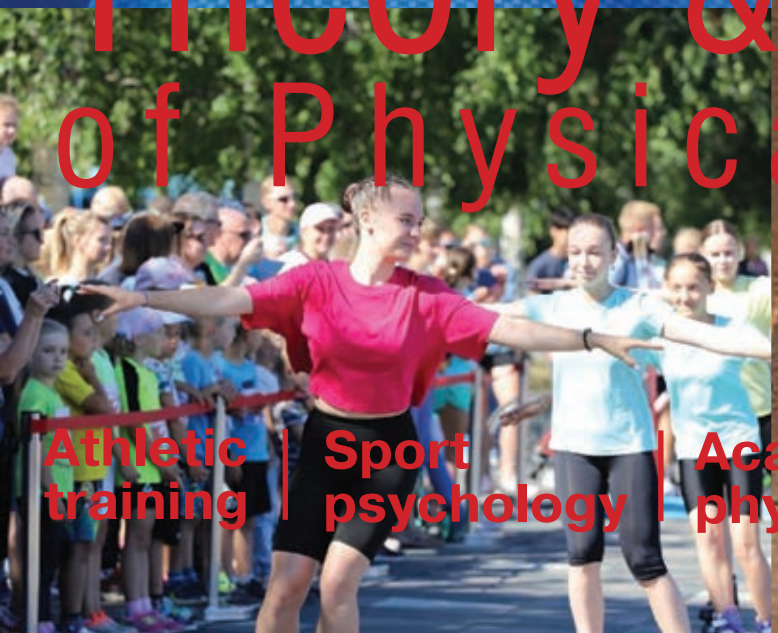

T&PPC

№ 8 august 2022

Theory & Practice of Physical Culture

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

Key issues of the modern sports science for discussion

Modern Sports Manager: who is he?

The continued growth of the sports industry and interest in it from public business structures necessitate the improvement of professional training of modern sports managers. Specialists are already facing the problem of technology development, sports ethics, social responsibility in the field of physical culture and sports. Therefore, it is important to understand what sports management is, what kind of specialist should be who solves the issues of organization and management of the sports industry, what is its functionality?

In modern science, "management" is usually understood as the process of leadership or management of an employee, a working group, a team, organizations in a market economy. Management in sports is an independent type of professional activity aimed at achieving goals and implementing managerial tasks within a sports organization through the rational use of material, labor and information resources.

Management in sports is the knowledge, skills and skills of effective management of organizations in the sports industry and intersectoral complexes of enterprises. Historically in Russia, it has happened that coaches, instructors, methodologists are engaged in sports management, who combine their main work with the duties of the head of the club, sports society, federation, despite the fact that their job descriptions do not provide for the performance of such functions. However, as modern research shows, the functionality of a modern sports manager provides for the performance of such specific duties as the formation of the budget of a sports organization, personnel management, development of marketing strategy, PR promotion, attracting sponsors, partners and investors, as well as working with fans and volunteers. A wide range of competencies of a sports manager requires special professional education, covering training in legal, financial, economic and other interdisciplinary fields of activity.

The analysis of the works of leading experts in the field of sports management allowed us to identify the fundamental principles of building the concept of training a manager of a sports organization. The variability of teaching methods presupposes the construction of a flexible educational process taking into account the diversity of areas of future professional activity in accordance with the changing needs of the sectoral labor market.

In turn, the principle of variability is focused on the realization of the possibility of free choice by future sports managers of educational programs through the design of an individual educational trajectory.

The principle of prognosticality is closely related to obtaining advanced information about the development of the sports industry, the ability to predict social processes occurring in the field of physical culture and sports.

The training of a future sports manager involves taking into account the principle of continuity in the education system, which is implemented by preserving, deepening, and expanding the goals and objectives of training at each stage of professional development.

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,
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Theory and Practice of Physical Culture

Contents

Biomechanical parameters of running technique in the distance of sprinter finalists of the world championship

UDC 796.4 22.093.354

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Abstract

Objective of the study was to compare the spatio-temporal, kinematic and angular characteristics of the running technique over the distance of the strongest sprinters in the world at 100 and 200 m.

Methods and structure of the study. As a methodological basis for the study, one of the methods of biomechanics, analysis, was adopted. The data of spatio-temporal, kinematic and angular characteristics of distance running, presented in the IAAF biomechanical report of the men's 100 and 200 m finals of the 2017 World Championships in Athletics, were analyzed.

Results and conclusions. In the middle of the straight in the 100 m run, the average speed is 11.60 ± 0.06 m/s, in the 200 m run - 10.31 ± 0.09 m/s. The difference in speed is achieved due to the frequency of steps (4.80±0.08 and 4.27±0.05 sh/s, respectively, p≤0.05), since the step length at both distances is identical and equals on average 2 .42 m. A greater frequency of steps per 100 m is achieved due to the shorter time of the reference (0.093±0.002 and 0.103±0.002 s, p≤0.05) and unsupported (0.116±0.002 and 0.132±0.003 s, p≤0.05) periods . When placing the leg on the support, significantly significant differences (p≤0.05) are observed in the angle of the torso, the angle between the thigh of the fly leg and the vertical. When removing the leg from the support, a significantly significant difference (p≤0.05) is observed in the angle of the torso and the angle between the lower leg of the supporting leg and the horizontal line.

Keywords: *sprinting, sprinting technique, 100 and 200 m running, spatiotemporal and kinematic characteristics of running, biomechanical parameters of sprinting.*

Introduction. Effective technique is one of the key components in achieving a high competitive result in sprint running. The study and comparison of its parameters among the strongest sprinters in the world makes it possible to identify the relations of individual links of technique, to form model characteristics. The data obtained in the work can be used in the preparation of runners at various distances of sprint running, in the selection and development of training means, exercises, which are close in spatio-temporal characteristics to the competition form.

Objective of the study was to compare the spatio-temporal, kinematic and angular characteristics of the running technique over the distance of the strongest sprinters in the world at 100 and 200 m.

Methods and structure of the study. In our study, we used data from the biomechanical report of the IAAF (International Association of Athletics Federation) of the men's 100 m and 200 m finals at the 2017 World Athletics Championships in London [3,4].

The report presents the results of a video analysis carried out for the 100 m run in the range from 47 m to 55 m, for the 200 m run at the 150 m mark. A comparison was made of the spatio-temporal and angular characteristics of the running technique of the men's 100 m and 200 m finalists. Statistical data processing was carried out using the Statgraphics Centurion software, the validity of differences was determined by Student's t-test for independent samples.

Results of the study and their discussion. The main characteristics that determine the speed of movement along the distance are the length and step rate. The higher the length and step rate, the higher the running speed. The average values of the length of the running stride in the 100 m and 200 m sprints are identical – 2,42 m. The minimum values for 100 m are 2,26 m, for 200 m – 2,29 m, the maximum values are 2,70 m and 2,60 m, respectively. It should be noted that since in the 100 m run the measurements were carried out on the interval from 47 to 55 m, when there is still some increase

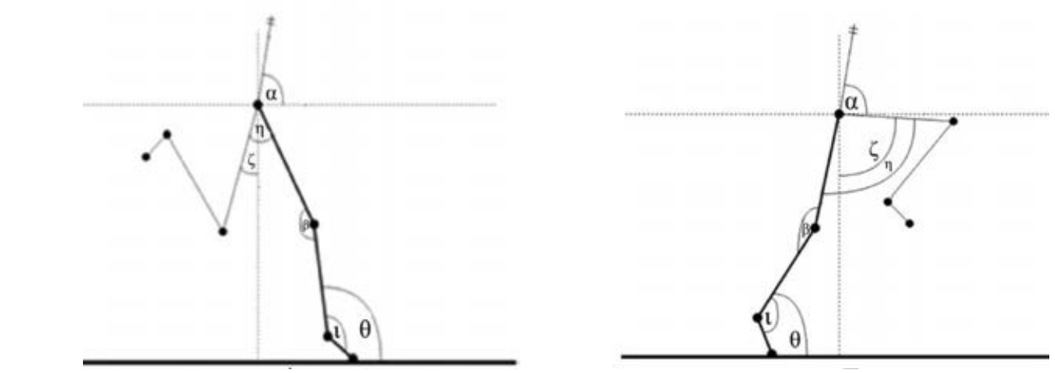

Figure 1. *Body schematic angles at touchdown (A) and toe-off (B)*

in the running speed, i.e. starting, it can be assumed, there are even greater maximum stride length values. The step rate at 100 m is significantly higher than at 200 m, 4,80±0,08 s and 4,27±0,05 s, respectively, p≤0,05. The time of the supported and unsupported periods of the running stride cycle in running is statistically less by 100m than by 200 m, p≤0,05, but in unsupported step this difference is more significant. The range of values of the supported period for 100 m lies within 0,08–0,09 s, for 200 m – 0,09–0,10 s; unsupported period for 100 m – 0,11–0,12 s, for 200 m – 0,13–0,15 s. The stride length-to-height ratio of a runner at both distances is approximately the same and has an average value of 1,31–1,33.

At the beginning of the contact period, the horizontal distance between the ground contact point at touchdown and the CM (centre of mass) does not have statistically significant differences (p>0,05) and is within 0,28–0,48 m. At the end of the contact period, the average horizontal distance between the ground contact point at toe-off and the CM is significantly greater by 100 m (0,62±0,01 m) than by 200 m (0,56±0,01 m), p≤0,05.

The study analyzed the angular characteristics of runners at the moment of placing the leg on the support and removing it from it (Figure 1): the angle of inclination of the trunk relative to the horizontal line (α), the angle of flexion of the knee joint (β), the angle between the vertical line and the hip of the swing-up leg (ζ), the angle between the swing-up and support legs (η), the angle of inclination of the lower leg/calf of the support leg relative to the horizontal line (θ), the angle of the ankle joint of the support leg (ι).

In the practice of training sprinters, many coaches pay attention primarily to the height of the hip raise (angle ζ) and extension of the support leg at the knee joint (angle β) at the moment of take-off, usually giving the setting for maximum flexion of the swing-up leg hip and extension of the support leg. The study of these values among the world's leading sprinters shows that the average value of the angle ζ for the 100 m run is 67,6±2,3º, and for the 200 m run is 60,6±2,8º (p> 0,05). The angle of flexion of the knee joint (β), despite the similarity of the mean values at both distances, has a significant scatter of values. At the moment of placing the foot, its minimum value for the 100 m sprint is 143º for the sprinter who took the eighth place and 144º is the second, maximum 168º, for 200 m the minimum and maximum values are 149º and 175º, respectively. When pushing off in a 100 m run, the range of values is from 138º to 160º, in 200 m from 141º to 170º. It is important that in addition to the large scatter of values in this indicator among the studied groups, some sprinters have a difference of more than 20º

Table 1. *Spatio-temporal characteristics in running at the 100 m and 200 m distances among the world-class sprinters*

Result			Time reaction (s)	Step rate (stride/s)	Step length (m)	Velocity (m/s)	Step length/ heigth	Contact time (s)	Flight time (s)	Distance from the ground contact to the body CM (m)	
										Touchdown	toe-off
100m	$\bar{x} \pm S_{\bar{x}}$	10,04± 0,04	0,155± 0,111	4,80± 0,08	2,42± 0,05	11,60± 0,06	1,33± 0,01	0,093± 0,002	0,116± 0,002	0,38± 0,01	0,62± 0,01
(n=8)	σ	0,12	0,033	0,22	0,14	0,16	0,03	0,004	0,007	0,04	0,04
200m	$\bar{x} \pm S_{\bar{x}}$	20,31± 0,08	0,156± 0,003	4,27± 0,05	2,42± 0,03	10,31± 0,09	1,31± 0,02	0,103± 0,002	0,132± 0,003	0,41± 0,02	0,56± 0,01
(n=8)	σ	0,23	0,009	0,15	0,09	0,25	0,06	0,006	0,008	0,04	0,03
p			>0,05	≤0,05	>0,05	≤0,05	>0,05	≤0,05	≤0,05	>0,05	≤0,05

Table 2. *Angular characteristics in 100 m and 200 m distances running for world-class sprinters*

Result			Touchdown (°)						Toe-off (°)					
			α	β	ζ	η	θ	(ι)	α	β	ζ	η	θ	(ι)
100m	$\bar{x} \pm S_{\bar{x}}$	10,04± 0,04	75,1± 1,0	156,2± 2,1	17,1± 2,8	9,7± 3,7	97,9± 1,1	115,9± 1,1	80,4± 1,2	153,8± 1,4	67,6± 2,3	93,1± 2,4	38,4± 0,6	138,5± 1,1
(n=8)	σ	0,12	3,0	6,1	7,1	10,6	3,0	3,1	3,3	4,1	6,6	6,9	1,6	3,0
200m	$\bar{x} \pm S_{\bar{x}}$	20,31± 0,08	81,5± 1,2	159,1± 1,6	6,6± 2,9	17,1± 3,1	99,9± 0,9	114,9± 1,6	84,3± 0,5	157,8± 1,6	60,6± 2,8	86,1± 2,8	43,1± 0,6	131,4± 3,5
(n=8)	σ	0,23	3,5	4,7	8,1	8,6	2,6	4,5	1,5	4,5	7,8	7,8	1,7	9,9
p			≤0,05	>0,05	≤0,05	>0,05	>0,05	>0,05	≤0,05	>0,05	>0,05	>0,05	≤0,05	>0,05

when comparing the angles in the left and right legs, which shows the existing asymmetry of motor actions even among the top-class sprinters.

