



T & P P P C

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Theory & Practice of Physical Culture

Athletic
training

Sport
psychology

Academic
physical education

Sport
physiology

Key issues of the modern sports science for discussion



Professional and personal qualities of a coach - the basic vector of an athlete's success

Modern sport requires the timely disclosure of the sports talent of a young athlete. The further success of his performances is largely due not only to the level of professional knowledge and skills of the coach, but also to the development of the personal qualities of a sports teacher: will, discipline, ability to communicate creatively. In fact, a children's coach is, first of all, a teacher who is entrusted with the upbringing and socialization of a young athlete. It is known that it is impossible to form a respectful attitude towards work among students if the coach himself shows dishonesty, is late for classes, cancels training sessions, or is unorganized. Therefore, a sports teacher is obliged to constantly exercise self-control and make high demands on himself. The study of the personal qualities of a sports coach should begin with the essential characteristics of the personality itself, which includes at least four main components.

The first component is represented by the moral qualities of the personality of a sports coach, which determine the motivational direction of his activity, a steady desire to transfer the accumulated sports experience to students. The vital activity of a sports teacher, his conviction and passion for the profession, devotion to his craft, as well as a creative attitude to professional activities, instills in a young athlete the desire to imitate his mentor. This per-

sonal component is formed under the influence of the values of modern society.

The second component contains the abilities acquired in the course of professional activity - professional and business qualities, which are determined, among other things, by the continuity of traditions that have developed in the sports team.

The professional qualities include didactic abilities, the ability to explain tasks in an accessible way, to motivate students to study, as well as to independently complete tasks. Such an organizational function is impossible without the formation of academic abilities - the desire to acquire new knowledge and use innovative technologies of sports training. The organization of the training process is also determined by the psychological focus of the coach on the emotional sphere of the student, which implies the ability to observe and understand the mental state of young athletes. An important role in the professional activity of a trainer is played by speech abilities in an accessible and understandable way for those involved to convey the methodology for performing technical techniques, taking into account the age characteristics of students. Planning, organization, control, communication in the process of training and preparation for it requires a high level of managerial abilities of the trainer.

The third component of the coach's personal characteristics is individual psychological traits, such as memory, mind, thinking, will, emotion, etc.

The fourth component is associated with the specific qualities of the coach's personality, such as temperament, age, etc., which give him a personal individuality, creativity, enhancing his professional abilities.

The formation of the component composition of the personal qualities of a coach should be based on basic universal values: humanism, kindness, love for people, honesty, sense of duty, responsibility, diligence, etc.

The subsequent stages of sports training, when athletes can already train on their own, the coach must be able to organize a systematic control over the implementation of training loads. At the same time, the content of classes becomes variable due to the manifestation of the creative abilities of a sports teacher.

In conclusion, I would like to emphasize that the skill of a sports coach is determined by a high level of professional and personal qualities. At the same time, the coach must correspond to the socio-cultural modernity. This means that a sports teacher has the ability to study and adequately perceive youth subcultures and present himself as a person belonging to the same era with young athletes, understanding his important role in the implementation of the ideology of the sports lifestyle of modern society.

We invite scientists to publish articles that are aimed at finding new approaches in the development of the Olympic movement and large-scale sports events.

**Chief Editor of TiPFC,
Honored Worker of Physical Culture of the Russian Federation,
doctor of pedagogical sciences, professor L.I. Lubysheva**



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Quality management of children and youth sports at the municipal level on the basis of monitoring the physical fitness of participants

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Abstract

Objective of the study was to develop a set of measures that improve the quality of management of youth sports at the municipal level based on monitoring data on the physical fitness of those involved.

Methods and structure of the study. Scientific work was carried out on the basis of 11 youth sports schools in Tyumen. The study involved 2352 athletes aged 11-17 years, including 1662 males and 690 females involved in 15 sports. Monitoring of general physical fitness was carried out in accordance with the requirements of the standards of III-V levels of the All-Russian Physical Culture and Sports Complex GTO on six tests characterizing the manifestations of basic physical qualities.

Results and conclusions. It has been established that female subjects have a higher level of physical fitness, as evidenced by the lower (by 8.6%) than male athletes, the number of results below the standard requirements and a greater (18.7%) number of indicators that meet the standards gold badge of the GTO complex.

Analysis of the results of monitoring the physical fitness of athletes aged 11-17 in the city of Tyumen made it possible to determine a number of activities aimed at improving the quality of youth sports, including organizational, managerial and content-technological components.

Keywords: youth sports, physical fitness monitoring, innovative management, hypoxic training, convergence.

Introduction. Support and development of children's and youth sports is a priority in the social policy of the state. The future of our state, the duration and quality of life of Russian citizens depend on the effectiveness of quality management in children's and youth sports [2, 6].

Quality control of youth sports management is, today, one of the innovative directions for improving the physical culture and sports management system, which has proven its effectiveness in the city of Tyumen. As scientific research and practice show, effective management of the training process of athletes is possible only on the basis of the results of a comprehensive monitoring of the state of health and preparedness of those involved [8].

In this regard, monitoring the physical fitness of athletes, especially at the stage of sports specialization, is the most effective means of managing the training process. Monitoring reveals weaknesses in the physical fitness of trainees, which allows you to adjust training plans and select the

most effective means and methods for developing lagging physical abilities. Regular monitoring of the physical fitness of athletes ensures effective planning of training cycles in accordance with the individual characteristics and capabilities of the athlete and promptly responds in case of deviations from the planned indicators [6, 8, 9].

Objective of the study was to develop a set of measures that improve the quality of management of youth sports at the municipal level based on monitoring data on the physical fitness of those involved.

Methods and structure of the study. Scientific work was carried out on the basis of 11 youth sports schools in Tyumen. The study involved 2352 athletes aged 11-17 years, including 1662 males and 690 females involved in 15 sports. Monitoring of general physical fitness was carried out in accordance with the requirements of the standards of III-V levels of the All-Russian Physical Culture and Sports Complex GTO on six tests characterizing the manifestations of basic physical qualities.

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Theory and Practice of Physical Culture



The results of the general physical fitness of athletes aged 11-12 (boys n=491; girls n=201)

Control exercises	Gender	X±σ	Compliance with the norms of the GTO complex (%)			
			Gold	Silver	Bronze	Below normal
30m run, s	m	5,49±0,82	28,9	35,2	10,9	25
	w	5,53±0,53	40,8	31,8	13,9	13,5
Shuttle run 3x10 m, s	m	8,27±0,88	40,6	32,5	7,5	19,4
	w	8,52±0,99	47,8	29,8	5,5	16,9
2000 m run, s	m	639,6±86,96	21,4	36,8	12,5	29,3
	w	655,67±80,59	37,8	28,3	7,5	26,4
Standing long jump, cm	m	178,49±19,82	52,5	35,7	5,9	5,9
	w	170,86±17,84	74,1	19,4	3,0	3,5
Flexion and extension of the arms in the lying position, the number of times	m	28,09±13,09	48,2	26,3	17,7	7,8
	w	18,4± 10,18	69,7	29,3	3,5	5,5
Tilt forward, cm	m	8,07±4,67	40,8	28,3	15,7	15,2
	w	13,6±6,74	57,2	26,9	4,5	11,4

Results of the study and their discussion. The results of monitoring the physical fitness of athletes aged 11-12 are presented in the table.

In the age category of 13-15 years, the most problematic for all athletes were tests in the 30-meter run, as well as in the 2000-meter run and the 3 × 10 m shuttle run for male subjects, where from 34 to 52% of the results corresponded to a low level.

The highest results were demonstrated by athletes in tests for flexibility and strength abilities. The following results corresponded to the norms of the golden sign of the TRP complex: 40.8% (200) of boys and 57.2% (106) of girls - in terms of flexibility; 48.2% (237) boys and 68.7% (140) girls - in terms of strength endurance of the upper shoulder girdle; 54.2% (258) of boys and 74.1% (149) of girls - in terms of speed-strength abilities. You can also note the test data in the test "Shuttle run 3 × 10 m", where the results of 73.1% (349) of boys and 77.6% (156) of girls corresponded to the gold and silver signs of the GTO complex.

The greatest difficulties for young athletes were caused by tests in the 2000-meter run. In this test, 29.3% (144) of boys and 26.4% (53) of girls did not fulfill the established standard. According to the results of all tests, an average of 17.1% of the results of boys and 12.8% of girls corresponded to a low level; the norms of the golden sign of the GTO complex - 38.7% and 54.5%, respectively.

Athletes aged 13-15 were more successful in tests for flexibility, strength and coordination abilities. The number of results for the gold badge of the GTO complex in these indicators varies from 47.8% (96) in the shuttle run 3x10 m to 62.2% (125) in push-ups.

In general, when compared with athletes of other age groups, among the subjects aged 13-15, according to such criteria as the number of results for the gold mark of the GTO complex and indicators below the standard requirements, the lowest level of physical

fitness was noted. For male athletes, the average number of results for the gold badge of the GTO complex was 21% with 30% of low-level indicators; in female subjects - 44% of the results of a high level and 16% - below the regulatory requirements.

In the age group of 16-17 years old, the average level of physical fitness prevails among young men in most tests.

In girls, a high level of physical fitness was recorded in terms of strength endurance - 66.7% (58) of the results for the gold badge of the GTO complex; 83.9% (73) of the results in the long jump and 77% (67) of the results in the 3 × 10 m shuttle run corresponded to the standards of the gold and silver signs. Among the problematic tests for individual athletes of both gender groups were tests for speed and general endurance: 88 (31.8%) boys and 18 (20.7%) girls did not cope with the normative requirements in the 30-meter race; in the 2000m run - 58 (21.1%) and 22 (25.3%), respectively.

In general, among athletes aged 11-17 years who participated in the monitoring, the highest rates were noted in the manifestations of strength abilities and flexibility, where the results of the subjects corresponded to the standards of the golden sign of the GTO complex: in the long jump - 34.3% (570) of males and 60.4% (417) female; in push-ups - 30.7% (511) males and 64.9% (448) females; in the flexibility test - 33.5% (556) males and 60.7% (419) females.

Analysis of monitoring data among representatives of various sports showed the following. A high level of speed-strength abilities was recorded in 63-90% of the results of women's disciplines of cycling, artistic gymnastics, rock climbing, athletics, figure skating, and among representatives of artistic gymnastics of both gender groups. In push-ups, similar results were demonstrated by 72% (120) of hockey players and from 56 to 95% of gymnasts, athletes, cyclists, skiers

and figure skaters. In the test for the flexibility of the norm of the golden sign of the GTO complex, male athletes performed in swimming (57%), hockey (74%) and artistic gymnastics (82%), as well as athletes involved in volleyball (53%), figure skating (89%) and rhythmic gymnastics (100%). In addition, high level values were recorded in male (50.5%) and female (57.4%) athletes in the 30-meter run and in 70% (77) football players, 56% (13) gymnasts and 78% (134) athletes in the shuttle run 3 × 10 m.

A significant number of results below the regulatory requirements of the GTO complex were found in athletes: 40.3% (670) of males and 24.3% (168) of females - in terms of endurance development; 27.4% (456) males and 17.1% (118) females in terms of coordination abilities; 27% (448) males and 29.8% (206) females in terms of speed development.

In men's disciplines, 78% (18) of gymnasts and 89% (17) of kettlebell lifters, as well as from 31 to 46% of representatives of martial arts, cyclic and team sports, failed to meet the standards in the 2000m run. The low level of coordinating abilities indicators prevailed in 45.5% (63) of skiers, 86.4% (32) of volleyball players and 87.2% (96) of wrestlers. In the 30m run, 40% (27) of volleyball players, 46.3% (51) of cyclists, 52% (127) of wrestlers, 60% (52) of boxers and 77.5% (107) of skiers demonstrated a low level of speed abilities.

In girls, the lowest results were noted among skiers in terms of speed abilities (67%) and among cyclists in terms of coordination abilities (63.4%). In addition, from 30 to 46% of low-level results were found: among volleyball players and swimmers - in the 2000-meter run; for rhythmic gymnastics athletes - in the shuttle run 3x10 m; for volleyball players - in the long jump; for figure skaters and cyclists - in the 30 m run.

Athletes demonstrated a high level of physical fitness in tests characterizing flexibility, speed-strength abilities and strength endurance of the muscles of the upper shoulder girdle. The most problematic for the subjects were tests for general (aerobic) endurance, speed and coordination abilities. The main reasons for unsatisfactory results may be factors related to the peculiarities of dosing physical activity and rest in the annual cycle of sports training, as well as an inappropriate shift in the amount of load towards special training by reducing the means of general physical training (this is especially true for means of developing strength and endurance).

After analyzing the results of monitoring the physical fitness of athletes aged 11-17 in the city of Tyumen, in order to improve the quality of the training process within the framework of the already implemented technology of innovative management of youth sports, we propose the following activities:

- correction by coaches and methodologists of the content of planning the training process on the basis of methodological recommendations developed by scientists and practitioners for improving the educational and training process, taking into account the need to develop lagging physical abilities and the correct dosing of physical activity and rest in accordance with the laws of sports training;

- organization of systematic, taking into account the calendar of competitions, complex psychological, pedagogical and medical and biological support of the training process, which includes stage-by-stage functional diagnostics and implementation of the "Athlete's Healthy Heart" project together with scientists from the Tyumen Medical University [3, 4, 7];

- purposeful introduction into the process of training athletes of simple means of artificial hypoxic training (respiratory simulator "Carbonic" and respiratory training mask), which have proven their effectiveness, to further increase the functionality of athletes as an auxiliary means of developing general and special endurance of athletes [5];

- systemic convergence in the process of training athletes at various stages of long-term preparation of means and methods of gymnastics, with the aim of a comprehensive development of physical abilities, prevention of sports injuries and the formation of a rational technique of motor actions among those involved [1].

Conclusions. According to the results of the study, it was found that female subjects have a higher level of physical fitness, as evidenced by the lower (by 8.6%) than male athletes, the number of results below the regulatory requirements and a greater (18.7%) number of indicators, corresponding to the norms of the golden sign of the GTO complex.

Analysis of the results of monitoring the physical fitness of athletes aged 11-17 in the city of Tyumen made it possible to determine a number of activities aimed at improving the quality of youth sports, including organizational, managerial and content-technological components.

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The role of mass sports events in the popularization of the gto complex and the preparation of the working-capacity population to perform the tests of the VFSK GTO

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Abstract

Objective of the study was to determine the role of mass sports events in the popularization of the GTO complex in the preparation of the able-bodied population for the performance of tests of the VFSK GTO.

Methods and structure of the study. In the course of scientific work, an analysis was made of plans for sports events aimed at organizing mass propaganda campaigns to promote the All-Russian physical culture and sports complex "Ready for Labor and Defense" (VFSK GTO) of the Ministry of Sports of the Russian Federation for 2018-2021, analysis of data from the analytical media monitoring system "Medialogy", a survey was conducted (18 constituent entities of the Russian Federation, 546 respondents of working age).

Results and conclusions. In the course of scientific work, it was revealed that the involvement of workers in the process of fulfilling the GTO standards through participation in mass sports events should occur, first of all, at the place of work. A large role in the popularization of mass sports work, including the implementation of the GTO complex in labor collectives, is assigned to corporate media. As part of the search for a solution to the problems of increasing the effectiveness of physical culture and sports events among the adult population, it is necessary to take into account the personal interests of citizens, since society has formed an order for a comfortable and accessible physical culture and sports environment for practicing "sports".

Keywords: employable population; GTO complex (ready for labour and defence); sports and mass events; corporate sports.

Introduction. The GTO complex is one of the priority projects of the state aimed at the mass development of physical culture and sports, improving the system of physical education of the country's population [8, 10].

Specialists in the field of physical culture and sports are actively searching for the most effective conditions, forms and methods of working with the population of the country: at enterprises of various forms of ownership, at the place of residence, in parks and other recreational areas, the formation of the interest and needs of the population in increasing physical activity, in including through preparation for the implementation of the standards of the GTO complex [1-3,

4, 6]. At the same time, statistical data and research in the field of mass sports, the results of monitoring the implementation of the GTO complex show an insignificant proportion of the adult population of the total number of those involved in physical culture and sports (0.4%) and participating in the implementation of the GTO (18.6%) [5, 9]. Thus, the relevance of studying the ways and means of involving the adult population in the process of implementing the GTO norms is determined by the contradiction between the massive nature of this project proclaimed at the state level and the insufficient activity of the adult population in this process.

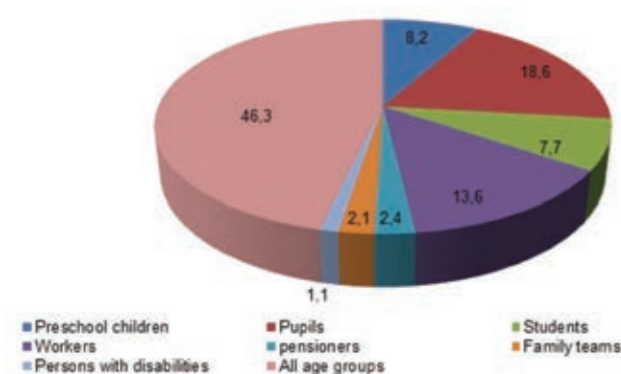
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of mass sports events in the popularization of the GTO complex in the preparation of the able-bodied population for the performance of tests of the VFSK GTO.

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Results of the study and their discussion. The study and analysis of plans for sports events aimed at organizing mass propaganda campaigns to promote the VFSK GTO of the Ministry of Sports of the Russian Federation made it possible to establish that in the period from 2018 to 2021, 1343 mass sports events of various levels were held for all age groups of the population. The share of mass sports events held for the able-bodied population is 13.6% of the total. For three years, 182 mass sports events were held among workers, aimed at popularizing the GTO complex. During each year, about 60 events were organized in Russia to involve workers in the GTO complex. At the same time, the number of physical culture and sports events for the adult population is much higher, since, in addition to the format of festivals for workers, physical culture and sports events are held among pensioners, family teams, as well as other events for all age groups, which is shown in the figure.

According to the data of the analytical media monitoring system "Medialogy" in 2021, according to



The share of the population participating in mass sports events of the VFSK GTO in the period 2018-2021 (in %)

references in various media to newsworthy events related to mass sports events of the VFSK GTO among labor collectives, the leading regions are: Moscow, Belgorod Region, Moscow Region, Kaluga Region, Chelyabinsk region, Kostroma region, Republic of Bashkortostan [7].

Thus, the data obtained indicate a sufficient number of mass sports events held among the adult population, aimed at popularizing the GTO complex and their coverage in the media, the systematic organizational and managerial activities of state and municipal authorities to implement the strategy for the development of physical culture and sports in the Russian Federation. Federation, demand and significance of these events in the structure of physical education of the population.

In order to determine the attitude towards mass sports events of the VFSK GTO among the able-bodied population, a sociological survey was conducted. The study was organized in 18 constituent entities of the Russian Federation, 546 respondents of working age were interviewed, belonging to the category of "working" according to their status.

According to the results of the survey, a positive trend was revealed towards an increase in the number of corporate sports events held for the implementation of the GTO complex in labor collectives, this was indicated by 55.1% of respondents. It is also significant that this category of respondents was able to name all the ongoing activities and indicate what types of GTO tests within the framework of these activities were able to perform for the badge of distinction. They did not take part in such events, but 18.6% of the respondents plan to do so in the near future.

A relationship has been established between the quality of a sporting event and the desire of employees to participate in it. When answering the question: "Can you agree with the opinion that the quality of the sports event held affects the employee's involvement in the implementation of the GTO standards and popularizes the complex as a whole?" 79.6% of the respondents answered in the affirmative, 20.4% gave a negative answer or found it difficult to answer. When organizing mass sports events among workers and their families, it is necessary to pay attention to the spectacular component of a sporting event, to organize the opening and closing ceremonies of events, and awarding participants at a high level. Actively involve fans and guests, family members in the events of mass sports events, which in the future may contribute to greater

coverage of the population, the emergence of interest and desire to take part in the implementation of the norms of the GTO complex.

The effectiveness of corporate media in promoting the ideas of the complex within a particular organization has been revealed. Thus, 44.6% of employees of enterprises indicated that their departmental media regularly publish information about the GTO complex, as well as information about sports events held (photo reports, protocols, discussions, etc.). However, it was noted that the corporate mass sports events of the VFSK GTO are practically not covered in the federal media. The fact that mass sports events of the GTO complex should be covered in the federal media and the Internet was indicated by 71.4% of respondents.

The results of the study clearly showed that one of the main factors in preparing for the implementation of the types of tests of the GTO complex is the availability of places for physical culture and sports. Of the total number of respondents, 56.7% noted the absence of any conditions for physical culture and sports and, accordingly, for preliminary preparation and performance of tests of the GTO complex, at the place of work. Only 24.4% of respondents stated that the conditions had been created to prepare for the testing of the GTO complex at their enterprises. 18.9% of respondents do not know or were not interested in the conditions for preparing for testing.

Thus, the study found that among workers there is a request to participate in mass sports events within the framework of physical culture and sports activities at the place of work, including the implementation of the GTO complex standards, increasing the entertainment of sports events, and covering corporate sports events of the VFSK GTO in the national media.

Conclusions. The study revealed that the involvement of workers in the process of implementing GTO standards through participation in sports events should occur, first of all, at the place of work. A large role in the popularization of sports and mass work, including the implementation of the GTO complex in labor collectives, is assigned to corporate media.

As part of the search for a solution to the problems of increasing the effectiveness of physical culture and sports events among the adult population, it is necessary to take into account the personal interests of citizens, since society has formed an order for a comfortable and accessible physical culture and sports environment for practicing "sports". It is necessary to

carry out more physical culture and sports activities of various levels of complexity and variety of forms of motor activity for the population of the country, using social and pedagogical factors that purposefully affect the personality, which will contribute to the formation of motivation for physical culture and sports, which will allow to form a priority for physical culture - sports activity before other forms of leisure.

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Prospects for use of strength exercises under unstable work posture as a method of increasing strength abilities in highly qualified biathletes

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Abstract

Objective of the study was to reveal, on the basis of a theoretical analysis, training effects when using strength exercises in an unstable working posture and to evaluate the prospects for their use as a method of increasing the specific strength of highly qualified biathletes.

Methods and structure of the study. To solve the problems of the study, a systematic review and analysis of foreign scientific and methodological literature on the problems of strength training was carried out.

Results and conclusions. The obtained results of scientific work made it possible to single out as the most significant effects of neuromuscular adaptation when performing strength exercises in an unstable working posture, first of all, improvement of the reciprocal innervation of agonist-antagonists and synchronization of the activity of agonists, synergists and stabilizer muscles. In this regard, strength exercises performed under conditions of an unstable support or with weights that create a multidirectional instability of the movement trajectory can be considered as a promising methodological solution to the problem of increasing the strength abilities of highly qualified biathletes.

Keywords: *strength exercises, unstable support, electromyography, biathlon.*

Introduction. The technique of skating skiing used in modern biathlon makes high demands on the ability to maintain a stable position of the common center of body mass in the repulsion and sliding phases [2, 3, 6, 8]. Increased requirements for maintaining balance in skating are due to the fact that the athlete is forced to exert considerable effort with a small area of support and in conditions of constantly acting disturbing external forces. In addition, the simultaneous one-step move, which is dominant among biathletes, places high demands on the speed-strength abilities of the lower, and especially the upper limbs [1].

Thus, the effective performance of the skating movement involves the ability of a biathlete to demonstrate high power of working efforts with a small area of support, in conditions of continuous opposition to reactive and inertial forces that cause the body to deviate from a biomechanically expedient position [16].

Strength training of highly qualified athletes in modern biathlon provides for the implementation of various exercises in the mode of maximum and explosive strength, which contributes to increasing the power of motor efforts in competitive movement. At the same time, most strength exercises are performed in the position of relative stability of the working posture [5]. However, as mentioned above, skating is performed by biathletes under conditions of an unstable support, under the action of various disturbing forces. In this case, the efficiency of transformation of the speed-strength capabilities of the skeletal muscles can be limited by the nervous system, for which the stability of the working posture is more important than the movement itself [4].

The above determines the relevance of studying the problem of improving the strength and speed-strength abilities of athletes in an unstable work-



ing posture provided by an unstable support (BOSU destabilizing devices, fitball, hanging loops, T-Bow platform, etc.) or resistance that creates an unpredictable trajectory of movement (destabilizing bar Earth-break, aquabag, bar with weights suspended on elastic bands, etc.), and the possibility of “transferring” the achieved power effects to more biomechanically specific movements.

Objective of the study was to reveal, on the basis of a theoretical analysis, training effects when using strength exercises in an unstable working posture and to evaluate the prospects for their use as a method of increasing the specific strength of highly qualified biathletes.

Methods and structure of the study. To solve the problems of the study, a systematic review and analysis of foreign scientific and methodological literature on the problems of strength training was carried out.

A computerized systematic search for relevant articles published from January 2002 to March 2022 was carried out using the PubMed, Scopus, ResearchGate and Web of Science electronic databases using the keywords: resistance training, instability training, unstable surface, unstable load, core stability, core strength, electromyography, muscle activity.

In addition, relevant articles were extracted from the references. The criteria for inclusion of articles in the number of analyzed were: the presence of EMG data on the level of muscle activation during strength exercises; use as destabilizing devices and surfaces of BOSU, fitball, hanging loops, T-Bow and Wobble-Board platforms, Dyna Disc balancing disk; conducting strength exercises and training in an unstable working posture in the form of controlled trials for healthy, adult, physically active people (including athletes).

Previous systematic reviews using similar inclusion criteria were also analyzed. The included articles had to be published in English in peer-reviewed journals. As a result, out of 327 articles initially selected, 89 studies met the inclusion criteria and were used for analysis.

Results of the study and their discussion. Improving the functional reliability of the joints under the influence of exercises in conditions of instability. Based on EMG studies, an increase in sensorimotor control over the dynamic stability of joints and an increase in the efficiency of reflex reactions of muscles performing postural or stabilizing functions were found [9, 13].

Influence of the instability factor on the mechanisms of neuronal control of muscle efforts. It is

assumed that the performance of strength exercises in an unstable working posture strengthens neuronal synaptic connections in the cerebral cortex, thereby increasing the cortical representation of the muscles involved in the work. As a result, there is an increase in the influence of the supraspinal centers of the CNS on – motor neurons and an increase in the ability of muscles to produce force [15].

The influence of the degree of instability and motor experience of an athlete on the manifestation of the power of efforts in an unstable position. The results of experimental studies indicate that, depending on the amount of resistance and the degree of instability, the manifestation of maximum power can be reduced by up to 30% compared with exercises performed on stable surfaces [16]. In addition, the lower the level of strength training of an athlete and the less motor experience of working on unstable supports, the higher the deficit of strength in an unstable position [10, 14].

