Media Football Team	Full-time	1 hour 35 minutes
I 2	Technical Director of MFL	Full-time	30 min.
I 3	SMM specialist MLF	Full-time	25 min.
I 4	Press attach of the media football club, author of the sports Telegram channel	Full-time	43 min.
I 5	MFL commentator and media football team goalkeeper	Full-time	31 min.

guide included three sets of questions, each of which was designed to reveal different aspects of the MFL's activities. The interviews were conducted on condition of anonymity, so further quotes with the informant's code will be used when describing the results.

Results and conclusions. Due to the variety of definitions of media football, it was important for us to first understand how the MFL representatives themselves define this term, what differences they see from professional football competitions. Thus, all informants emphasized a freer format for organizing the tournament, the presence of a bright media component, close attention to the lives of the players themselves and great emotional intensity. As I4 noted, “this is emancipation. Here, even the most reserved professional footballer will sooner or later open up. Each of us is talented, you just need to understand in what. Media football differs from professional football in that here people talk about everything they want. No frills. Everything is in plain sight, as the viewer loves.

This is not the case in professional sports.” Opinion of I2: “Media football is a lot of content, availability everywhere, no boundaries and a large number of switches.” I1 also noted the attention to the players: “Media football is professional football teams that talk about themselves in the most detailed and open way.” However, any content is created taking into account the interests of the audience. According to interviewees, the MFL audience is predominantly men aged 15 to 35. All informants see the main goal of promotion as not only broadcasting interesting original football content, but also getting closer to the viewers. “People like to be involved in projects, people are interested in receiving feedback, being contacted, photographed, and participating in various projects. Media League is the closeness of stars and ordinary people.

This is very attractive. Therefore, our main goal in promotion is to make the viewer feel the club. Feel their involvement in the team” (I4); “the phenomenon of media football popularity is associated with freedom, which consists of several aspects. Firstly, it is closeness to the body, in fact. Fans can come to the stadium, meet, take pictures, and chat with their idols. There is no FanID here, which is important. Plus, freedom in media football is also freedom of opinion. I think that viewers like the harshness of statements and their frankness, controversy, they like that media football is full of colors, emotions, albeit not always positive, often negative, and these are most often conflicts" (I5).

The informants named social media YouTube and Telegram as the main tools for promoting media football content. At the same time, the latter resource seems to be the most promising to representatives of the MFL, since it is key for the target audience of the league, includes various opportunities for publishing different types of content, interacting with advertisers and other sports channels. As I5 noted, "in media football, the most effective promotion resource is the Telegram channel.

The club's channels, the main dealers of the team's opinions, from where users can go to the "big" video on the YouTube platform." At the same time, an important feature of the MFL content is its focus on the life of the football team players, and not just the broadcast of competitions, which makes viewers get closer to their media idols. This fact forces representatives of the MFL to constantly come up with different ways of interacting with their audience.

For example, a documentary series about the life of the MFL Egrisi team was launched on V. Utkin's YouTube channel. A representative of this team also said that they use streams, during which any viewer can come and ask questions to the team: "We answer them honestly and openly. Plus, throughout the entire time, we very openly reported in our videos what was happening in the team, that is, if there was some kind of conflict, we left it so that people could see what was really going on inside" (I5).

At the same time, all informants noted that not all representatives of the teams are included in the frame, but the most charismatic ones, who are more capable than other representatives of the team to attract the au-

dience ("We pay attention to how he looks and speaks. Charismatic characters who will attract the viewer are always needed in the frame" (I4); "We have, God willing, five such heroes in the team, they are the recognizable faces of the team" (I1)). Partly by the same principle, "media" players are invited to the teams.

An important component of the MFL promotion is the issue of interaction with the media, which, as we assumed, can be of decisive importance for the popularization of media football. All informants expressed their opinion regarding the interest of the media in the events of the Media League. In many cases, it is the media that initiate such media cooperation ("Nobody negotiates, they come themselves, because there is interest" (I2); "We have been and are in very close cooperation with Sport.ru. We have, let's say, a friendly agreement that they support our releases and some of our posts. And we place them on the uniform, their logo.