Another, no less important characteristic of running, is the position of the foot when it is placed on the support. The angle of the ankle joint (ι) at the moment of touching the running track at both distances is on average 114–115º (p>0,05), i.e. the heel is slightly above the surface of the track. The lower leg is placed almost vertically, the angle θ slightly exceeds 90º, the average values are 97-99º (p>0,05). At the same time, the angle of inclination of the trunk (α) for the 200 m run is significantly higher both when the legs are set (81,5±1,2º) and when pushing off (84,3±0,5º).

It is generally accepted that the strongest sprinters are distinguished by the ability to quickly "bring their legs together", which is characterized by the location of the swing-up hip next to or even in front of the support leg at the time of its placing. It means that the angle η should be near zero. However, according to biomechanical data, both the gold and silver medalists of the 100 m race has their swing-up leg behind the support leg at an angle of 24–28º. Usain Bolt, the bronze medalist, world record holder for 100 m and 200 m, his support left leg has a swing-up leg at 21º behind, and when placing the right leg - the left is in front by 4º. For the rest of the participants in the finals, the values are in the range from 0 to 11º, while only in one case the swing-up leg is in front of the support leg, by 7º. In the 100 m sprint, all sprinters have the swing-up leg in front of the vertical line, the average angle ζ 17,1±2,8º. The same is observed among the runners who took from the first to the fourth places in the 200 m race (angle ζ from 7º to 19º). The calculation of the correlation coefficients did not reveal a reliably significant relation (p>0,05) between the investigated angular and space-time characteristics.

Conclusions. Comparison of the spatial-temporal and angular characteristics of the world's leading 100 m sprinters (47–55 m segment) and 200 m (150 m segment) sprints showed that reliably significant differences were observed in the running speed (11,60±0,06 m/s and 10,31±0,09 m/s), cadence (4,80 ± 0,08 stride/s and 4,27±0,05 stride/s), contact (0,093±0,002 s and 0,103±0,002 s) and flight (0,116±0,002 s and 0,132±0,003 s) periods of the running strides, the horizontal distance between the ground contact point at toe-off and the CM (0,62 ±0,01 m and 0,56±0,01 m), p≤0,05. When comparing the angular characteristics, reliably significant differences (p≤0,05) are observed in the angle of inclination of the trunk (α), in both studied phases, the angle of inclination of the lower leg when removing the leg from the support (θ).

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Simulation of the technique of pedaling of cyclists on the basis of visual control of the correspondence of the rhythm of angular movements in the links of a kinematic chain

UDC 796.012

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Abstract

Objective of the study was to substantiate the possibility of correcting the movements of the links of the kinematic chain of the motor apparatus of cyclists when performing the technique of circular pedaling based on visual control over the compliance of the realized movement with the ideal model of the power graph.

Methods and structure of the study. The work was carried out in the laboratory of ergonomic biomechanics of the Adyghe State University, 19 cyclists of the first category and CMS took part. Athletes were asked to demonstrate the technique of circular pedaling on the WATTBIKE bicycle ergometer, which allows real-time visualization of the power graph. At the same time, based on the results of visual control of the power graph, the athlete can make corrections to the technique of the performed action and control its quality.

Results and conclusions. The stability of the manifestation of the rhythm of angular movements in the knee and hip joints is manifested in all methods of pedaling and is typical for all subjects. When pedaling in accordance with the visual comparison of one's own movements with the power graph model, the rhythm of angular movements in the knee and hip joints increases due to a decrease in the time spent on the implementation of one cycle of pedal rotation, as well as a decrease in the magnitude of angular movements in the knee and hip joints, correction of rhythmic structures of implementation of angular movements in the ankle joint and in the best athletes - correction of the spatial structure of the rhythm.

Keywords: *pedaling technique of cyclists, angular movements in the knee, ankle and hip joints, time of angular movements, kinematic chains, rhythmic cycle.*

Introduction. The pedaling technique is a cyclic order of angular movements in the kinematic chains of the cyclist's motor apparatus, which ensure the rotation of the pedal crank. The cycle is based on a rhythmic sequence of actions that ensure the implementation of one revolution of the pedal crank. The content of a single cycle of actions can be conditionally divided into four phases:

1) pushing the pedal;
2) pedal press;
3) summing up the pedal;
4) pulling up the pedal.

However, all these phases are not always used by cyclists to influence the pedal. So, in a study (Martin Hillebrecht, Ansgar Schwirtz, Björn Stapelfeldt, Wolfgang Stockhausen, Martin Bührle, 1998) it is shown that even highly skilled riders do not act on the pedal after passing the crank angle of 200 degrees in the direction of travel, the magnitude of the pedal force is reduced to a minimum or has completely negative values, which indicates that the racer uses this phase as a pause to prepare for the implementation of the future effort [3]. In this regard, a dilemma arises when determining the content of training at various stages of sports improvement: one should develop the ability to show efforts in all phases of the rhythmic cycle of pedaling, or it is necessary to develop the quality of implementation in those phases where more favorable biomechanical conditions are noted for realizing the potential of the kinematic chain of an athlete.

Objective of the study was to substantiate the possibility of correcting the movements of the links of the kinematic chain of the motor apparatus of cyclists when performing the technique of circular pedaling based on visual control over the compliance of the realized movement with the ideal model of the power graph.

Methods and structure of the study. The work was carried out in the laboratory of ergonomic biomechanics of the Adyghe State University, 19 cyclists of the first category and CMS took part. Athletes were asked to demonstrate the technique of circular pedaling on the WATTBIKE bicycle ergometer, which allows real-time visualization of the power graph. At the same time, based on the results of visual control of the power graph, the athlete can make corrections to the technique of the performed action and control its quality.

Pedaling quality is assessed in the form of a polar power graph, which reflects the impact of the kinematic system of the athlete's motor apparatus on the pedal in one pedaling cycle (moving the pedal crank by 360 degrees). In accordance with the method of recording the power graph on the WATTBIKE exercise bike, its shape, close to the figure eight, characterizes the discrete way of pedaling, and the shape of the power graph, close to the circle, characterizes the continuous way of implementing the analyzed motor action [2]. During the experiment, the subjects were asked to demonstrate the technique of circular pedaling in an arbitrary form and the technique of performing the same action while visualizing the power graph. It was assumed that the biomechanical and qualitative results of the implementation of the technique would have significant differences.

The subject made two attempts. In the first one, the task was to demonstrate the technique of arbitrary circular dominance, and in the second, the technique of circular pedaling corresponding to the power graph. All attempts were filmed on two video cameras, and the resulting video sequence was processed on the basis of the Ortho_3D software from Biosoft, a three-dimensional model of pedaling technique was created [1].

Results of the study and their discussion. The study of graphic trajectories of angular movements in the hip and knee joints in the process of transition from voluntary pedaling to the implementation of movement in accordance with the power graph made it possible to establish that the manifestation of rhythm during flexion and extension in the hip and knee joints is characteristic of all subjects with all methods of pedaling. That is, the dynamics of angular displacements in the knee and hip joints is characterized by the repetition of the same kinematic parameters of movement at regular intervals (Figure 1).

Comparison of graphic trajectories of changes in angular movements in 87% of the subjects allows us to establish that when switching from voluntary pedaling to pedaling according to the power graph, the rhythm of angular movements increases. The basic unit of the rhythm of angular movements in the joints is the rhythmic cycle, which includes one flexion and one extension. During the same time (Fig. 1), when pedaling arbitrarily, the athlete performs seven rhythmic cycles, and when pedaling according to the power graph, already nine. In addition, an increase in the rhythm of angular movements was observed during the transition from voluntary pedaling to the construction of movement according to the power graph (see Fig. 1, 2), and a decrease in the amplitude of angular movements also occurred.

Thus, it has been established that during the

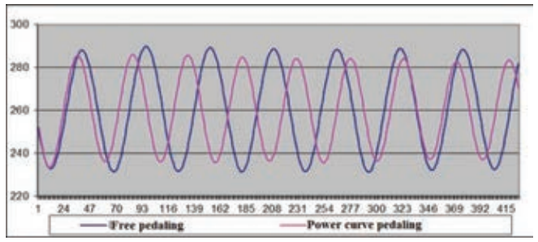

Figure 1. *Dynamics of angular displacements in the knee joint during voluntary pedaling and performing a motor action according to the power graph*

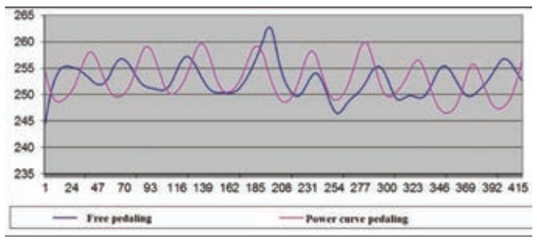

Figure 2. *Dynamics of angular movements in the ankle joint during voluntary pedaling and pedaling in accordance with the power graph*

Table 1. *Parameters of angular movements in the hip joint during the implementation of arbitrary circular pedaling and pedaling according to the power graph*

Pedaling methods	Angle of flexion in the knee joint, degrees	Angle of extension in the knee joint, degrees	Angular movement in the knee joint, degrees	Implementation time of one cycle, s
Free circular pedaling	71,4 ±4,3	132±5,5	60,6±5,9	0,3±0,03
Power curve pedaling	73,4±4	128±2,7	54,1±5,2	0,28±0,03
Reliability of differences, p	≥0,05	≤0,01	≤0,01	≤0,01

Table 2. *Parameters of changes in angular displacements in the knee joint during the implementation of arbitrary circular pedaling and pedaling according to the power graph.*

Pedaling methods	Angle of flexion in the hip joint, degrees	Angle of extension in the hip joint, degrees	Angular movement in the hip joint, degrees	Implementation time of one cycle, s
Free circular pedaling	107,5±4	146,2±3,7	38,7±2,9	0,31±0,03
Power curve pedaling	109,9±4	144,4±2,7	34,5±3	0,28±0,03
Reliability of differences, p	≤0,05	≥0,05	≤0,01	≤0,01

transition from voluntary pedaling to pedaling according to the power graph, the rhythmic structure of angular movements is preserved, the rhythm of angular movements increases, and the amplitude of angular movements decreases.

The study of the parameters of angular displacements in the hip joint in the process of transition from arbitrary circular pedaling to movement detail when visualizing the power graph model allows us to establish a decrease in the flexion angle in the hip joint,

a decrease in the angular displacement in the hip joint, a decrease in the time required for the implementation of one cycle of pedaling (Table 1).

The study of changes in the spatio-temporal order of angular displacements in the knee joint during the transition from arbitrary circular pedaling to pedaling according to the power graph allows us to establish a decrease in extension in the knee joint, a decrease in angular displacement in the knee joint and a decrease in the time required to implement one movement cycle (Table 1). 2).

The dynamics of the rhythm of angular movements (Fig. 2) during flexion and extension in the ankle joint occurs differently. There is an instability of the parameters of angular displacements, which manifests itself in the instability of the magnitude of angular displacements in cycles and the time boundaries between cycles.

When switching to pedaling according to the power graph, the number of subjects who are characterized by the manifestation of rhythm increases to 20%. Thus, the reproduction of rhythmic cycles of flexion and extension in the ankle joint is not available for this qualification group of athletes. Moreover, the appearance of a visual possibility of comparing one's own movement parameters with an ideal schedule leads to an increase in rhythm.

That is, the insufficient manifestation of rhythm during the implementation of movement in the ankle joint is a consequence of insufficient attention to the formation of the technique for performing this part of the integral movement and, most likely, an increase in its significance only after the athlete learns to use larger muscle groups in an optimal way. Of interest is the fact that the transition to pedaling according to the power graph has little effect on the typical manifestation of the rhythm of flexion and extension in the ankle joint. The number of repetitions of the same parameters of angular displacements at equal time intervals increased by only 20%.

It is possible that the manifestation of the rhythm of flexion and extension in the ankle joint, as an element of the pedaling technique, is the most difficult in terms of implementing sensory corrections based on the visualization of the power graph, since during flexion and extension in the knee and hip joints, the rhythm of angular movements when visually compared with the graph power is increased.