Urgent and delayed adaptive effects of training programs using the instability factor. It has been established that within the framework of urgent adaptation, a change in neuromuscular coordination is observed in the direction of strengthening the coactivation of antagonist muscles and reducing the activity of agonists. At the same time, in terms of a delayed effect, training in an unstable environment improves the reciprocal innervation of antagonistic muscles, creating favorable conditions for increasing angular velocity.

In addition, targeted training on unstable surfaces increases “core stability”, i.e. the ability of the complex of the lumbo-hip muscles to control the position and movement of the lower body and maintain, within physiological limits, the stability and structural integrity of the spinal column under external influences, which in turn improves the production of force and its transmission between the links of the upper and lower extremities [10, 11].

Features of the “transfer” of training effects from strength exercises performed in conditions of an unstable working posture to other types of movements. The results of a number of studies [17, 18] indicate the absence of a “direct” transfer of the effect of resistance training under unstable conditions to power output under stable conditions. At the same time, the main factors limiting the manifestation of the achieved strength effects are the biomechanical similarity of exercises and the similarity of the muscle work mode.

Features of the periodization of strength ex-

ercises performed in stable and unstable conditions within the preparatory period. The results of a number of studies indicate the possibility of using two options for periodization of strength exercises. The first option provides for the consistent use of strength exercises in unstable, and then, in stable performance conditions [7]. The second option involves the parallel use of strength exercises during the preparatory period [12]. At the same time, it is indicated that the second variant of periodization is more suitable for sports with a variable structure of motor actions.

Conclusions. It can be assumed that for highly qualified biathletes it is advisable to use strength exercises in an unstable working position from the standpoint of preventing injuries of the musculoskeletal system by increasing sensorimotor control over the position of the joints and stability of the core muscles.

Strength exercises in an unstable working posture provided by an unstable support or resistance that creates an unpredictable trajectory of movement can be considered as a means of enhancing the effect of traditional biathletes’ strength exercises in relation to explosive strength by enhancing the role of the cerebral cortex in MU activation, reducing the coactivation of antagonists and synchronization of the activity of synergist and stabilizer muscles.

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Dynamics of physical fitness indicators of girls aged 6-14 participated in tennis and their qualitative assessment

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Abstract

Objective of the study was to determine the magnitude of changes in the indicators of physical qualities in female tennis players aged 6-14 years.

Methods and structure of the study. To assess the physical fitness of tennis players aged 6-14, training at the stage of initial training and the training stage, it was proposed to perform 18 tests, on the basis of which 21 indicators were calculated. A total of 228 girls aged 6-14 who go in for tennis at sports schools in Moscow and the Moscow region, as well as private academies and clubs, were examined.

Results and conclusions. Achievements demonstrated by tennis players at 14 years old are better than at 6 years old. However, in some tests, the best results were recorded in tennis players under 14 years old. The scatter in the values of the increase in results in different tests is large and ranges from 1.48% to 345.03%. The magnitude of the increase in the result in a test that evaluates physical quality largely indicates the degree of trainability of the quality.

It has been established that in tests evaluating the same physical quality, there is a large scatter in the values of the increase in results, which indicates a different degree of trainability of manifestations of the same quality.

Keywords: physical qualities, physical fitness, female tennis players aged 6-14, dynamics of results, growth rate, trainability.

Introduction. The specificity of competitive activity underlies the preparation of athletes and physical training, in particular. It is the competitive activity that requires the appropriate structure of the physical fitness of athletes, as well as knowledge of the priority of physical qualities required in each specific sport [4]. Studies of the factor structure of the physical fitness of tennis players with a high level of mastery of men and women, as well as the priority of physical qualities to achieve success in tennis, were carried out by the employees of the Federal Science Center of Physical Culture and Sport (VNIIFK) [6, 7].

The question arises of how physical qualities change at the first stages of a long-term training process, that is, at the stages of initial training and training, as well as the question of what physical

qualities coaches should focus on during the initial selection.

Objective of the study was to determine the magnitude of changes in the indicators of physical qualities in female tennis players aged 6-14 years.

Methods and structure of the study. To assess the physical fitness of tennis players aged 6-14, training at the stage of initial training and the training stage, it was proposed to perform 18 tests, on the basis of which 21 indicators were calculated. Similar tests are used when examining members of the country's national tennis team of different ages, regardless of gender differences [6-8].

Means and methods of tennis players' physical readiness control are developed on the basis of competitive activity requirements [6, 8].

**Table 1.** Age of the best results in tests assessing various physical qualities

Physical qualities	Test	Result in 6 years	Best result	The largest increase in the result, %	Age of achievement of the best result, years
Speed abilities	- 5 m run, s;	1,52	1,23	19,1	13
	- 10 m run, s;	2,71	2,01	25,8	14
	- speed of reaction, s	0,73	0,51	30,2	8
Force abilities	- dynamometer compression, kg hand holding a racket	9,43	25,66	172,1	14
	helping hand;	8,55	24,24	183,5	14
	- long jump from the place, cm;	123,5	194,05	57,2	14
	- jumping up, cm;	16,56	28,68	73,2	13
	- throwing stuffed ball, weighing 1 kg, m	8,74	14,65	86,4	14
Coordinating ability	- stepping over a stick, quantitatively;	12,45	22,48	80,5	11
	- 6 jumps, 5 of which need to be done a little further than the previous one, cm;	17,12	4,62	73,01	13
	- hitting the ball with the edge of the racket, quantity;	5,85	22,90	291,5	14
	- jumping up with a swing of the hands / jumping up the arms on the belt, in%	116,68	120,55	3,3	7
Endurance	- «shuttle» 6x8 m, s;	15,57	13,84	20,0	13
	- the sum of 10 jumps up, cm;	136,17	295,57	117,1	13
	- repulsion time when performing 10 jumps up, s	0,57	0,47	19	8
Flexibility	- downward slope, cm;	2,57	9,52	270,42	13
	- twisting of the stick, cm;	53,54	52,75	1,48	7
	- «lock» right hand on top, cm	3,24	11,52	255,56	12
	left hand on top, cm	1,91	8,50	345,03	13

A total of 228 girls aged 6-14 who go in for tennis at sports schools in Moscow and the Moscow region, as well as private academies and clubs, were examined. At the stage of initial training, 71 girls are training and 157 at the training stage. Thus, at least 20 tennis players were examined in each age group.

Results of the study and their discussion.

An analysis of the dynamics of indicators of speed, strength, coordination abilities, flexibility and endurance of tennis players aged 6-14 allowed us to establish an improvement in indicators with age, as well as to identify differences in the increments in each test from the value recorded in girls 6 years old to their best result (Table one).

The data obtained are consistent with the conclusions made earlier by other authors [5-8].

The scatter in the values of the increase in results in different tests is large and ranges from 1.48% to 345.03%. As can be seen from Table. 1, the best result was not always recorded at the age of 14. The earli-

est achievement of the best result is observed in tests associated with speed and speed-strength manifestations that require speed of action - speed of reaction, speed of repulsion, as well as specific mobility of the shoulder joints. In tests that require a greater manifestation of strength abilities, the age of achievement of the best result increases. For a qualitative assessment of the growth rate, we have proposed the following table (Table 2).

Table 2. Qualitative assessment of the magnitude of the increase in results in tests that assess the physical fitness of tennis players aged 6-14

Growth rate, %	Qualitative assessment
≤ 10	Very low
≤ 20	Low
≤ 50	Below average
≤ 100	Medium
≤ 150	Above average
≤ 200	High
> 200	Very high

In accordance with the data obtained as a result of the study, a very high increase was registered in the test of knocking the ball with the edge of the racket, which evaluates the spatial accuracy of movements.

A high increase in the dynamometer compression test with the right and left hands - the actual power abilities of the muscles that grip the racket during the performance of the impact are evaluated.

The growth rate is above average - it is noted in the amount of 10 jumps up, by which one can judge the power component of the speed-strength endurance of the muscles of the lower extremities.

The average increase was recorded in the tests: long jump and jumping up, which assess the speed-strength abilities of the muscles of the lower extremities; stuffed ball throwing - speed-strength abilities of the muscles of the upper shoulder girdle; stepping over a stick - the speed of rebuilding movements; six jumps, five of which are performed a little further than the previous one - differentiation of muscle efforts.

The growth rate is below average in the tests: 10-meter run, which evaluates the speed of gaining speed on a long stretch and the speed of a single movement; tilt down - the mobility of the spinal column; «lock» - the mobility of the shoulder joints.

The growth rate is low in the tests: 5 m run, which assesses the speed of speed gain in a short segment and the speed of a single movement; «shuttle» - endurance to a short draw of a point; repulsion time when performing 10 jumps up, by which one can judge the speed component of the speed-strength endurance of the muscles of the lower extremities.

A very low increase was noted in the tests: jumping up with a swing of the arms in relation to jumping up with the arms on the belt - coordination of actions and twisting of the stick, evaluating specific manifestations of the mobility of the shoulder joints.

Each test assessed the manifestation of one of the physical qualities. The magnitude of the increase in the result in a test that evaluates physical quality largely

Table 3. The degree of trainability of physical qualities in girls aged 6-14 involved in tennis

Degree of trainability	Physical Quality	Test
Very high	Coordination abilities: spatial accuracy of movements	Hitting the ball with the edge of the racket, quantity
High	Power abilities: absolute hand strength	Dynamometer compression with each hand, kg
Above average	Speed-strength endurance (emphasis on repulsion force)	The sum of 10 jumps up, cm
Medium	Speed-strength abilities: - muscles of the lower extremities; - shoulder girdle; Coordinating abilities: - the speed of rebuilding movements; - differentiation of muscle efforts	Standing long jump, cm; Jumping up, cm; Throwing stuffed ball, m; Stepping over a stick, quantity; 6 long jumps, 5 of which are a little further than the previous one, cm
below average	Speed abilities: - the speed of picking up speed on a long stretch and the speed of a single movement; - speed of reaction Flexibility: - general; - shoulder joints	10 m run, s; Start time for light stimulus, s; Tilt down, cm; «Castle», see
Low	Speed abilities: - the speed of acceleration in a short segment and the speed of a single movement; Endurance: - to a short draw of a point (alactic anaerobic); - speed-strength (emphasis on the speed of repulsion)	5 m run, s; "shuttle", with; Repulsion time when performing 10 jumps, s
Very low	Coordinating abilities: - coordination of actions; Flexibility: - mobility of the shoulder joints	Jumping up with a swing of the hands in relation to jumping up the hands on the belt, % Stick twist, cm

indicates the degree of trainability of the quality. Thus, based on the results obtained, it is possible to assess the degree of trainability of each physical quality in girls aged 6-14 years old involved in tennis (Table 3).

The listed manifestations of physical qualities are necessary for tennis players to perform the whole variety of striking actions, to play points during the match. And this means that a clear selection of means and methods of training is necessary. This is of particular relevance to the manifestations of those qualities in which a high degree of trainability has not been revealed [9, 10].

The results obtained, which made it possible to establish the degree of increase in physical qualities in the first nine years of a long-term training process, should be taken into account during the initial selection for classes in sports groups. Namely, to clarify and adjust the tests used in the selection in the initial training groups. They must include tests that evaluate physical qualities with a degree of trainability below average, low and very low.

Conclusions. The results demonstrated by tennis players at 14 years old are better than at 6 years old. However, in some tests, the best results were recorded in tennis players under 14 years old. The scatter in the values of the increase in results in different tests is large and ranges from 1.48% to 345.03%. The magnitude of the increase in the result in a test that evaluates physical quality largely indicates the degree of trainability of the quality.

It has been established that in tests evaluating the same physical quality, there is a large scatter in the values of the increase in results, which indicates a different degree of trainability of manifestations of the same quality.

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Substantiation of the concept of technical and physical training of swimmers in a long-term training cycle

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Abstract

Objective of the study was to scientifically substantiate the concept of technical and physical training of swimmers in a long-term training cycle.

Methods and structure of the study. To solve the tasks, we used the material obtained as a result of many years of research of 607 swimmers at the training stage (three years), the stage of improving sportsmanship (three years) and higher sportsmanship (two years), questioning 49 coaches of sports teams. Biomechanical (computer video analysis, analysis of intracycle swimming speed, analysis of dynamic parameters), pedagogical (physical fitness testing), physiological (blood lactate) methods were used in the work.

Results and conclusions. Synergistically coupled training means and additional methods of physical and technical training based on the achievement of a systemic effect (emergence) have been developed. Based on the identification of significant parameters of physical and technical readiness, which have a high specificity, a variant of constructing the training activity of swimmers was found, in which physical and technical training are combined into one integrative system - technical and physical training. Thus, the allocation of technical and physical training as a single part of the training process due to the achievement of a synergistic systemic effect (emergence) allows us to determine a new direction in the planning, systematization and management of sports training components, which contributes to the achievement of higher sports results.

Keywords: technical and physical training, swimmers, synergism, contingency, training means, long-term training, concept.

Introduction. The modern system of sports training presupposes the presence of its separate, private types - physical, technical, tactical, psychological [2-4]. Sometimes integral training is also singled out, although its content is not entirely clear. It is clear that the division into separate types of training is conditional, however, in sports practice, their content is characterized by a specific focus, allocation in the planned training cycles, control of the level of development, etc. Given the ever-increasing competition in sports arenas, it is futile to wait for the solution of tasks to achieve higher sports results due to a further increase in the volume and intensity of training loads [2, 3]. New approaches should be sought, in particular, based on the integration, conjugation, and interaction of individual training tools.

The conceptual position of this work is the definition of new approaches to the system of formation of sportsmanship of athletes, based on the ideas of integrating the physical and technical training of swimmers in a long-term training cycle.

Objective of the study was to scientifically substantiate the concept of technical and physical training of swimmers in a long-term training cycle.

Methods and structure of the study. 607 swimmers took part in the scientific work, 527 of them in the ascertaining, 58 in the forming and 21 in the local experiment, as well as 49 coaches of sports teams. The duration of the experiment was eight years and affected three stages of sports training: training (three years), the stage of improving sportsmanship (three years) and higher sportsmanship (two years).

The following methods were used in the work: biomechanical (computer video analysis, analysis of intracycle swimming speed, analysis of dynamic parameters), pedagogical (physical fitness testing), physiological (blood lactate).

The training plans of the athletes of the control groups were not changed and were carried out in strict accordance with the regulations of the Federal standard of sports training for the sport - "swimming". Synergistically coupled training means and additional methods of sports training based on achieving a systemic effect (emergence) were introduced into the training programs of the experimental groups.

Results of the study and their discussion. When pairing the means of physical and technical training, the task was to strengthen the training effects in the programs at each of the sports stages. When the selected training means are merged, their interaction becomes more pronounced, which makes it possible to achieve flexibility in planning the training process and achieve a greater effect than with the traditional approach. In our works [1], the effectiveness of a combination of such means was proved and described when performing movements on land using the VASA Ergometer simulator and in water.

Thus, integrating the means of physical and technical training in the training process, without violating the integrity of the form of movement, but only strengthening the influence of some exercises on others, in our opinion, the synergism of training will manifest itself, which in turn will form a systemic effect or emergence of the entire process of managing the sports training of swimmers. This dictates the introduction of a new concept - technical and physical training.

The system of movements that form the cycle of movement in the technique of swimming is a priori subject to changes caused by the biological maturation of the athlete, on the one hand, and the influence of the coach, on the other. The acquisition of system stability in this case can be considered from the standpoint of the formation of a dynamic stereotype. For qualitative transformations of the motor action system, in our opinion, it is inappropriate to allow the creation of stereotypes in the structure of the swimmer's movement.

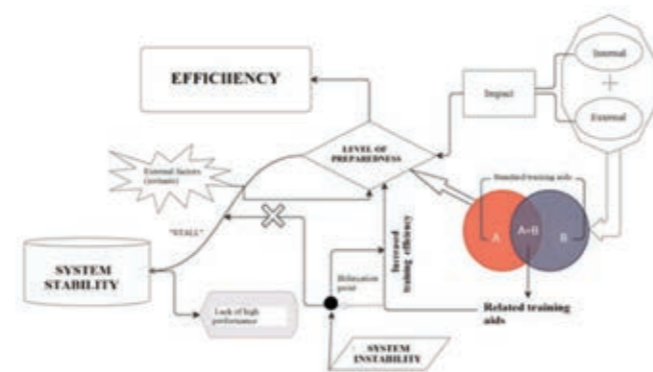
Of course, the sequence of phase trajectories in the structure of the cycle, their forms, vector directions and others are formed and fixed in the swimmer for life, but in the most general form. However, in order

to be able to change the structure of the movement in order to improve it, it is necessary to "leave" the field for making adjustments to the form of movement, that is, not to bring it to automatism.

As our studies have shown [1], the form of a swimmer's movement is changeable and technical readiness is associated with the level of development of physical qualities that fill the form with content. The results of the ROC analysis, which made it possible to identify specific parameters that affect the "gold standard" of training - the maximum swimming speed, showed that not all biomechanical characteristics retain high specificity in a long-term training cycle, but only some (for example, power and acceleration of hand movement in the phase pull-ups), that is, the stability of the swimmer's movement system is not so rigid.

One of the characteristic features of the technical and physical training of swimmers is concentration - focusing on a time-limited stage of preparing loads of a certain predominant direction and breeding loads with different directions of training influences in time. The concentration of loads provides the possibility of a massive specialized impact on the athlete's body, and the breeding of loads in time - the achievement of a sustainable adaptive effect from the use of each of them. The scheme of manifestation of the systemic effect or emergence within the framework of the implementation of technical and physical training is shown in the figure.

Thus, the level of preparedness of swimmers is determined by the effectiveness of internal and external influences, where, according to the theory of L. von Bertalanffy [5], standard training means (A and B) are combined into conjugate (A + B), synergistically enhancing the effectiveness of each other.



Scheme of technical and physical training of swimmers based on the manifestation of a systemic effect

The use of such synergistically coupled means in training programs contributes to the appearance of increased training efficiency and, accordingly, affects the level of technical and physical fitness. However, in the described scheme, it is necessary to take into account external stimulus factors (psychological, physiological, etc.), which can negatively affect the level of preparedness of swimmers. At the same time, the system (in terms of "preparedness") will be subject to the so-called "dumping" into a stable position, in which the level of development of the system will be reduced to zero if it does not show degradation.

In this case, it is advisable to include in the technical and physical training programs the means of the so-called stress impact, which will lead the system away from a stable state due to "stall". The use of such means in this case acts as a bifurcation point, overcoming which, the system acquires an unstable, that is, a more flexibly developable state.

Thus, in order to achieve a level systemic effect, it is necessary to select conjugate means of training and strictly regulate training loads. However, it is not advisable to achieve the stability of the system, since its manifestation will lead to the so-called "dead end" in the development of the athlete's preparedness.

In order to create conditions in the process of training to increase the training effect, it is advisable to talk about the allocation of training patterns that will have ramifications in their direction and depth of impact. Any branching is the choice of the coach based on the already achieved level of preparedness of the athlete.

In any case, the emergence of division into patterns at the bifurcation point is an inevitable process in terms of technical and physical training of swimmers. For example, when making adjustments to the swimming technique, the athlete is invited to perform the exercise at various levels of load - aerobic, ANOT and anaerobic-glycolytic, however, if the corrected element was not stabilized at any level of load, then some violation of the integrity of the system occurs. In this case, it is necessary to return to a lower level to introduce other conjugate means of physical and technical training into the training process, enhancing the effect of those already learned. This moment will be the bifurcation point that determines the choice of a controlled way to improve the swimmer's technical and physical fitness.

After conducting research in terms of searching for the interface between technical and physical training, and highlighting significant parameters with high

specificity, a variant of planning the training activity of swimmers was found, in which physical and technical training are combined into one integrative mechanism - technical and physical training.

The allocation of technical and physical training as a separate integrative link in the system of training activity of swimmers, in our opinion, is also logical due to the fact that the calendar plans of sports events are quite saturated, which forces coaches to artificially reduce the share of technical training by increasing physical training. Therefore, the allocation of technical and physical training, as a separate component of the training activity of swimmers, has a number of advantages: firstly, the conjugation of physical and technical training means allows you to find the so-called bifurcation points, when overcoming which the athlete enters a new higher level of training, and secondly, inclusion (if necessary) in the training programs of loads that force training allows minimizing the negative impact of physical training means on the swimmers' stroke structure, thirdly, the use of synergistically coupled means in technical and physical training at each sports stage allows leaving the so-called "field for maneuver" in terms of correcting swimming technique even when using stressful elements included in training programs.

It should be noted that the conjugation of means and the selection of methods in the process of technical and physical training plays a decisive role in the formation of a sports result. This is primarily due to the fact that exercises (synergists) of strength, speed and speed-strength orientation, which have a reasonable influence on the biomechanical parameters of swimming technique, allow planning the training process without reducing the load and without changing the orientation of training programs (by reducing the physical component, increasing technical).

Conclusion. Thus, the allocation of technical and physical training as a single part of the training process due to the achievement of a synergistic systemic effect (emergence) allows us to determine a new direction in the planning, systematization and management of sports training components, which contributes to the achievement of higher sports results.

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Achieving the best results at the games of the olympiad by elite judokas

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Abstract

Objective of the study was to conduct a comparative analysis of the achievement of the best results by judo athletes of the leading national teams at the Olympiad Games and the main competitions in the training cycle that preceded these Games, as well as to identify the information content of other indicators of the realization of the potential of national judo teams.

Methods and structure of the study. In the course of the desk analysis, professional biographies of 121 judoka athletes were studied: 63 men and 58 women, who represented the four leading national teams of Japan, Russia, Georgia and France at the 2012, 2016 and 2020 Games. The results of the performances of athletes and teams at the Games of the Olympiad were compared with the results at the main starts of the seasons in the previous training cycles: world championships, previous Games of the Olympiad, world series tournaments.

Results and conclusions. The most conservative characteristics of both men's and women's national teams that won the first team place in the Olympic tournaments are the presence of winners of the World Series tournaments (all participants), winners of the World Championships or the previous Olympiad (6-7 Olympians), world champions or Olympic champions of the previous Olympiad (2-6 Olympians). Along with this, the range of fluctuations in indicators characterizing the realization of the potential of athletes in the world's leading judo teams is assessed as high. The foregoing indicates that coaching staffs are looking for programs that allow athletes to reach their full potential at the main start of the four years.

Keywords: achievement of the best results, Olympic Games, elite sportsmen, judo.

Introduction. Research by L.P. Matveev [1] the statistics of achievement by highly qualified athletes of their best results in the main competitions during the year led to the creation of a classical system of periodization of sports training. After this famous work, such concepts as "training cycles", "sports uniform", "narrowing" and a number of other definitions firmly entered the sports community. The international sports environment in judo is characterized by very high competition.

Olympic champions, by definition, perform at their best in the Games of the Olympiad. Re-winning a prize at the Olympiad Games is available to a very limited circle of judo athletes [3]. As it was established earlier, the winners of the world championships have more chances for Olympic medals [2]. However, a significant number of elite judokas have reached the Olympic and

World Championship podiums on a limited number of occasions. In this regard, it is very important that the peak of their preparedness and the achievement of sports form fall on the Olympic season.

Objective of the study was to conduct a comparative analysis of the achievement of the best results by judo athletes of the leading national teams at the Olympiad Games and the main competitions in the training cycle that preceded these Games, as well as to identify the information content of other indicators of the realization of the potential of national judo teams.

Methods and structure of the study. The desk research examined professional biographies of 121 judo athletes: 63 men and 58 women, representing four countries at the 2012, 2016 and 2020 Olympiad Games. The results of the performances of athletes and teams at the Games of the Olympiad were com-

pared with the results at the main competitions of the seasons in the previous training cycles. As you know, the main starts for national teams are the World Championships, as well as the previous Games of the Olympiad. It is also important to take into account the results of performances in World Series tournaments.

Results of the study and their discussion.

Based on the performance results at the 2012, 2014 and 2016 Olympiad Games, the *judokas of the Japanese men's national team* had the highest sports results in the main competitions (World Championships and previous Olympic Games) in the Olympic cycle compared to competitors. In the Olympic compositions of the Japanese team, 4-5 world champions (more than half of the composition) and 6-7 medalists (1-3 places) of the World Championship were declared. However, at the 2012 Olympiad Games, a problem was discovered with the realization of the highest potential of the Japanese men's national team. This was especially evident in the lost gold medals. Already at the next Games of the Olympiad, which took place in Rio de Janeiro, the Japanese team regained the first team place. Experts and spectators were especially impressed that all seven members of the Japanese national team won Olympic medals. However, not all world champions on the Japanese team were able to convert world championship gold into Olympic gold. In this regard, the number of athletes who showed their best results at the Games of the Olympiad was only 43%. At the home Olympics, the Japanese won a record four gold medals. At the same time, 71% of athletes demonstrated their best results. This performance is an absolute record. In

terms of the number of gold medals, Japan beat all other countries.

The men's judo team of Georgia at the Olympic Games in London did not include any champions, or even prize-winners of the world championships. At the next Olympiad, the composition of the Georgian team was much stronger: its participants even surpassed the Russian team, which won more gold medals at this Olympiad. However, only 14% of athletes were able to show their best results. The potential of the team was not fully realized. At the Games of the Olympiad in Tokyo, the Georgian team not only had the strongest line-up compared to other Olympiads, but was also able to increase the number of athletes who showed their best results and / or were among the winners at the Games of the Olympiad 2020. The result is positive - 2nd place in the team standings.

The Russian men's national team had the strongest line-up at the 2012 Olympiad Games compared to the line-ups at other Olympiads. At the same Games of the Olympiad, the team realized its potential in the best possible way: a significant number of athletes showed their best achievements (43% of the team), most athletes became Olympic medalists (71% of the team), many World Cup winners - team leaders became Olympic medalists (71% of the winners of the world championships). At the subsequent Games of the Olympiad, the composition of the Russian team was not as strong as at the Olympics in London. However, the Russians were inferior to the Georgian team only in terms of the number of world champions. However, in terms of the number of athletes who showed their best results and the number of medalists at the 2020 Olym-

piad Games, the Russian team was inferior both to the performance of its rivals and to its own performance. In parallel with this, a deterioration in the team result was recorded from 1st place at the 2012 Olympiad Games to 8th place at the 2020 Olympiad Games.

The performance results of the *women's national judo team of Japan* are in many respects in tune with the data and repeat the trends observed in the men's team of this country. Thus, the women's judo team of Japan had the strongest composition among the teams participating in the Olympiad Games. Despite the leading position at the 2012 and 2016 Olympiad Games, not many members of the Japanese team were able to achieve their best results at the Olympiad Games. However, at the home Olympics, the Japanese women's team successfully coped with this problem.

The French women's national team had the second-best line-up in all three Olympiad games and was second only to the Japanese team. The French compete successfully with the Japanese at the Olympic Games and the World Championships, both because of the good line-up and the fact that a significant number of athletes have achieved their best results at the Olympic Games.