We have a general conversation where we discuss our plans, what videos we have, when they come out, how we can integrate sports into it" (I5)). I1 noted that there is no close cooperation with the media, although the representative of the MFL (I1) is on friendly terms with many journalists: "now we have chosen a different vector – to work for our audience and for ourselves, so that it is cool, interesting, and fun for us. When you set the task of creating radio content so that the media will notice you, this is wrong."

During the interview, we also tried to find out whether there are any features of preparing MFL content that distinguish it from the content of professional competitions. In this case, I5 noted the importance of using several characters in the frame: "It is more difficult for one to work in the frame. It is much easier to work with two, three, and so on, because these are different voices, different intonations, different people. And the person who watches this video is less likely to get tired."

Another important point is related to the emotions that the organizers of the MFL try to convey to the viewers ("in 80% of cases they are sincere, because people are really worried, and they cannot always control their emotions" (I5)). Moreover, one of the informants (I1) in the question regarding the future of the MFL also outlined a "demand for sincerity" and a move away from excessive media coverage ("I feel that little by little these "throw-ins", "warming up" and other things will go away, because there is no sincerity in this").

According to the informants, these details affect the content performance indicators (number of views, comments, clicks on links and others), which are paid attention to by sponsors, bookmakers and advertisers.

Conclusions. The conducted study allowed us to identify key aspects of the specifics of MFL promotion and the phenomenon of media football popularity in Russia. Thus, one of the key points is the orientation of MFL content to its target audience. This content is related not only to competitions, but also to the life of MFL teams.

Team representatives actively interact with their audience not only offline, but also online, organizing meetings with fans. Secondly, MFL teams are actively present in social media, relying on two resources – Telegram and YouTube. Cooperation with traditional sports media is also used as promotion tools.

The original format of the Media League competitions and, accordingly, creative content that focuses on people, their emotions and informal communication are a key factor in the popularity of the MFL. We believe that individual elements of the media football promotion strategy can be extremely useful in preparing media strategies for professional football teams and, in general, for stimulating interest and developing Russian professional football.

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Mobile Phone Use and Safety: Ways to Reduce the Risk of Injury During Sports and Exercise

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Abstract

Objective of the study is to determine measures aimed at preventing injuries associated with the use of mobile communications during training sessions.

Methods and structure of the study. The information base for the study was the laws and regulations of the Russian Federation, professional standards, statistical data from foreign organizations (NIOSH, OSHA, HSE), data from the All-Russian Research Institute of Labor of the Ministry of Labor of Russia, reflecting the main causes of injuries associated with the use of mobile communications, as well as an analysis of cases of injuries resulting from the use of mobile devices during training sessions in sports schools in Moscow.

Results and conclusions. The ways of preventing injuries due to the use of mobile communications during training sessions were determined, which are associated with improving the regulatory framework, expanding the knowledge of teachers about ways to prevent threats with the conscientious performance of their job responsibilities, as well as regular advanced training of employees of sports organizations. In the future, it is necessary to develop local regulations aimed at limiting the use of mobile devices during training sessions. All of the above measures will improve the safety of training, minimize the risk of injury, and increase the level of responsibility of specialists working in the field of physical education and sports.

Keywords: *mobile communications, educational and training process, safety of classes, injury prevention.*

Introduction. The use of mobile communications is an integral part of the daily life of a modern person. At the same time, despite the numerous capabilities and functionality of these devices, there are serious risks when using them during various actions that require increased attention, such as driving a car and other vehicles, while working with dangerous machinery and equipment, during educational and training sessions, etc. Distraction and the inability to quickly respond to changes in the environment create real threats to human safety and health.

Foreign and domestic studies have repeatedly addressed the issue of using mobile communications during working and school hours. Employers note that the use of personal mobile devices during the working day distracts the employee from performing his or her job function, which leads to decreased productivity, minor or serious damage to the company's property, and, most importantly, creates a threat to labor safety.