At the same time, among the leading athletes, determined according to the coach's opinion and on the basis of sports results, a more distinct manifestation of the rhythm was revealed. The manifestation of the rhythm of flexion and extension in the ankle joint, which was found in 20% of the subjects, who, according to the coaches, are the leading athletes, determines the need to include in the training means such exercises that provide an idea of the technique of the ankle joint and form it as an important element of the holistic technique. pedaling.

Conclusions. The stability of the manifestation of the rhythm of angular movements in the knee and hip joints is manifested in all methods of pedaling and is typical for all subjects. When switching from voluntary pedaling to pedaling according to the power graph, the rhythm of angular movements in the knee and hip joints increases. The number of rhythmic cycles of angular movements performed by athletes during voluntary pedaling (seven cycles) steadily increases (up to eight) when it becomes possible to visually compare the results of their activity with the power graph model by reducing the time spent on the implementation of one pedal rotation cycle (from 0, 31±0.03 s to 0.28±0.03 s).

When switching from voluntary pedaling to pedaling according to the power graph, there is a decrease in the magnitude of angular displacements in the knee and hip joints, which is characterized by a decrease in the amplitude of flexion and extension in the hip joint, a decrease in the angle of flexion in the hip joint, a decrease in the amplitude of flexion and extension in the knee joint, and a decrease in the angle extension at the knee joint.

Manifestations of the rhythm of angular movement in the ankle joint during voluntary pedaling are not detected. When switching to pedaling in accordance with the power graph, the manifestation of rhythm in the ankle joint is found in 20% of the subjects.

Correction of the rhythmic structure of the implementation of angular movements in the ankle joint includes actions to correct the temporal and spatial structure of the rhythm. All subjects cope with the correction of the temporal structure, and only 20% cope with the correction of the spatial structure of the rhythm.

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THEORY AND METHODS OF SPORT

Professionally-oriented model of long-term sports training of football players

UDC 796.08

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Abstract

Objective of the study was to theoretically substantiate the stages of a professionally oriented model of long-term sports training of football players from the standpoint of increasing their competence in competitive activities.

Methods and structure of the study. As a result of the theoretical analysis, the issues related to the current state of the issue of long-term training of young athletes, the requirements for the qualification of football players from the standpoint of increasing competence in competitive activities at various levels have been studied.

Results and conclusions. A professionally-oriented model of long-term sports training of football players is theoretically substantiated from the standpoint of increasing competence in competitive activities. The paper shows that the professionalization of a player goes through certain stages and is determined by three stages of the formation of sportsmanship associated with an increase in competitiveness in various conditions of competitive activity: 1) basic stage; 2) pre-professional stage; 3) professional stage. The competence of a football player is manifested: at the basic stage in the official competitions of young men of the regional and all-Russian levels in the actions of a player on the football field in a role corresponding to his abilities (the stage of professional orientation); at the pre-professional stage - in international competitions in actions in various roles, where the talent of the player is manifested (the stage of professional universalization); at the professional stage - in the optimal role for the most effective performance of their labor functions as part of an adult professional team (stage of professional specialization).

Keywords: *long-term sports training, football players, professionally oriented model, competence, sportsmanship, competitive activity, skill level.*

Introduction. Currently, there is a tendency to consider issues related to the problems of training a sports reserve in football in the conditions of modern realities of professionalization of sports [4]. New sports training institutions are being formed everywhere in the Russian Federation, where various football training Centers and football Club Academies can be identified, in which the most capable teenagers should receive professional education [5]. At the same time, despite the creation of such institutions in many regions of the Russian Federation, methodological support of the process of training football players is still insufficiently scientifically grounded from the standpoint of competitiveness or competence. Competitiveness is identified in the special scientific literature [10; 11] with the concept of competence, since these terms have the same etymology. The competence of a football player is associated with the manifestation of sportsmanship in competitive activities of various levels, due to a certain degree of development of tactical, technical, physical and mental abilities [1]. Thus, considering the long-term training process as a promotion in the profession, priorities change in its target orientation and the final result.

The purpose of this study was the theoretical substantiation of the stages of a professionally-oriented model of long-term sports training of football players from the position of increasing competence in competitive activities.

Objective of the study was to theoretically substantiate the stages of a professionally oriented model of long-term sports training of football players from the standpoint of increasing their competence in competitive activities.

Methods and structure of the study. As a result of the theoretical analysis, the issues related to the current state of the issue of long-term training of young athletes, the requirements for the qualification of football players from the standpoint of increasing competence in competitive activities at various levels have been studied.

In connection with the identified features of the existing organization of a long-term cycle in the domestic system of sports training [3, 9], there is a need to develop a new periodization model aimed at improving the competence of football players in competitive activities. The adopted Federal Law on the professionalization of sports [7] and the creation of new organizational forms of sports training have updated the theoretical development of a professionally oriented model for the periodization of the training process of football players, supplementing the theory and methodology of football with new knowledge about the patterns of growth of sportsmanship in a long-term aspect.

Results of the study and their discussion. The current Federal standard of sports training for the sport “football” [8], which is used both for children’s sports schools and for new state sports training institutions (Sports Training Centers), provides requirements for the results of sports training and control and conversion standards at each stage , which reflects the general direction of the entire long-term training process. This orientation is associated with an increase in the level of sports (general and special physical, technical) preparedness of football players. However, the mentioned regulatory document does not take into account the competencies in the chosen sport, which is assumed in the professional standard “Athlete” [6], that is, the educational component of the sports activities of football players is not spelled out.

In connection with the professionalization of football, the creation of state institutions designed to ensure the training of football players for professional football, it is necessary to identify criteria for the level of sportsmanship (qualification) at each of the stages of long-term training recommended by the Russian Football Union [5]. It seems appropriate to establish a connection between the Federal standard of sports training for the sport “football” and the professional standard “Athlete”, as well as to determine the requirements for competence and assessment of the sportsmanship of football players in the organizational and methodological conditions of new football sports training institutions created to provide educational activities for the professional training of a football player.

This causes the introduction of new standards of sports training for football players, based on increasing competence in professional (competitive) activities, which involves the development of a professionally oriented model for periodization of a long-term training process that takes into account age-related patterns of sportsmanship growth in competitions of various youth levels (regional, all-Russian, international) and adult professional level.

The table presents the main characteristics of sportsmanship in the context of the existing traditional model and the proposed professional-oriented model of long-term training of football players, and also draws parallels between age and sports stages in achieving the highest results.

The initial *basic stage* **(professional orientation stage)** of the formation of a player’s professionalism is associated with the formation of competence in official competitions at a certain playing position (role). The professional suitability of a player is assessed from the position of adapting his abilities to the requirements of the role, where the quality of individual actions will testify to his qualifications. The competencies of a young football player are largely due to the acquisition of knowledge, skills and abilities of playing in a certain position (increasing personal competence in relation to their own capabilities and the capabilities of partners and rivals in competitions for teenagers and young men at the regional and all-Russian level).

The pre-professional stage **(the stage of professional universalization)** is a key stage in the structure of the model of professionally oriented long-term sports training, since it is in this age period that the first professional contracts are concluded, and the formation of a young football player as a professional takes place. The priority task of training at this stage, in our opinion, should be considered the mastery of those universal competencies that, regardless of the role, will allow the football player to operate effectively in competitive conditions at the level of the national teams of the Russian Federation, staffed by the most gifted young football players. Therefore, the pre-professional training of football players should be considered as a long-term process aimed at the formation

Requirements for competence in competitive activities and assessment of the sportsmanship of football players within the existing and professionally-oriented models of periodization of the long-term training process

The traditional model of long-term sports training of football players (in accordance with the Federal Standard of sports training for the sport «football» in 2019)	**Professionally-oriented model of long-term sports training of football players** (based on the results of their own research)
Training stage *Competence requirements:* gaining experience of regular participation in official sports competitions; mastering general knowledge about the rules of the sport "football". *Assessment of sportsmanship*: the level of preparedness is determined according to the control standards of general and special physical training, technical program.	**Basic stage** *Competence requirements*: knowledge, skills and abilities of competitive activity in a certain role (**phase of professional orientation**). *Assessment of sportsmanship*: the effectiveness of individual actions in competitions of teenagers and young men at the regional and All-Russian levels.
The stage of improving sports skills *Competence requirements*: formation of the skill of participation in official sports competitions; positive dynamics and stability of results at sports competitions; mastering theoretical knowledge of the rules of the sport "football". *Assessment of sportsmanship*: the level of preparedness is determined according to the control standards of general and special physical training, technical program, performance of 2 sports categories.	**Pre-professional stage** *Competence requirements*: knowledge, skills and abilities of competitive activity in various roles (**phase of professional universalization**). *Assessment of sportsmanship*: the effectiveness of individual actions in competitions of young men of international level.
The stage of the highest sportsmanship *Competence requirements*: participation in official sports competitions and stability of sports results; achievement of results of the level of sports teams of the constituent entities of the Russian Federation. *Assessment of sportsmanship*: the level of preparedness is determined to the control standards of general and special physical training, technical program, performance of 1 sports categories.	**Professional stage** **Competence requirements**: knowledge, skills and abilities of competitive activity in an optimal role (**phase of professional specialization**). *Assessment of sportsmanship*: the effectiveness of individual actions in adult professional level competitions.

of universal knowledge, skills and abilities that allow them to quickly adapt to the conditions of competitive struggle among the most gifted youth football players (increasing personal competence in relation to their own capabilities and the capabilities of partners and rivals in the youth competitions of the international level).

The professional stage **(the stage of professional specialization)** is associated with the effectiveness of individual actions within the framework of the most appropriate role for realizing one's own capabilities in matches of professional teams. Requirements for competence are characterized by the formation of a player's sportsmanship in relation to his self-realization in the conditions of a football team of a certain skill level (Russian Premier League, Football National League), where cooperation and rivalry takes place with football players of different ages and experience in competitive activities (increasing personal competence in relation to their own opportunities and opportunities of partners and rivals in competitions of an adult professional level).

Conclusions. It should be emphasized that the results of matches in team sports do not provide complete information about the quality of performance of an individual player. This is the difficulty in predicting the future sports career of sportsmen-players in general and football players in particular. The professionally oriented model of long-term sports training of football players establishes specific guidelines for the requirements and assessment of the sports skills of football players at all stages of their professional development in relation to the maximum realization of their own capabilities in various conditions of competitive struggle and allows to outline promising directions for the development of scientific research in solving the problem of selection and forecasting abilities.

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Development of hypertrophy in ski jumpers

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Abstract

Objective of the study was to theoretically substantiate the feasibility of developing hypertrophy in ski jumpers.

Methods and structure of the study. The main research method was the method of analysis and generalization of scientific and methodological literature data.

Results and conclusions. During the study, the following conclusions were made: exercises with a hypertrophic effect are an effective tool for increasing the strength potential of skeletal muscles; hypertrophic "response" of the athlete's skeletal muscles, as a response to power loads, depends on two groups of factors: congenital and acquired; strength exercises used for the purpose of myofibrillar hypertrophy must meet two requirements: to ensure the involvement of the maximum number of muscle fibers in the composition of the working (loaded) muscles and to ensure the maximum tension of each muscle fiber; an increase in myofibrillar hypertrophy requires special training to transform the strength effect into the power of motor efforts; skeletal muscle hypertrophy threatens to reduce the speed of the competitive exercise in ski jumpers.

Keywords: *strength abilities, hypertrophy, ski jumping.*

Introduction. The logic of strength training in ski jumping is in many ways similar to the logic of strength training in the absolute majority of speed-strength sports: first, muscle hypertrophy is developed, then the emphasis is shifted to the development of maximum strength, and, finally, a transition is made to the development of speed-strength abilities (power) [6]. This logic solves the problem of transforming the maximum strength, developed, among other things, with the help of exercises with a hypertrophic effect, into an impulse of strength, manifested in ski jumping.

The force impulse (I) is determined by the product of muscle force and the time of its manifestation ($I=F \cdot t$) and is the most important factor in the mechanical efficiency of ski jumping [4].

The morphological basis of the force impulse is determined by the ratio of fast (FMF) and slow (SMF) muscle fibers in the composition of the working muscles, as well as the cross-sectional area of the muscles (that is, their hypertrophy) [5].

Regarding the expediency of hypertrophy among specialists who train ski jumpers, there is no consensus today. There are concerns that myofibrillar hypertrophy may reduce the rate of muscle shortening and adversely affect the aerodynamics of the jump [1, 2].

Thus, it can be stated that the use of exercises with a hypertrophic effect in the strength training of ski jumpers needs scientific justification and additional and comprehensive research.

Objective of the study was to theoretically substantiate the feasibility of developing hypertrophy in ski jumpers.

Methods and structure of the study. The main research method was the method of analysis and generalization of scientific and methodological literature data.

Results of the study and their discussion. Hypertrophy is one of the factors in increasing the power potential of a ski jumper, so we consider it appropriate to clarify the following:

– the presence of a hypertrophied muscle does not guarantee the manifestation of a high power of its work in a competitive motor mode [3], which necessitates a specialized stage of "transformation" of the accumulated muscle power potential into the performance of a competitive movement,

– for ski jumpers, it is advisable to develop, first of all, the hypertrophy of fast muscle fibers (FMF), which have the ability to develop significant efforts at high speed movements in the phase of repulsion from the take-off table.