The women's team of Russia at the analyzed Games of the Olympiad did not have such a strong composition as the teams of Japan and France. The Russians were even more significantly inferior to the competing teams in achieving the best results in the Olympic tournaments. Nevertheless, according to the results of the team's performance at the Olympiad Games, which are characterized by a place in the

team standings, progress was found at the Olympiad Games in Tokyo.

From the data provided by other authors (see Table 1), one can see the range of the percentage of achievement of the best result in the main competitions. Contemporaries of L.P. Matveev estimated the achievement of 25% of athletes of the best results at the main start of the season as insufficient [1]. Cited by V.N. Platonov, the data on the achievement of 70% of the athletes of the USSR national team of their best results at the Olympic Games in Seoul can be considered a model level.

It should be noted that for the national judo teams that took first places in the team event at three Olympiads, this indicator, in most cases, turned out to be slightly less than the value given by V.N. Platonov. First of all, this is due to the fact that the world's leading judo teams (especially the Japanese) pay great attention to achieving the highest possible results by future members of the Olympic team at the main starts in the Olympic training cycle. A high margin of competitive reliability allows these teams to achieve victory in the team event even in a situation where many team members do not show their best achievements. Along with this, the deterioration of results at the Games of the Olympiad, in most cases, is insignificant. For example, the world champion becomes the winner of the Olympiad Games.

In this regard, the use of winning a prize at the Olympic Games as a criterion for the best result without taking into account the level of achievements at the world championships and world series tournaments significantly increases the number of athletes

Table 1. Comparison of data obtained by different authors

Author, publication year	Characteristics of the subjects	Indicators	Values, unit of measure
L.P. Matveev, 1964	450 highly qualified track and field athletes, weightlifters, swimmers	Achieving the best result at the main start of the season	15-25% of the total number of subjects
V.N. Platonov, 2015	Athletes of the USSR national team - participants of the 1988 Olympiad Games (all sports)	Achieving the best result at the 1988 Olympiad Games	70% of the total number of subjects
Own data (see table 3)	Judoka men from Russia (n=7) and Japan (n=14), members of the winning teams of the Olympiad Games	Achieving the best result at the Games of the Olympiad 2012-2020	43-71% of total team members
		Number of winners of the Games of the Olympiad	71-100% of total team members
Own data (see table 4)	Female judokas of Japan (n=14) and France (n=7), members of the winning teams of the Olympiad Games	Achieving the best result at the Games of the Olympiad 2012-2020	29-57% of total team members
		Number of winners of the Games of the Olympiad	43-86% of total team members

Table 2. Characteristics of the problems that hinder the achievement of the best sports results at the Games of the Olympiad

Localization	Period	Practical examples
Final preparation	1-2 months	1. Insufficiently effective construction of the final training cycle. 2. Lack of programs for the prevention of emotional stress and its emergency correction during the competition.
Preparation in large cycles		1. Insufficient attention to the development of basic physical qualities (abilities). 2. Lack of individual training programs or insufficient individualization of training.
- winners of the Olympiad Games and World Championships	1-5 annual cycles ¹	1.1. Underestimation of the opponents he defeated. 1.2. Unreasonable reduction in training load.
- not winners of the Olympic Games and World Championships	one year cycle	1. The level of preparedness is not sufficient for an abrupt increase in the level of results. 2. Athletes are not motivated to win, but to participate. 3. Lack of qualified sparring.

¹from the moment of winning a prize at the World Championships or previous Games of the Olympiad or until the start at the Games of the Olympiad.

that meet this criterion. This indicator is related to the overall team result and evaluates well the performance of national teams at the Olympic Games and other significant judo tournaments.

L.P. Matveev linked the achievement of the best sports results in the season with the development and implementation of programs by coaches aimed at achieving sports form. The probability of insufficient effectiveness of such programs exists even now. However, it is obvious that there are other problems that hinder the achievement of the best sports results at the Olympic Games (see Table 2).

Conclusions.

1. An analysis of the characteristics of the performances of the national teams that successfully performed in the last three Games of the Olympiad showed that these teams had very strong lineups: the winning teams in the men's tournaments and women's tournaments included from 2 to 6 world champions and from 6 to 7 world championship medalists or champions/winners of the previous Olympiad.

2. Despite the highest skill, not all athletes in the studied teams were able to show their best results at the Games of the Olympiad, which would be equal or superior to the results at the main tournaments: the Games of the Olympiad and the world championships in the previous cycle. In the winning teams in men's tournaments, the best results were achieved by 43 to 71% of team members. In the winning teams in women's tournaments - from 29 to 57% of the team members. These teams peaked at the 2020 Tokyo Olympics. This indicates a purposeful search for preparation programs for the main start of the four-year period.

3. The use of the *number of athletes who won prizes at the Games of the Olympiad* as a criterion for realizing the potential of a team is an informative indicator.

4. It is important to point out that the prize-winning place at the Games of the Olympiad was the first great success at the most important world judo tourna-

ments (world championships and the Games of the Olympiad) for 13% of the studied sample of both men and women. This indicates that not only recognized tatami masters have a chance for Olympic medals, but also athletes who do not have such a successful competitive history.

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Structural composition of a double backfold in a group over the bars on parallel bars, performed from various starting positions of the flight part

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Abstract

Objective of the study was to determine the structural composition of the studied gymnastic exercises.

Methods and structure of the study. In the course of scientific work, the following were carried out: video recording of exercises, computational models for analyzing the movements of biomechanical systems, system-structural analysis of motor actions. The subject of the study is the technique of gymnastic exercises in the unsupported and in the support periods based on the materials of optical registration of movements.

Results and conclusions. The sequence of changes in the phase composition in the studied gymnastic exercises is the same, and the parameters of biomechanical characteristics in the phases of movement are different. The division (differentiation) of the athlete's motor actions into separate components (periods, stages) is biomechanically justified by the motor tasks of the exercise, and its division into smaller structural parts (phases) is determined by the criterion of changing the unidirectional change in the angle in certain joints of the athlete. In complex gymnastic exercises, preparatory, basic and final actions can refer not only to the entire exercise as a whole, but also to its individual phases.

Keywords: *technique of gymnastic exercises, improvement of the structure of motor actions, period, stage, phase.*

Introduction. Coordinatingly complex exercises on gymnastic apparatus are rarely performed at official competitions, which makes it difficult to study their technique biomechanically [4-6]. Such exercises, rarely demonstrated at gymnastic tournaments, include the studied exercises:

Exercise 1. Decline from a handstand to a hang and a double back somersault in a tuck above the poles in an emphasis on the hands (performed by Honored Master of Sports of Russia M. Devyatovsky).

Exercise 2. Decline from the handstand to the emphasis on the hands and lifting forward with a swing forward double somersault back in the group over the poles in the emphasis on the hands (performed by the master of sports of Russia of international class N. Ignatiev).

Only in a few works is an attempt made to explain the deterministic relationship between the trajectory of the biomechanical system in the flight

part of these exercises and the implementation of the motor skill under support conditions [1, 2, 3, 5]. The search for ways to improve the technique of the studied exercises requires an additional biomechanical study of the kinematic structure of the flight and support periods, which determines the relevance of the study.

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Methods and structure of the study. In the course of scientific work, the following were carried out: video recording of exercises, computational models for analyzing the movements of biomechanical systems, system-structural analysis of motor actions. The subject of the study is the technique of gymnastic exercises in the unsupported and in the support periods based on the materials of optical registration of movements.

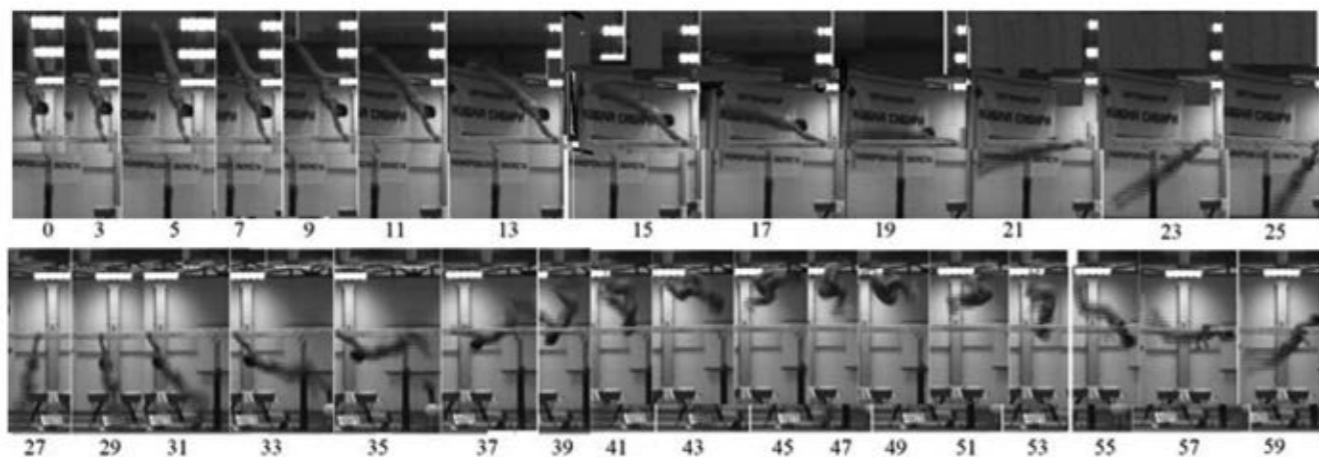


Figure 1. Exercise 1. Decline from a handstand to a hang and a forward swing double back somersault in a group over the poles in emphasis on the hands (M. Devyatovsky)

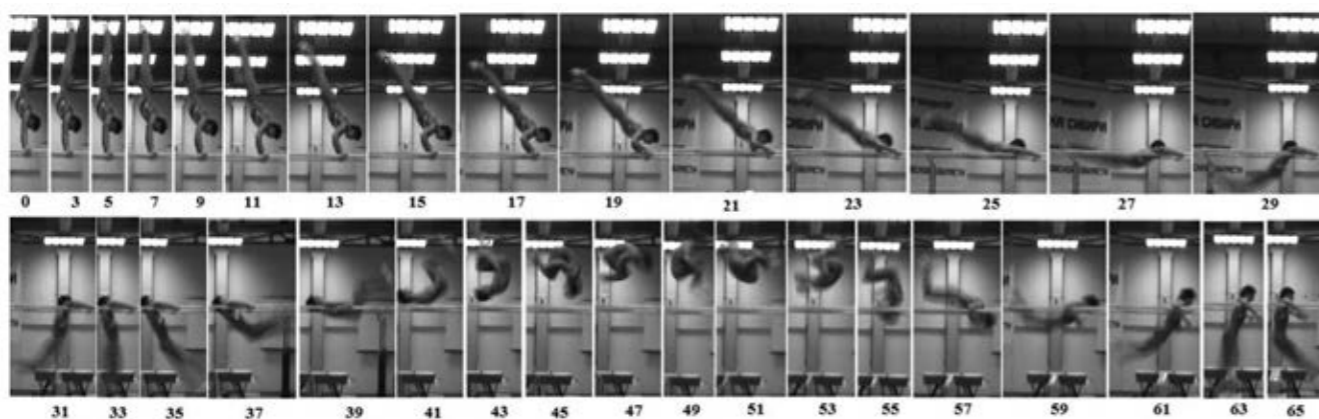


Figure 2. Exercise 2. Decline from a handstand to an emphasis on the hands and a swing forward double back somersault in a tuck over the poles in an emphasis on the hands (N. Ignatiev)

Results of the study and their discussion. Kinetograms of the studied exercises (Figure 1, 2).

Exercises start from the same starting position: handstand (Figure 1, Figure 2; frame 0). The exercise also ends with the same type of position: emphasis on the hands (Figure 1, frame 53; Figure 2, frame 55).

Exit from the reference position to the flight part of the exercise (the "Start" time point) is performed in the first exercise from the hanging position, and in the second exercise from the position of support on the hands, which causes different parameters of kinematic characteristics with the same phase composition of the flight part of the exercises.

Structural composition of exercises. In the structural composition of the exercises, periods, stages of the phase are distinguished (Figure 3).

Exercise periods include the following components: the first support period, the non-support period, the second support period.

Stages consist of elements: *accumulation*, *working* (the first reference period); *realizations* (benchmark period); *depreciation* (second reference period).

Phases: *bale* - flexion in the joints, *extension* - extension in the joints (accumulation stage); *throw* - the most accelerated decrease in the angle in the joints, *pre-start* (working stage); *grouping* - acceptance of grouping, *twist* - rotation with the most dense grouping, *extension* - extension in the joints (implementation stage); *emphasis* - arrival on the support with the shoulders, *dynamic posture* - the standard position of the emphasis on the hands (depreciation stage).

The sequence of changes in the phase composition in the studied exercises is the same, the parameters of biomechanical characteristics in the phases are different.

Parameters of biomechanical characteristics of the flight period of exercises. The resulting linear

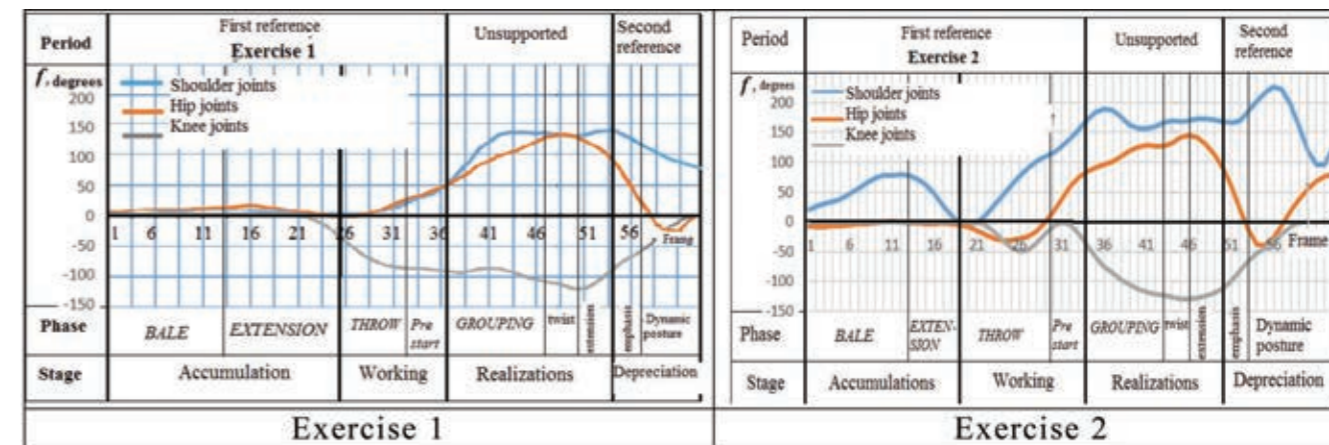


Figure 3. Structural composition of the studied exercises: periods, stages, phases

velocity of the general center of gravity (GCG) of the gymnast's body at the moment of time "Start" is 4.27 m/s, which is 17.56% more than the same velocity in the second exercise (Table 1, line 14).

The main share of the speed difference falls on the vertical component of the resulting linear velocity of the general center of gravity (GCG) of the gymnast's body - 19.71% (Table 1, line 13). A significantly smaller part of the speed difference falls on the horizontal component of the resulting linear

velocity of the gymnast's body GCG - 4.92% (Table 1, line 12).

In the first exercise, the general center of gravity of the athlete moves vertically upwards by 0.86 m, in the second - by 0.55 m (table 1, line 9). The movement of the gymnast's GCG in the horizontal direction is -0.84 m and -0.78 m for the first and second exercises, respectively (Table 1, line 6). Consequently, a characteristic feature of the flight part of the exercises is a significantly larger amplitude of movement of the

Table 1. Parameters of the biomechanical characteristics of the general center of gravity of the gymnast's body in the flight part of the exercises

No. p/p	Biomechanical characteristics	Exercise Options 1	Exercise Options 2	Absolute difference	Relative difference
1	Total flight time	0,720 (c)	0,64 (c)	0,08 (c)	11,11 %
2	Time of flight to the maximum along the axis Oy	0,419 (c)	0,336 (c)	0,083 (c)	19,81 %
3	Decline time from maximum to coming to close range (on poles)	0,301 (c)	0,304 (c)	0,003	1,00 %
4	The initial position of the GCG along the Ox axis at the moment of time «Start»	0,94 (m)	-0,265 (m)	No comparison	
5	The final position of the GCG along the Ox axis at the moment of time «Finish»	0,10 (m)	-1,04 (m)	No comparison	
6	Flight on the Ox axis	-0,84 (m)	-0,78 (m)	-0,06 (m)	7,14 %
7	The initial position of the GCG along the Oy axis at the moment of time «Start»	-0,03 (m)	0,046 (m)	No comparison	
8	End position of the GCG along the Oy axis at the time «Finish»	0,38 (m)	0,17 (m)	No comparison	
9	Flight on the Oy axis	0,86 (m)	0,55 (m)	0,31 (m)	36,04 %
10	Maximum (max) on the Oy axis	0,83 (m)	0,60 (m)	0,23 (m)	27,71 %
11	The coordinate along the Ox axis at the moment of time «max» along the Oy axis	0,45 (m)	-0,68 (m)	No comparison	
Linear speed (V) at time «Start»					
12	V along the Ox axis	-1,16 (m/c)	-1,22 (m/c)	-0,06 (m/c)	4,92 %
13	V along the Oy axis	4,11 (m/c)	3,30 (m/c)	0,81 (m/c)	19,71 %
14	V resulting	4,27 (m/c)	3,52 (m/c)	0,75 (m/c)	17,56 %
15	Departure angle GCG - «Start» (Ox axis - radius vector GCG)	105,77 (град)	110,24 (град)	5,53 (град)	5,23 %

gymnast's GCG in the first exercise than in the second: horizontally by 7.14% (table 1, line 6) and vertically by 36.04% (table 1, line 9).).

Due to the existing difference in the vertical component of the resulting linear speed of the athlete's body GCG at the time "Start" (19.71%; Table 1, line 13), the different time to achieve, as the maximum lift height of the athlete's GCG (0.419 s - the first exercise, 0.366 s - the second exercise), and the total time the athlete was in a non-supported state (0.72 s - the first exercise, 0.64 s - the second exercise). The difference in time to reach the maximum take-off height of the gymnast's GCG is 0.083 s, or 19.81 % (Table 1, line 2).

The flight time of the body's GCG to the maximum vertically is 0.419 s for the first exercise, and 0.336 s for the second (Table 1, line 2). The time of Gymnast's body GCG decrease from the maximum take-off point to the point of emphasis (on the shoulder segments of the arms) is: for the first exercise - 0.301 s, for the second exercise - 0.304 s.

Conclusions. The sequence of changes in the phase composition in the studied gymnastic exercises is the same, and the parameters of biomechanical characteristics in the phases of movement are different. The division (differentiation) of the athlete's motor actions into separate components (periods, stages) is biomechanically justified by the motor tasks of the exercise, and its division into smaller structural parts (phases) is determined by the criterion of changing the unidirectional change in the angle in certain joints of the athlete. In complex gymnastic exercises, preparatory, basic and final actions can refer not only to the entire exercise as a whole, but also to its individual phases.

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Features of adaptation of sensory systems of athletes in swimming with fins

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Abstract

Objective of the study was to identify the features of the adaptation of the sensory systems of the body of athletes involved in swimming with fins.

Methods and structure of the study. The indicators of three groups were compared: those who go in for finswimming (diver swimmers), those who go in for classical swimming, and those who go in for general physical training (GPT). The age of the examined is 18-23 years. The study was conducted on a day off from training using the "Simple visual-motor reaction" technique. To carry out the statistical method, the Mann-Whitney U test was used.

Results and conclusions. As a result of the experiment, it was revealed that in the group of swimmers-submariners, the reaction rate is higher, and there is also less dispersion of results compared to the group of general physical education. Similar results were also observed when comparing the performance of the classical swimming group and the GPT group. There were no significant differences in the obtained results between the sportsmen-submariners and swimmers of classical swimming.

Based on the results obtained, it can be concluded that under the influence of many years of training, the speed of sensorimotor reactions increases both in swimmers engaged in fins and in classical swimming.

Keywords: *swimming with fins, classical swimming, speed of sensorimotor reactions.*

Introduction. In modern elite sport, all systems of the athlete's body are subjected to extremely intense loads. In water sports, including swimming with fins, high tension is required not only from the musculoskeletal and respiratory, cardiovascular systems, but also from the controlling and controlling neural mechanisms. Achieving high results in sports activities largely depends not only on the physical, but also on the psycho-physiological state of athletes [3, 4].

The problem of increasing the functionality of analyzer systems in sports and professional activities is quite relevant. This is primarily due to the fact that in sports there is a significant increase in the requirements for the speed of execution of motor acts, which occur mainly in conditions of lack of

time against the background of increased neuro-emotional stress [2, 5].

The effectiveness of many physical exercises depends on the capabilities of sensory systems. The performance of sports movements is constantly regulated with the help of feedbacks that constantly come from proprioceptors and are corrected by the nervous system and acoustic or visual information.

The constant growth of results in swimming with fins, especially at sprint distances, requires the fastest possible response to the starting signal. The results of studying the adaptation of the athletes' sensory systems will make it possible to correct the training process in order to more effectively solve the problems and challenges of elite sports.

Objective of the study was to identify the features of the adaptation of the sensory systems of the body of athletes involved in swimming with fins.

Methods and structure of the study. The experiment was conducted at the Department of Sports and Health Tourism, Sports Physiology and Medicine of the Faculty of Physical Culture of Tomsk State University. The study group consisted of 15 finswimming athletes. Control group 1 included 15 athletes involved in classical swimming. Athletes of both groups were highly qualified (Candidate Master of Sports, Master of Sports) at the age of 18-23 years old, with a sports experience of at least nine years. The training regime consisted of one to two workouts per day, five to six times a week. Control group 2 consisted of 15 students of Tomsk State University aged 18-21 years old, who are engaged in groups of general physical training (GPP). The training regime included two to three sessions per week. The studies were carried out on the day off from training.

The study used the "Simple visual-motor reaction" technique, carried out using the NS-Psychotest hardware complex (Neurosoft LLC, Ivanovo). This technique allows you to identify the typological features of the nervous system and functional state, determine the strength, balance and mobility of nervous processes, as well as the reaction rate. In addition, the speed of a simple visual-motor reaction makes it possible to evaluate the integral characteristics of the human CNS, since its implementation involves both the main human analyzer systems (visual and kinesthetic), as well as certain parts of the brain and descending nerve pathways [1].

Two parameters were investigated: the speed of sensorimotor reactions and the standard deviation, which reflects the dispersion of the results.

The choice of technique is due to the diagnostic capabilities of the methods, their safety and operator comfort, as well as the short time required for measurements.

Statistical data processing was performed using the statistical analysis package STATISTICA 12.0.

The following distribution parameters were used to describe the obtained quantitative data: Valid N (sample size), Mean (sample mean), Standard Deviation (sample standard deviation), notation $\bar{X} \pm \sigma$. To carry out the statistical method, the Mann-Whitney U test was used.

Results of the study and their discussion. An analysis of the results of a study of a simple visual-motor reaction allows us to conclude that in the group of divers, the reaction rate is higher, and there is less dispersion of results compared to the group of general physical training (GPT), based on the presence of statistically significant differences in the speed of sensorimotor reactions and standard deviation. These results indicate that the attention of divers is more stable than that of the general physical education group (Table 1).

Swimmers in classical swimming also have a higher rate of sensorimotor reactions compared to the general physical training group, based on the standard deviation (Table 2), but there are no significant differences in the dispersion of results.

Analysis of the results of the study of a simple visual-motor reaction did not reveal statistically significant differences between the groups of divers and classical swimmers.

Conclusions. The results obtained showed the presence of changes under the influence of systematic intensive training of the reaction rate to the stimulus in the direction of its increase in swimmers in comparison with the group of general physical training, as well as an increase in the stability of the nervous system in swimmers.

The absence of statistically significant differences between the groups of divers and classical swimmers allows us to conclude that sensory systems in both groups are relatively equally developed.

The study was supported by the Development Program of Tomsk State University (Priority 2030).

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Table 1. Indicators of a simple visual-motor reaction in divers and general physical training groups

Index	Control group 2 ($\bar{X} \pm \sigma$)	Study group ($\bar{X} \pm \sigma$)	p
Speed of sensorimotor reactions	248,94±15,68	216,29±22,64	<0,01
Standard deviation	85,28±35,77	52,34±44,02	<0,01

Table 2. Indicators of a simple visual-motor reaction in swimmers of classical swimming and a group of general physical training

Index	Control group 2 ($\bar{X} \pm \sigma$)	Control group 1 ($\bar{X} \pm \sigma$)	p
Speed of sensorimotor reactions	248,94±15,68	219,92±24,75	p<0,01

Influence of physical load on the cognitive sphere of athletes-orienters

UDC 796.015

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Abstract

Objective of the study was to evaluate the effect of physical activity on the cognitive sphere (memory, attention and thinking) in orienteers.

Methods and structure of the study. The experiment involved male students of three specializations: "cross-country skiing", "general physical training" and "orienteering", aged 18 to 24 years, a total of 45 people. Students of the specializations "cross-country skiing" and "orienteering" attended training sessions in their sports more than five times a week from 60 to 120 minutes and were in the preparatory period of training. Students of the specialization "general physical training" attended classes at the university twice a week for 60 minutes.

Results and conclusions. It was shown that the values of cognitive qualities before the load differed insignificantly between the groups. The exception was the indicator of attention in terms of the number of errors - it was initially significantly lower in the group of orienteers than in both control groups. After physical activity, there was an improvement in most indicators in the group of orienteers, while in the control groups, an improvement was noted in only one indicator.

The data obtained made it possible to conclude that orienteers, against the background of intense physical exertion, have an increase in indicators characterizing cognitive qualities. It can be assumed that this is the result of the formation of technical preparedness in this sport.

Keywords: *orienteering, cross-country skiing, cognitive sphere, physical activity.*

Introduction. Orienteering is a unique sport where athletes, using a map and compass, have to mark all certain checkpoints in the shortest possible time. The peculiarity of this sport is that the distance is not familiar to the participants, and it is impossible to pass it without a map. The training of athletes in orienteering differs from similar sports such as cyclo-cross disciplines, cross-country skiing and athletics, primarily in that there is no map in front of the participants in these sports, and they can look at the distance before the competition.

An orienteer during the race has to drastically change his pace of movement, since various obstacles can be encountered along the way in the form of dense vegetation, windbreak, swamps, etc. The competitor needs to slow down in order to avoid injuries and mistakes, and in well-run areas, the athlete can develop a high running speed. In addition to physical training, coaches and athletes include technical training

in the training process aimed at improving the level of card possession [1, 6]. According to Ivan Sirakov, PhD. from the University of Veliko Tarnovo (Bulgaria), most professional athletes note that technical training is an integral part of the orienteering training process [7]. With the help of technical training, cognitive mental processes develop. In working with the map, the athlete uses attention in order to have time to switch between landmarks, memory in order to look at the map as little as possible and not slow down the pace of movement; analysis - to determine the optimal variant of movement. Thus, orienteering classes impose increased demands on both physical fitness and cognitive qualities, and both types of activity are implemented simultaneously.