The legislation of the Russian Federation does not establish specific restrictions on the use of mobile phones during the working day, and there are no official statistics directly linking industrial injuries with the use of mobile communications while performing professional duties. However, the general safety requirements set out in the Labor Code of the Russian Federation imply that the employer must take measures to prevent injuries in the workplace[1].

At the same time, according to statistics from the All-Russian Research Institute of Labor of the Ministry of Labor of Russia, the most common cause of injuries and deaths of workers (almost 50% of cases) is the failure of managers and department specialists to monitor the progress of work, as well as failure to comply with labor discipline [1]. An analysis of foreign practice allows us to identify the main causes of

[1] Labor Code of the Russian Federation of 30.12.2001 No. 197-FZ (as amended on 28.12.2024) [Electronic resource]. URL: https://www.consultant.ru/document/cons_doc_LAW_34683/ (date of access: 27.01.2025).

injuries associated with distraction by mobile phones while performing professional duties:

1. Distraction and loss of concentration. According to a study by the National Institute for Occupational Safety and Health (NIOSH, USA), workers using phones in high-risk areas reduce their reaction time by 38-50% [5].

2. Falls from heights. According to OSHA (Occupational Safety and Health Administration, USA), about 17% of falls in the workplace are associated with distraction, including the use of phones [6].

3. Collisions with objects and vehicles. HSE (Health and Safety Executive, UK) studies note that 37% of workplace accidents occur due to "blind spots" and employee inattention [4].

4. Errors when operating equipment. In the manufacturing sector, incorrect actions due to distraction by a phone lead to accidents in 12% of cases (NIOSH data) [5].

The dangers and risks caused by the uncontrolled use of mobile communications during the educational and training process deserve special, close attention [2, 3]. The first steps to control the use of mobile communications in the educational process have already been taken: from September 1, 2024, a ban was introduced on the use of mobile radiotelephone communications (mobile phones, tablets, smart watches, etc.) by schoolchildren, which is reflected in the amendments introduced to the Federal Law "On Education in the Russian Federation"[1, 2].

Control over the use of mobile communications during training sessions is delegated to the administration of youth sports schools and other organizations implementing additional educational programs for sports training. Moreover, such local regulations mainly regulate the use of mobile communications by students and practically do not impose restrictions on the use of these devices during training sessions by coaches, sports instructors, and teachers of additional education.

According to statistics in Moscow for 2024, as a result of the use of mobile electronic devices during training sessions, 26 cases of serious injuries were recorded, including one group incident in which 17 teenagers were injured. Data analysis showed that a significant portion of injuries were associated with the fact that in many cases employees were distracted by the use of mobile devices for personal purposes during classes, including when organizing classes in swimming pools.

The purpose of the study is to determine measures aimed at preventing injuries due to the use of mobile communications during training sessions.

Methodology and organization of the study. The information base of the study included laws and regulations of the Russian Federation, professional standards, statistical data from foreign organizations (NIOSH, OSHA, HSE), data from the All-Russian Research Institute of Labor of the Ministry of Labor of Russia, reflecting the main causes of injuries associated with the use of mobile communications, as well as an analysis of cases of injuries resulting from the use of mobile devices during training sessions in sports schools in Moscow. Results of the study and their discussion. The analysis shows the need for preventive measures aimed at reducing injuries, including through explanatory work among specialists carrying out training activities: coaches, teachers of additional education, sports instructors.

1. Improving regulatory and legal acts to ensure conditions for the safe conduct of training sessions:

Amend the Labor Code of the Russian Federation:

Supplement Art. 21 "Basic Rights and Obligations of an Employee" with the following sentence:

The employee is obliged to:

- comply with the internal labor regulations, including in terms of using communication tools and other electronic devices (phone, smartphone, tablet, etc.).