The analysis of the scientific and methodological literature made it possible to identify two groups of factors that affect the hypertrophic response of skeletal muscles under the influence of strength exercises: congenital and acquired (the latter include biomechanical and didactic) (see figure).

Let us present a brief description of the selected factors.

The group of congenital factors included:

– the ratio of FMF and SMF (an athlete with a large percentage of FMF has an advantage in the hypertrophic response of muscles to a power load than an athlete with a large percentage of SMF),

– the dominant side of the body (the muscles of the dominant side of the body have priority in innervation from the CNS and may show a more pronounced response to hypertrophic training).

The group of didactic factors included:

– the ability to recruit 100% MU (the more high-threshold motor units (MU) are involved in the exercise, the higher the hypertrophic response),

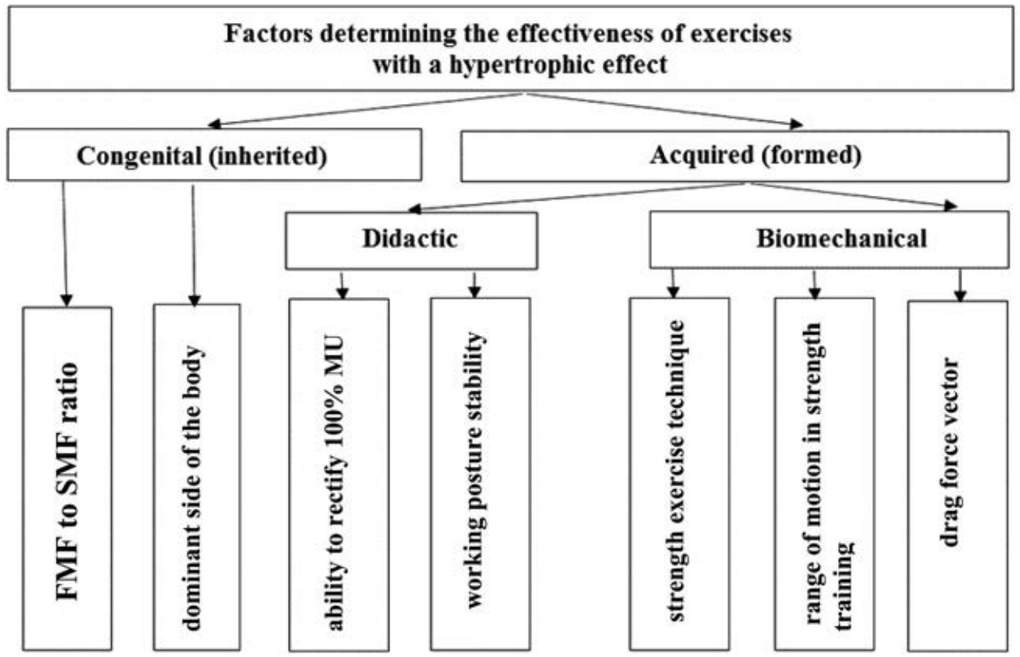
– stability of the working posture (an unstable posture limits the innervation of the muscles from the side of the central nervous system, which reduces the hypertrophic stimulus).

The group of biomechanical factors included:

– strength exercise technique (changing technique causes a redistribution of load among muscle groups, which causes selectivity of hypertrophy of specific muscles),

– amplitude of movement in a strength exercise (with an increase in amplitude, the amount of muscle stretch increases, causing increased mechanical stress and the creation of a hypertrophic stimulus),

– vector of action of the resistance force (depending on the direction of action of the external resistance force, there is a selectivity of muscle hypertrophy with a similar vector of traction force).



Factors affecting the hypertrophic "response" of skeletal muscles during strength training

With regard to the methodological aspects of the development of hypertrophy, a number of authors agree that myofibrillar hypertrophy is caused by traumatization of contractile elements in the process of strength work [3, 4, 6].

At the same time, foreign experts single out the amount of mechanical tension in muscle fibers as the leading hypertrophic stimulus [7, 9]. According to the authors, the creation of maximum mechanical stress on muscle fibers requires:

– recruitment of a significant number of high-threshold MU,

– decrease in the speed of movement in the joints.

It is possible to achieve the recruitment of high-threshold MUs both through the use of a significant amount of external resistance (more than 85% of 1 RM), and due to unlimited weighting (70-75% of 1 RM), performed to “failure” [4, 6, 8] .

The task of reducing the speed of motor action as a factor in increasing the level of mechanical tension in muscle fibers can be solved in two ways: natural or artificial slowing down of movement. “Artificial” deceleration involves conscious control of speed due to the coactivation of agonist-antagonist muscles, which can adversely affect the speed of ski jumping [10].

The methods of “natural” deceleration include:

– high external resistance, including rubber shock absorbers and steel chains, which increase the load in the final part of the working amplitude of the strength exercise;

– performing the exercise “to failure” within the framework of the approach,

– increased coordination complexity of the power exercise (unstable support, asymmetric resistance, etc.).

Given that one of the key negative consequences of muscle hypertrophy in ski jumpers is a decrease in the rate of contraction of muscle fibers, we suggest adhering to the following recommendations:

– apply the value of external resistance not lower than 80% of 1 RM, which will eliminate the need to perform each power approach “to failure”,

– increase the duration of rest, both between sets within a workout (3-4 minutes), and between workouts, during which exercises “to failure” were performed (three to four days),

– do not overestimate the volume of strength exercises (in a weekly cycle, the volume of strength work per muscle group should not exceed 10-15 approaches).

Conclusions. Exercises with a hypertrophic effect create a morphofunctional basis for increasing maximum strength.

Strength exercises must meet two requirements: due to the magnitude of external weights, ensure the involvement of the maximum number of muscle fibers in the composition of the working (loaded) muscles and ensure the creation of maximum tension for each muscle fiber due to the low speed of weight movement.

An increase in muscle power potential due to hypertrophy requires the subsequent transformation of the hypertrophic effect into the power of motor efforts through the use of high-speed exercises.

Muscle hypertrophy poses a threat of reducing the angular velocity in the repulsion phase on the take-off table, which requires caution in performing strength exercises by jumpers to “failure”, with a shortened rest pause, as well as in an increased volume of such exercises.

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The effectiveness of the competitive implementation of archery in the preparatory period

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Abstract

Objective of the study was to evaluate the effectiveness of athletes' sports implementation at the beginning of the preparatory period.

Methods and structure of the study. The work is based on the study and analysis of the protocols of competitive performances of archers at the Russian winter championship. Mathematical methods for calculating the obtained data were used: calculation of Student's t-test and coefficient of variation.

Results and conclusions. The work performed indicates the heterogeneity of the technical readiness of the top three leaders of the Russian championship. It is noted that the average results of the top three leaders of the first round are lower than the average results of the leaders of the second round of the qualifying round, which indicates a different level of special preparedness of athletes, both in men and women.

Passing the second round of the qualifying round requires the manifestation of special endurance, which indicates the need to maintain it among the leaders of the first round. On the contrary, insufficient implementation in the first round of the leaders of the second round indicates an insufficient level of "training", which requires a longer warm-up before entering the start of the qualifying round.

Keywords: *archery, winter program, technical readiness, competitions.*

Introduction. The competitiveness of athletes in competitions is a key factor in sportsmanship, the success of which depends on the qualitative contribution of their physical fitness [1-3].

Sports performances of archers in winter championships allow assessing the quality level of their implementation during the preparatory period, determining the vector of training impacts in the training process management system of the main competitive season.

The winter archery program differs from the summer 18 m distance, held in a closed hall. Athletes shoot twice at a distance of 18 m, according to the sum of which points are calculated (qualification round). Archers then perform individual pair shootings, which are scored according to the best hit from the three series.

Taking into account the short length of the distance in the winter program of performances, the center of the target is limited to a hole of the maximum value of 10 points.

Evaluation of the effectiveness of sports performances at the winter championship allows you to evaluate the density of the results of the leading team, the accuracy of hits, their variability and the level of their technical preparedness.

Objective of the study was to evaluate the effectiveness of athletes' sports implementation at the beginning of the preparatory period.

Methods and structure of the study. The work is based on the study and analysis of the protocols of competitive performances of archers at the Russian winter championship. Mathematical methods for calculating the obtained data were used: calculation of Student's t-test and coefficient of variation.

Results of the study and their discussion. The winter program of sports performances of athletes is focused on the assessment of special preparedness within the preparatory period before the summer archery program.

44 teams took part in the Russian championship, with a total of 213 athletes, including 122 men and 91 women. The performances of the athletes were ranked in accordance with the passage of the first and second distances of 18 m of the qualifying round, the sum of points, the total number of holes of the highest value of 10 points and 9 points. Individual performances of athletes were ranked according to the results of passing sets and final firing.

The results of sports performances were studied according to the protocols of the competition (the first 32 places). The report presents the results of evaluating the effectiveness of the competitive activity of the qualifying round (men and women) (Table 1).

The coefficient of variation of the considered amount of points during the passage of the qualifying round is more pronounced in women, in whose group the greatest variability is noted in holes corresponding to 10 and 9 points, which is reflected in the reduced accuracy of their hits. Also noteworthy is the pronounced variability of a 9-point hole in men, which is 1.2 times higher than in women (22.9% and 18.3%, respectively), which also reflects the low stability of hits.

Based on the results of the qualifying round, the effectiveness of the competitive performances of the first three leaders for men and women of the first and second rounds of the qualifying round at a distance of 18 m was assessed (Table 2).

An analysis of the effectiveness of shooting at the Russian Championship in the qualifying round showed the following results:

- in men, the difference in the performance of the three winners of the first and second rounds (at a distance of 18 m), on average, was 0.7 points (296.7±0.6 vs. 296.0±0), while in the first round of passing the distance the reliability of hits was noted only after the 11th participant of the competition (t=4.4), and in the second round the reliability of hits was noted after the 6th participant (t=4.0), which indicates an increase in the density of the results of the leading team during the second round of the distance ;

- for women, the difference in the performance of the top three winners of the first and second rounds (at a distance of 18 m), on average, was 2.0 points (292.0±2.0 versus 294.0±1.0), while in the first round of passing the distance the reliability of hits was noted only after the 14th participant of the competition (t=2.1), and in the second round the reliability of hits was noted only after the 17th participant (t=2.0), which indicates a low density of the results of the leading women during the second distance circle;

– the dynamics of the amount of hits in men showed a high density of the results of the first 13 participants, as evidenced by the reliability of the differences in the analyzed result (t=3.1);

– in women, the dynamics of the amount of hits showed a low density of results, as evidenced by the reliability of differences in the analyzed indicators after the 24th participant of the competition (t=5.0);

- in men, the total number of holes with a value of 10 points only after the 17th participant indicates their significant difference (t=4.8);

– in women, the difference in the total number of holes, worth 10 points, already after the 10th participant has a significant difference (t=3.0).

The leading positions of the first three winners of the qualifying round indicate the heterogeneity of their special preparedness, as evidenced by the indicators of the first three positions of the first and second rounds at a distance of 18 m (Table 3).

Table 1. *Protocol of sports performances of men and women*

Indicators	Distance		Sum of points	Hole, points	
	First round, 18 m	Second round, 18 m		10	9
Men					
X	291,2	291,7	582,8	44,0	14,8
σ	3,1	2,5	4,5	3,8	3,4
V, %	1,06	0,8	0,7	8,6	22,9
Women					
X	286,2	280,4	570,9	35,8	20,2
σ	5,3	21,9	7,9	5	3,7
V, %	1,8	7,8	1,3	13,9	18,3

Note: X - average value; σ is the standard deviation; V - coefficient of variation.

Table 2. *Evaluation of the effectiveness of competitive performances of archery at the Russian Championship (winter program)*

Indicators		Places			
		Men		Women	
Places by rank		n_1=3	n_2=11	n_3=3	n_4= 14
1 circle, 18 m	X	296,7	293,6	292,0	289,4
	σ	0,6	2,2	2,0	1,8
p≤0,05	t	4,4		2,1	
Places by rank		n = 3	n = 6	n = 3	n = 17
2 circle, 18 m	X	296,0	294,8	294,0	277,8
	σ	0	1,0	1,0	32,8
p≤0,05	t	4,0		2,0	
Places by rank		n = 3	n = 13	n = 3	n = 24
Final result	X	590,3	587,2	583,3	579,8
	σ	1,5	2,4	1.2	2,5
p≤0,05	t	3,1		5,0	
Places by rank		n = 3	n = 17	n = 3	n = 10
The hole is 10 points	X	50,7	46,8	44,7	42,3
	σ	1,2	2,7	1,2	1,8
p≤0,05	t	4,8		3,0	

Note: X - average value; σ is the standard deviation

The results of the performances indicate a high density of hits in the top three, with men on average higher than women. It should be noted that the leaders of the qualifying round of the second round, both in men and women, showed significant differences in the greater direction (t=4.5 and t=5.3, respectively), which indicates the importance of the competitive implementation of the second round.