Objective of the study was to evaluate the effect of physical activity on the cognitive sphere (memory, attention and thinking) in orienteers.

Methods and structure of the study. The study involved male students of three specializations: "cross-country skiing", "general physical training" and "orienteering", aged 18 to 24 years, a total of 45 people. Three groups were formed: experimental (orienteering), 1st control (cross-country skiing) and 2nd control (general physical training), 15 people each.

Students of the specializations "cross-country skiing" and "orienteering" attended training sessions in their sports more than five times a week from 60 to 120 minutes and were in the preparatory period of training. Students of these specializations had the 2nd sports category and above. Students of the specialization "general physical training" attended lessons at the university twice a week for 60 minutes.

The research program consisted of three stages: testing of cognitive qualities before exercise, physical activity, testing after exercise. The testing was aimed at assessing attention, memory and thinking and included the following tests:

1. **B. Bourdon's correction test.** This test is aimed at studying the features of attention, namely its characteristics such as stability, concentration, switchability, volume. The subjects were given forms with rows of random letters 40 rows of 40 letters each. Prior to testing, participants were not allowed to look at the form. After the examiner calls the letter, the participants turned the form over and the time was cut off. The task was that in each row the participant must cross out the named letter. Mistakes were considered incorrectly crossed out letters, missing letters. The task completion time is 5 minutes [2].

2. **Testing short-term visual memory for numbers.** The subjects were given a form with three rows of numbers, four random numbers in each. For 20 seconds, the subjects had to remember as many numbers as possible. After the original form with numbers was removed. In the form of answers, it is necessary to display the memorized numbers in their places [4].

3. **Testing short-term visual memory for images.** The rules for testing are the same as in the previous task. The subjects were given forms with different images 3x5. In 20 seconds, it is necessary to remember the largest number of images and display them in the form of answers [4].

4. Scale of progressive matrices. Raven test. The test is aimed at determining the level of development of mental abilities and logical thinking. The subjects were given forms with 30 drawings, divided into five groups. The figures are graphic representations of "certain dependencies". Each image is miss-

ing a section. Its variations are at the bottom of the figure. The task of the participants is to choose the logically correct version of the missing fragment. The complexity of tasks increases within the group and between them. Participants were given 10 minutes to solve 30 tasks [5].

The Harvard step test was used as a load. Participants stepped onto a step 50 cm high for 5 minutes at a frequency of 30 times per minute [3].

Statistical data processing was carried out using the statistical analysis package STATISTICA 10.0. The level of significance in testing the hypothesis that two samples belong to the same general population was estimated using the Kruskal-Wallis ANOVA test. Data are presented as $X_{av} \pm SE$.

The study was approved by the local ethical committee of the biological institute of Tomsk State University (protocol No. 33 of December 02, 2019).

Results of the study and their discussion. The results of testing the cognitive qualities of the three groups before and after the load are displayed in Table 1.

From the data in Table 1 it can be seen that the values of cognitive qualities before the load differed insignificantly. The exception was the indicator of attention by the number of errors - it was initially significantly lower in the experimental group than in both control groups. After exercise, there was an improvement in most indicators in the experimental group, while in the control groups, an improvement was noted in only one indicator.

Conclusions. The data obtained allow us to conclude that orienteers have an increase in indicators characterizing cognitive qualities against the background of intense physical exertion. It can be assumed that this is the result of the formation of technical preparedness in this sport.

The study was supported by the Development Program of Tomsk State University (Priority 2030).

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Table 1. Indicators of testing the cognitive mental processes of orienteers, skiers and students of physical fitness specialization before and after exercise

Indicators	Stage experiment	Experimental group (Sports orientation, n=15)	1st control group (cross-country skiing, n=15)	2nd control group (GFT (general physical training), n=15)
Attention (sec)	Up to load	221,3±39,8	247,2±46,5	231,1±35,6
	After loading	165,5±30,8 *#@	222,3±62,0 @	226,8±15,0
Attention, errors (number)	Up to load	2,9±2,5 #@	8,0±4,8	7,1±4,1
	After loading	1,0±0,8 *#@	3,8±1,6 *	3,1±3,8 *
Memory, images (number)	Up to load	5,6±1,8	4,0±1,6@	7,1±1,9
	After loading	7,0±1,8*	5,6±1,8	6,8±2,0
Thinking, mistakes (number)	Up to load	12,3±2,8	13,0±3,2	13,3±2,4
	After loading	11,1±2,4	13,4±1,7	13,1±2,4
Memory, numbers (qty)	Up to load	4,0±1,4	5,0±1,9	5,0±1,8
	After loading	4,8±2,3*	3,8±0,8	4,5±2,6
Average heart rate after exercise (bpm)		101@	98@	130

* - reliability of changes after exercise, $p < 0.05$.

- significance of differences with the 1st control, $p < 0.05$.

@ - significance of differences with the 2nd control, $p < 0.05$.

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Dynamics and energy of starting acceleration of sprinter students and the strongest runners in the world

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Abstract

Objective of the study was to compare the kinetic and dynamic indicators of the starting acceleration of student sprinters and the strongest athletes in the world.

Methods and structure of the study. The scientific work used experimental data on the spatio-temporal characteristics of the starting run at a distance of 100 m from eight students with results in the range of 11.08-11.45 s, as well as data from a report on the biomechanical study of the dynamics of running of participants in the finals of the 2017 World Championships in Athletics, having a result of 9.92-10.08 s. Using the least squares method, the constants (V_{max} и τ) of the running model equation $V(t) = V_{max}(1 - e^{-t/\tau})$ were selected. Based on this model, with the help of Newton's dynamics equations, the acceleration, force and mechanical power developed by athletes in time in the horizontal-longitudinal direction were calculated.

Results and conclusions. The greatest differences were found in the values of the maximum mechanical power developed in the horizontal-longitudinal direction. The strongest athletes of the world recorded an average value of 2435 ± 203 W, and for student runners - 1532 ± 224 W, which is 58.9% less, $p \leq 0.05$. The theoretical value of the maximum horizontal force at the initial moment of acceleration was 814 ± 79 and 616 ± 34 N for elite athletes and students, respectively. The difference is 32.1%, $p \leq 0.05$. Large amounts of strength and power allow world-class sprinters to reach a maximum speed in the range of 11.6-12.2 m/s, which is on average 17.2% higher than that of student runners.

Keywords: 100m run, starting acceleration, mathematical modeling, kinetics and energy of running, students, elite athletes.

Introduction. The most significant factors that determine the result in sprinting are the value of the maximum speed achieved and the value of the mechanical power developed in the longitudinal direction, which depends on the forward force and its relation to the resulting support reaction [5].

For a long time, these data were recorded on the basis of a biomechanical analysis of the results of high-speed filming, the use of a laser speed meter and long strain gauge platforms [3].

Recently, these indicators can be obtained based on a simple method of calculating the kinetics from the data of the velocity dynamics, which can be obtained on the basis of the mathematical method of iteration - the selection of the parameters of the velocity equation until the coincidence, calculated using its data,

with the spatio-temporal characteristics of the starting run [3].

Objective of the study was to compare the kinetic and dynamic indicators of the starting acceleration of student sprinters and the strongest athletes in the world.

Methods and structure of the study. Spatio-temporal characteristics of the starting run of eight sprint students aged 19-20 years (height - 177.4 ± 2.1 cm, weight - 68.6 ± 2.7 kg) with a sports result in the 100 m run 11.08-11.45 s. Athletes completed two attempts in the 100m race from a low start. Using the analysis of a video recording of a run made by an Apple 6 smartphone at a frequency of 240 fps and mounted on a rotating tripod, the time to overcome 5, 10, 15, 20 and 30 meter segments of the distance

Values of kinetic and energy indicators of starting acceleration in 100 m run among students and finalists of IAAF WCA 2017 (M±SD)

Athletes	Constants models		Theoretically maximum values			Max Power	
	V_{max}		F_{HO}		V_0	P_{max}	
	m/s	s	N	N/kg	m/s	W	BW/kg
Students	9,9 ±0,15	1,10 ±0,07	616 ±34	8,9 ±0,5	10,2 ±0,23	1532 ±224	22,3 ±3,3
Finalists WCA 2017	11,6 ±0,11	1,15 ±0,05	814 ±79	10,2 ±0,8	12,1 ±0,15	2435 ±203	30,5 ±2,5
Difference,%	17,2*	4,3	32,1*	14,6*	18,6*	58,9*	36,8*

– $p \leq 0.05$. F_{HO} is the value of the forward force at the initial moment of time.
 V_0 is the value of the maximum running speed in the absence of air resistance.

was recorded [1]. Then, based on the least squares method, the values of the constants (V_{max} and τ) were selected in the velocity modeling equation $V(t) = V_{max} \cdot (1 - e^{-t/\tau})$. Based on Newton's equations of dynamics, the values of velocity, acceleration, horizontal force, and mechanical power were calculated [1, 3]. Starting acceleration data of the strongest runners in the world, taken from the protocol of biomechanical analysis of the final 100 m race at the 2019 World Championships in London [2] ($n=6$, height - 183.2 ± 3.6 cm; weight - 79.8 ± 4.1 kg; sports result - 9.98 ± 0.03 s) were subjected to the same calculation procedure.

Results of the study and their discussion. The most significant differences are observed in the indicators of maximum running speed, in the magnitude of the forward force, in the magnitudes of mechanical power developed in the horizontal direction (see table).

Differences in acceleration and instantaneous speed are already observed in the initial section of acceleration. These differences increase as the distance is covered, and at the 6th second, the differences in running speed reach a maximum value of 1.5 m/s (Fig. 2).

The analysis of the "strength-speed" profile shows that at the start, the best sprinters, although they are superior in terms of strength registered among students, but these differences are most significant at a speed of 10 m/s, which makes it possible for them to further increase their speed (Fig. 1). At this time, the force developed by the students becomes equal to the force of air resistance and the acceleration stops. The advantages of world-class sprinters are due not only to greater power capabilities, but also to the most efficient use of the repulsive force, directing most of it compared to forward students to move forward [5]. The energy of starting acceleration in the strongest

athletes of the world is characterized by a significantly greater value of mechanical power developed in the horizontal direction, which is in good agreement with previously obtained data [4, 5].

Conclusion. The obtained results confirm the prevailing notion that the most important indicators of achieving a sprint result are the maximum speed and maximum power developed by runners in the starting run. In addition, the running of the world's strongest athletes is characterized by a higher efficiency of using the resulting repulsion force, which makes it possible to develop large efforts in the longitudinal direction even at high running speeds.

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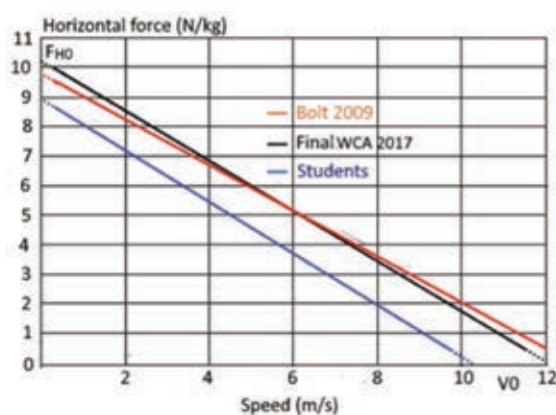


Figure 1. Constructed average strength-speed profiles of students and participants in the finals of the World Championship 2017 and U. Bolt when setting a world record in 2009 (according to [4])

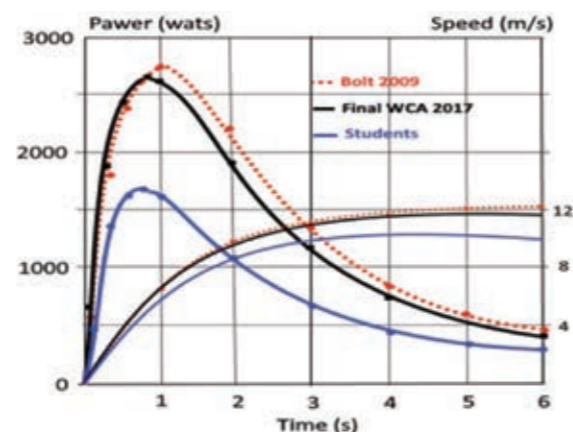


Figure 2. Models of the dynamics of running speed and mechanical power developed in the horizontal direction by students and the strongest athletes of the world in the starting acceleration of 100 m running

Load adaptation of the heart rate of qualified wrestlers

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Abstract

Objective of the study was to identify patterns of tolerance to extreme physical activity in highly skilled wrestlers of various specializations.

Methods and structure of the study. A group of active athletes (24 people) took part in the scientific work. In the course of bicycle ergometric testing, the cardiogram of the pre-start, start and the entire load period was studied. Physical exercise tolerance (PE) was determined by the difference between the achieved maximum PE (Wmx) and power W1.

Results and conclusions. The greatest maximum of PE is associated with an increase in the number of long-term differences in the prelaunch period (PS); maximum differences in start (ST) and 1 minute of load; minimizing small differences and increasing long-term differences during exercise (2-4 min); an increase in minimal and a decrease in long-term differences (7-9 min).

The revealed patterns characterize the features of the formation of the maximum physical performance of wrestlers of various specializations, the dynamics of which probably underlies the formation of the optimal sports form.

Keywords: stress test, cardiogram.

Introduction. The high sensitivity of the heart rate to systematic training physical loads (PE) makes it possible to use the analysis of the variability in the duration of cardio intervals (CI) and their differences to search for the most significant markers of exercise tolerance [5, 6, 9, 1-3].

At the same time, extreme and often excessive training physical loads lead to serious violations of the functional state of the body, the early diagnosis of which is important not only for the prevention of overload-overtraining consequences, but also for the effective assimilation of physical activity in order to develop optimal sports form, positive cross-effects of adaptation. It is known that it is the achievement and tolerance of the load maximum that reveals the predictors of survival and fitness, however, even before it begins, a functional system of mutually assisting adaptive mechanisms is formed in the body for optimal exercise tolerance [5-8]. The variability of the cardiogram (CRH) during the period of creation and improvement of this FS is of scientific interest.

Objective of the study was to identify patterns of tolerance to extreme physical activity in highly skilled wrestlers of various specializations.

Methods and structure of the study. A group of active wrestlers (24 people, 17-22 years old) was studied: MS qualification (master of sports), specialization - sambo, judo, universal fight.

Maximum bicycle ergometric testing was carried out according to an individual protocol. The power W1 (Watts) of the 1st stage (3 minutes) was calculated from the value of the proper basal metabolic rate (PBMR): $W1(W) = PBMR \cdot 0.1$. Next, ramp-protocol, increment 30W per minute, until failure - an individual maximum (Wmx), which determines the end of the load and the beginning of the recovery period - 7 minutes [2, 4, 6]. Exercise tests were carried out in the first half of the day on a Lode Corival bicycle ergometer (7-1000 W). During the entire testing, the digitized ECG was converted (PolySpectr-12, Neurosoft) into a sequential time series of RR-intervals (CI) - a cardiogram (CRH).

Cardiogram was studied: prestart - 30 s, preceding the start of ergometry; start - 30 s from the

beginning of rotational locomotion with a load of 50 W; per minute - the entire load period [9]. pNN2-16 values were calculated in Microsoft Excel tables. Physical exercise tolerance (Watts) was determined by the difference between the achieved maximum physical activity (Wmx) and the power W1. The results of the study were processed by the Statistica 10.0. package - nonparametric methods. The data were presented as a percentile (Pc) series (5-10-25-Me-75-90-95).

Results of the study and their discussion. The indicator NNx1x2 is the percentage of pairs of cardio-intervals (CI) with a difference (modulo) from X1 to X2 ms to the total number in the CI array (Table 1).

The difference in the duration of successive cardio-intervals is determined by the duration of the CIs themselves, therefore, with an increase in heart rate, the variability of CRH decreases [2]. Since the value of the difference in cardio-intervals over a median of 19 ms is detected only in the prestart period, the NNx indicator was studied in the range of 2-16 ms (Table 2).

In the prelaunch period, there is an approximately equal percentage distribution along the variability corridors with a slight predominance in the first (NN2) and a lack in the last (NN16). After the start, there is a pro-

nounced shift towards less variability with a maximum of NN2 (20%), a gradual decrease to NN10 (5%), stability in the interval of NN10-14 and an unchanged minimum of NN16. At the beginning of the loading period (1-3 min) there is an even greater shift in the variability of the heart rate to the minimum intervals. The maximum of NN2 increases to 40%, a more pronounced drop to NN8 (6.5-7.5%) with a further minimization to NN16 to 0.8-1.1%. In the future (4-9 min), the loading period has similar dynamics in the intervals (NN2-16) with the initial period. However, if from the prestart to the 3rd minute of the load, the value of NN2 increases (increases up to 2 minutes of the load, but is actually stable for 1-3 minutes), then starting from the 4th minute (from 4 to 9) it actually drops evenly to 23.4%. The same trend persists for NN4. At the same time, NN6 shows an increase in the indicator starting from the 6th minute of the load (except for the 8th minute). NN8 is manifested by an increase in load at 3-5 minutes and stability at a level of 8-10% in the future. NN10 increases at 3-8 minutes (up to 9.4) with a pronounced drop at the last (5.8%). NN12 increase at 2-6 minutes with a slight drop at 7.8 and a noticeable increase at 9 minutes. NN14 - the minimum severity at

Table 1. Indicators of the difference in cardio intervals of the pre-start (PS), start (ST) and load periods (1-9 min)

Pc	W(Вт)	PS	ST	Load period (min)						
				1	2	3	4	5	6	7-9
5	115	2	1	0	0	0	0	0	0	0
10	118	3	1	1	0	0	1	1	1	1
25	121	8	3	1	1	1	1	2	2	2
Me	139	19	6	3	3	3	3	3	4	4
75	175	45	14	5	5	5	6	7	8	8
90	190	89	31	8	7	8	10	11	13	14
95	192	118	42	12	9	10	15	16	17	18

Table 2. Value (%) NN2-16 of the pre-start (PS), start (ST), and load periods (1-9 min)

NN	PS	ST	Load period (min)								
			1	2	3	4	5	6	7	8	9
0-2	7,2	20,2	40,4	41,9	40,7	37,3	33,2	27,8	29,9	26,9	23,4
2-4	5,5	17,3	28,1	28,8	28,2	24,9	22,0	21,7	23,3	20,1	19,7
4-6	6,7	12,9	13,5	15,2	15,1	14,8	15,8	17,5	16,2	13,2	19,7
6-8	5,5	10,4	7,5	6,3	6,7	8,2	10,0	9,3	7,9	10,3	10,2
8-10	5,5	5,0	3,7	3,4	3,8	4,2	6,5	7,6	6,8	9,4	5,8
10-12	5,5	5,2	2,2	1,4	2,1	3,0	3,5	4,7	3,6	3,3	5,8
12-14	5,7	4,4	1,6	1,2	1,0	2,0	2,3	3,3	2,7	3,3	2,2
14-16	3,7	3,1	0,8	0,4	1,1	1,8	1,6	2,4	2,4	4,3	2,2
>16	54,8	21,5	2,2	1,4	1,3	4,0	5,0	5,7	7,3	9,2	10,9

Table 3. Correlations of the load maximum with the indicators NN2-16 of the pre-start (PS), start (ST) and load periods (1-9 min)

NN	PS	ST	Load period (min)						
			1	2	3	4	6	7	8, 9
2-4	0,24	-	-	-0,25	-0,29	-0,60	-0,32	-	0,32
4-6	0,49	-	-	-0,2	-0,28	-0,48	-0,43	-	0,32
6-8	0,45	-	-	-	-	-0,46	-0,40	-	0,21
8-10	0,48	-	-	-	-	-	-0,42	-0,33	-0,74
10-12	0,58	-	-	0,35	0,43	-	-0,41	-0,29	-0,68
12-14	0,65	-	-	0,38	0,35	-	-0,24	-0,23	-0,7
14-16	0,63	-	0,29	0,42	0,28	-	-0,24	-0,34	-0,65
>16	0,64	0,32	0,37	0,32	0,28	-	-0,37	-0,34	-0,7

1-3 minutes (1.6-1%), then an increase from 3 to 8 to 3.3%. NN16 the same trend with minimal severity as for NN14. Nevertheless, the intensity of the maximum differences in cardio intervals has a parabolic trend: a pronounced decrease from the prestart period to 1 minute of loading, a minimum of participation at 1-3 minutes, a slow but stable increase from 3 to 9 minutes of the loading period (Table 3).

The load maximum in the group of athletes has clear connections with the pre-start period. At the same time, an increase in the interaction strength from the minimum for pNN2 to the maximum for pNN16 is clearly noticeable, the periods pNN4-6 and pNN12-14 are characterized by stable equal bonds, and the value of pNN10 is a transitional value from the "first step" of the intensity of connection to the second. The start period actually has no significant relationship with the transferred load, except for the pNN16 indicator (0.32), indicating a borderline moderate direct relationship. The first minute of loading also has a minimum of connections with a loading maximum, which is manifested by the presence of direct connections for pNN14 and 16.

The second minute of the load is characterized by a large assortment of interactions. At the same time, pNN2, 4 are determined by a weak negative, and pNN10-16 by a moderate increasing positive effect on the level of exercise tolerance. The second minute demonstrates similar patterns with the only difference that the level of negative relationships for pNN2, 4 increases to moderate values, positive moderate relationships increase to the maximum for pNN10, and then in the period pNN12-16 weaken to 0.28.

The fourth minute is characterized by a moderate reverse interaction with the period pNN2-6, while its strength loses intensity from -0.6 to -0.46. The sixth minute is determined by negative relationships for all pNNs. At the same time, the pNN2-10 period demonstrates a greater intensity of the relationship. The seventh minute is characterized by a reverse stable

interaction with the period pNN8-16. A pattern worthy of scientific and applied interest is demonstrated by the 8th minute of the loading period, when the pNN2-4 period shows a moderate positive, and pNN8-16 - a strong, stable negative interest in the maximum load tolerance.

Conclusions. The increase in the participation of short intervals (NN2-4-6) has a parabolic trend: the maximum increase by the 1st minute of the load, a high stable level of 1-3 minutes, then a slow decrease by the 9th minute. The participation of the central intervals is characterized by a conditionally stable intensity. In turn, long intervals demonstrate a conditionally parabolic nature of variability with a more pronounced drop by the 1st minute of the load, stability at 1-3 minutes, and a differently pronounced upward trend by the 9th minute.

The greater the load, the greater the long-term differences in PS; the greater the maximum differences in the ST period and 1 minute of load; the less minimal differences and more long-term differences during exercise (2-4 min); the more minimal and less long-term differences (7-9 min).

The revealed patterns characterize the features of the formation of the maximum physical performance of wrestlers of various specializations, the dynamics of which probably underlies the formation of the optimal sports form.

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Control and prevention of disturbances of the normal physiology of the muscle system of athletes

UDC

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Abstract

Objective of the study was to study the factors that provoke muscle pathologies during the period of intense loads of basic training in preparation for the main starts of the season.

Methods and structure of the study. A survey of 30 athletes under the age of 25 years was carried out using the methods of manual diagnostics, functional tests for lateroflexion (bends of the spine to the sides), as well as MRI examination of the state of the muscular corset of the spine.

Results and conclusions. Uncompensated pathologies of the tissues of the spine occur due to the development of spastic conditions of the intervertebral muscles. Spastic conditions of the muscles of the spine are caused by a violation of the state of the human neuromuscular apparatus due to malnutrition - excessive consumption of foods containing starch and sugar, white rice, with active elimination of vitamin B1 against the background of high loads. Pain syndromes in the spine can be prevented and/or stopped by normalizing the nutrition structure.

Keywords: *Muscle pathologies, nutrition, vitamins.*

Introduction. Muscular disorders in athletes (myalgia, myofascial pain syndromes, krepatura, etc.) are widely studied in sports science [1-3, 5]. In particular, it has been shown that intense physical loads of basic training, exceeding adaptive capabilities, have a significant impact on the psychophysical state of athletes, and are manifested by a complex of signs of overtraining, the gradations of which are presented in the works of N.I. Volkov (1999 and others) [4].

Nutrition has an extremely important influence on the functional manifestations of overtraining states, their control and prevention. Studies aimed at assessing the state of the functional systems of the body of athletes, in connection with the structure of nutrition during the period of intensification of loads at the base camps in preparation for the main starts of the season, are not enough, and they are mainly aimed at pathological manifestations in relation to working capacity and energy productivity.

The lack of a generally accepted approach to long-term prevention of disorders in the state of the muscular system of the spine hinders the development and implementation of a scientifically based training program, and real prevention of injury to the muscular system and tissues of the spine, which in acute cases leads to interruption of the training process for long-term rehabilitation.

This provision is especially relevant in relation to youths and juniors. In particular, in water polo, typological athletes are those whose height is 190-200 cm, and their weight is 78-85 kg. Of course, such height-weight characteristics cause significant stress on the muscular system of the musculoskeletal system in general and the spine in particular.

Objective of the study was to study the factors that provoke muscle pathologies during the period of intense loads of basic training in preparation for the main starts of the season. The provisions pre-

sented are less relevant to the period of pre-competitive "narrowing".

Methods and structure of the study. A survey of 30 athletes under the age of 25 years was carried out using the methods of manual diagnostics, functional tests for lateroflexion (bends of the spine to the sides), as well as MRI examination of the state of the muscular corset of the spine. The control group included 100 spine studies of middle-aged, non-athletic people with back pain. Also, medical and statistical studies were carried out on the basis of 600 conclusions of radiation diagnostics doctors to identify the causes and patterns of development of dystrophic manifestations in the tissues of the spine.

Results of the study and their discussion. As a result of staged surveys of national teams within the framework of the work of complex scientific groups, athletes are identified with an unpredictable decrease in the productivity of competitive activity, a high level of psychophysical tension, the causes of which, in relation to the research topic, are factorized in the form of: sleep disturbances (especially important during periods of intense exercise); discomfort in the muscular system, primarily the spine. It has been shown (Egorov G.E., 1983; and others) that pain in the back and spine occurs in athletes of different qualifications. It was found that more than 50% of athletes have pain syndromes in the spine and impaired mobility of the spinal segments detected in test procedures.

In many examined patients, back pain manifests itself only with manual diagnosis. In the majority of examined individuals who had pain in the spine, areas with reduced mobility or complete immobility of individual segments of the spine were found. Next to the data, as a rule, there were areas with hypermobility of the vertebrae, which created compensation for immobile segments, and a misleading picture of the flexibility of the entire spine.