Supplement Article 189 "Labor Discipline and Work Schedule" with the following sentence:

- Internal work schedule rules – a local regulatory act that regulates, in accordance with this Code and other federal laws, the procedure for hiring and firing employees, the basic rights, obligations and responsibilities of the parties to the employment contract, work schedule, rest time, incentive and disciplinary measures applied to employees, as well as other issues related to the regulation of labor relations with this employer, existing contradictions in labor relations with the presented employer, including in terms of the use of information and communication tools (telephone, cellular communications, tablets) in the work process.

- include the relevant provisions in the "Instructions for Labor Protection during Classes", establishing a

[1]Federal Law of 19.12.2023 No. 618-FZ "On Amendments to the Federal Law "On Education in the Russian Federation" [Electronic resource]. URL: https://www.garant.ru/products/ipo/prime/doc/408131681/ (date of access 27.01.2025).

[2]Federal Law of 04.12.2007 No. 329-FZ "On Physical Culture and Sports in the Russian Federation" [Electronic resource]. URL: https://www.consultant.ru/document/cons_doc_LAW_73038/ (date of access 02.27.2025).

restriction or ban on the use of mobile devices for personal purposes during the training process.

Amend Article 34 of the Federal Law "On Physical Culture and Sports in the Russian Federation": sports organizations may introduce a ban on the use of mobile devices in order to ensure the safety and effectiveness of the training process. Based on the above-mentioned regulations, children's and youth sports schools and other physical education and sports organizations may introduce their own restrictions, which must be reflected in the institution's charter; internal regulations; safety instructions [1]. These measures will improve the safety of classes, minimize the risk of injury and increase the level of responsibility of specialists working in the field of physical education and sports.

2. Expanding the teacher's knowledge of ways to prevent threats with the conscientious performance of their job responsibilities in accordance with the qualification requirements of the professional standards "Trainer-teacher", "Specialist in instructor and methodological work in the field of physical education and sports", "Teacher of additional education".

Organization of a safe space for students, timely identification of threats and the degree of danger of external and internal factors, prompt response to emergency situations and the use of correct action algorithms to eliminate or reduce the danger are labor functions included in professional standards.

Safety training for trainers-teachers, instructors, teachers is of key importance. Modern approaches to safety training include several aspects aimed at raising awareness, practical application of knowledge and the use of new technologies.

It is recommended to increase the number of disciplines in the bachelor's curriculum aimed at developing competences in injury prevention during training sessions. Classes on disciplines should be conducted offline with an emphasis on practical activities.

3. Ensuring regular advanced training of trainers-teachers, instructors-methodologists, teachers of additional education in programs aimed at improving the professional competencies of teaching staff in the field of safety and injury prevention during training sessions. In this context, special attention should be paid to the quality of advanced training and professional retraining programs, and the advantage of obtaining additional education in state specialized universities in an offline format should be noted.

Conclusions. In order to prevent injuries associated with the use of mobile communications during training sessions, a number of measures have been proposed, consisting of improving the regulatory framework, expanding the knowledge of teachers on ways to prevent threats with the conscientious performance of their job responsibilities, as well as regular advanced training of employees of sports organizations. The listed measures will improve the safety of classes, minimize the risk of injury and increase the level of responsibility of specialists working in the field of physical education and sports.

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Impact of Reaction Time on 50m Freestyle Performance in Male Swimmers: A Differential Analysis Across Qualification Levels

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Abstract

Objective of the study This study investigated the relationship between start reaction time (RT) and 50-meter swimming race performance across different swimmer qualification levels. The precise nature and strength of this relationship may vary significantly depending on an athlete's skill proficiency. A large dataset comprising 2,252 competitive swimmers was analyzed and categorized into Elite (n=471), High-Level (n=574), and Medium-Level (n=1207) groups based on their competitive results.

The overall analysis of the combined sample revealed a statistically significant positive correlation between RT and 50-meter race time ($r=0.5078$, $p<0.0001$), with RT explaining 25.78% of the variance in swimming performance. However, a differential analysis by qualification level demonstrated notable variations. For Elite swimmers, the correlation was $r=0.2083$ ($p<0.0001$, $R2=4.34\%$), indicating a weak but significant association. High-Level swimmers showed the weakest correlation ($r=0.1043$, $p=0.0124$, $R2=1.09\%$). Medium-Level swimmers exhibited the strongest group-specific correlation ($r=0.2404$, $p<0.0001$, $R2=5.78\%$).