C**onclusions.** Evaluation of the effectiveness of sports implementation at the beginning of the preparatory period made it possible to determine the leading and limiting indicators of the special preparedness of archers based on the results of competitive implementation.

The performed study indicates the heterogeneity of the technical readiness of the top three leaders of the Russian Championship, the difference in indicators of which differs between the first passage of a distance of 18 m and the second.

It is noted that the average results of the top three leaders of the first round are lower than the average results of the leaders of the second round of the qualifying round, which indicates a different level of special preparedness of athletes, both in men and women.

Passing the second round of the qualifying round requires the manifestation of special endurance, which indicates the need to maintain it among the leaders of the first round.

On the contrary, insufficient implementation in the first round of the leaders of the second round indicates an insufficient level of “training”, which requires a longer warm-up before entering the start of the qualifying round.

Table 3. *Difference in the indicators of the leaders of the qualifying round when passing the first and second rounds of the 18 m distance*

Leaders of the first circle of the qualifying round				Leaders of the second circle of the qualifying round			
Place	Result	Place	Result	Place	Result	Place	Result
first circle		second circle		first circle		second circle	
Men							
1	297	4	295	18	291	1	296
2	297	36	287	28	289	2	296
3	296	5	294	8	293	3	296
X	296,7	-	292,0	-	291,0	-	296,0
σ	0,5	-	4,4	-	2	-	0
t	1,9			4,5			
Women							
1	994	12	288	7	289	1	295
2	992	8	289	13	290	2	294
3	290	2	294	19	287	3	293
X	292,0	-	290,3	-	288,7	-	294,0
σ	2,0	-	3,2	-	1,5	-	1,0
t	0,8			5,3			

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The effectiveness of the model of the pre-competitive stage of training highly qualified goalkeepers in beach soccer

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Abstract

Objective of the study was to theoretically develop, experimentally substantiate and evaluate the effectiveness of the model of the pre-competitive stage of training highly qualified goalkeepers in beach soccer.

Methods and structure of the study. The experiment was carried out for three years from 2018-2021 on the basis of professional beach soccer clubs participating in the Super League and the First Division of the Russian Championship. The scientific study included four stages. The solution of the tasks set was carried out in the process of explanatory research, in which 24 highly qualified beach soccer goalkeepers with qualifications from Candidate Master of Sports to International Master of Sports of Russia took part.

Results and conclusions. The presented data give grounds to assert that the model of the pre-competitive stage of training highly qualified goalkeepers in beach football, developed and implemented in the annual cycle, which includes target, content, procedural and control modules for optimizing the content of training sessions and pre-game warm-up, can significantly improve the qualitative and quantitative characteristics of game actions and as a result, the level of sportsmanship.

Keywords: *beach soccer, highly qualified athletes, goalkeeper, model, pre-competition stage of preparation.*

Introduction. The organization of sports training in modern varieties of football includes a fairly rich scientific and methodological material, however, in the existing works, the main attention is reduced to the problem of training field players and only in some cases the issues of training goalkeepers are touched upon [1, 3].

An analysis of the data of special literature [2, 4, 5] shows that at present, a small number of works are given to the means and methods of organizing training sessions and warming up goalkeepers in beach football, which, in addition, do not have experimental justification. Basically, all the available scientific and methodological material on the training of goalkeepers comes down to optimizing physical and technical-tactical training at various stages of training.

The lack of different approaches to the organization of the pre-competitive stage of training highly qualified goalkeepers in beach soccer is the main drawback that hinders the improvement of sportsmanship of modern professional players.

Objective of the study was to theoretically develop, experimentally substantiate and evaluate the effectiveness of the model of the pre-competitive stage of training highly qualified goalkeepers in beach soccer.

Methods and structure of the study. The experiment was carried out for three years from 2018-2021. on the basis of professional beach soccer clubs participating in the Super League and the First Division of the Russian Championship. The scientific study included four stages. The solution of the tasks set was carried out in the process of explanatory research, in which 24 highly qualified beach soccer goalkeepers with qualifications from Candidate Master of Sports to International Master of Sports of Russia took part.

Results of the study and their discussion. The experimental model of the pre-competitive stage of training highly qualified goalkeepers in beach soccer includes four modules: target, content, procedural and control, which determine each other and solve the main task, which is to achieve the optimal level of preparedness for key competitive starts.

As the data show (Figure 1), game actions performed by goalkeepers with both hands in highly qualified goalkeepers of the control (CG) and experimental (EG) groups have the highest value in the first half - 525.7±40.3 and 530.2±41, 0 times than in the third - 368.4±30.3 and 372.6±31.5 times ($p>0.05$), respectively, with the game efficiency over 75%.

It is necessary to pay attention to the fact that highly qualified goalkeepers from the EG let balls into their own nets significantly less during the competitive period, both in the first and third halves – 46.1±4.4 and 61.3±5.6 times than CG athletes – 68.3±6.1 and 87.4±8.0 times, respectively ($p<0.05$).

The study of the organization of attacking actions by the goalkeeper showed that the athletes from the EG in the process of the formative pedagogical experiment significantly increase the accuracy of putting the ball into the game with the foot and hand in the third half by 5.4±0.4 and 6.2±0.3 times, respectively ($p<0.095$, Fig. 2).

The results of the study of the control group indicate that among highly qualified goalkeepers, the accuracy of putting the ball into the game with the foot in the third half increases slightly ($p>0.05$), and significantly decreases with the hand ($p<0.05$). It is quite characteristic that highly qualified goalkeepers from the EG in the third half have an increase in the number of shots on goal, while in the CG there is a slight decrease ($p>0.05$).

Conclusions. The presented data give grounds to assert that the model of the pre-competitive stage of training highly qualified goalkeepers in beach football, developed and implemented in the annual cycle, which includes target, content, procedural and control modules for optimizing the content of training sessions and pre-game warm-up, can significantly improve the qualitative and quantitative characteristics of game actions and as a result, the level of sportsmanship.

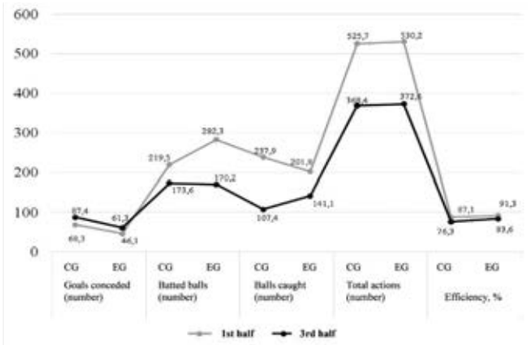

Figure 1. *Comparative analysis of indicators of two-handed playing actions for highly qualified goalkeepers from the CG and the EG*

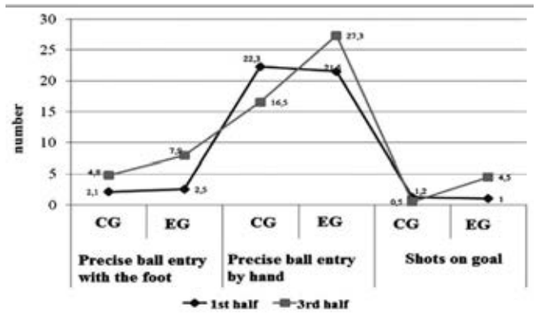

Figure 2. *Comparative analysis of indicators of game actions when organizing an attack for highly qualified goalkeepers from the CG and the EG*

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Features of the aerobic energy supply system as a result of the activity of the cardiorespiratory system

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Abstract

Objective of the study was to identify the features of the aerobic energy supply system as a result of the activity of the cardiorespiratory system, depending on the age of athletes involved in cyclic sports, during bicycle ergometric testing.

Methods and structure of the study. The subjects were athletes involved in endurance sports and, depending on age, the following groups of subjects were formed: 15-16 years old, 17-21 years old, 22-35 years old and 36-60 years old. All of them performed work on a bicycle ergometer with a power of 50, 100, 150 and 200 watts. Each stage of the load lasted 3 minutes, during which the differential rheogram according to Kubizek was recorded, modified by Yu.S. Vanyushin et al., and the indicators of the cardiovascular system were determined: heart rate, stroke volume, minute volume of blood circulation. With the help of a pneumotachograph, indicators of external respiration were determined: respiratory rate, tidal volume, minute respiratory volume. The oxygen utilization coefficient was calculated according to the generally accepted formula.

Results and conclusions. A comprehensive study of the process of adaptation of the cardiorespiratory system of athletes of different ages involved in endurance sports allowed us to identify the possibilities of the aerobic method of energy supply, which depends on the age of the athletes.

In athletes aged 15-16 and 36-60 years, according to the results of our research, it is advisable to develop an external respiration system aimed at increasing the minute volume of respiration, since in this case the aerobic method of energy supply functions better.

Athletes aged 17-21 years should develop a circulatory system that increases the performance of the pumping function of the heart (stroke volume, minute volume of blood), which affects the ability of the heart to eject a larger volume of blood. This will have a positive effect on the aerobic way of energy supply.

Athletes aged 22-35 years should stimulate the gas exchange function associated with an increase in the oxygen utilization factor (UFO2), which is the most optimal. In athletes of this age, apparently, it is advisable to develop this particular method of energy supply.

Keywords: *cardiorespiratory system, exercise, respiration, blood circulation, gas exchange, athletes.*

Introduction. It is expedient to consider functional systems and their functions in connection with ideas about the features and patterns of development of the adaptation process [1, 6, 7]. In the functional systems themselves, transformations occur that contribute to the adaptation process [5, 8, 9], that is, there is a relationship between functional systems and the adaptation process:

Functional → Adaptation
systems ←

Adaptation, as a process of adapting functional systems to motor activity, has attracted numerous minds of scientists for decades. This was based on the approaches of P.K. Anokhin [1] in the study of functional systems and the concept of A.A. Ukhtomsky [10] about the dominant focus of excitation in the CNS, the readiness of the organism for a certain type of activity when other foci of excitation, insignificant for a given period of time, are inhibited. PC. Anokhin [1] believed that “a functional system is understood as such a dynamic organization of the structures and processes of the body, which involves them regardless of the anatomical, tissue and physiological certainty.” In his opinion, in this case, one of the criteria for the involvement of components in a particular system is “the ability to contribute to obtaining the final adaptive result.”

Currently, one of the most important functional systems that can contribute to obtaining the final adaptive result, namely, providing the body with oxygen, is the oxygen transport system, or a system that represents the totality of respiratory and circulatory functions, that is, the cardiorespiratory system. It should be attributed to the systems of the first type, the activity of which is aimed at maintaining the constancy of the internal environment of the body. Systems of the second type contribute to the implementation of behavioral acts, which is an important component not only for optimizing the process of sports training, but also for the development of the entire theory and practice of physical education and sports [8, 13, 15].

Considering the cardiorespiratory system, it is necessary to pay attention to the fact that its activity is associated with aerobic energy supply, which is important for the development and improvement of endurance. Especially if sports exercises are related to cyclic sports. With an aerobic energy supply system, the formation of ATP in muscles (mitochondria) occurs with the participation of oxygen. As a result, high efficiency is observed and there are no harmful decomposition products. Such shortcomings are observed in anaerobic alactate and anaerobic lactate energy supply systems [8].

Objective of the study was to identify the features of the aerobic energy supply system as a result of the activity of the cardiorespiratory system, depending on the age of athletes involved in cyclic sports, during bicycle ergometric testing.

Methods and structure of the study. The subjects were athletes involved in endurance sports and, depending on age, the following groups of subjects were formed: 15-16 years old, 17-21 years old, 22-35 years old and 36-60 years old. All of them performed work on a bicycle ergometer with a power of 50, 100, 150 and 200 watts. Each load step lasted three minutes, during which a differential rheogram was recorded according to Kubitschek [14], modified by Yu.S. Vanyushina et al. [2, 3], and indicators of the cardiovascular system were determined: heart rate (HR), stroke volume (SV), minute volume of blood (MVB). With the help of a pneumotachograph, external respiration indicators were determined: respiratory rate (RR), respiratory volume (RV), respiratory minute volume (RMV). The oxygen utilization factor (UFO_2) was calculated according to the generally accepted formula [11].

Results of the study and their discussion. When analyzing the activity of functional systems of the first type, which are homeostatic, one should pay attention to the cardiorespiratory system, whose work is aimed at providing the body with oxygen necessary for aerobic energy supply. This circumstance plays a key role in the development and improvement of general endurance. This is especially true for those athletes who are involved in cyclic sports associated with the development of endurance, as well as those who care about their health, developing endurance to improve physical performance and increase the level of life. Therefore, in a comprehensive study of the process of adaptation of the cardiorespiratory system of athletes, it was not by chance that we chose such a wide age range: from 15 to 60 years.