We carried out an age analysis of the stages of development of dystrophic manifestations in the spine from 17 to 60 years. It was revealed that spastic states of intervertebral muscles are the primary process. Spasmodic muscles cause disturbances in the blood circulation of the vertebrae. As a result, over the course of several years, a decrease in the thickness of the intervertebral muscles, the appearance of osteophytes (outgrowths from the vertebral body) that injure muscles, osteoporosis

of the vertebrae, leading to compression fractures of the vertebrae during high physical exertion, develop.

The next stage is the degeneration of the muscles of the spine and fibrosis of the muscles. Muscles lose their ability to contract and provide mobility to the spine. The back becomes "stony", and this leads to the irreversibility of dystrophic changes in the spine. In addition, compression of the sympathetic nerves emerging from the intervertebral foramina leads to chronic gastrointestinal diseases and cardiac dysfunction [6].

In the medical diagnosis, there is no analysis of the state of the muscles of the spine. In areas of the spine with discs affected by pathological changes, intervertebral muscles streaked with light thin stripes are visible behind the spinal canal. These are fatty layers between bundles of muscle fibers. Their presence is a sign of the inactivity of these muscles or the loss of their contractility.

In areas of the spine with good discs, the intervertebral muscles do not have fatty layers, and their structure has a darker texture than normal muscles. This is a sign of high muscle activity, muscle inflammation or swelling. It is in this area that the patient experiences pain, and not where there is "osteochondrosis" or disc herniation.

In most of the persons examined by us, who had pain in the spine, areas with reduced mobility or complete immobility of the spinal segments were found. Next to them, as a rule, there were areas with hypermobility of the vertebrae, which created a misleading picture of the flexibility of the entire spine. These disorders were caused by spastic conditions of the intervertebral muscles (Cherkasov A.D., 2009, 2012, etc.). Long-term spastic conditions of the spinal muscles lead to the development of dystrophic manifestations in the bone and cartilage tissue - osteochondrosis, disc herniation and compression fractures [8, 9].

The causes of pain in the back and spine are still the subject of debate. The causes and mechanisms of the occurrence of spastic conditions in the muscles are practically not studied. We have a number of observations of some sports veterans. Long-term observations show that physical or stress overloads are only provocateurs of spasticity, and the main cause of spastic conditions is a change in the ionic composition in the muscles and their energy supply. Here it is worth recalling the currently forgotten



beriberi disease, analyzed in the works of Zaborova and other authors [7].

According to our observations, and data from literary sources, in the European population of Russia, there is currently an increased consumption of starch, sugar, and white rice. A high consumption of white rice was also found in the base crops. With high physical exertion, there is also a lack of vitamin B1. This leads to muscle spasm, and is nothing more than a benign Western version of beriberi, rice disease.

Pain syndromes disappear two weeks after refusing to eat flour, sweet, white rice, and a course of vitamin B1.

However, for the muscular system of the spine, this is necessary, but not enough. Regular massage of the deep muscles of the spine is necessary, using "vacuum" techniques, which eliminates the spastic conditions of the muscles.

Without pretending to cover all aspects of nutrition, we propose our own approach to the content of some components of the nutrition structure of athletes during the period of basic loads of centralized preparation for the main starts of the season in order to long-term prevention and rehabilitation of injuries and disorders of the normal physiology of the spinal muscular system.

To preserve the health of athletes and prevent the breakdown of adaptation during the period of intense loads at the base training camp in preparation for the main starts of the season, the following measures are necessary:

- Regular diagnostics of the state of the muscular corset of the spine using manual diagnostics and functional tests for lateroflexion of the segments of the spine and identification of areas with reduced mobility of the segments, as well as areas with a painful condition of the muscles.

- Introduction to the medical diagnosis of an in-depth medical examination section: "Analysis of the condition of the muscles of the spine." At least, the introduction of this section in the list of surveys of complex scientific groups by sports.

- Limiting the consumption of foods containing high concentrations of starch (pasta, white bread, etc.) and sugar, as well as the complete replacement of white polished rice with brown. Additional consumption of foods containing vitamin B1, as well as complexes of vitamins of group B. The use of "Buffet" nutrition technologies, when athletes them-

selves choose a side dish, instead of a fixed serving of dishes, reduces the consumption of white rice.

- Embedding rehabilitation exercises for the muscles of the spine in the structure of the warm-up before training, and strength training.

- If spastic conditions of the spinal muscles are detected, massage the deep muscles of the spine using special "vacuum" methods. The usual back massage performed by the team's full-time masseurs must be supplemented with special techniques.

Conclusions. The most important factor in maintaining the health of athletes and ensuring stable adaptation to high loads of basic training is the prevention of spastic conditions of the muscular system of the spine. Uncompensated pathologies of the tissues of the spine occur due to the development of spastic conditions of the intervertebral muscles. Spastic conditions of the muscles of the spine are caused by a violation of the state of the human neuromuscular apparatus due to malnutrition - excessive consumption of foods containing starch and sugar, white rice, with active elimination of vitamin B1 against the background of high loads. Pain syndromes in the spine can be prevented and/or stopped by normalizing the nutrition structure.

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Optimization of athletes' mental self-regulation under conditions of sports restrictions during the covid-19 pandemic

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Abstract

Objective of the study was to develop and test a mental self-regulation optimization program for athletes under conditions of restrictions due to the COVID-19 pandemic.

Methods and structure of the study. Participants were athletes (men and women) engaged in different sports. The questionnaire "Difficulties of self-regulation in conditions of self-isolation" and the questionnaire of self-government by Y. Kul and A. Furman were used in the study. A program of mental self-regulation for athletes being involved in training and competition activities has been developed based on the psychodiagnostic data analysis. The experimental group of athletes included the program in their preparation, control group trained in the usual mode. A comparative analysis of mental self-regulation among control and experimental groups was conducted.

Results and conclusions. The effectiveness of athletes' mental self-regulation in COVID-19 pandemic conditions depends on the level of formation of planning, self-motivation and volitional regulation. Classes on the program significantly increased the effectiveness of athletes' mental self-regulation. The classes were aimed at improving goal setting, self-motivation of doing sports and persistence in difficult situations during training and competition activities.

Keywords: COVID-19 pandemic, athletes, mental self-regulation.

Introduction. Due to the COVID-19 pandemic restrictions, athletes had difficulties with normal training process and competitions [1, 5]. These difficulties negatively affected the athletes: their motivation and psychological well-being decreased, and their anxiety and emotional burnout increased [3, 4]. For two years, restrictions due to COVID-19 have been maintained and new ones have been introduced. Therefore, optimizing mental regulation skills that could increase the effectiveness of sports training are extremely relevant for athletes.

Objective of the study was to develop and test a program to optimize mental self-regulation of athletes under the COVID-19 pandemic restrictions.

Methods and structure of the study. The study involved 195 athletes (82 men and 113 women) involved in athletics, swimming, cross-country skiing,

sports and rhythmic gymnastics, volleyball, football, judo and boxing. The age of athletes is 18-24 years, sports experience is 7-16 years, russian sports qualification: first adult category (23.1%), candidate for master of sports (48.7%), master of sports (28.2%). At the first stage (15.11.2020 - 10.02.2021), a survey of athletes was conducted according to the questionnaire of A. E. Lovyagina and I.K. Syrykh "Difficulties of self-regulation under conditions of self-isolation" and the questionnaire of self-government by Yu. Kul and A. Furman in adaptation by O.V. Mitina and E.I. Rasskazova [2, 5]. Authors of the study had developed the program to optimize mental self-regulation in training and competition activities based on the diagnostic results. At the second stage (25.03.2021-20.06.2021), athletes of the experimental group attended classes where they studied the program. After that, a com-

parative analysis of self-government indicators in the athletes of the experimental (22 men and 19 women) and control (21 men and 20 women) groups was conducted. The groups were not statistically significantly different in terms of sport, training experience, and athletic qualifications. Diagnostics and corrective activities were conducted remotely using the google-forms online service and the Zoom program.

Results of the study and their discussion. According to the estimates of the majority of athletes, the situations of training camps and competitions cancellation, as well as the worsening of financial situations and the inability to solve everyday problems as it was before the pandemic turned out to be the most difficult for them in the conditions of COVID-19 restrictions. Limitations in communication with the coach and teammates, health problems, distance learning, etc. were noted as less difficult. The survey showed that during the COVID-19 pandemic, improving physical fitness and technical and tactical skills caused athletes much less difficulties than increasing psychological readiness for competitions. Athletes evaluate the degree of difficulty of situations that have arisen due to COVID-19 limitations in different ways, but the effectiveness of their mental self-regulation does not depend on the type of problem situation. It is statistically reliable (regression analysis).

From the list of 22 statements about the difficulties of self-government during the pandemic, were identified problems that reduce the effectiveness of mental self-regulation of athletes under the constraints of the COVID-19 pandemic (Table 1.). It turned out that the quality of self-government mostly depends on the athlete's ability to put forward the goals of his athletic training and adjust them in constantly changing conditions. The effectiveness of self-regulation in situations of COVID-19 restrictions is negatively affected by problems with "planning", motivational and volitional

skills that on turn reduces mental stability and ability to maintain persistence to achieve current goals.

Based on the identified problems of self-government, a program for optimizing mental self-regulation was developed for athletes, including group forms of work (focus groups, discussions, psychotechnical games) and individual psychological counseling for athletes (Table 2.). Group classes were held once a week for 1,5 months. Individual consultations were held at the request of athletes 2-3 days after each group session, as well as after the end of the entire cycle. During the consultations, it was discussed how an athlete applies self-regulation techniques that were considered in group classes, whether it turns out to apply these techniques in training and competition situations, what else needs to be done to reinforce mastered skills, etc.

After the program was completed, the athletes were surveyed again. The Y. Kul A. Furman method revealed statistically significant (Wilcoxon criterion) improvements in self-determination ($Z = 3,78$; $p \leq 0,01$), self-motivation ($Z = 3,91$; $p \leq 0,01$), cognitive self-control ($Z = 2,81$; $p \leq 0,05$) of athletes engaged in the program of optimization of mental self-regulation, volitional skills ($Z = 4,06$; $p \leq 0,001$) and readiness to overcome failures ($Z = 3,69$; $p \leq 0,01$). In the control group (not engaged in the program) there were no statistically significant positive changes in the studied indicators of self-government. And the indicators of self-motivation even worsened (Wilcoxon's criterion, $Z = -2,74$; $p \leq 0,05$). The effectiveness of mental self-regulation in difficult situations during training and competition activities turned out to be higher in athletes engaged in the program than in athletes of the control group (Student's criterion, $t=2,67$, $p \leq 0,05$). Most of the athletes in the control group rated the effectiveness of self-government as average: sometimes they managed themselves successfully, sometimes not. And

Table 1. Difficulties of self-government determining the effectiveness of mental self-regulation of athletes during the COVID-19 pandemic (multiple regression analysis, $R^2 = 0,756$)

Athletes' answers about the difficulties of self-regulation	β	p	Self-government problems
1. It was difficult to set goals, to plan anything.	-0,236	0,004	Goal setting
2. It was difficult to act flexibly, to change the scheduled action plan.	-0,309	0,001	Planning
3. It was difficult to contain the irritation, the anger, the rage.	-0,209	0,005	Emotional control
4. It was difficult to persistence and finish what was started.	-0,187	0,022	Volitional skills
5. Couldn't figure out how to train to minimize my loss of fitness.	-0,146	0,043	Planning
6. I wanted to quit sports, I hardly forced myself to continue my sports career.	-0,152	0,039	Motivation

Table 2. Program of optimization of mental self-regulation in difficult situations during training and competition activities

Goals	Objectives	Activities	Planned results
To increase motivation to do sports	Analysis of motives for doing sports. Formation of ideas about self-motivation. Mastering self-motivation techniques.	The method of unfinished sentences. Group discussion. Psychological diary.	Athletes will improve their understanding of their motives for playing sports. They will develop the ability to motivate themselves.
To improve planning	Formulation and reformulation of goals in the context of changes in the training schedule and competitions. Development of variable plans for their sports training.	Focus group discussion. Exercise «Designing goals». Psychological diary. Psychotechnical game «Chameleon».	Athletes will improve the ability to set goals and adjust them due to changes in the situation.
To increase self-control of emotions	Formation of ideas about the peculiarities of their emotional sphere. Analysis of the causes of negative emotions. Training in self-regulation techniques to control irritation and anger.	Exercises: «Physical relaxation», «Switching attention», «Rationalization». Psychological diary.	Athletes will improve the ability to react, repress and experience negative emotions.
To improve the ability to show strong-willed efforts	Analysis of the difficulties of persistence. Informing about the peculiarities of the development of volitional skills. Formation of persistence skills.	Focus group discussion. Finding situations for the development of persistence. Diary of psychological life.	Athletes will increase the severity and generalization of persistence.

the representatives of the experimental group gave good and excellent assessments of the effectiveness of self-government: they mostly managed themselves well and controlled themselves all the time.

Conclusion. Athletes are experiencing decline of mental self-regulation under the constraints of the COVID-19 pandemic due to insufficiently formed skills in planning sports training, self-motivation to do sports and volitional skills. The results of the study showed that classes aimed at improving planning, self-motivation and volitional regulation optimize the mental self-regulation of athletes in conditions of COVID-19 restrictions. This program can be used to improve the psychological preparedness of athletes.

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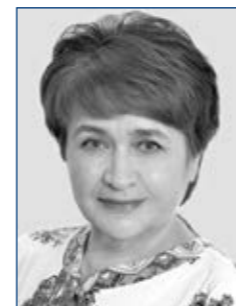
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Networking as a tool of career self-determination of future teachers in the sphere of physical culture and sport

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Abstract

Objective of the study was to conduct a theoretical analysis and test the effectiveness of networking for career self-determination of future teachers in the field of physical culture and sports.

Methods and structure of the study. The experiment took place on the basis of two universities in Voronezh and Chelyabinsk, 194 students of 3-4 courses took part in it. For two years, networking of various modifications was included in each event. The following diagnostic tools were chosen: "Methodology for measuring career self-determination" (A.N. Demin, A.B. Sedykh, B.R. Sedykh); author's development "Strategic career map" and student surveys.

Results and conclusions. The use of networking made it possible to significantly reduce the students' need for information about potential jobs, increase their professional motivation, confidence in their chosen profession and their abilities. A significant decrease in job changes in the first year after graduation was recorded. According to the modern "social-cognitive theory of career" (R. Lent, S. Brown and G. Hackett), the results obtained are largely due to the expansion of individual professional contacts of each student, which allowed students to better know the intricacies of the profession, get an external assessment of their abilities, claims and plans, and often support from more experienced professionals.

Keywords: *networking, future teachers of physical culture and sports.*

Introduction. Currently, universities actively promote the employment of graduates by conducting various career guidance events: excursions to organizations, job fairs, round tables and meetings with employers. At the same time, young specialists¹ quite easily change jobs, which causes a reasonable increase in claims from employers both to such specialists and to universities that train them.

There are no statistically accurate data on the turnover of young specialists in the field of physical culture and sports. But we conducted our own study (in the Voronezh, Kursk, Belgorod and Chelyabinsk

regions), according to which in the first year 24.3% of young specialists change jobs, in the second year - in 20.2%, in the third a year - for 18.6%, often this was due to leaving the profession. Such data was obtained in 2017-2018 based on feedback from 678 university graduates.

There are several main reasons for this: mismatch of work with expectations (52.7%), low wages (29.3%), inconvenient work schedule or geographical location of the organization (12.4%), uninteresting work (8.4%). Attention is drawn to the fact that more than half of the respondents quit their jobs because their work does not meet their expectations. It was suggested that the graduates of the faculties of physical culture and sports do not have a clearly defined vision of their professional path, there are

¹ In Russia, the concept of a "young specialist" includes an age criterion (up to 30 years), a professional education received for the first time, employment under an employment contract within a year after graduation. A graduate receives this status for three years.



not enough ideas about organizations - a potential career, career growth prospects are not indicated. In other words, in the process of studying at a university, students' career self-determination has not been sufficiently implemented.

Sufficient attention has been paid to this phenomenon in the scientific literature.

"Self-determination" is considered as a process and a result of a person's choice of his goals, actions, principles, positions. This process is carried out throughout a person's life, but in different directions, volumes and scales [8]. In our professional sphere, self-determination is interpreted as a search for personal meaning, development of target guidelines, vision of prospects, determination of one's position in the chosen and mastered professional activity [5].

There are two approaches to defining the essence of the concept of "professional self-determination": the first is as a choice of profession (mostly older teenagers are concerned), the second is as a complex development of the subject in the process of all labor activity. The integration of these approaches can be carried out in the process of career self-determination.

The theoretical foundations of career self-determination are well developed by Western psychologists: D. Super "Theory of professional career development" [7], M. Savikas "Theory of career design" [6], L. Gottfredson "Theory of limitation and compromise" [2], R. Lent, S. Brown and G. Hackett "Social-cognitive theory of career" [3].

Based on these theories, it can be noted that career self-determination begins quite early, even at school age, it is expressed in dreams, primary plans, the choice of the direction of one's professional activity and a professional educational institution. This is the first step in building a career.

The second stage corresponds to student age. During this period, "career readiness" is formed, expressed in the presence of four abilities:

1. Career determination (self-confidence and activity);
2. Career planning (clearness of plans for the next 5-10 years);
3. Career research (the degree of knowledge about the external environment and the opportunities that it provides);
4. Professional identity (understanding your interests and talents in your chosen professional activity).

The third stage - the beginning of the implementation of career self-determination, coincides with the beginning of professional activity. These are the first years of operation. Consequently, the success of a professional career throughout life largely depends on the effectiveness of career self-determination in student years. This circumstance determines the continuous search for new methods, mechanisms and tools that increase the success of students' career self-determination.

Objective of the study was to conduct a theoretical analysis and test the effectiveness of networking for career self-determination of students of the faculties of physical culture and sports.

Methods and structure of the study. The following methods were used in the experiment: "Methodology for measuring career self-determination", which is a modification of the American "MVS" methodology, which was developed by A.N. Demin, A.B. Sedykh, B.R. Sedykh [1]; author's development "Strategic career map" and student surveys.

The research work was carried out for two years, full-time students of the 3rd-4th courses of the Faculty of Physical Culture and Life Safety of the Voronezh State Pedagogical University, as well as the Departments of Sports Improvement and Theory and Methods of Physical Culture and Sports took part in it. Institute of Sports, Tourism and Service of the South Ural State University (NRU), who are studying undergraduate programs in the directions 49.04.01 "Physical Education" and 44.03.01 "Pedagogical Education".

A total of 194 students were involved, of which the experimental and control groups were naturally formed. Students who were active and participated in university events (experimental groups) and students who either did not take part in events or participated in them very rarely (control groups). Thus, we received three experimental and one control group in each university, since there are much more interested students.

The structure of the study was that during each event of a faculty, university or departmental scale, networking was organized, which can be interpreted as "establishing contact between people" [4], professional interaction or connecting a dream with resources. In fact, this is the acquisition of new professional contacts. For this, various methods were used:

- the presence of a "wall of contacts", on which

students had the opportunity to place their business cards;

- networking quest (which involved building a given pattern in the form of puzzles (six pieces) by searching for event participants with the required puzzles);
- organization of meeting places for sports during coffee breaks;
- stimulation of acquaintances by the speaker of the event;
- the use of role-playing games "forfeits", "anti-mafia", "Novgorod Veche" ...

The events were always attended, in addition to students, by graduates of the faculty, heads of sports organizations, members of sports committees and federations. In this regard, students got the opportunity to acquire new professional contacts.

Results of the study and their discussion. An analysis of the first events showed that students need to be trained in networking: to develop their own business card, compose their resume, briefly describe their interests, etc. In addition, the contacts that have appeared must be maintained, and this is also a kind of art. In particular, write a congratulation on a holiday, birthday, or just sometimes wish good morning. In addition, it is very important to learn to record in your notes the details and the place of the contact, the information received about the new acquaintance.

Maintaining contacts is always accompanied by some new information or an invitation to participate in new events. Unfortunately, due to pandemic restrictions, the number of events has been reduced. However, students in the questionnaires noted that virtual contacts and communication in chats had significantly increased. At the same time, each student received three to five invitations to participate in professional events from new acquaintances.

Diagnostics of the level of career self-determination of students was carried out after two years of work, in 2021. The data obtained made it possible to fix the differences in a number of positions between the students of the experimental and control groups:

- according to the indicator "need for information", the difference in points was 3.22. Very low scores were given by the students of the control groups, which is associated with their unmet need for information on employment;
- in terms of confidence in the correct choice of profession, the difference was 2.14 points, which is explained by the presence of doubts among stu-

dents in the control groups about the accuracy of their choice of professional path;

- in terms of self-confidence, the difference was fixed at 1.86 points, which is explained by the lack of confidence of students in the control groups in their abilities and capabilities.

Analysis of the "Strategic Career Map" built by students before the defense of the qualification papers gave grounds for the conclusion that the students of the control groups did not decide on their vision of professional improvement, could not make a career plan for the next 10 years, little then, vaguely imagined their future place of work.

Surveys of students about their attitude to networking and its usefulness for future employment showed: 1) each student made 14 to 27 professional contacts in two years, which were obtained at faculty events; 2) the usefulness of such contacts is assessed as very high; 3) thanks to new professional acquaintances, 66.4% of students received comprehensive information about potential jobs; 51.8% - noted an increase in motivation for the profession; 47.8% were able to discover new opportunities in the profession; 32.7% found a job; 20.3% - changed their attitude to the need for master's tours; 14.9% found potential partners.

A year has passed since the end of our experimental work, therefore, feedback was organized with graduates with clarification of their place of work. We were pleased with the results: among the students from the experimental groups, 9.3% changed jobs (of which 5.4% due to moving to a new place of residence), 1.2% decided to change jobs in the near future, while among of graduates from the control groups, 16.8% have changed jobs, and 12.2% are going to do so in the coming months.

Conclusions. Networking, as a tool for students' career self-determination, turned out to be very effective and worthy of attention in the career guidance system. Thanks to expanded professional contacts, students receive: information they are interested in about physical culture and sports organizations in the region, information about the features and subtleties of a particular profession, an external assessment of their abilities, claims and plans, often support from more experienced professionals. Universities acquire a higher image due to their purposeful and motivated graduates and connections with practitioners. And the economy of the region receives personnel stability among young specialists.



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Interdisciplinary integration as a condition for the implementation of the competence-based approach in vocational education

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Abstract

Objective of the study was to experimentally substantiate the pedagogical conditions of interdisciplinary integration in the implementation of the competency-based approach in the educational process of the University of Physical Culture.

Methods and structure of the study. Theoretical (analysis and generalization of literature, normative documents, pedagogical experience) and empirical research methods (pedagogical observations, pedagogical and psychological testing, peer review, pedagogical experiment) were used in the scientific work; two Wilcoxon sampling criteria were used to process the experimental data. The pedagogical experiment, in which 30 students participated, was carried out on the basis of the Department of Pedagogy of the Lesgaft National State University of Physical Education, Sports and Health, St. Petersburg in order to test the effectiveness of theoretically based pedagogical conditions for interdisciplinary integration.

Results and conclusions. It has been established that the implementation of interdisciplinary links is carried out through all components of the educational process. The logic of designing the interdisciplinary content of an academic discipline is determined. Evaluation funds were developed for the disciplines "Pedagogy", "Pedagogy of physical culture and sports", "Scientific and methodological activity" taking into account the requirements of the professional standards "Coach-teacher", "Coach". Pedagogical conditions of interdisciplinary integration were identified and experimentally substantiated in the course of implementation of the competence-based approach in the educational process of the University of Physical Culture.

Keywords: pedagogical conditions of interdisciplinary integration, interdisciplinary connections, competence-based approach, educational process at the University of Physical Culture.

Introduction. Integration processes in higher education in the field of physical culture and sports at the present stage determine the relevance of training a competitive specialist who is in demand on the labor market and who is able to adapt in the modern information space. This necessitates building the logic of passing academic disciplines, applying a competence-oriented approach in building the main professional educational program. An important aspect in this process is the definition of a block of academic disciplines that form competencies, the establishment of interdisciplinary links in their content, which makes it possible to eliminate duplication of subject content and design a model for mastering the competencies

being formed. It should be taken into account that the very definition of the concept of "competence" contains the principle of interdisciplinary integration [6].

Objective of the study was to experimentally substantiate the pedagogical conditions of interdisciplinary integration in the implementation of the competency-based approach in the educational process of the University of Physical Culture.

Methods and structure of the study. To achieve the goal of the study, theoretical (literature analysis, regulatory documents, pedagogical experience) and empirical methods (pedagogical observations, pedagogical and psychological testing, peer review, pedagogical experiment) were used, and the two-sample



Wilcoxon test was used to process the experimental data. A pedagogical experiment, which involved 30 students, was conducted to test the effectiveness of theoretically based pedagogical conditions for interdisciplinary integration.

Results of the study and their discussion.

An analysis of many years of experience in teaching pedagogical disciplines at the University of Physical Culture shows that the implementation of an interdisciplinary approach, which requires the integration of interdisciplinary knowledge, the establishment of continuity and interdisciplinary connections, is carried out through all components of the educational process [2]. The greatest difficulties for teachers in the context of the implementation of the competency-based approach are caused by the activity component, which requires the use of active teaching methods and non-traditional forms of organization, the development of funds for assessment tools in the discipline from the standpoint of interdisciplinarity.

In order to form competencies, the design of the content and procedural components of the process of studying an academic discipline is carried out [1]. In this regard, the interrelation of the subject content of academic disciplines is established, which jointly form these competencies, as well as interdisciplinary connections are built with the content of disciplines-prerequisites and postrequisites.

The logic of designing the interdisciplinary content of an academic discipline includes: defining the goals and objectives of studying the academic discipline; determination of indicators of achievement of competence and formed learning outcomes in the discipline; construction of subject content, taking into account the definition of educational elements, establishing a relationship with the content of other disciplines; identification of the procedural component of the study of the academic discipline, taking into account the possibilities of interdisciplinary integration. At the same time, it is necessary to take into account the requirements of professional standards, within the framework of which a specialist is trained in a specific direction and profile.

In order to form students' ability to "establish and maintain interaction that ensures successful work in a team" as a component of the universal competence "Able to carry out social interaction and realize their role in a team" [7], in the process of studying the discipline "Pedagogy", a system of methods was developed and experimentally substantiated active learning

in the process of organizing teamwork of students to complete competence-oriented tasks.

So, for example, on the theme of the seminar "Methods of pedagogical research", a team work of students was organized to complete the educational task: "Develop questions and conduct a conversation in order to identify factors that positively or negatively affect productive pedagogical interaction. Make a conclusion based on the results of the survey.

The results of the formative experiment indicate that the organization of teamwork to solve problematic problems in the course of applying active learning methods contributed to an increase in the level of social interaction in the experimental group, namely, the activity of students from the level of "below average" to the level of "above average" ($p < 0.001$), compliance with ethical standards during communication from the level of "below average" to the level of "above average" ($p < 0.001$), listening skills from "average" to "above average" ($p < 0.001$), and the level of group cohesion increased (method Sishora) from "average" to "high" level ($p < 0.001$), which positively affected students' mastery of knowledge ($p < 0.01$) and skills ($p < 0.001$) in the discipline [3].