While RT is a statistically significant factor influencing overall swimming performance, its predictive power substantially diminishes within more homogenous, higher-qualified groups. The results highlight the general importance of start efficiency in competitive swimming but also underscore the increasing dominance of other performance determinants (e.g., technique, power, endurance) as skill level advances. This differential impact provides valuable insights for targeted coaching strategies, suggesting a varied emphasis on start training based on a swimmer's current qualification level.

Keywords: *Swim Start, Reaction Time, competitive readiness, Swimmer Qualification, swimming.*

Introduction. Competitive swimming demands a complex interplay of physiological attributes, refined technique, and strategic execution. In sprint events, such as the 50-meter freestyle in a 50-meter long course pool (LCM) for male athletes, every fraction of a second is critical [5]. The overall race time is a composite of several phases (the start, swimming propulsion, turns). Among these, the start phase (encompassing the reaction to the starting signal, the dive, the initial underwater glide) is widely recognized as a crucial determinant of performance, often constituting a significant portion of the total event time particularly in short-distance races [3].

Reaction time (RT), the time taken for a swimmer to respond to the starting signal, is the first measurable component of the start phase [4]. A faster RT is perceived as beneficial, potentially allowing a swimmer to gain an early lead and optimize their race strategy from the outset. This initial burst of speed contributes to overall velocity and can influence subsequent phases of the race. Biomechanical studies have consistently highlighted the intricate mechanics of the swimming start (block mechanics, flight phase, entry) are initiated by the reaction to the signal [1, 9].

While the importance of start, including RT, is generally accepted, the precise extent to which RT predicts overall race outcomes, and whether this predictive power varies across different levels of athletic qualification, remains an area requiring more nuanced investigation. Previous research of the relationship between RT and performance often focused on Elite cohorts or general populations [2]. However, a comprehensive analysis that stratifies a large dataset across distinct qualification levels (Elite, High-Level, Medium-Level) to systematically evaluate this relationship is less common. A differential analysis could reveal

whether the emphasis on minimizing RT should be uniform across all swimmers, or if its importance diminishes as athletes reach higher levels of proficiency where other factors like stroke technique and anaerobic capacity might become more dominant.

Understanding these differential impacts holds significant practical implications for coaches and sports scientists. It could inform more targeted training programs, guiding decisions on how much emphasis to place on specific start drills versus other aspects of swimming development at various stages of an athlete's career [7]. It also could contribute to more precise talent identification models by clarifying the specific components of performance that hold greater predictive value at different skill tiers [8].

This study aims to bridge this gap by conducting a detailed differential analysis of the relationship between RT and 50-meter freestyle performance for male swimmers, across Elite, High-Level, and Medium-Level qualification groups, as well as for the combined heterogeneous sample. Our findings seek to provide a clearer, evidence-based understanding of the role of RT in swimming performance, thereby offering valuable insights for optimized training.

Methods and Organization of the Study. Participants and Classification. The study utilized a large dataset comprising competitive male swimmers specializing in the 50-meter freestyle event. A total of 2,252 individual race entries were analyzed. Based on official competitive results [10], participants were categorized into three qualification groups: 1) Elite (n=471): swimmers who met top-tier national or international performance standards; 2) High-Level (n=574): swimmers with consistently strong regional or national performances, slightly below the elite; 3) Medium-Level (n=1207): swimmers with developing competitive experience and results typically at local or beginner regional levels.

Data Collection. All data were extracted from official competitive records of 50-meter freestyle races conducted in 50-meter long course pools (LCM) of National Championships, European and World Championships, from 2017 to 2024 [10]. The primary variables collected for each race entry included: 1) Reaction Time (RT): the time (in seconds) from the starting signal to the swimmer's departure from the starting block, measured electronically by fully automated timing systems; 2) Final Time (FT): the total time (in seconds) to complete the race, also measured by official timing systems. Other available data (e.g., athlete's name, score) were used solely for organizational purposes and participant identification and were excluded from the statistical analysis of the RT–FT relationship.