Previous studies [4] considered several areas related to the study of the cardiorespiratory system. In this work, we want to dwell on the direction that is relevant for athletes developing endurance, namely, on supplying their body with oxygen for the process of energy supply through aerobic reactions. For this purpose, we selected a contingent of subjects involved in endurance sports, and proposed a test load in the form of work on a bicycle ergometer from 50 to 200 W. Every 50 W and 3 min, the load gradually increased, which, in our opinion, will help to identify the predominant reactions from the cardiovascular and respiratory systems in athletes of different ages (Table 1).

During muscular activity, as is known, the activity of almost all visceral systems of the body is noted, which is associated with increased oxygenation and the flow of nutrients to working muscles. Consequently, the capabilities of the oxygen transport system increase, which affects the ability of the heart, as a pump, to pump a significant amount of blood and the work of the respiratory system.

The most preferred response in athletes aged 22-35 years was the reaction with an increase in the oxygen utilization factor (UFO_2), which indicates a more rational energy supply to the body of athletes when performing endurance work. The next type of reaction capable of satisfying the oxygen demand when working on a bicycle ergometer was an increase in the parameters of the cardiovascular system, to which we attributed the minute volume of blood circulation (MVB). This was noted in male athletes aged 17-21 years, which was 20.38 ± 0.46 l/min at a load of 200 W. In highly qualified athletes, this indicator, as a rule, reaches 40–45 l/min [12]. From

Table 1. *Indicators of a comprehensive study of the process of adaptation of the cardiorespiratory system of athletes of different ages involved in endurance sports*

Load	Indicators	Groups of athletes			
		15-16 years old	17-21 years old	22-35 years old	36-60years old
Initial state	HR	77.51±4.63	62.20±2.14+	65.29±2.19*	65.40±2.07v
	SV	62.55±3.55	79.37±2.22+	82.28±3.21*	79.32±2.52v
	MVB	4.77±0.28	4.95±0.24	5.29±0.19	5.23±0.27
	RMV	9.37±0.81	10.24±0.40	9.59±0.61	10.15±0.47
	UFO_2	21.36±1.98	22.73±0.82	23.71±1.15	22.44±0.61
50 W	HR	105.62±5.21	90.42±2.09+	85.65±2.09*	87.23±1.75v
	SV	81.09±3.44	106.00±3.82+	115.98±3.68*	101.61±3.95v
	MVB	8.46±0.50	9.62±0.49	9.95±0.44*	8.88±0.42
	RMV	25.76±1.74	22.85±0.87	23.41±1.00	27.25±1.01x
	UFO_2	28.52±1.86	34.30±1.37	34.76±1.03	32.35±0.81
100 W	HR	133.13±6.05	108.79±1.95+	103.86±1.71*	104.16±2.04v
	SV	80.07 ±3.45	122.82±3.69+	131.40±4.17*	117.98±3.65v
	MVB	10.53±0.41	13.30±0.38+	13.59±0.39*	12.22±0.42v
	RMV	40.35±3.04	33.11±1.27+	33.50±1.44*	37.87±0.89x
	UFO_2	33.39±2.02	39.45±1.43+	39.85±1.30*	38.18±0.93x
150 W	HR	161.24±6.25	130.50±2.39+	123.72±2.18*o	125.20±2.39v
	SV	77.83±4.60	129.86±3.30+	141.72±4.95*o	130.80±4.46v
	MVB	12.35±0.56	16.92±0.43+	17.44±0.54*	16.28±0.47v
	RMV	54.15±3.21	45.96±1.28+	46.49±1.60*	56.55±2.15x
	UFO_2	36.35±2.56	43.31±1.28+	43.36±1.20*	39.89±1.03x
200 W	HR	178.10±6.98	151.44±3.09+	142.44±2.82*o	147.32±2.69v
	SV	73.30±5.45	136.31±4.45+	141.19±4.22	129.52±5.55v
	MVB	12.90±0.87	20.38±0.46+	20.03±0.57*	18.93±0.69v
	RMV	68.57±3.84	59.34±1.48+	59.55±1.79*	75.65±3.26x
	UFO_2	40.82±1.64	44.30±1.00	47.64±1.17*0	40.37±1.21x

Note. + – statistical significance of differences between groups 1 and 2; * – statistical significance between groups 1 and 3; v – statistical significance between groups 1 and 4; o – statistical significance between groups 2 and 3; x – statistical significance between groups 2 and 4; . – statistical significance between groups 3 and 4.

this we can conclude that in our studies, a load of 200 W is not intense enough or young athletes have not yet reached the level of high skill in cyclic sports that develop endurance.

In our opinion, a less significant response to exercise performance during bicycle ergometric testing is an increase in external respiration, the main requirement of which is to maintain arterial blood plasma gas homeostasis, adequate to the metabolic needs of the body during exercise. These indicators should include a significant increase in RMV. We observed this reaction from the respiratory system in adolescents aged 15-16 years and veteran athletes aged 36-60 years. This characterizes the activity of their organism on the part of the cardiorespiratory system as uneconomical, capable of consuming significant reserves of the oxygen transport system, in particular, oxygen, which is significantly consumed by the work of the skeletal muscles of the respiratory system.

Therefore, the last type of aerobic energy supply considered by us is considered ineffective. However, age-related features of the maturation of individual parts of the cardiorespiratory system do not always allow the use of other methods of providing the body with oxygen during motor activity. In this regard, in adolescent athletes 15-16 years old, it is necessary to develop and improve the respiratory capabilities of the oxygen transport system to perform aerobic loads that are adequate to the requirements of the body.

Conclusions. Thus, a comprehensive study of the process of adaptation of the cardiorespiratory system of athletes of different ages involved in endurance sports allowed us to identify the possibilities of the aerobic method of energy supply, which depends on the age of the athletes. In athletes aged 15-16 and 36-60 years, according to the results of our research, it is advisable to develop an external respiration system aimed at increasing the RMV, since in this case the aerobic method of energy supply functions better. Athletes aged 17-21 years should develop a circulatory system that increases the performance of the pumping function of the heart (SV, MVB), which affects the ability of the heart to eject a larger volume of blood. This will have a positive effect on the aerobic way of energy supply. Athletes aged 22-35 years have a gas exchange function associated with an increase in the oxygen utilization factor (UFO_2), which is the most optimal. In athletes of this age, apparently, it is advisable to develop this particular method of energy supply.

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Heart functional indicators in hand workers

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Abstract

Objective of the study was to find out the features of the function of the left ventricle of the heart in systematically trained hand-to-hand fighters.

Methods and structure of the study. The observation was made on 23 well-trained hand-to-hand young men with at least four years of uninterrupted sports experience. The control group included 27 healthy male volunteers who had never been involved in physical culture and sports. The examination included an ultrasound assessment of the heart using an SSD-80 Aloka echocardiograph (manufactured in Japan) with the registration of a number of heart parameters. Mathematical processing of the results was performed by Student's t-test by computer data processing.

Results and conclusions. The examined hand-to-hand fighters showed signs of hypertrophy of the left ventricular myocardium, manifested by an increase in its mass and an increase in the thickness of its posterior wall. However, its overall size and cavity volume remained normal. Hand-to-hand fighters were characterized by a high rate of myocardial relaxation, exceeding this indicator in untrained young men. The results obtained allow us to consider that hand-to-hand combat exercises strongly stimulate the entire body. This ensures the development of a physiologically very beneficial increase in the mass of the left ventricular myocardium while maintaining the optimum of its functional characteristics and the normal volume of its cavity.

Keywords: *hand-to-hand combat, heart, left ventricle, hemodynamics, physical training.*

Introduction. Regular muscle loads, including training in hand-to-hand combat, ensure the formation of a number of adaptive, functionally beneficial changes in the body [5, 7]. At the same time, rational systematic muscle loads provide a pronounced stimulation of the main physiological and biochemical parameters, primarily in the musculoskeletal system and life support organs [2]. Under conditions of strict dosing of physical activity, they lead to the development of adaptive phenomena in all internal organs, including the cardiovascular system [6].

Of considerable scientific interest is the effect of regular loads in martial arts on myocardial contractility, the volume of the left ventricle of the heart, and the dynamics of the anteroposterior size of the left ventricular myocardium throughout the cardiac cycle. Their assessment to a large extent can help to assess the dynamics of the functional characteristics of the heart of this category of athletes [9].

It is noticed that in highly trained athletes there is an increase in systolic volume and a change in the size of the left ventricle. At the same time, in beginner athletes, the systolic volume may be even lower than in untrained people [4].

Despite the great physiological significance of heart parameters for sports results, adaptation processes in the heart muscle to systematic sports loads in hand-to-hand fighters have not been studied enough [3].

For a better understanding of the impact of regular training in hand-to-hand combat on the body of athletes, it seems justified to evaluate the morphofunctional parameters of the heart in experienced hand-to-hand combatants [10].

Objective of the study was to find out the features of the function of the left ventricle of the heart in systematically trained hand-to-hand fighters.

Methods and structure of the study. The observation was made on 23 hand-to-hand young men (11 people had the first adult category and 12 young men were candidates for the master of sports of Russia). All athletes were between the ages of 18 and 21. These surveyed regularly trained at least three times a week in the hand-to-hand combat section and had a continuous sports experience of at least four years. The control group included 27 healthy young men (18-21 years old) who agreed to participate in the study and experienced physical activity only during academic physical education classes.

All young men under observation underwent an ultrasound examination of the heart using an ultrasonic device SSD-80 manufactured by Aloka (Japan). Based on the obtained data, the diastolic cardiac volume was calculated [1] and the value of the myocardial mass was determined by the standard method [11].

Mathematical processing of the obtained results was carried out using Student's t-test. The statistical significance of differences in indicators in the compared groups of young men was recorded under the condition $p<0.05$.

Results of the study and their discussion. In the performed scientific study, the features of the heart parameters in hand-to-hand fighters were established and compared with those of the boys in the control group (table). Very pronounced differences between both observed groups were found for the morphological characteristics of the myocardium of the left parts of the heart.

The width of the left atrium in melee fighters tended to exceed by 5.0% over that in the control. In athletes, the anteroposterior diastolic size of the left ventricle had a weak tendency to prevail over that in the control (by 3.1%). Also, a slight tendency to exceed the control level was noted in hand-to-hand fighters in terms of reduction in the anteroposterior value of the left ventricle (by 3.7%).

The thickness of the posterior wall of the ventricle in the left heart at the time of diastole in athletes was 15.2% greater than in the control group ($p<0.05$). The value of the end diastolic volume of their hearts showed a tendency to yield to the control level (by 8.1%), while the magnitude of the stroke volume was comparable in both observation groups.

The index of myocardial mass in athletes was significantly higher (by 17.9%) than in the control group. This indicated a slight adaptive hypertrophy of the myocardium in hand-to-hand fighters, caused by their regular training. However, the presence of signs of hypertrophy did not affect the value of cardiac output, which remains comparable in both groups of the examined young men.

The highest rate of relaxation of the posterior wall of the left heart ventricle, which is an important marker of the functionality of the heart, in hand-to-hand fighters exceeded this indicator by 29.2% in the control group.

Cardiac parameters in the athletes taken into the study

Indicator	Hand-to-hand fighters M±m, n=23	Control, M±m, n=27
Stroke volume, cm^3/kg	1,11±0,15	1,07±0,09
End diastolic volume of the heart, cm^3/kg	1,85±0,12	2,00±0,05
Diastolic thickness of the left ventricle in the posterior wall, cm	1,21±0,06	1,05±0,07 p<0,05
Reduction of the anteroposterior value of the left ventricle, %	34,38±0,75	33,16±0,69
Anteroposterior diastolic size of the left ventricle, cm	5,30±0,12	5,14±0,11
Left atrium width, cm/m^2	1,89±0,06	1,80±0,05
Ratio of end diastolic volume to myocardial mass, cm^3/kg	0,72±0,07	0,93±0,09 p<0,01
The highest rate of relaxation of the left ventricle in the posterior wall, cm/s	13,4±1,33	10,1±0,67 p<0,01
Ejection fraction, %	61,78±1,26	60,33±0,72
Myocardial mass, cm^3/kg	2,54±0,21	2,14±0,12 p<0,05
Ejection fraction, %	61,78±1,26	60,33±0,72

Note: p - significance of differences between groups.

The performed study indicates the comparability of the parameters of the left atrium, as well as the size and volume of the cavity of the left ventricle, in young men of both groups. A similar status had indicators of general hemodynamics and the state of myocardial contractility (except for the highest rate of relaxation of the posterior part of the left ventricle). Under these conditions, the ratio of the end-cardiac diastolic volume to the mass of the myocardium under conditions of regular hand-to-hand combat training turned out to be significantly less than in the control. This should be associated with an increase in the heart muscle of athletes, including in the walls of the left ventricle. The decrease in the ratio of end-diastolic volume to the value of myocardial mass in hand-to-hand fighters to 0.72 ± 0.07 indicates the prevalence of left ventricular hypertrophy in this category of athletes over dilatation of its cavity (see table).