For the formation and assessment of the ability to "educate socially significant personal qualities, form the moral values of fair sports competition" (Professional standard "Coach-teacher" Labor function A / 06.6) [5] as a component of general professional competence related to the category "Education" [7], in the course of studying the discipline "Pedagogy", students acquire knowledge of the essence of the educational process and the ability to be guided by them in solving pedagogical problems; in the discipline "Pedagogy of Physical Culture and Sports" (PFCS), they perform competence-oriented tasks, for example, "Describe the pedagogical situation in which students (indicate the age of students, the stage of education / sports training) at a physical education lesson or a training session for sport violated the requirements imposed on them by the teacher. Determine the reasons for this behavior of those involved. Based on the analysis of the pedagogical situation, formulate general and particular educational tasks, ways to solve them.

Successful completion of tasks required the students to apply interdisciplinary knowledge, and the teacher to create a number of pedagogical conditions: the development of guidelines for completing the task; updating previously acquired knowledge, establishing relationships with related disciplines and

private didactics; giving examples, an algorithm for setting educational tasks; reliance on the experience of educational and training activities of students; creating an atmosphere of cooperation, goodwill, etc.

Within the framework of the academic discipline "Scientific and methodological activity", the formation of universal competence in the category "Systemic and critical thinking" and general professional competence in the category "Scientific research" is carried out [7]. So, for the formation and evaluation of the ability to "systematize and aggregate information from various sources, including interviews, special literature, statistical collections, reporting data on sports training by sport (group of sports disciplines), group of sports" (Professional standard "Coach", qualification: Coach-consultant, labor function: E / 01.6 - Generalization and dissemination of best practices in coaching) [4] the following task is proposed: "Compose abstracts on the proposed scientific texts" (this is one of the types of current control within the academic discipline).

Thesis training is a significant fact in the formation of the skills of research activities. This is due to the adequacy of the selection and application of the necessary methods of pedagogical research, the demonstration of the ability to analyze, synthesize, generalize theoretical information, the formation of the logic of scientific research. It should be noted that in the process of forming students' knowledge and skills in mastering the logic of pedagogical research, we use the "Saw" method, which allows us to implement a group form of work in the classroom, which contributes to a more detailed and high-quality study of all aspects of this educational task.

In the process of forming this skill, students get acquainted with the main ways of obtaining and processing information, model the structure of the logic of pedagogical research, select the necessary information, adequately use the methods of pedagogical research, which allows designing the writing of educational research papers, term papers, final qualifying work, as well as carry out writing a scientific article, report, speech at scientific, scientific-practical and methodological conferences. All this makes it possible to implement interdisciplinary connections with such academic disciplines as "Theory and Methods of the Chosen Kind of Sports", "Theory and Methods of Physical Culture", "Pedagogy", "PFCS".

Conclusions. Pedagogical conditions for interdisciplinary integration in the educational process have

been identified: the establishment of interrelationship and continuity in the study of disciplines, as well as interdisciplinary connections with the content of disciplines-prerequisites and postrequisites, which together form the competencies specified by the work programs; development of funds of evaluation tools for the discipline from the standpoint of interdisciplinary integration; the establishment of interdisciplinary links through the performance of competence-oriented tasks by students, close to the conditions of professional activity, requiring search independence and manifestations of creativity; in accordance with the competencies being formed, the widespread use in the educational process of active teaching methods, modern educational technologies and various forms of learning organization; integration of educational and research activities of students.

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Assessment of motivation for going in for sports and fitness of students of physical culture and sports universities using athletics exercises

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Abstract

Objective of the study was to identify the features of the technical and physical readiness of students as a result of mastering the discipline "Theory and methods of teaching the types of athletics" taking into account the direction of their special motivation.

Methods and structure of the study. Students (full-time and part-time) who specialize in various sports and study at the 1st year of university (n=356) took part in the scientific experiment. The motives that prompted them to go in for sports and receive higher professional education were established. Technical readiness in the types of athletics was determined using an expert assessment method using a point-rating system. The level of physical fitness was assessed using the standard results shown in the types of athletics. Motivation was determined by analyzing a questionnaire survey.

Results and conclusions. It was revealed that the level of physical fitness among full-time students of both sexes, in comparison with the part-time form, is significantly higher ($p \leq 0.05$). Full-time students master the technical types of track and field exercises more effectively. Full-time students have a higher level of professional motivation, and part-time students are purposefully motivated to receive higher education.

Keywords: students, sports education, physical fitness, motives for training, athletics.

Introduction. The modern system of higher education in the field of physical culture and sports makes high demands on the results, structure and conditions for the training of future specialists in this industry. The effective implementation of this program is possible if the target settings of the educational standard of higher education correspond to the characteristics of the learning environment of universities [4, 5, 8]. The success of receiving sports education is determined by the degree of physical health, motor and technical readiness of students [2, 3, 7, 9], as well as their motivation [1, 2, 6]. Taking into account the initial motives for physical exercises helps to correct the direction of motives that do not have sufficient stability, to ensure the movement of the motive from the result to the activity itself [6].

Objective of the study was to identify the features of the technical and physical readiness of students as a result of mastering the discipline "Theory and methods of teaching the types of athletics" taking into account the direction of their special motivation.

Methods and structure of the study. The study involved students (full-time and part-time), specializing in various sports and studying at the 1st year of university (n=356). The motives that prompted them to go in for sports and receive higher professional education were established. The technical readiness of students in the types of athletics was determined using an expert assessment method using a point-rating system. The level of physical fitness was assessed using the standard results shown in the types of athletics.

Motivation was determined by analyzing a questionnaire survey. Motives were divided into groups (physiological, psychological, communicative and professional). In each group, particular motives were determined, which were generalized according to group membership. In the questionnaire, the study participants had to evaluate their attitude to each motive in points - from 1 to 5 (1 point - not important at all, 2 points - important, 3 points - both important and not important, 4 points - important, 5 points - very important). After statistical processing of the answer

options, the average values for each motive were determined in points.

Results of the study and their discussion. It has been established that, although the percentage of regular part-time students who train regularly is lower compared to full-time students, their level of preparedness differs slightly (see table). The greatest difference among men was found in the 1000m run and high jump, where the result is 10.1% and 7.4% higher in the group of full-time education. The level of development of strength abilities is not statistically significantly different, however, the average value for the group of part-time students is somewhat lower (less than 1%). Full-time students statistically significantly exceed part-time students in terms of development of special endurance (by 11.8%), speed-strength (high jump - by 5.6%) and strength abilities (by 2.7%). The level of development of the complex form of speed and speed-strength abilities, according to the results of evaluating the long jump, differ insignificantly.

There is also a different degree of mastering the technique of full-time and part-time students. Thus, full-time students more effectively master coordinating complex types of track and field exercises due to a more in-depth study and improvement of the basics and details of exercise technique. Students "in absentia" are deprived of the opportunity to study the technique of movement in detail, the reason for which is the limited amount of contact work with the teacher for mastering the discipline. This conclusion is confirmed by higher scores in shot put and high jump among full-time students. However, the greatest difficulty in learning the technique is the long jump. In our opinion, low scores reflect the complexity of mastering the technique, associated with a change in the coordination and structure of movement and the redistribution of speed and effort during the transition from run-up to repulsion.

Cross-country athletics are more successfully mastered by students of correspondence departments. The relative naturalness of movements in the running types of athletics and the increased requirements for the competitive result of full-time students do not make it possible for them to realize the importance of the structure of movements. This is reflected in a significant difference in the level of proficiency in medium-distance running technique.

The results of questioning students of full-time and correspondence departments revealed a number of significant differences in the motivation that prompted them to engage in physical culture and sports, depending on the different form of education (Figure 1, 2)

Full-time students have more pronounced physiological motives. The average score for each particular motive exceeds 4.5 points, which corresponds to the value of "very important". And only the motive "the desire to have an aesthetically beautiful body" is less significant.

Physiological motives of part-time students are in the range from 3 to 4 points. The desire to have a healthy and aesthetically beautiful body with a sufficient level of development of physical abilities is not paramount. Psychological motives of students of various forms of education differ in the "desire to be part of a sports team". For students studying in absentia, the average score does not exceed the value of 3.5 points. The most important motive for regular physical culture and sports, regardless of the form of training, is "enjoying the activities, overcoming difficulties."

Of the communicative motives, the desire to satisfy the needs for communication during physical education and sports is more relevant for full-time students. For part-time students, this group of motives ranges from 2.9 to 3.8 points. Moreover, "the desire to en-

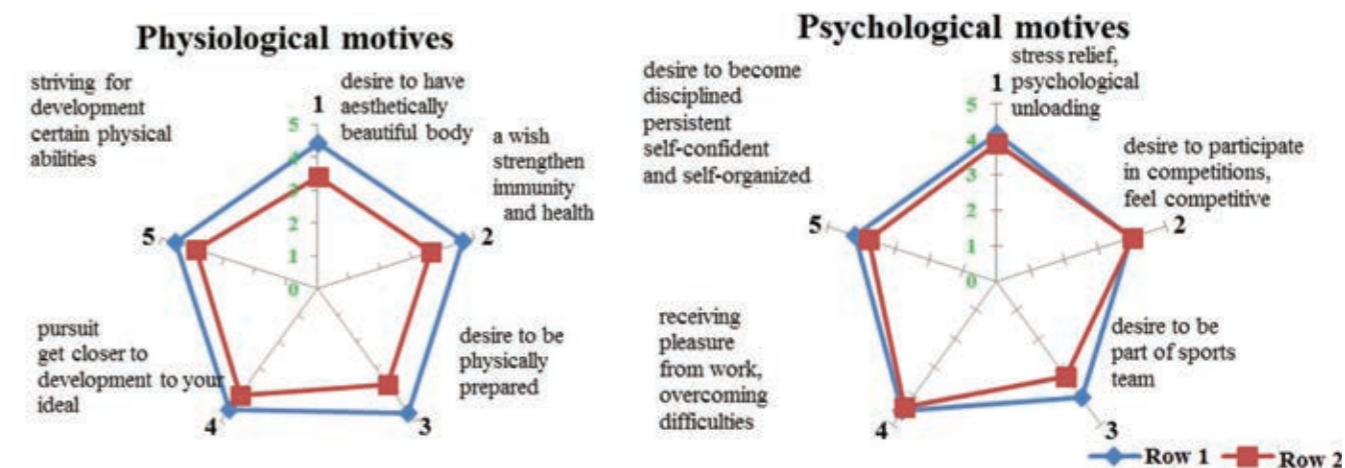


Figure 1. Physiological and psychological motives of students for physical culture and sports (Row 1 - full-time department, Row 2 - correspondence department, 1-5 - points)

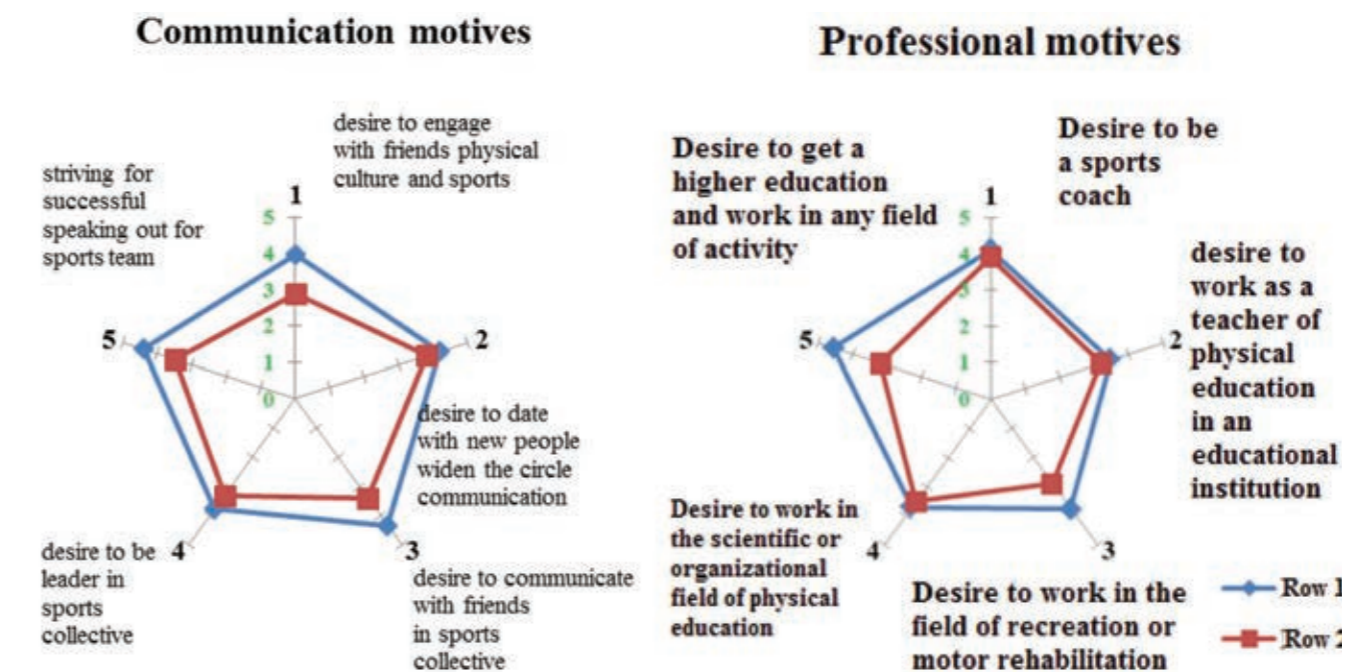


Figure 2. Communicative and professional motives of students for physical culture and sports (Row 1 - full-time department, Row 2 - correspondence department, 1-5 - points)

The results of the implementation of practical standards for the studied types of athletics by students of the full-time (FD) and correspondence (CD) departments

Form of study	gender	Types of athletics									
		Sprint run, s		Middle distance running, s		Long jump, m		High jump, cm		Pushing cores, m	
		Result	p	Result	p	Result	p	Result	p	Result	p
FD	man	7,1±0,1	< 0,05	207,2±1,7	< 0,05	4,44±0,05	< 0,05	134,7±0,8	< 0,05	8,11±0,11	≥ 0,05
		M ± m		M ± m		M ± m		M ± m		M ± m	
CD	man	7,4±0,1	< 0,05	228,2±3,9	< 0,05	4,20±0,06	< 0,05	124,7±0,6	< 0,05	8,06±0,15	≥ 0,05
		M ± m		M ± m		M ± m		M ± m		M ± m	
FD	woman	8,4±0,1	≥ 0,05	109,9±0,9	< 0,05	3,49±0,03	≥ 0,05	115,9±0,5	< 0,05	6,30±0,10	< 0,05
		M ± m		M ± m		M ± m		M ± m		M ± m	
CD	woman	8,6±0,1	≥ 0,05	122,9±2,5	< 0,05	3,40±0,04	≥ 0,05	109,4±0,4	< 0,05	6,13±0,12	< 0,05
		M ± m		M ± m		M ± m		M ± m		M ± m	

gage in physical culture and sports with friends" is a less significant, private motive in this group.

Professional motives for regular physical culture and sports of students studying at the universities of physical culture and sports also have differences. Significant motives for full-time students are "the desire to get a higher education" (4.6 points) and "the desire to be a sports coach" (4.1 points). For part-time students, the priority is to obtain the profession of "trainer" (3.9 points) and "the desire to engage in scientific or organizational activities in the field of physical education" (3.5 points).

Conclusions. The required level of formed competencies is ensured by the high physical fitness of

students in combination with a sufficient amount of professional knowledge. This gives an advantage in the success of mastering the technique of mastered competitive exercises and understanding their structure. Consolidation of special knowledge, skills and abilities by students within the framework of the studied discipline guarantees them effective and independent professional activity in the future.

Analysis of the data obtained shows that full-time students have more pronounced generalized indicators for all groups of motives. However, they do little to differentiate the most important arguments for themselves that characterize the attitude towards the chosen type of activity. Unlike full-time students, students

of correspondence departments have a more balanced argument for choosing one or another leading private motives for themselves. A high level of physical fitness and a degree of motivation to get an education can improve the efficiency of the technical development of athletics.

Given the low interest of employers in the employment of young people without work experience, it is necessary to strengthen the practical orientation of full-time students. A deeper understanding of the learning motivation and work expectations of the new generation of full-time and part-time students can help universities and employers work together better so that students can gain adequate hands-on experience and find suitable jobs in the future.

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Stato-locomotor resistance in children with cerebral palsy

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Abstract

Objective of the study was to determine the relative position of body segments as a factor in the stato-locomotor stability of children with cerebral palsy.

Methods and structure of the study. In children with cerebral palsy, who had motor disorders of varying degrees of complexity, the statokinetic characteristics of the vertical stance and changes in the configurations of body segments were determined using the Habilect software and hardware complex with biofeedback, the H.VrS virtual stabiloplatform module. The examination was carried out by 134 boys and 129 girls aged 5-14 years, in total - 263 people. The presence of an imbalance in the body segments, the degree of its severity, and the connection of the segments with each other were analyzed.

Results and conclusions. The numerical values of variants of combinations of the location of body segments when taking a vertical stance are revealed. There was a decrease in the effectiveness of the processes of stability and postural regulation, which was expressed in an increase in the amplitude of oscillations along the sagittal, frontal and rotation in various segments of the body, reduced support ability of the lower extremities.

Keywords: disabled children with cerebral palsy, vertical stability, body segments, posture control.

Introduction. The physical development of children with cerebral palsy (CP) is usually accompanied by impaired motor functions, which prevents the child from coordinating his movements in space and fully developing. Motor disorders in them are manifested in the instability of maintaining stability when taking a vertical position, the development of pathology of movements, the formation of vicious postures [1].

The problem of optimizing the process of developing the motor abilities of children with disabilities is provided, among other things, by determining the factors that affect the relative position of the body's links and its orientation in space. The control of the posture and movements in space is carried out by the coordinated activity of a number of receptor systems, which are of a continuous dynamic nature, associated with the constant interaction of the body's links, the movement of the common center of pressure and the change in the level of tonic activity of the postural muscles.

If the muscular system and physical capabilities of the child are weak, then with a decrease or absence of loads (for example, a long stay in a horizontal position), antigravity mechanisms may either not develop or be lost with a corresponding loss of motor skills, primarily skills of maintaining an upright position, which can lead to changes in body segments, development of deformities and vicious positions.

In addition, the support load on the feet is reduced, which significantly affects the motion control system in space and is expressed as an imbalance in the distribution of the masses of the musculoskeletal system, tone-power imbalance and leads to a violation in the support contour of the feet [2-6].

Determining the relative position of body segments and the main causes of violations in the formation of vertical stability, as a factor limiting the development of positioning postures and the integrity of the motor action, underlies the study

of the patterns of formation of motor skills and the structure of movements in children with motor disorders, creates the prerequisites for the development of an actual program of rehabilitation and correction [7-9].

Objective of the study was to determine the relative position of body segments as a factor in the stato-locomotor stability of children with cerebral palsy.

Methods and structure of the study. Stato-locomotor stability in space was determined using the Habilect software and hardware complex with biofeedback, the H.VrS virtual stabiloplatform module. An assessment was made of posture and imbalance of the body, pathological changes in the configuration of body segments when taking a vertical position. The static and dynamic balance and the trajectory of the center of mass in the horizontal, frontal and sagittal planes were evaluated. The presence of an imbalance of body segments and their relationship with each other, their type (in what plane, at what level of the musculoskeletal system it manifested itself), as well as the severity of the imbalance were analyzed.

The study involved children with cerebral palsy aged 5-14: 134 boys and 129 girls, a total of 263

people. The position of the body segments (head, shoulders, trunk, pelvis, knees, feet) in the frontal and sagittal planes (cm, degrees), as well as the percentage of deviations (right-left, back and forth) separately in groups of girls and boys. The studies were carried out at the beginning of the rehabilitation session, before physical activity.

Results of the study and their discussion.

The average values of deviations of indicators of the spatial position of body parts in the frontal and sagittal planes (cm, degrees), and the frequency of occurrence of deviations (%), are shown in Table 1.

The use of the "Habilect" complex makes it possible to obtain an expanded idea of the stato-locomotor stability of the body of children with disabilities by determining the variants of combined arrangements of body segments and parameters characterizing their angular deviations. Despite the great diversity, in most cases, the frequency of combinations of body segment deviations is noted to the right-back, which is true for boys and girls (Table 1).

In a vertical position, most children with cerebral palsy have a head shift back and rotation of the shoulders forward-left, which leads to instability of the body and increased vicious postures [10].

In girls, in the position of the head, there is a deviation to the right and back by 5.3 and 9.6 cm with a rotation of 7.8 and 1.2 degrees. In boys, the deviations in the same directions were 3.7-5.1 cm, with a rotation of 4.1-1.7 degrees. Such a deviation of the head is characterized by the manifestation of a syndrome caused by tonic postural activity or an unadapted oculomotor disorder [5]. In some cases, girls have a variant of slight (2.7 and 0.7 cm) displacement of the shoulders in the frontal and sagittal planes with a significant rotation of 8.4 degrees. In boys, there is a shift of the shoulders to the right (by 2.9 cm) and back (5.0 cm) with a rotation of 5.0 degrees.

The reason for the imbalance of the shoulder girdle is, apparently, the asymmetry of the range of motion of the upper limbs due to spasticity of the muscles of the shoulder girdle or different heights of the shoulders (long walking with the right arm raised, relying on the parent), as a result of reflex muscle contraction at different levels: hand, forearm, shoulder [8, 9].

In addition, with a long stay in a vicious position, there is a deviation of the body back in the sagittal plane in both girls (10.1 cm) and boys (6.3 cm) with a minimum deviation in degrees (1.6-2.3).

It was revealed that with a vertical stance, there is a shift of the pelvis back to the right, with a compensatory function of the head and hands and rotation of the knee to maintain balance. So, in girls in the pelvic segment, there is a posterior displacement of 7.6 cm with a rotation of 2.3 degrees, in boys - a posterior displacement of 5.3 cm with a rotation of 3.4 degrees, with simultaneous rotation of the knee forward by 8.2 degrees in girls and 5.3 degrees in boys.

In the sagittal plane, in girls, the body is mainly shifted back with a predominant rotation of the knee segment back (by 3.3 degrees), which leads to an increase in vicious postures.

In the frontal plane in girls, there is a displacement of the pelvis to the right by 3.6 cm with a rotation of 3.8 degrees, while the knee is displaced by 2.4 cm and rotated by 7.6 degrees. In boys, when the pelvis is displaced to the right by 2.4 cm, the knee is displaced to the right by 1.3 cm with a rotation of 6.6 degrees. Such an imbalance in the frontal plane is formed with unilateral shortening of the iliopsoas muscle and muscles of lateral stabilization synergy, which leads to functional imbalance of the lower extremities [7, 10].

Thus, the revealed structural and functional imbalance in children with cerebral palsy when taking a vertical position is characterized by postural tonic asymmetry of body segments, a limited structure of

the kinematic chain, reduced support ability of the lower extremities, which, apparently, is a consequence of a sedentary lifestyle due to the underlying disease [10].

Conclusions. Children with cerebral palsy are characterized by reduced stato-locomotor stability, limited by deviations in the relative position and rotation of body segments and limbs in the frontal and sagittal planes.

The use of the Habilect system makes it possible to identify the localization of the main pathological disorders, the presence of dysfunctions and weak links in children with cerebral palsy and contributes to decision-making on the formation of motor skills in children with cerebral palsy.

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Table 1. Average deviations of body segments (cm, degrees, %) along the frontal (1) and sagittal (2) in children with cerebral palsy

Average deviations of body segments along the front (cm, degree, %) in children with cerebral palsy												
Values	A head		B shoulder		C torso		D pelvis		E knee		F foot	
	right	left	right	left	right	left	right	left	right	left	right	left
	Girls											
cm	5,3	2,3	4,7	2,7	4,3	2,6	3,6	2,6	2,4	1,5	0,0	0,0
degrees	7,8	2,2	3,6	1,9	2,6	1,3	3,8	2,1	7,6	12,5	5,6	9,0
%	68,3	31,7	65,2	32,6	59,4	38,6	61,8	38,2	58,6	40,2	0	0
Boys												
cm	3,7	2,6	2,9	2,2	2,6	2,0	2,4	1,7	1,3	1,0	0,0	0,0
degrees	4,1	5,0	5,0	3,6	1,9	1,5	5,9	3,0	6,6	13,4	9,4	4,8
%	59,2	40,5	55,5	44,2	52,8	46,3	60,0	40,7	59,8	38,5	3,8	0,0
Average deviations of body segments along the sagittal (cm, degree, %) in children with cerebral palsy												
Values	A head		B shoulder		C torso		D pelvis		E knee		F foot	
	back	forward	back	forward	back	forward	back	forward	back	forward	back	forward
	Girls											
cm	9,6	1,1	8,6	0,7	10,1	0,3	7,6	0,6	3,5	1,1	0,0	0,0
degrees	1,2	5,0	1,4	8,4	1,6	7,6	2,3	9,1	3,3	8,2	0,0	0,0
%	77	23	83	17	93	6,75	75,5	24	66,5	33,5	0	0
Boys												
cm	5,1	2,1	5,0	1,7	6,3	1,2	5,3	1,4	3,0	1,9	0,0	0,0
degrees	1,7	2,9	2,1	3,4	2,3	5,0	3,4	6,1	5,1	5,3	0	0
%	67,2	32,7	70,0	29,9	81,8	18,2	76,0	22,6	63,3	35,0	0,0	0,0

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The role of self-strength abilities in increasing the level of physical fitness of students of military training centers

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Abstract

Objective of the study was to identify the effectiveness of the use of training cycles in the process of physical exercises aimed at developing self-strength qualities, and to assess their impact on the level of physical fitness of students of military training centers in general.

Methods and structure of the study. To achieve this goal, a six-month pedagogical experiment was conducted on the basis of the military training center at the National Research Tomsk State University, in which 20 4th-year students (male, aged 21-22 years) took part in the training programs frame officers. The experimental and control groups of 10 people each were formed from the number of subjects. The experimental group (EG) was engaged according to the developed training plan containing cycles aimed at developing self-strength qualities. The control group (CG) underwent complex training sessions in gymnastics and athletic training, in which low-intensity exercises with own body weight and non-limiting weights were used.

Results and conclusions. On the basis of the results of the pedagogical experiment, it was proved that the construction of the educational and training process, taking into account the cyclical nature of physical activity, aimed at developing self-strength qualities, contributes to the formation of a higher level of physical fitness of students of military training centers in general.

Keywords: self-power qualities development, students of military training centers.