Statistical Analysis. For each qualification group, and for the combined heterogeneous sample, the following statistical methods were applied: 1) Descriptive Statistics: the sample size (n), mean, and standard deviation (SD) were calculated for both RT and FT to provide a comprehensive summary of the central tendency and dispersion of the data within each group; 2) Pearson Correlation Analysis: Pearson's product-moment correlation coefficient (r) was used to quantify the strength and direction of the linear relationship between RT (independent variable) and FT (dependent variable). Corresponding p-values were calculated to assess statistical significance, with $p<0.05$ considered significant; 3) Linear Regression Analysis: simple linear regression models were constructed to predict FT based on RT, and the regression equation (slope and intercept) was determined; 4) Coefficient of Determination (R2): R2 was computed for each regression model to quantify the proportion of variance in FT explained by RT.

Research Results. The analysis revealed distinct patterns in the relationship between reaction time (RT) and 50-meter freestyle performance across the different qualification levels of male swimmers. Table 1 presents descriptive statistics for RT and FT for each group, along with the combined sample.

As expected, Elite swimmers showed the fastest mean RT and lowest mean FT, along with the smallest standard deviations, indicating high consistency in performance. Conversely, Medium-Level swimmers

Table 1. Descriptive Statistics for Reaction Time and Final Time by Qualification Level

Group Level	n	Reaction Time (mean ± SD, s)	Final Time (mean ± SD, s)
Elite	471	0.6431 ± 0.0381	22.0208 ± 0.3100
High-Level	574	0.6607 ± 0.0433	23.2979 ± 0.4594
Medium-Level	1207	0.7127 ± 0.0675	25.8995 ± 1.1032
Combined Sample	2252	0.6849 ± 0.0645	4.4252 ± 1.8504

Table 2. Correlation and Regression Analysis by Qualification Level

Group Level	n	Pearson r (p-value)	Regression Equation	R2 (%)
Elite	471	0.2083 (p<0.0001)	FT = 1.6949 * RT + 20.9309	0.0434 (4.34%)
High-Level	574	0.1043 (p=0.0124)	FT = 1.1054 * RT + 22.5675	0.0109 (1.09%)
Medium-Level	1207	0.2404 (p<0.0001)	FT = 3.9273 * RT + 23.1006	0.0578 (5.78%)

exhibited the slowest mean RT and highest mean FT, accompanied by greater variability. High-Level swimmers showed intermediate characteristics in both RT and FT.

Overall Sample Analysis. In the combined sample of all 2,252 swimmers, a statistically significant positive correlation was observed between RT and FT (r=0.5078, p<0.0001). The linear regression analysis resulted in the following equation: FT = 14.5779 RT + 14.4408.

The coefficient of determination (R2) for the combined sample was 0.2578, indicating that 25.78% of the variance in 50-meter freestyle performance can be explained by differences in RT among swimmers of all qualification levels. This substantial R2 suggests a notable influence of RT on performance across a heterogeneous swimming population.

Differential Analysis by Qualification Level. The analysis of individual qualification groups revealed varying correlation strengths between reaction time (RT) and 50-meter freestyle performance (Table 2).

For Elite swimmers, a weak but statistically significant positive correlation was observed (r=0.2083, p<0.0001), with RT explaining only a small portion of performance variance (R =4.34%). While a faster RT is still beneficial, its predictive power on race time is limited within this highly homogenous group.

High-Level swimmers exhibited the weakest correlation among all groups (r=0.1043, p=0.0124). The corresponding R2 was the lowest at 1.09%, indicating that RT has a negligible explanatory power for performance variance in this particular group.