The conducted study gives grounds to assert that hand-to-hand combat leads to the development of a very moderate adaptive hypertrophy of the left ventricular myocardium. This was proved by the found increase in its thickness in the posterior wall and the increased value of its mass at the optimum of its total volume and the volume of its cavity, which did not significantly differ from their values in the control group.

There is a point of view that a high rate of realization of relaxation phenomena in myocardiocytes is characteristic of physically trained people [11]. At the same time, the maximum rate of myocardial relaxation in the posterior wall of the left ventricle during diastole can be considered as a marker of a high level of physical fitness [12]. These literary data are quite consistent with the results of the work performed, which demonstrated a higher level of this indicator in hand-to-hand fighters. At the same time, there is a point of view that this parameter is very dynamic even in the course of one observation [10], which does not allow it to be considered as a reliable indicator for serious conclusions. This circumstance requires further research to clarify this issue among hand-to-hand fighters.

C**onclusions.** Systematic, feasible training in hand-to-hand combat has a very positive effect on the work of the heart. Regular long-term loads during hand-to-hand combat training form functionally very beneficial changes in the myocardium in athletes. In experienced hand-to-hand fighters, there is a slight increase in the muscle mass of the left ventricle while maintaining its functionality and the size of the cavity volume.

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Age dynamics of the maximum alactate power of highly qualified hockey players

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Abstract

Objective of the study was to evaluate the dynamics of maximum alactic power (MAP) as the main indicator of the speed-strength fitness of hockey players and to identify its relationship with the age of athletes.

Methods and structure of the study. The work was carried out on the example of hockey players (n=11, field hockey), who underwent regular testing for 14 years. To assess this indicator in laboratory studies, a modified Wengate test was used.

Results and conclusions. Testing of the index of maximum alactic power (MAP) of highly qualified field hockey players conducted over 14 years allows us to speak about the dynamics of an increase in the level of speed-strength fitness of the muscles of the lower extremities in the process of ontogenesis in all the studied athletes, which is confirmed by the results of regression (an increase in R2 from 0.51 to 0.80) and correlation ($p<0.01$) analyses.

Adequate construction of the training process for athletes under the age of 40 contributes to an increase in the indicator of maximum alactic power.

Keywords: *field hockey, maximum alactic power, athlete's age.*

Introduction. In most team sports, to achieve high results, the manifestation of functional capabilities is required: maximum alactic power, maximum oxygen consumption at the level of aerobic and anaerobic thresholds, and other indicators [2, 4]. Studies of the indicator of the maximum alactic power of athletes using the Wengate test are widely used in the practice of elite sports [1, 3, 5]. But, unfortunately, these studies are carried out sporadically.

Objective of the study was to evaluate the dynamics of maximum alactic power (MAP) as the main indicator of the speed-strength fitness of hockey players and to identify its relationship with the age of athletes.

Methods and structure of the study. In the period from 2004 to 2017, 19 laboratory examinations were conducted, in which 80 hockey players with qualifications from the first sports category to the international class master of sports took part. We selected athletes who passed at least 10 tests (Table 1). Among 11 athletes - eight masters of sports of Russia of international class and three masters of sports of the Russian Federation.

Testing was carried out at various stages of the annual training cycle in the laboratory of fundamental problems of the theory of physical and technical training of the Russian State University of Physical Culture (RSUPESY&T) from 2004 to 2007, and from 2008 to 2017 - in the research laboratory "Information Technologies in Sports" Moscow Institute of Physics and Technology (MIPT). The standardization of studies for 14 years was fully respected.

Functional testing methodology: The subjects performed two tests in succession. First step test on the Monark 894 Peak Bike. Heart rate (HR) and pulmonary ventilation (PV) were recorded, exhaled air was sampled and analyzed using a METAMAX (Cortex) device made in Germany. The power of aerobic and anaerobic thresholds (AeT, AnT), as well as oxygen consumption (OC) and heart rate were estimated by changing the rate of pulmonary ventilation and the respiratory coefficient. The indicators of maximum oxygen consumption (MOC) and potential maximum possible oxygen consumption (MOC), oxygen consumption at the level of AeP and AnP were calculated. Then, after recovery (3–5 min), the main test was performed to determine the maximum alactic power (MAP) in the form of sprint acceleration on the same bicycle ergometer (a variant of the Wengate test). The load for hockey players was determined taking into account body weight: Load (Newtons) = 0.9 body weight. The hockey player without load starts pedaling, trying to gradually increase the pace. The load is gradually added. When the rate of 80-90 rpm is reached, the subject is given a command and the maximum load for this athlete is set. After that, the subject must pedal as quickly as possible in order to show the maximum pace in the range of 130-150 rpm in 5-7 s, and as soon as the pace starts to decrease, the test stops. In this case, the maximum values of the rate and power are fixed, which is defined as the maximum alactic power (MAP).

Methods of mathematical statistics: Standard methods of statistical data processing were used: determination of the sample mean (M), standard deviation (б) and coefficient of variation (V%). Linear regression and correlation analysis made it possible to evaluate the relationship between parameters by calculating the Pearson correlation coefficient. All processing was carried out in an Excel spreadsheet environment. In the same place, scatter diagrams were constructed, which displayed the dependence of the index of maximum alactic power (MAP) on age for each of the subjects with the calculation of the regression equation for this dependence and the coefficient of determination R2.

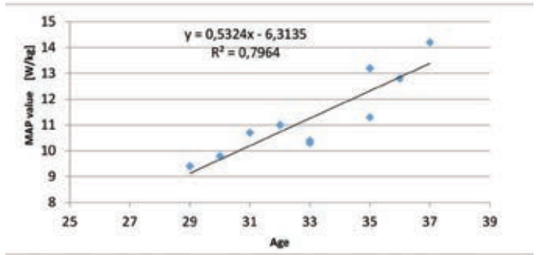
Results of the study and their discussion. The results of a linear regression analysis between the independent variable - the athlete's age (predictor) and the dependent variable - the indicator of maximum alactic power (MAP, W/kg) are presented in the form of scatter plots, an example is shown in fig. 1. In parentheses is the age of the subject at the time of the last examination. In all cases, we see a trend towards a linear increase in the values of the MAM variable, depending on the increase in the age of the athlete. The values of the obtained R2 values from 0.51 (Zhi-ov, 34 years old) to 0.80 (Lo-ov,

Table 1. *Age, role, terms of stay in the team of hockey players who have passed 10 or more tests*

Player	Age at first examination	Role	Length of time on the team, years	Number of examinations
Che-ov	17	Defender	2004-2016	18
Lo-ov	17	Defender	2004-1017	17
Go-ov	17	Midfielder	2004-2017	16
Mo-ov	20	Defender	2004-2017	15
Az-ov	18	Forward	2004-2017	14
La-ov	16	Defender	2004-2017	14
Zhi-ov	20	Forward	2004-2017	12
Ku-ev	15	Defender	2006-2017	11
Pl-ov	30	Forward	2004-2011	10
Ma-in	23	Forward	2004-2010	10
Go-ev	16	Forward	2006-2011	10

Table 2. *Results of correlation and regression analysis of the dependence of the maximum alactic power on the age of the athlete*

Sportsman	Average age, years	Athlete's age at the end of the study period, years	Average MAP value (W/kg) M± б	Pearson correlation coefficient	Bilateral correlation. level significance:	Regression coefficient, R^2
Pl-ov	33.1	43	11.3±1.58	**0,892**	< **0,01**	0,796
Ma-in	26,1	36	12,3±1,14	**0,806**	< **0,01**	0,649
Zhi-ov	25,5	34	12,7±1,53	**0,718**	< **0,01**	0,515
Mo-ov	27,5	34	14,6±1,81	**0,787**	< **0,01**	0,618
Az-ov	25,3	32	12,7±1,79	**0,859**	< **0,01**	0,738
Lo-ov	25,5	30	12,7±1,53	**0,820**	< **0,01**	0,672
Go-ov	22,2	30	14,6±1,85	**0,816**	< **0,01**	0,665
Che-ov	22,9	30	13,6±1,16	**0,825**	< **0,01**	0,680
La-ov	22,3	29	13,6±1,67	**0,895**	< **0,01**	0,800
Go-ev	18,8	27	13,7±1,24	**0,864**	< **0,01**	0,750
Ku-ev	19,7	25	13,4±1,44	**0,864**	< **0,01**	0,751



The results of a linear regression analysis between the independent variable-athlete age (predictor) and the dependent variable, Pl-ov, 43 years old

29 years old) indicate a fairly good approximation of the MAP dependence on the age of the athletes. The coefficients in the presented linear regression equations are statistically significant at $p<0.05$ and above.

To confirm the trend of dependence of the increase in MAP with the age of hockey players, we conducted a Pearson correlation analysis. The results of the correlation analysis and some statistical values are presented in Table 2.

The results of the correlation analysis showed a close relationship between the growth dynamics of the desired indicators, with a high degree of reliability $p<0.01$ for all athletes. The initial age differences of the studied athletes from 15 to 30 years (Table 1) and various individual relative values of MAP from 11.3±1.58 to 14.6±1.85 W/kg (Table 2) for the dynamics of the results of the increase in speed -strength abilities had no effect. We have found that with age, the athlete increases the speed-strength readiness of the muscles of the lower extremities. It can be assumed that this relates to the strength component to a greater extent, due to the number of recruited muscle fibers, the number of myofibrils, and the average ATPase activity of myosin in them [6].

Presented in table 2 values of R2 in a paired linear relationship can be interpreted as coefficients of determination, which characterize the share of change in one of the indicators when the other changes. Therefore, in our case, it can be argued that changes in the age of athletes by more than 0.5 (50%) determine changes in MAP indicators. That is, an adequate construction of the training process for athletes under the age of 40 contributes to an increase in the indicator of maximum alactic power (MAP).

C**onclusions.** Testing of the index of maximum alactic power of highly qualified field hockey players conducted over 14 years allows us to speak about the dynamics of an increase in the level of speed-strength fitness of the muscles of the lower extremities in the process of ontogenesis in all the studied athletes, which is confirmed by the results of regression (an increase in R2 from 0.51 to 0.80) and correlation ($p<0.01$) analyses.

The initial age of the studied athletes was 15-30 years and the individual relative MAP values of hockey players of various roles during the first tests did not affect the subsequent dynamics of the results of the increase in speed-strength abilities.

Adequate construction of the training process for athletes under the age of 40 contributes to an increase in the indicator of maximum alactic power.

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Anticipation as a conscious acceleration of response time under conditions of initiative and counteraction with the enemy

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Abstract

Objective of the study was to consider the effect of anticipation on the performance of certain mental functions aimed at: reducing the response time to the enemy's influences; to reduce the time for the use of combat actions (methods) due to earlier determination of the moment of the start of an attack and automation of responses to a trigger signal.

Methods and structure of the study. The study of the influence of ideomotor representations of the performance of deliberate combat actions led to the understanding of anticipation as a phenomenon characteristic of almost all mental processes of controlling motor actions. Anticipation allows, before the appearance of a favorable situation or a pre-launch and trigger signal, to already carry out mental and motor preparation for combat.

Results and conclusions. As a result of the use of impromptu combat actions, anticipation makes it possible to reduce the time of the launch reaction to enemy actions, to change the temporal structure and duration of mental processes that accompany the response in combat (competitive) countermeasures. Understanding the patterns of controlling the speed of one's own reactions in combat interaction allows the athlete to respond most quickly to the trigger signal.

Keywords: *anticipation, self-order, starting reaction, moment of attack start, anticipation, pre-launch and starting signal.*

Introduction. The concept of anticipation as a mental function of the brain found its justification in the works of N.A. Bernstein as a model of the required future and in the works of A.K. Anokhin as an acceptor of the result of an action.

Anticipation is an anticipatory projection of situations and actions and, accordingly, all mental functions associated both with the acceleration of "self-order" (a conscious trigger command) to apply actions, and with the performance of response actions on a trigger signal.

Anticipation acts as a universal brain function that allows an athlete in conflict interaction with an opponent to anticipate his actions with some lead in time before they are performed [2, 4]. The manifestation of anticipation in psychomotor actions (by analogy with reactions that are response actions, psychomotor actions are opposite to them and are initiative actions) allows the athlete to anticipate not only the impact of the opponent, but also mentally unfold his intentions in the future, which, in fact, is the initial problem timing research in the field of accelerating arbitrary response in conflict situations. In the process of improvement, timing is automated and applied both intuitively and consciously when solving mental problems in micro time intervals [3].

Under timing (from English timing - timing - timing; timing; regulation) in martial arts, we understand the

temporal structure of combat opposition, as well as the regulation and selection of temporal parameters for the use of combat (competitive) actions in conflict interaction with the enemy.