Introduction. In military-applied physical training, considerable attention has traditionally been paid to the development of strength. It is known that strength is the main physical quality that underlies other abilities, such as self-strength and speed-strength qualities, as well as strength endurance (Matveev, 1977). At the same time, the analysis of the existing instructions on the organization of physical training in the Armed Forces of the Russian Federation (Order of the Ministry of Defense of the Russian Federation No. 200 dated April 21, 2009) shows that insufficient attention is paid to the education of military personnel of self-power qualities. It is assumed that the inclusion in the training process of training cycles aimed at developing self-strength qualities will increase the level of physical fitness of students enrolled in military training programs.

Objective of the study was to identify the effectiveness of the use of training cycles in the process of

physical exercises aimed at developing self-strength qualities, and to assess their impact on the level of physical fitness of students of military training centers in general.

Methods and structure of the study. To achieve this goal, on the basis of the military training center at the National Research Tomsk State University, a six-month pedagogical experiment was conducted, in which 20 4th-year students (male, aged 21-22 years) took part, studying in military training centers for officer training programs. The experimental and control groups of 10 people each were formed from the number of subjects. The experimental group (EG) was engaged according to the developed training plan containing cycles aimed at developing self-strength qualities. The control group (CG) underwent complex training sessions in gymnastics and athletic training, in which low-intensity exercises with own body weight



Table 1. General structure of the training plan

No.	Mesocycle type	The direction of development of motor abilities	Main goals
1-2	Cumulative	Aerobic endurance and overall strength	Increase in overall physical performance
3-4		Self-power qualities	Achieving the required level of muscle strength
5	Transformative	Speed-strength qualities	Bringing to the required level of development and maintenance for a certain time
6	Implementation	Specific strength	Maximum result in control exercises

and non-limiting weights were used. The evaluation of the results of the experiment was carried out using pedagogical testing, on the basis of which the level of physical fitness of the subjects was determined: pull-ups on the crossbar and a run of 60 meters.

Results of the study and their discussion. Self-power abilities are manifested in the process of work that requires large muscle tensions, in overcoming, yielding and static modes of muscle work, in relatively slow movements with large external weights.

As the practice of physical training of officers of the personnel of military training centers shows, in the training process of military personnel, physical activity that requires the manifestation of self-strength abilities is rarely used, since to fulfill the established standards, to a greater extent, a high level of development of general and strength endurance is required.

The main reason for underestimating the importance of the development of self-power qualities in the process of physical training of military personnel is a rather narrow interpretation of this concept, which is often associated only with a low speed of performing motor actions, a short duration of physical activity and the use of external weights.

On the one hand, such an interpretation of this concept is not unfounded, since some factors can indeed negatively affect the qualities necessary for military service - for example, an increase in the physiological diameter of muscles, with a concomitant decrease in mitochondrial density, entails a decrease in local endurance.

However, on the other hand, factors that favorably affect the level of physical fitness of military personnel as a whole are not taken into account. In addition to strengthening the musculoskeletal system and increasing the functionality of the neuromuscular system, the development of self-strength qualities has a positive effect on the components of strength that are associated with other physical qualities: speed-strength, strength endurance, etc.

Based on this provision of the theory and methodology of physical culture, an experimental methodology for the physical training of cadre officers was developed, which was tested in a pedagogical experiment. Its main difference from the traditional military-applied

physical training, based on an integrated approach, is the presence of training cycles of physical activity, focused, to a greater extent, on the development of the self-strength component.

The formative experiment, aimed at evaluating the effectiveness of the developed methodology, assumed the use of a block concept of periodization of sports training (Issurin, 2010), where a significant part of the physical load was focused on the development of self-strength qualities. Table 1 shows the general structure of the training plan, a semi-annual macrocycle consisting of six mesocycles.

Consider the structure of the macrocycle, as well as the sequence and characteristics of mesocycles. According to the concept of block periodization of the training process, they can be differentiated into accumulative, transforming and implementation ones.

1. The first two mesocycles are cumulative. They are aimed at developing aerobic endurance and overall strength, which together contribute to an increase in overall physical performance. Training impacts within this period are aimed at:

- strengthening of the cardiovascular and respiratory systems through low-intensity aerobic exercise (heart rate - 120-140 bpm) with a gradual increase in the duration of the load (by 10% during one microcycle);

- anatomical adaptation of the body, due to muscle hypertrophy caused by the use of gymnastic exercises aimed at developing muscle strength, strengthening the ligamentous apparatus and tendons in order to prevent injuries and prepare for subsequent more intense loads.

2. The category of cumulative also includes the third and fourth mesocycles, which are aimed at developing self-strength qualities that ensure the achievement of the required level of muscle strength. This period is characterized by:

- consistent application in the training process of methods of non-limiting and near-limiting physical loads using athletic exercises of medium (50-80% of 1RM) and high (80-95% of 1RM) intensity, contributing to the improvement of coordination links of the central nervous and motor-muscular systems ;

- maintaining or slightly reducing the volume (no more than 20% of the previous period) of the load in aerobic

Table 2. Results of testing students of the control and experimental groups

Group	Pull-ups on the bar			60 m run		
	$x \pm m_x$	t	p	$x \pm m_x$	t	p
<i>Ascertaining experiment</i>						
EG	15,00 ± 1,01	0,62	0,54 (>0,05)	8,19 ± 0,09	0,45	0,66 (>0,05)
KG	15,90 ± 1,05			8,25 ± 0,07		
<i>Control Experiment</i>						
EG	19,80 ± 0,60	2,16	0,04 (<0,05)	7,92 ± 0,05	2,56	0,02 (<0,05)
KG	17,00 ± 1,15			8,14 ± 0,07		

exercises while maintaining their previous intensity in order to maintain the level of physical performance.

3. Within the framework of the transforming mesocycle, the basic components laid down during the previous accumulative mesocycle are modified into physical qualities that are professionally significant for military service - speed-strength and strength endurance. The main task of this period is the development of the qualities listed above, bringing them to the required level and maintaining them at this level for a certain time. This period is characterized by:

- application of methods of dynamic efforts and near-limit weights with a decrease in the total volume of load in athletic exercises;

- reduction in the volume of aerobic exercise and an increase in cyclic exercises aimed at developing anaerobic power.

4. The implementation mesocycle is aimed at achieving the maximum result in competitive, and in this case, military-applied physical training, control exercises. Its characteristic feature is the principle of directed localization of means of training influences aimed at developing target physical qualities, which consists in:

- decrease in volume and increase in intensity of all types of load;

- concentration of efforts on the development of professionally significant physical qualities that increase the efficiency of military service (speed-strength and strength endurance).

Testing of the level of physical fitness of officers of the cadre in order to assess the effectiveness of the developed methodology was carried out during the ascertaining and control stages of the study. Its implementation was carried out using control exercises taken from the Manual on Physical Training in the Armed Forces of the Russian Federation: No. 4 - "Pull-up on the crossbar" and No. 40 - "Running for 60 meters".

Table 2 presents the results of testing students from the control and experimental groups, the comparison of the indicators of which was carried out using Student's t-test for independent samples. Statistically significant differences were considered significant at $p < 0.05$.

The ascertaining experiment showed the absence of qualitative differences in the initial levels of physical fitness of the subjects of both groups. According to the results of the control experiment, after its completion, statistically significant differences were noted in the results of the tested exercises. The performance of the experimental group was higher than that of the control group. This was especially evident in the 60-meter run, which is explained by a higher level of development of strength qualities, due to the use of the block concept of periodization of sports training, which provides for the use of a higher intensity of physical activity on the muscles of the legs with near-limit and limit weights.

Thus, the results of the experiment indicate that the inclusion of physical activity in the training process for the development of self-strength qualities has a positive effect on the level of physical fitness of students undergoing military training programs. In this regard, the most effective is the use of techniques based on the concept of block periodization of physical activity, which allows you to consistently strengthen the adaptation processes to training influences that contribute to the harmonious development of the basic physical qualities of military personnel.

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Analysis of the volume of competitive loads of leading foreign riders in modern cycling-highway

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Abstract

Objective of the study was to identify the parameters of the volume of competitive load among the leading foreign racers in different age periods.

Methods and structure of the study. In the course of the study, the results of the performances of foreign athletes (men) in road cycling in competitions included in the schedule of the International Cycling Union (UCI) for the period 1997-2021 were analyzed. The final sample included data from leading foreign athletes from 13 countries with different racing roles (n=31). The following parameters were taken as the main studied parameters (VCL): the total number of competition days - TNCD; the total distance (length) of the competitive load, expressed in kilometers, - TDCL.

Results and conclusions. The result of the study was the determination of the confidence zones of the optimum volume of competitive load in cycling-highway for each age of athletes in the range from 18 to 33 years, which should be reflected in the federal standards of sports training in cycling. The authors recommend that, when forming the calendar plan of All-Russian and interregional highway cycling competitions (and its financial support), provide athletes with such a volume and nature of competitive starts that will allow them to fulfill the volumes of competitive loads recommended by the results of the study and get closer in this component of sports training to the leading cyclists of the world.

Keywords: cycling-highway, sports competition, competitive load, volume of competitive loads.

Introduction. The main component of the system of training athletes in almost any sport is physical activity. The concept of "load" in the classical interpretation of L.P. Matveeva (1991) means an additional degree of functional activity of the body compared to rest, brought by the performance of an exercise (or exercises) [1], which is also true for road cycling. High physiological and psychological demands are placed on cyclists due to significant amounts of training loads and a large number of competitions: the sports season of professional road cyclists, namely, from their composition, a pool of elite athletes is currently being formed, begins around the end of October - beginning of November, and some of the first races start as early as January. A professional cyclist residing in Europe annually performs a volume of cyclic load from 30,000 to 35,000 km, this includes about 90-100 competition

days [2]. Therefore, high-quality and regular monitoring of various aspects of the training process of athletes becomes one of the goals of the modern cyclist training system, and careful control over the course of training is necessary to ensure a balance between the physical load received by the athlete and the rehabilitation measures used as part of the training plan.

Currently, the development of the federal standard for sports training in cycling is carried out without taking into account information about the volume of competitive loads (hereinafter referred to as VCL) in professional road cycling, which does not allow the formation of a system of goals justified by the best practices of world road cycling in the long-term process of training Russian cyclists and thereby ensure the high competitive level of the Russian national team at major international competitions.

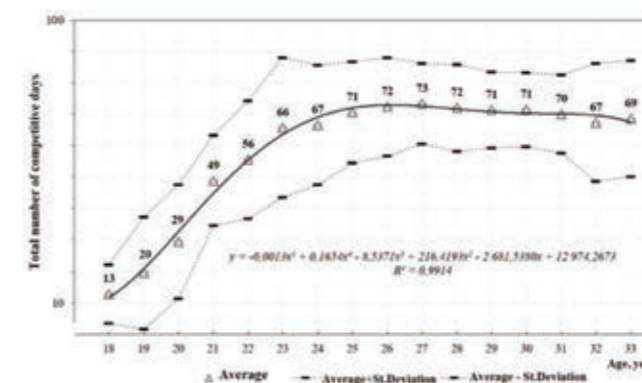
Objective of the study was to identify the parameters of the volume of competitive load among the leading foreign racers in different age periods.

Methods and structure of the study. In the course of scientific work, the results of the performances of foreign athletes (men) in road cycling in competitions included in the schedule of the International Cycling Union (UCI) for the period 1997-2021 were collected and analyzed. The data source was the official protocols of the competitions posted on the UCI website and the information resource <https://www.procyclingstats.com/index.php>. The final sample included data from leading foreign athletes from 13 countries with different racing roles (n=31), including eight champions and prize-winners of the Olympic Games, 14 winners and prize-winners of the world championships, eight winners of multi-day Grand Tour races in the general classification, 23 Grand Tour winners. Athletes in different years of their sports careers occupied high positions in the UCI ranking: 19 of them were among the top ten cyclists in the world, five more athletes were in the top twenty and three were in the top thirty in the UCI ranking. The volume of the formed data sample was limited to the age period of 18-33 years, while some athletes had a sports career of 40 years or more. Data from sports seasons in which the number of competition days was significantly reduced due to an athlete's injury or illness were excluded from the analysis matrix. In total, 1218 values of the competitive load volume parameters were analyzed.

The following parameters were taken as the main studied parameters VCL:

- total number of competition days - TNCD;
- total distance (length) of the competitive load, expressed in kilometers - TDCL.

Data processing was carried out according to the method of time series analysis, the elements of which are:



Growth dynamics of the total number of competition days depending on from the age of leading foreign male athletes in road cycling (n=31)

1) athlete's age (calendar)

2) the numerical value of the parameter VCL.

Results of the study and their discussion. During the analysis of the "total number of competition days" parameter, a two-component growth trend was revealed depending on the age of the athletes (see figure).

Starting from the age of 18 years and up to and including 23 years, there is a gradual increase in the annual indicator of TNCD from 13 to 66 days. A statistically significant difference in the values of TNCD (at a significance level of 0.95) is observed only in the age period of 20-21 years. In all other cases, the differences are not statistically significant. Starting from the age of 24-25 years, the "age - TNCD" schedule of highly qualified cyclists reaches a plateau - 71 competition days per season, which is almost 20% of the duration of the full annual training cycle.

The maximum number of competitive days per season - 100 - was shown by two athletes. Another seven athletes scored TNCD in 90 days or more, and four athletes reached this level more than once during their sports career. In total, nine athletes out of 31, or almost a third of the sample group - 29%, reached the level of the TNCD indicator "90 days or more". Thus, in the structure of the annual cycle of the sports training system for this group of athletes, the type of training "competitive training" in terms of days takes a share of 25-27% of the total duration of the annual cycle.

The analysis of the "total distance of the competitive load" parameter showed that in the long-term aspect, the dynamics of changes in the TDCL of the leading foreign athletes in road cycling also has two periods: starting from the age of 18 years, there is a period of almost linear increase in the TDCL parameter, which lasts up to 23 years. In the age range of 18-23 years, each subsequent value of TDCL (average for the year) differs statistically significantly from the previous one (at a significance level of 0.95). Further, the dynamics of the growth of the TDCL parameter slows down, but nevertheless shows a positive growth trend up to 28 years of age inclusive, however, starting from 23-24 years of age, the differences in the values of TDCL are no longer statistically significant. In general, it can be noted that the period of relative stabilization of the values of TDCL begins at the age of 24, which lasts for foreign athletes up to 33 years inclusive.

The maximum length of the competitive load in the studied group of foreign athletes was 15,590 km. At the same time, five out of 31 athletes exceeded the annual ODSN of 15 thousand kilometers, one of them

Confidence zones of the optimum volume of competitive load in road cycling for each age of athletes in the range of 18-33 years

Age, years	Volume of competitive load			
	Total number of competition days		Total distance of competitive load, km	
	Lower optimum	Upper optimum	Lower optimum*	Upper optimum*
18	0	23	0	2 440
19	8	36	950	4 770
20	17	49	2 400	7 100
21	27	62	3 850	9 430
22	36	75	5 300	11 760
23	45	85	6 750	14 100
24 and older on average (but not more than 33 years old)	56	86	8 770	13 700

Note: * – rounding up to 10.

exceeded this milestone twice and another three times.

The given maximum values of TDCL should be taken into account as the maximum allowable, since they are, most likely, not so much the result of the desire of athletes to set local records in their competitive activities, but rather the result of a combination of the characteristics of the functional systems of the athlete's body, the highest degree of their development in a particular sports season and the provided the leadership of professional teams of the opportunity to perform for this athlete in the largest possible number of races. Based on the data obtained, when planning the volume of competitive loads of Russian racers, their increase in junior age should be gradual and consistent with reaching the peak by the age of 23-24 years. This will help to avoid regimes of forcing loads, to accumulate and preserve the potential of young athletes for its implementation at a more mature age. Therefore, it would be more expedient and justified from the point of view of using it in practical work with cyclists to determine a confidence "corridor" of the values of the volumes of competitive loads for different ages - the optimum zone (see table).

It should be especially emphasized that the confidence zones of the optimal volume of competitive load in road cycling presented in the table were obtained

on the basis of data on the participation of athletes in international competitions only under the auspices of the UCI. Taking into account the probable participation of the same athletes in the continental championships, the boundaries of the VCL optimum zone indicated above can be increased by two or three days and by 300-400 km.

Conclusions. The result of the study was to determine the confidence zones of the optimum volume of competitive load in road cycling for each age of athletes in the range of 18-33 years, which should be reflected in the federal standards of sports training in cycling.

In order to ensure the fulfillment of modern requirements for the level of preparedness of Russian athletes in road cycling and increase their competitiveness at international sports competitions, when compiling sports training programs, one should be guided by the parameters of the volume of competitive loads applicable among the world's leading cyclists. To do this, when forming the calendar plan of all-Russian and interregional competitions in road cycling (and its financial support), it is necessary to provide athletes with such a volume and nature of competitive starts that will allow them to fulfill the volumes of competitive loads recommended by the results of the study and to approach the leaders in this component of sports training. cyclists of the world. At the same time, athletes must gain at least 75 percent of the competition days during multi-day races.

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Use of non-standard sports equipment in physical education classes with preschool children

UDC 373.24



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Abstract

Objective of the study was to substantiate the effectiveness of the use of non-standard sports equipment - soft modules in the physical education of preschool children.

Methods and structure of the study. Children of 6-7 years old participated in the pedagogical experiment. 15 children - in the control group (CG), 15 children - in the experimental group (EG). The study took place on the basis of Municipal Autonomous Preschool Educational Institution No. 99, Tomsk. Both groups were engaged in physical education three times a week. Physical education of children from the CG was carried out in accordance with the current program "Childhood" by V.I. Loginova, T.I. Babaeva. The EG was trained according to the developed methodology using non-standard sports equipment - soft modules. The EG was engaged in physical education according to the developed methodology of physical education using non-standard sports equipment - soft modules, which were gymnastic mats of various sizes, tunnels, arches, cylinders, cubes, triangles, rectangles, rollers, beams made of foam rubber and placed in covers made of polymer fabrics.

Results and conclusions. The use of non-standard sports equipment in the physical education of preschool children had a positive impact on the formation of their motor skills and the development of physical qualities.

Keywords: physical education, preschool children, non-standard sports equipment, development of physical qualities.

Introduction. To date, the problem of preserving and strengthening the health of the younger generation remains the most important for the state and society. One of the tasks of teachers is to form in children a sustainable interest and desire to engage in physical education. In this regard, there is a need to diversify the organization of physical education classes in a preschool institution.

Scientific studies of a number of authors touch upon the issue of using new non-traditional forms, methods and means of physical education of preschoolers. So, for example, children with great interest attend classes in an unconventional form - karate, where, due to the variety of exercises, the progressive development of basic physical qualities takes place [1, 6]. The use of the circular method contributes to the formation of a stable interest and desire in children for physical education [2].

However, many preschool educational institutions do not use modern innovative health-saving technolo-

gies enough, do not use non-traditional methods of physical education in physical education classes, and do not introduce non-standard sports equipment into practice [7].

M.A. Geraskina and V.V. Bogdashkin (2015) believe that one of the factors hindering the solution of such tasks of physical education as the development of motor skills, skills, physical qualities, a positive attitude of children to physical activity is the insufficient material base in a preschool institution [3].

According to O.V. Semenova (2019), the effectiveness of the implementation of the tasks of physical education of preschoolers depends on the availability and variety of sports equipment. This makes it possible to significantly expand the range of motor skills and abilities of children, and also has a positive effect on the overall physical fitness of the child. The motor density of physical education increases and the optimal physical load on the body of a preschooler is provided [5].



Objective of the study was to substantiate the effectiveness of the use of non-standard sports equipment - soft modules in the physical education of preschool children.

Methods and structure of the study. The experiment took place on the basis of the kindergarten of a combined type No. 99 in Tomsk from September 2021 to April 2022. Two groups of children aged 6-7 years old took part in it - 15 people in the control group (CG) and 15 people in experimental group (EG). For the formation of the CG and the EG, a preliminary pedagogical testing was carried out in order to determine the homogeneity of the groups in terms of the level of physical fitness.

Both groups were engaged in joint motor activity 3 times a week. The duration of each session was 30 minutes. The physical education of the children of the CG was carried out in accordance with the current program "Childhood" by the authors V.I. Loginova and T.I. Babaeva [4]. The EG was engaged according to the developed methodology of physical education with the use of non-standard sports equipment - soft modules. The modules are gymnastic mats of various sizes, tunnels, arches, cylinders, cubes, triangles, rectangles, rollers, bars, made of foam rubber and placed in covers made of polymer fabric.

Results of the study and their discussion. Table 1 presents the diagnostics of the development of physical qualities in children of both groups. At the ascertaining stage of the pedagogical experiment, there were no statistically significant differences in terms of speed-strength qualities, coordination abilities, strength endurance and flexibility between the subjects from the EG and the CG.

In order to increase the level of physical fitness of preschool children, a methodology was introduced into physical education classes using non-standard sports equipment - soft modules. When conducting classes, this inventory was used in the structure of all parts of the lesson. In the preparatory part, when per-

forming drill exercises, soft modules served as guidelines. They were also used during walking (stepping over, jumping over), running exercises (snake running, obstacle running, zigzag running) and general developmental exercises (jumping, climbing, climbing, climbing).

In the main part of the lesson, soft modules were used when mastering the technique of new or previously studied exercises. When teaching children the technique of the exercise of flexion, extension of the arms in the lying position, soft modules were used on the basis of the method of directed movement sensation, which contributed to the accelerated learning of the technique of the studied motor action. At the initial stage, children learned to hold a soft cube on their backs in a lying position, without bending. Further, when bending the arms in the lying position, they touched the cube with their chests. In exercises for the development of flexibility, the children performed inclinations to the cube (from a sitting or standing position). To increase the tilt amplitude, the module was moved away from the child or replaced with a smaller module. When teaching preschoolers the shuttle running technique, small colored cubes were used. During this exercise, the cubes were located behind the lines that the child needed to step in.

In addition to the group and frontal methods, the "circular training" method was used in the classroom, during which a group of children was divided into five stations (three to four people each). In the exercises of all stations, soft modules were used (jumping over a bar, crawling through a tunnel, holding a soft triangle on the head, stepping over structures of different heights, jumping on a gymnastic mat). Depending on the objectives of the lesson, the exercises varied.

In the final part of the lesson, the modules were used during outdoor games of low intensity. They were landmarks, obstacles and targets. Due to the fact that this inventory is soft, bright and safe, you can use different types of games. In order to develop creative

abilities, imagination, independence, children were asked to build an obstacle course at their discretion. To develop attention, the lessons included games related to the distribution of soft modules according to their characteristics (shape, color, size).

After the study, a diagnosis of the development of physical qualities of preschoolers was carried out. It can be seen in the table that in the experimental group, the results in the indicators evaluating the coordination and speed-strength abilities, as well as the strength endurance and flexibility of the subjects, increased statistically significantly. In the control group, there is also a positive trend in the manifestation of the assessed abilities, but no statistically significant differences were found during the study period.

Conclusions. The analysis of scientific and methodological literature showed that teachers use non-traditional methods, forms and means in their work in order to form a desire in children to engage in physical education. In addition, the success of the implementation of the tasks of physical education also depends on the availability and variety of sports equipment. Based on the results of the pedagogical experiment, it can be concluded that non-standard sports equipment is effective in the physical education of preschoolers and contributes to the progressive development of the basic physical qualities of children.

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The results of testing the motor abilities of children from the CG and the EG

Tests	The value of the indicators before the pedagogical experiment		The value of the indicators after the pedagogical experiment	
	CG $\bar{X} \pm \sigma$	EG $\bar{X} \pm \sigma$	CG $\bar{X} \pm \sigma$	EG $\bar{X} \pm \sigma$
Shuttle run 3x6 m, s	7,95±0,86	7,92±0,73	7,91±0,71	7,42±0,41*
Tilt forward from a sitting position, cm	6,3±1,4	6,1±1,3	6,9±1,3	7, 8±2, 6*
Flexion, extension of the arms in the lying position, the number of times	11,4±1,23	12,1±1,84	12, 5±1,93	14,86±2,86*
Maintaining static balance, s	23,7±0,38	25,1±0,43	27, 3±0,61	36,7±1,62*
Standing long jump, cm	119,7±1,1	118,2±1,1	126, 6±-1,5	136,1±2,1*

* - The value of a statistically significant difference between the indicators compared with the control group, p<0.05.

Harmonization of students' physical fitness using the group method

UDC 796.011.3



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Abstract

Objective of the study was to search, test and implement methods of organizing the educational process that contribute to the harmonization of the physical fitness of male students.

Results and conclusions. The article concretizes the concepts of harmonious physical readiness of students and lagging behind physical qualities. Based on the results of the study, model characteristics of the development of the main physical qualities of modern students were determined, a classification of male students was developed according to the level and harmony of physical fitness. A technology for determining the lagging indicators of the development of physical qualities of students is proposed.

The article substantiates the expediency of using blocks of physical exercises for the development of lagging physical qualities. An effective form of organizing the implementation of these exercises is a group method using temporary typical subgroups. Subgroups are formed according to the results of testing and include students with lagging indicators of the physical quality developed in this part of the lesson. As a result of the experiment, the effectiveness of this technique was proved. By the end of the experiment, the number of students with harmonious physical fitness increased significantly.

Keywords: harmonization, lagging physical qualities, physical fitness, model characteristics, blocks of physical exercises, students, differentiated approach, typical subgroups.

Introduction. At present, in higher education, when organizing the educational process in the discipline "Physical Culture and Sports", a sportized approach has become widespread. The main feature of this approach is the emphasis on the development of physical qualities and motor skills that are important for the chosen sport. This approach has a significant number of positive aspects, one of which is the high motivation of students.

However, the desire for maximum achievements in the level of development of physical qualities that are significant for the chosen sport should not be in conflict with the principle of harmonization. This principle is manifested in the balance, proportionality of the development of various physical qualities. Both insufficient and excessive level of development of one or

another physical quality or functional system can negatively affect the effectiveness of training and sports results [1].

Previous studies and analysis of the current situation in the labor market led to the conclusion about the need for versatile harmonious physical fitness of university graduates [2-4].

Harmonious physical development is understood as the correspondence of the level of development of the basic physical qualities and anthropometric indicators of an individual to gender, age and population norms.

By harmonious physical readiness we understand the proportionality of the levels of development of individual physical qualities of a student to the general level of his physical readiness. Consequently, lagging

physical qualities are qualities whose development indicators are lower than those of most of the qualities of a given student.

Determining the required level of development of basic physical qualities, the ratio of indicators of development of individual physical qualities, requires a detailed study of the requirements of social and future professional activities.

Objective of the study was to search, test and implement methods of organizing the educational process that contribute to the harmonization of the physical fitness of male students.

Methods and structure of the study. During the experiment, a battery of tests was used to control the development of basic physical qualities.

During the search experiment, 400 male students of the main medical group of the 1st and 2nd courses of the Omsk State Transport University were tested. Based on the test results, average group indicators of the development of students' physical qualities and percentile scales for evaluating these indicators were calculated. Using the obtained average group indicators of the development of physical qualities, the model characteristics of the development of physical qualities of modern students of a transport university were determined.