Among Medium-Level swimmers, the correlation was statistically significant and slightly stronger than that of the Elite and High-Level groups (r=0.2404, p<0.0001). RT explained 5.78% of the variance in their performance, representing the highest R2 value among the individual qualification levels.

These results are illustrated in Figure 1, which presents the linear regression lines for each group and the combined sample, highlighting the distinct slopes and scatter patterns across the different groups.

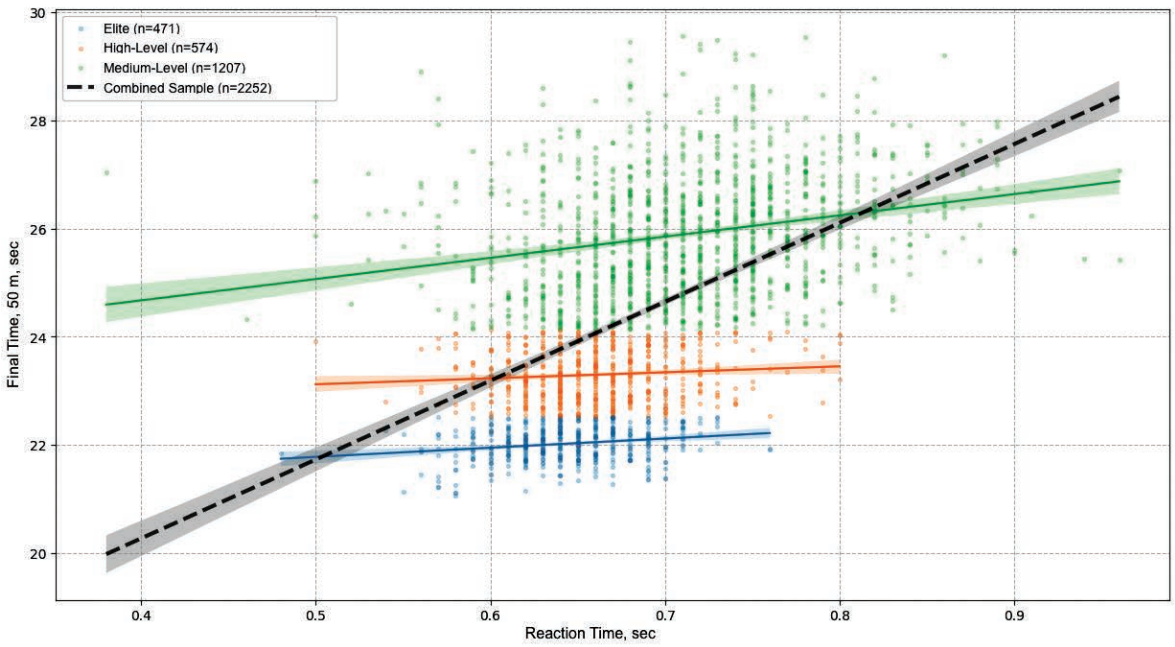

Figure 1. The Linear Regression: Final Time vs Reaction Time Across The Different Groups

Discussion. This study aimed to elucidate the nuanced relationship between start reaction time (RT) and 50-meter freestyle performance in male swimmers, specifically exploring how this relationship varies across different qualification levels. The findings provide a comprehensive perspective, highlighting both a significant overall impact of RT and a distinct differential effect across Elite, High-Level, and Medium-Level swimmers.

The most striking finding is the substantial and statistically significant positive correlation (r=0.5078) observed in the combined sample of 2,252 swimmers, with RT explaining 25.78% of the variance in 50-meter race time. This result underscores the general importance of a quick start in competitive swimming when considering a broad spectrum of athletes. Across all competitive levels, faster RT are consistently associated with better overall race performance. This aligns with intuitive understanding and provides a strong foundational argument for incorporating start training into general swimming development programs. The larger variance in RT and final times across the combined heterogeneous group likely amplifies this correlation, as greater differences in RT between individuals lead to more pronounced differences in overall race outcomes.