The basis of the chosen approach is the harmonization of physical fitness through the accentuated development of lagging physical qualities. One of the tasks to be solved was the development of a methodology for identifying lagging indicators that characterize the development of basic physical qualities.

Table 1. Model level of development of physical qualities and functional indicators of the cardiorespiratory system

Control exercise, test	Model level
2000 m run, s	555 – 525
Pull-ups from the hang on the high bar, the number of times	7 – 12
Flexion-extension of arms in an emphasis lying, number of times	23 – 29
Raising the legs in an emphasis on the forearms, the number of times	19 – 24
Long jump from a place with a push with two legs, cm	225 – 239
Shuttle run 3 10 m (T2), s	8 – 7,6
30m run (T1), s	4,7 – 4,5
Index of coordination abilities in motor locomotions (T2 – T1), s	3,3 – 3,1
Tilt forward from the main rack, cm	5 – 10

As part of the study, using percentile scales, a classification of students' preparedness by level and harmony was developed. Further, the criteria and methodology for identifying lagging physical qualities were determined.

At the next stage of the study, methods were identified, theoretically substantiated and experimentally tested, contributing to the harmonization of students' physical fitness.

When determining the model characteristics, the proper and standard values of the indicators of the tests used were taken into account. The model level of development of physical qualities is in the range from 31 to 68 percentiles on the percentile scale, which corresponds to $\bar{X} \pm 0.5\sigma$ according to the normal distribution law. In our opinion, this is the optimal level of development of physical qualities of students, necessary for successful educational, social and labor activities (Table 1).

Indicators of the development of physical qualities, exceeding 68 percentiles, correspond to the level of "above the model". The results of students in tests that characterize the level of development of physical qualities, less than the 31st percentile of the assessment scales calculated by us, correspond to an unsatisfactory assessment of the control standards of the university curriculum, are at the lower limit of the norm or below the norm for healthy people of this age and, in our opinion, need to be corrected. That is, in our study, the model level of indicators of the development of physical qualities corresponds to the average level of development of these qualities of the totality of students of a technical university examined by us.

The use of percentile scales made it possible to compare the indicators of the development of physical qualities, presented in different units of measurement, and to develop a classification of students' physical fitness by level and harmony (Table 2).

This made it possible to identify lagging physical qualities for further accentuated development in training sessions within the framework of the group method. We consider lagging physical qualities as qualities, the level of development of which is lower than other physical qualities of a given student, corresponding to the level of his physical fitness. Lagging behind physical qualities are students with a disproportionate development of basic physical qualities.

For the effective organization of the process of physical education of students of different levels of preparedness within the framework of group classes, it is necessary to implement a differentiated ap-

**Table 2.** Classification of physical fitness of students by level and harmony

Harmony and level of physical fitness	Characteristic physical readiness of students	Share of the studied population, %
Harmonious development of a low level	The level of all indicators of the development of physical qualities is below the model	3
Harmonious development of the middle level	The level of all indicators of the development of physical qualities corresponds to the model	6
Harmonious development of a high level	The level of all indicators of physical qualities testing is higher than the model	5
Disharmonious development of a low level	Level, at least 6 * indicators of the development of physical qualities below the model	19
Disharmonious development of the middle level	Level, 5* or more test indicators, corresponds to the model and above, but there are indicators with a level below the model	59
Disharmonious development of a high level	The level of physical qualities testing indicators is higher than the model and model. There are no indicators below the model level	8

*Note. Here and below - from the nine indicators of the development of physical qualities studied by us.

proach. This approach provides for the division of the study group of students into subgroups according to certain typical features. In this study, we used temporary typical subgroups formed for one or more lessons. The composition of these subgroups depended on the pedagogical tasks being solved and individual indicators of the development of individual physical qualities of students. When using the group form of organizing a lesson, students were divided into two temporary subgroups. The first subgroup included students with lagging indicators of the physical quality developed in this part of the lesson. The remaining students of the study group were included in the second subgroup.

To achieve harmonious physical fitness at each lesson, an additional training effect was exerted on the lagging physical qualities of students of the temporarily formed first subgroup. This subgroup included students with lagging indicators of developed physical quality. Students of the second subgroup performed exercises aimed at the complex development of physical qualities.

A block of exercises developing lagging physical qualities was included in different parts of the lesson. This depended on the expediency of performing exercises that develop one or another quality. Thus, exercises aimed at developing speed and coordination abilities were performed at the beginning of the main part of the lesson. And exercises to increase endurance were performed at the end of the session.

To test the effectiveness of our methodology, a pedagogical experiment was conducted on the basis of the Omsk State Transport University. 48 male stu-

dents of the main medical group of the second year of study took part in the experiment. The duration of the experiment was one academic year. The participants of the experiment were divided into control (n=24) and experimental (n=24) groups.

In the control group (CG) classes were held according to the traditional program of complex development of physical qualities without taking into account lagging indicators. The experimental group (EG) was engaged according to the experimental methodology with the use of a block of physical exercises aimed at developing lagging physical qualities at each lesson. The exercises were performed in a group method using temporary typical subgroups. Lagging indicators of the development of physical qualities were determined by the results of testing.

At the beginning and end of the experiment, the level and harmony of the development of physical qualities of the control and experimental groups were tested.

Results of the study and their discussion. As a result of the pedagogical experiment, using the methods developed by us for the accentuated development of lagging behind physical qualities of students using a differentiated approach, the following was established in the experimental group:

- Statistically significant positive changes in the performance of students of the experimental group were achieved in the tests "Running for 2000 meters", "Pull-up from the hang on a high bar", "Flexion and extension of the arms in the lying position", "Raising the legs in emphasis on the forearms", "Jump in length from a place with a push with two legs", "Shuttle run

3 × 10 m", in a test characterizing the coordination abilities manifested in locomotion, and "Bending forward from a standing position on a gymnastic bench";

- no statistically significant changes were found in the parameters of the "Running for 30 m" test during the experiment;

- by the end of the experiment, the number of students who achieved proportionality in the development of physical qualities increased significantly (from 8 to 33%);

- when analyzing the individual profiles of the students of the experimental group, an improvement in the level and proportionality of the development of physical qualities and functions of the cardiorespiratory system was noted.

Conclusion. As a result of the conducted pedagogical experiment, the effectiveness of the methodology based on a differentiated approach using blocks of physical exercises aimed at developing lagging physical qualities was proved. An effective organizational form of this part of the lesson is a group method using temporary typical subgroups.

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Significant qualities of a sports school coach rural municipality

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Abstract

Objective of the study was to study the professionally significant qualities of a children's coach in the opinion of three subjects of a rural municipality: coaches, athletes and parents.

Methods and structure of the study. Scientific work was carried out in 2022 at the Municipal Autonomous Institution of Additional Education for Children and Youth Sports School No. 2 of the Tyumen district of the Tyumen region with the involvement of coaches (16 people), teenage athletes (256 people) and their parents (278 pers.). The sample consisted of 550 people aged 10 to 69 years. During the study, an online survey was organized using structured questionnaires of three types "Coach", "Athlete", "Parent", consisting of 10 blocks of questions. In one of the blocks, the respondents were asked questions about the significant qualities of an ideal and real children's coach and a list of them was proposed, with a proposal to evaluate them on a 10-point scale.

Results and conclusions. It was revealed that the ideas about the image of the ideal children's coach, which have developed in the minds of the coaches themselves and the parents of athletes, exceed the assessment of a real coach in most qualities and differ from the assessment of teenage athletes, in whose minds a real coach is better than an ideal one. An analysis of the significant qualities of a children's coach showed that all the subjects of a sports school highly appreciate a real coach, giving preference to such personal qualities as responsibility, discipline, diligence, considering him primarily as a teacher-educator. In addition, the technical-tactical, psychological competence and self-control of the coach are important for coaches and parents, and the fairness of the coach is important for teenage athletes and their parents.

Keywords: children's coach, sports school of a rural municipality, professionally and personally significant qualities, teenage athletes, parents of athletes.

Introduction. The information cultural era imposes the requirements of predictability and advanced development on educational organizations of a sports orientation as social and genetic institutions in order to prepare the younger generation for life in the coming day.

The events of recent decades have shown that ignoring educational priorities in education has a negative impact on social development due to the violation of universal spiritual values and, as a result, rampant nationalism and extremism among the youth.

Sports activities and the sports environment have a unique educational potential for the formation in children and youth of not only health and psychophysical

conditions, but also spiritual values, reference models of behavior through inclusion in the training and competitive process as a "school of life", through coverage of sports in the media events and biographical information about the heroes of sports, demonstration of samples of moral choice [2, 3, 5].

A sports school in a rural municipality is the core of leisure life, the center of attraction for children and youth due to the insufficiently wide range of leisure activities in the countryside compared to the city.

A children's coach, who creates a special sports environment in his team and sports school, not only teaches technique, tactics and instills a love for sports, but is a model of moral behavior, a person who brings

up children and adolescents by personal example.

Moreover, the expectations of coaches, parents and children from playing sports have a fairly wide range of differences: from health promotion and character education to achieving sports results, recognition and fame.

As part of the study of the socio-psychological characteristics of coaches, two groups of professionally and personally significant qualities are usually distinguished. To the professionally significant qualities of R.S. Weinberg, D. Goldwell (2001), E.P. Ilyin (2006) refer to love or attention to children, creativity, physical fitness, communication skills, self-management, organizational and projective abilities, leadership qualities, anticipation [9, 3]. S.D. Neverkovich (2008) supplemented the group of professionally significant qualities of a coach with corporate culture, project thinking, erudition, diligence, openness to new things, eventfulness [7].

Personally significant qualities of a coach most often include benevolence, justice, honesty, sincerity, strong-willed qualities, self-control, patience [3, 7, 9].

In the work of R.A. Andreeva et al noted that the ideas of athletes and coaches about the qualities of an ideal coach diverge. Moreover, with the growth of skill, athletes give preference to professionally significant qualities to the detriment of personal ones [1].

However, time makes its own adjustments, and what was relevant ten or more years ago may not meet the expectations of the subjects and the requirements of today.

The question arises: what should be the ideal children's coach of the 21st century in order to meet the expectations of parents and children, and most importantly, be able to prepare their pupils for life in the day to come?

In this regard, it is appropriate to quote K.D. Ushinsky: "The influence of the personality of the educator on the young soul is that educational force that cannot be replaced either by textbooks, or by moral maxims, or by a system of punishments and rewards" [8].

Objective of the study was to study the professionally significant qualities of a children's coach in the opinion of three subjects of a rural municipality: coaches, athletes and parents.

Methods and structure of the study. Scientific work was carried out in 2022 at the Municipal Autonomous Institution of Additional Education for Children and Youth Sports School No. 2 of the Tyumen district of the Tyumen region with the involvement of coaches

(16 people), teenage athletes (256 people) and their parents (278 pers.). The sample consisted of 550 people aged 10 to 69 years.

We organized an online survey based on structured questionnaires of three types "Coach", "Athlete", "Parent", consisting of 10 blocks of questions [6]. In one of the blocks, the respondents were asked questions about the significant qualities of an ideal and real children's coach and a list of them was proposed, with a proposal to evaluate them on a 10-point scale.

An analysis of the socio-demographic characteristics of the respondents showed that there are four times fewer coaches - women (19%) than men (81%). Moreover, 2/3 of the coaches were persons aged 18 to 39 years (69%). 56% of coaches have a higher education, 31% have a specialized secondary education (63% physical education and 37% pedagogy). 19% of trainers have been working in their specialty for over 21 years, and 38% for up to five years. Among the athletes surveyed, 74% are boys and 26% are girls, 40% of athletes are 13-14 years old. Among the parents who participated in the online survey, 79% are women and 21% are men, of which 91% are between the ages of 30 and 49. Moreover, 50% of parents have higher, and 42% - secondary specialized education.

Results of the study and their discussion.

An analysis of the significant qualities of a children's coach, in the opinion of the coach himself, indicates that the idea of an ideal children's coach exceeds the self-esteem of a real one in most qualities, with the exception of accuracy (+ 0.69 points), patriotism (+ 0.36), purposefulness (+0.11), perseverance (+0.9), which are higher than ideal scores.

Coaches' self-assessment in terms of such qualities as diligence, conscientiousness, responsibility,

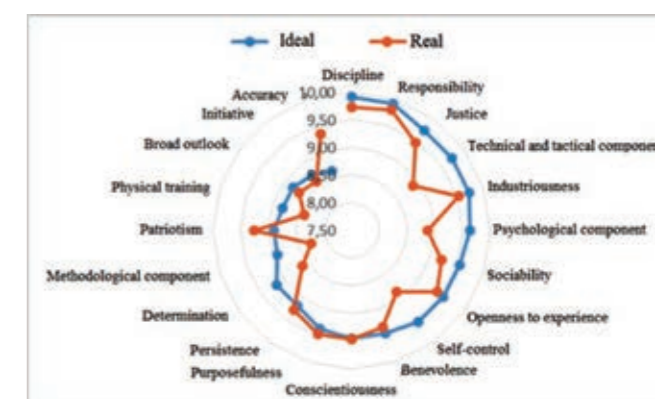


Figure 1. Professionally significant qualities of an ideal and real children's trainer (opinion of trainers from a rural municipality)

discipline, openness to new things is close in points to the ideal coach's scores.

Coaches' self-assessment showed them some dissatisfaction in comparison with the ideal of their technical-tactical (-0.86), psychological (-0.77 points), methodical (-0.64) competence and self-control (-0.68).

An analysis of the significant qualities of a children's coach, according to adolescent athletes, showed that the assessment of a real coach working "here and now" with children is slightly higher than their idea of an ideal coach. For a child, a coach, like a parent, is the best of the best, which is especially evident when assessing accuracy (+0.79 points), patriotism (+0.37) and conscientiousness (+0.35).

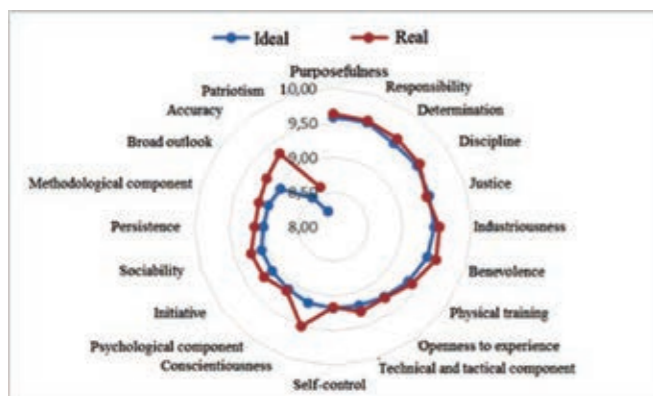


Figure 2. Professionally significant qualities of an ideal and real children's coach (opinion of teenage athletes from a rural municipality)

A different picture emerged when analyzing the significant qualities of a children's coach, taking into account the opinions of the athletes' parents. Parents' ideas about the ideal coach are significantly higher in all respects than their assessment of the significant qualities of a real coach, with the exception of accuracy (+0.65 points) and physical fitness (+0.15), which exceed the ideal ratings. According to parents, the most significant discrepancies between the desired and real significant qualities of a coach were found in psychological competence (-0.51), in the ability to self-control (-0.48) and fairness (-0.47). Moreover, justice, according to parents, ranks second in the hierarchy of significant qualities of an ideal coach and seventh in assessing the qualities of a real one.

In general, both ideal and real assessments of parents are in the corridor of high values, however, parents and coaches are much more critical in the assessments of the coach than adolescent athletes.

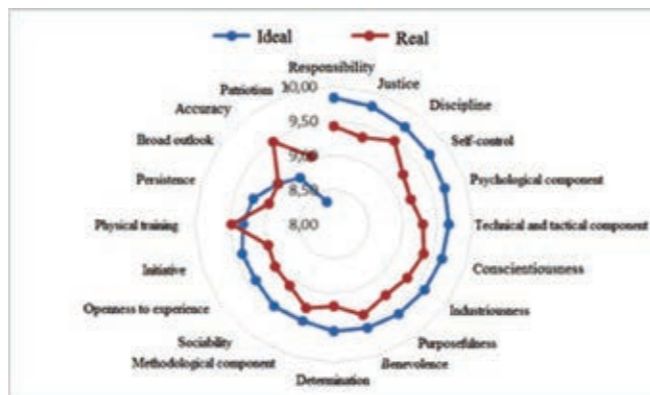


Figure 3. Professionally significant qualities of an ideal and real children's coach (the opinion of the parents of athletes in a rural municipality)

Conclusions. The ideas about the image of an ideal children's coach, which have developed in the minds of the coaches themselves and the parents of athletes, surpass the assessment of a real coach in most qualities and differ from the assessment of teenage athletes, in whose minds a real coach is better than an unknown ideal one.

An analysis of the significant qualities of a children's coach showed that all the subjects of a sports school highly appreciate a real coach, giving preference to such personal qualities as responsibility, discipline, diligence, considering him primarily as a teacher-educator. In addition, the technical-tactical, psychological competence and self-control of the coach are important for coaches and parents, and the fairness of the coach is important for teenage athletes and their parents.

Promising lines for improving the programs of additional education and advanced training were identified in order to improve the technical-tactical, psychological, methodological competence and self-control of the coaching staff in a rural municipality.

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Physical and sports activity of preschool children

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Abstract

Objective of the study was to identify factors influencing the organization of physical culture and sports activity of preschool children based on sociological analysis.

Methods and structure of the study. A sociological survey was conducted as part of the implementation of the Federal project "Sport is the norm of life" in 85 constituent entities of the Russian Federation. Respondents: 1205 parents of children aged 3 to 5, representing the economically active population. CATI and CAWI technologies were used, the method of group focused interviewing (focus groups) using elements of facialscanning technology.

Results and conclusions. It was determined that it is necessary to correct the priority areas of work in the organization of physical culture and sports work with preschoolers, including the improvement of work on the formation and increase of the level of motivation for this activity of all interested persons; increasing the efficiency of physical education and sports based on the search for and implementation of innovative technologies, forms and methods of organizing physical culture and sports activities for preschool children; creation of appropriate objective conditions for the effective organization of this work at home, in preschools, at the place of residence (appropriate sports facilities, sports equipment, as well as training and retraining of qualified specialists).

Keywords: children, preschool age, physical culture and motor activity, sociological survey.

Introduction. The concept of "activity of an individual (or group of people)" is used in sociology and other humanities to characterize the qualitative and quantitative parameters of a person's attitude to activity (participation in it). Qualitative parameters - a set of actions of a person (a group of people) that characterize their participation in an activity and are expressed not only in certain cognitive acts, emotional reactions, but primarily in behavior, real participation in this activity. In this regard, there are such types of activity as cognitive, emotional and behavioral. Quantitative parameters - a measure or magnitude (degree) of participation of a person (group of people) in an activity.

The theoretical basis for the analysis of factors that act as determinants or as social barriers to physical culture and sports activity of preschoolers is their typology (systematization) into two groups:

- objective factors that are non-family conditions for preschoolers to engage in physical education and sports: the presence or absence of a system of organization, management, financing, propaganda, the necessary material and technical base (structures, equipment, inventory), appropriate personnel, scientific and methodological support for activities; as well as family objective factors: material conditions of the family; the presence of mother and father in children; their own physical culture and sports activity;

- subjective factors, which are the value orientations of parents on the physical culture and sports activity of their children - recognition of the significance, importance, usefulness of this activity. The most important components and indicators of such a value orientation: a) cognitive (rational) - positive judgments, opinions, reviews about the importance of

physical education and sports for children; b) motivational - interest in these activities, the desire (desire) to promote the physical culture and sports activity of children; c) real assistance of parents to physical culture and sports activity of children. The readiness of parents to promote the physical culture and sports activity of their children: the presence of such qualities (knowledge, skills, abilities, abilities) that allow them to realize their value orientation and motivation in relation to this activity [5].

Objective of the study was to identify factors influencing the organization of physical culture and sports activity of preschool children based on sociological analysis.

Methods and structure of the study. The sociological survey was conducted jointly with the Federal State Budgetary Educational Institution of Higher Education Russian State Social University as part of the implementation of the Federal project "Sport is the norm of life" [2] in 85 constituent entities of the Russian Federation. Respondents: 1205 parents of children aged 3 to 5 years (women - 64.3%), economically active population and currently working (61.2%), 18.9% are engaged in housework or are on parental leave child. The survey mainly involved the parents of boys (55.8%). CATI and CAWI technologies were used, the method of group focused interviewing (focus groups) using elements of facialscanning technology.

Results of the study and their discussion. Analysis of the quantitative parameters of physical culture and sports activity of preschool children showed that in this age group: more than 75% of children are engaged in physical education; in villages - 66.2%.

It has been established that 79.6% of the number of pupils of preschool institutions attend compulsory physical education and sports classes in an educational institution; 31.7% are self-employed at home or on the street under the supervision of their parents. Paid sports are attended by 24.6% of children.

Most of all children go in for physical education: on weekdays (54.9%); 31.5% daily; 17.8% - on weekends. Two days a week, children attend additional physical education and sports classes: paid in an educational institution (57%), free in an educational institution (40.6%); paid in sections / clubs (outside the educational institution) (46.2%); self-study (39.3%).

Preschoolers are engaged in physical education and sports mainly from 1 to 1.5 hours a week: compulsory classes in an educational institution (22.3%), additional paid classes in an educational institution

(40.0%), additional free classes in an educational institution (45, 3%). For other forms of conducting classes, the largest share is the answer - from 1.5 to 2 hours.

Taking into account the order of Rosstat dated March 27, 2019 No. 172, systematically engaged preschoolers are included in physical culture and sports in any form of activity for at least 75 minutes per week [4], which is almost 2.5 times less than the norm established by the earlier by order of Rosstat dated November 17, 2017 No. 766 (3 hours per week, subject to two or three classes a day). Sociological studies in 2021 showed that in the age group of 3-5 years old, 63.6% of preschool children systematically (at least 75 minutes a week) go in for physical culture and sports.

In response to the question about the sufficiency of sports facilities at the place of residence, 54.3% of respondents note that the number of sports facilities built is optimal, 35.1% consider it insufficient. At the same time, an equal number of respondents say that they lack a sports ground equipped with exercise equipment (53.0%) and a swimming pool (51.3%) within comfortable walking distance. 85.1% of parents are satisfied with the home conditions for physical education and sports for their children, 15.1% rate the conditions as excellent. Only 2.9% believe that they have poor conditions for physical education and sports, 8.05% of respondents note that there are practically no conditions.

Satisfied with the conditions for physical education and sports, as well as their comfortable accessibility, 64% of respondents, and 26.2% note that they are rather not satisfied with the conditions for physical education and sports for children aged 3 to 5 years (lack of sports facilities and playgrounds within walking distance; does not take into account the age specificity of various groups, etc.).

The results of the survey testify to the positive subjective attitude of the interviewed parents to the physical culture and sports activity of their children. Most respondents believe that physical education and sports are useful for their children: for improving the health and general physical development of the child (49.6%), for the harmonious development of the child (22.3%), for instilling discipline (17.2%), for formation of character and volitional qualities (16.4%), for the educational process as a whole (35.8%). 47.1% of respondents noted that, despite the fact that physical education and sports are important, they still do not have a leading meaning, and only 7.3% of respond-



ents say that classes are not important for a child (the sum of answers is "rather not important" and "not important at all"). Only 1.3% of parents expressed the opinion that there is no benefit in these activities.

The positive attitude of parents to the physical culture and sports activity of their children is evidenced by the following data: 58.1% of respondents would like their child to be engaged in the sports section over the next five years, 16.7% want to see their child in the general physical training section, and those who chose the answer option "others" offered such sections as dancing, gymnastics, swimming pool and others. But, at the same time, 9.1% of respondents did not want their child to be engaged in physical education and sports sections in the next five years.

According to a sociological survey, 14.9% of parents of preschool children do not support or encourage physical education and sports for their children; 45.6% of respondents provide moral support to their children; 19% of the respondents support and stimulate sports activities in their families through joint activities.

Of all those who took part in the survey, 47.6% of respondents believe that they do not have enough knowledge for independent physical education and sports with a child, taking into account his age characteristics from 3 to 5 years.

The informational and operational readiness of parents to promote the physical culture and sports activity of their children largely depends on whether they are (are) engaged in physical education and sports themselves. As a result of the study, it was found that both parents of preschool children go in for physical education and sports mainly from time to time (41.9% of fathers and 39.2% of mothers), 30.8% of fathers and 35.0% of mothers do not go in for sports at all.

The results of the conducted sociological research and a number of others [5] indicate that, despite the significant success achieved in our country in organizing physical culture and sports activity of preschool children, there are significant gaps in the organization of physical culture and sports work with preschoolers - from the point of view of involving all children in physical education and sports, and also (which is especially important) ensuring the effective positive impact of these activities on health, physical development, and personal development of children in general.

These gaps include the following:

- the forms and methods of organizing physical education and sports used in practice do not fully cor-

respond to the interests and needs of children of different ages, their state of health and physical fitness, regional, national and other features, do not provide a full-fledged social, cultural and educational effectiveness of these classes;

- the mass media do not provide a sufficiently complete and convincing propaganda of the multilateral value of physical culture and sports activity for preschool children, a scientifically based and intelligible presentation for parents of the methodology for organizing physical education and sports with children, criteria for assessing the state of health and the level of physical readiness of children;

- there are often gaps in the training and retraining of specialists in the field of physical education, physical culture and sports of preschool children in preschool institutions;

- pedagogical teams of preschool institutions do not always pay enough attention to working with parents to form a high level of motivation in them to organize physical culture and sports activity of preschool children, as well as an appropriate system of knowledge, skills and abilities;

- there is no proper coordination of various organizations and departments involved in the issues of physical culture and sports activity of preschool children.

Conclusions. Taking into account the theoretical analysis of empirical information obtained on the basis of sociological surveys of parents with children of preschool age, the following scientifically substantiated proposals for improving physical culture and sports work with preschoolers in family conditions and in preschool educational organizations are formulated.

It is necessary to correct the priority areas of work in the organization of physical culture and sports work with preschoolers, including the improvement of work to form and increase the level of motivation for this activity of all interested persons; increasing the efficiency of physical education and sports based on the search for and implementation of innovative technologies, forms and methods of organizing physical culture and sports activities for preschool children; creation of appropriate objective conditions for the effective organization of this work at home, in preschool educational organizations, at the place of residence (appropriate sports facilities, sports equipment, as well as training and retraining of qualified specialists).

Given the importance of sociological surveys for obtaining reliable information about the state and

problems of physical culture and sports activity of preschoolers, as well as for developing scientifically based recommendations for improving physical culture and sports work with them, it is advisable to conduct annual large-scale sociological surveys of this kind with ensuring a high scientific level of surveys. corresponding to the principles, provisions and requirements of sociological science.

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