However, the differential analysis by qualification level reveals a critical distinction. While the correlation remains statistically significant across all groups, its strength and explanatory power (R2) are notably diminished within the more homogeneous, higher-qualified categories. For Medium-Level swimmers, RT exhibited the strongest group-specific correlation (r=0.2404, R2=5.78%). This suggests that for swimmers at this stage, improvements in RT still contribute measurably to overall performance. Given the relatively larger individual differences in skill and physical attributes at the medium level, a quicker reaction to the signal can still provide a tangible competitive edge, as these athletes might not yet possess the highly refined technique or power to compensate for a slower start. Therefore, for Medium-Level swimmers, dedicated training focused on improving reaction time is indeed a valuable and highly recommended aspect of their development. It represents a relatively accessible avenue for performance enhancement, and the return on investment for such training is likely to be higher compared to more advanced groups.

Conversely, for Elite swimmers, the correlation was considerably weaker (r=0.2083, R2=4.34%), and for High-Level swimmers, it was the weakest of all groups (r=0.1043, R2=1.09%). This significant drop in the coefficient of determination (from 25.78% in the combined group to less than 6% in individual groups) strongly indicates that as swimmers progress to higher qualification levels, RT becomes a far less dominant factor in explaining overall race performance. Elite and High-Level swimmers have already optimized many aspects of their starts, and their RTs fall within a very narrow, highly efficient range (e.g., mean RT of 0.6431s for Elite). At these levels, the marginal gains from further minute improvements in RT are likely to be overshadowed by superior technical execution, powerful propulsion, efficient turns, and enhanced anaerobic capacity throughout the swimming phase [6, 11]. Therefore, for Elite and High-Level swimmers, while maintaining optimal RT is important, concentrating significant training time exclusively on improving RT may be less time-efficient compared to focusing on other, more impactful determinants of performance. These might include advanced stroke mechanics, underwater phase optimization, turn efficiency, strength and power development, and specific endurance training that directly contributes to sustained speed over 50 meters.

The finding that the High-Level group exhibited the weakest correlation (even weaker than Elite) is particularly interesting. This could be due to a combination of factors. Perhaps this group represents a transitional phase where the homogeneity of skill levels is less defined than in the Elite group, but the ceiling for RT improvement is already approaching, leading to a more diffuse relationship. Alternatively, other performance factors might show even greater variability in this group, further diluting the relative impact of RT. This finding may require further investigation.

This study's findings provide practical implications for coaching strategies. For developing swimmers (Medium-Level), emphasizing start training and reducing RT can yield tangible benefits. As swimmers advance, the focus should strategically shift towards continuous refinement of technique, power output, and race strategy, with RT maintenance rather than primary improvement becoming the goal.

Conclusions. Based on the comprehensive analysis of 2,252 male competitive swimmers in 50-meter freestyle long course events, the following conclusions can be drawn:

1. Start reaction time (RT) is a statistically significant factor influencing 50-meter freestyle perfor-

mance across the entire spectrum of competitive male swimmers. For the combined heterogeneous sample, RT explains a considerable portion (25.78%) of the variance in race outcomes, highlighting its general importance in competitive swimming.

2. The predictive power of RT on 50-meter race performance varies significantly across different qualification levels. While a fast start is universally desirable, its relative importance as a training focus evolves with a swimmer's progression through the qualification ranks.

3. For Medium-Level swimmers, RT shows the strongest group-specific association with performance (R2=5.78%). It is advisable for coaches to focus on specific RT training for swimmers at this level, as improvements in RT can still offer a noticeable advantage and contribute to overall performance enhancement.

4. For Elite and High-Level swimmers, while RT remains a statistically significant component of performance, its explanatory power (R2<5%) is considerably diminished. At these advanced stages, resources and training emphasis should shift towards other determinants of performance, such as highly refined technique, explosive power, and race-specific endurance, rather than disproportionately focusing on marginal improvements in RT. The exceptionally narrow range of RTs means that other factors account for the vast majority of performance variance.

5. These findings offer valuable insights for individualized training program design, emphasizing the need for a differential approach to start training based on a swimmer's current qualification level.

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