Timing allows you to solve two types of main tasks: 1) immediate - choosing the moment the attack begins; slowing down enemy responses; acceleration of own response; 2) indirect - simultaneous attack in several directions; using the inertia of the body, both one's own and the opponent's; use of positioning with the enemy.

In martial arts, the performance of combat actions at important competitions is most often carried out in micro-intervals of time and requires the athlete to respond as quickly as possible from the moment a favorable situation arises for the start of an attack to the starting start of the use of a combat action (reception). In a fight (duel), the time of performing motor actions is perceived by athletes in different ways, for some the movements seem slow, but for some they simply flicker "like in a movie". This is primarily due to the work of the brain, that is, with the arbitrary perception of martial arts with the enemy in micro-intervals of time, which ensures the transformation of sensory information into a perceptual image of the current conflict situation of the fight that is realized by the athlete [1]. At the same time, it is of great importance that interference can be introduced into this work of the opponent's brain, which disrupts his work and leads to slowdowns in the application of competitive actions or, in general, to the loss of the adequacy of these actions in the current conflict situation of the fight. At the same time, the work of your brain can be accelerated by certain techniques, mainly related to the anticipation of conflict interaction with the opponent during the fight.

Objective of the study was to consider the effect of anticipation on the performance of certain mental functions aimed at: reducing the response time to the enemy's influences; to reduce the time for the use of combat actions (methods) due to earlier determination of the moment of the start of an attack and automation of responses to a trigger signal.

Methods and structure of the study. The study of the influence of ideomotor representations of the performance of deliberate combat actions led to the understanding of anticipation as a phenomenon characteristic of almost all mental processes of controlling motor actions. This allows, before the appearance of a favorable situation or a pre-launch and trigger signal, to already carry out mental (entering the state of starting readiness) and motor (for example, creating a starting position with the enemy, favorable capture) preparation for combat (competitive) action [2].

The use of a self-order (in which, as it were, you give yourself a "go-ahead", that is, a command to start applying an action) a pre-expected signal, read by characteristic information features (objects of attention), to identify the right moment to launch a trigger signal to perform a competitive action, allows you to do anticipation of a controlled one and apply a motor action (initiative) in a timely manner or even ahead of the moment of the beginning of counteraction [2]. Characteristic information features (objects of attention), as a rule, are determined in the process of preliminary observation of the competitive activity of a potential opponent.

The speed capabilities of an athlete, manifested in combat counteractions and interactions, to a large extent depend not only on the timely recognition of the moment of application of attack and defense actions, but also on those mental processes, the totality of which is carried out in his mental activity during the fight.

The first in importance for the successful conduct of a fight is the prediction of the development of a conflict situation in a duel, its anticipation and entry into a heightened response associated with the implementation of a certain intention when recognizing a trigger signal for the application of a competitive action.

When using deliberate actions, athletes in the course of the latent period of reaction undergo a long and complex mental activity, which includes: perception and analysis of the current situation of the fight, decision making (selection of a motor program), choice of the moment, self-order, trigger reaction, etc. Beginning athletes are characterized by a long sequence of implementing their intentions to perform deliberate competitive actions (techniques): perception and analysis of the current situation of the fight, recognition of a favorable situation, decision-making when choosing the use of one or another tactical and technical action, determining the moment of attack, self-order. At the same time, beginner athletes often lack the mental state of entering the starting readiness and motor pre-adjustment to the start position and the execution of the technique. It is the choice of combat actions in a favorable situation that takes a lot of time, in contrast to the recognition of a trigger signal by means of anticipation for the application of a specific tactical and technical action. It should be noted that psychomotor reactions differ from sensorimotor reactions primarily in that they are triggered not by a sensory signal, but by the image of a combat (conflict) situation.

However, all this mental activity before the emergence of a favorable situation, which prolongs the reaction, can proceed not only in such a consistent and fully developed form, but also in a collapsed form, which is typical for highly qualified athletes. In the latter case, the athlete's response time will be shorter. At the same time, for timing, the mental mechanisms of anticipatory entry into a heightened response and starting readiness even before the moment the trigger signal is recognized are of key importance.

When carrying out impromptu actions, a highly skilled athlete can foresee a favorable situation in advance during the fight, and the appearance of a perceptual signal (image) becomes a trigger signal, which allows you to achieve the fastest possible response - up to 100 ms. Prior to the use of impromptu actions, the athlete carries out: correlation of a favorable situation with intentions, anticipation of the starting signal. The athlete, having entered the combat (starting) readiness and starting position, performs presetting for action and, upon recognition of the starting signal, attacks in a timely manner.

The pre-signal, as an orientation in the situation, makes it possible to anticipate the starting signal and, being in the starting readiness, perform presetting for the implementation of the starting reaction. It is the pre-signal for the use of combat action by the enemy that is the main factor in the manifestation of anticipation and allows for an early entry into the start (starting position) and attack.

In a trained athlete, the number of components of mental activity is reduced to a starting start (signal) due to the anticipation of the image as a starting signal, which is typical for impromptu actions.

Conclusions. In timing, the reaction time is reduced by recognizing and foreseeing the pre-launch and starting positions of the enemy. In deliberate actions, this is the prediction of favorable situations for the start of an attack for the use of combat (competitive) actions. In terms of consciously accelerating the implementation of impromptu actions to a trigger signal, this means having time to complete all the mental processes that are part of the structure of both psychomotor reactions and psychomotor actions, before entering the starting position, while being in starting (combat) readiness. The athlete reacts with maximum speed to the start signal. Anticipation acts as a mechanism for accelerating psychomotor processes in both the attacking and counterattacking athletes.

The main factor of an athlete's psychomotor readiness is the reduction of reaction time based on anticipation in various conflict interactions in a duel with an opponent. Of particular value is the anticipation of the perceptual image of the triggering signal, which allows you to speed up the process of perception and recognition of the ongoing changes in the current conflict situation of the fight and timely perform tactical and technical actions.

The success of timing training in martial arts is primarily determined by the athlete's sense of micro-intervals of time. It allows the athlete to manage conflict interaction with the opponent in a duel, providing a predictable result of his actions. It depends on the mental abilities of the athlete, since not all of them have the ability to operate with micro time intervals. It is better to teach such athletes tactical actions based on false movements.

In the presented work, extreme cases of building a response (structure (maximum and minimum) of mental activity in the process of response) of athletes in conflict interaction in a duel of combatants are considered: the full structure of a deliberate combat action and the most reduced structure of an impromptu combat action. However, the practice of martial arts is characterized by the existence of a fairly wide range of individual reactions and psychomotor actions, which are due to a different combination and effectiveness of the mental processes involved in the course of the reaction and, accordingly, the time of their implementation.

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System of psychological assistance in self-realization of the personality of the athletes: domestic and foreign approach

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Abstract

Objective of the study was to study domestic and foreign approaches to the system of psychological assistance in the self-realization of the athlete's personality at the stages of many years of sports training.

Methods and structure of the study. The study of the features of the psychological support system in the self-realization of the athlete's personality was carried out by theoretical analysis of scientific, methodological and practical publications of the experience of sports psychologists, the study of web resources for the device of the psychological assistance system on the example of such leading countries as Russia, USA, Germany, Great Britain, Italy, Canada , Japan.

Results and conclusions. Compared to Russia, athletes, parents and coaches abroad have more access to professional support from a sports psychologist. They have the opportunity to choose for themselves the specialist who is most interesting, for example, in terms of education and competence in sports psychology.

To solve the identified problems, the NPO "Association of Sports Psychologists" (ASP), developed a project aimed at creating a system of scientific and methodological support for the professional activities of sports psychologists, educational and educational support, and assistance in creating jobs.

Keywords: *NPO "Association of Sports Psychologists", self-realization of the athlete's personality, psychological support, psychological assistance, domestic and foreign approaches.*

Introduction. The training of an athlete in any kind of sport, without exception, is associated with the solution of a variety of psychological problems that arise in the process of sports activities [4]. At the initial stage, the work of a sports psychologist is more focused on the formation and support of the motivation of young athletes in sports. At the stage of sports specialization, which lasts for several years depending on the sport, attention is directed to the psychological support of the athlete in terms of preventing negative emotional states (anxiety, stress, frustration), etc. At the stage of improving sportsmanship, athletes need psychological help to a greater extent. associated with the formation of a sports career and satisfaction with a sports result. At the stage of higher sportsmanship, they are faced with the problem of finding themselves "at the top of the sports Olympus", or leaving sports and deep anxiety about their future life and self-realization outside of sports activities.

Sometimes, despite the fact that a sports psychologist has done a great job at one of the stages, at the next it turns out to be useless, since the psychological problems of an athlete already have completely different specifics. The approaches used in practice by sports psychologists do not always meet the needs of athletes and coaches. The indicated processes expose the problem of the fragmentation of psychological assistance to athletes observed by us at the stages of many years of sports training.

In many countries, much attention is paid to the organization and scientific and methodological support of versatile psychological assistance to athletes at all stages of training [1]. In Russia, only a few physical culture and sports organizations, children's and youth sports schools have psychologists on their staff who are aware that such support at the stages of preparation should not be built in the form of steps, but “stretched by a thread”. Moreover, in such a way that, despite its diversity and versatility, it was subordinated to a single goal: self-realization of the individual in all its aspects [2, 3], psychological well-being and mental health of the athlete from the initial stage of training until the moment of leaving the sport and beyond.

Objective of the study was to study domestic and foreign approaches to the system of psychological assistance in the self-realization of the athlete's personality at the stages of many years of sports training.

Methods and structure of the study. The study of the features of the psychological support system in the self-realization of the athlete's personality was carried out by theoretical analysis of scientific, methodological and practical publications of the experience of sports psychologists, the study of Internet resources for the device of the psychological assistance system on the example of such leading countries as Russia, USA, Germany, Great Britain, Italy, Canada , Japan. The requirements for the qualification of a sports psychologist, who provides psychological support for participants in sports life, as well as the organization of a system of psychological assistance to athletes at various stages of long-term training, were analyzed.

Results of the study and their discussion. In the foreign countries studied by us, programs of psychological assistance for an athlete specific to sports have been developed and have proven themselves well. The main impact of these programs is aimed at developing psychologically important personal characteristics and mastering the techniques of mental self-regulation by athletes. Sports psychologists are actively working with the parents of young athletes, which increases the effectiveness of psychological impact. The attention of sports psychologists is also directed to improving the psychological competence of coaches. Athletes from the USA, Canada, Great Britain and Japan have free access to psychological support at all stages of their sports career. At any time convenient for themselves, athletes have the opportunity to seek psychological help, get advice and practical advice [1].

The U.S. Olympic and Paralympic Committees have posted on the Team USA ATHLETE SERVICES website information for U.S. Team Athletes to access a roster of proven and highly regarded sports psychologists. Each of them is accompanied by an exhaustive description of skills and abilities, a list of documents on education and qualifications, licenses for educational and psychological activities. It also provides a list of tasks to be solved by a sports psychologist, whether it is increasing stress resistance, strengthening mental health, building relationships in a team, and more. The athlete is provided with a wide choice of specialists and the issues and problems they solve.

Russian athletes and their parents, as well as the coaches themselves, are not accustomed to turning to a sports psychologist "for nothing". They do this only when the situation gets out of control or has already got out of control 1, 5. Moreover, the problem may arise at the initial stage of training, and “shoot” at the stage of sports improvement or higher sportsmanship. The reason and resources for this lie, in our opinion, in the lack of psychological work “for the future” according to the principle of “advanced setting of tasks”, in the poor development of the system of psychological support in the self-realization of the athlete’s personality [2, 3].

It was revealed that sports psychologists in the USA, Canada, Great Britain, Germany, Italy, Japan, in addition to working with athletes, parents and coaches, focus on the mental health of sports personnel not only throughout their sports career, but also at the time of their preparation for leaving sports. sports. In this case, the psychological impact of the psychologist is redirected to the athlete's self-realization in other, non-sporting areas of life. The optimization of self-attitude, self-esteem of an athlete, his resilience, satisfaction with a sports career (even if it is not so successful) and life in general are cultivated.

Conclusions. Compared to Russia, athletes, parents and coaches abroad have more access to professional support from a sports psychologist. They have the opportunity to choose for themselves the specialist who is most interesting, for example, in terms of education and competence in sports psychology. Information about sports psychologists, their professional qualities, work experience, the list of tasks to be solved, documentary support and other information is presented on the websites of foreign organizations, including the Olympic and

Paralympic Committee (USA). It is rather difficult for Russian potential clients to find such information on domestic official websites. Only a few organizations of the physical culture and sports profile offer the services of a sports psychologist. It should be noted that there is a lower level of demand in Russia for the services of sports psychologists on the issues of psychological support for athletes, compared with the countries mentioned above.

To solve the identified problems, the Association of Sports Psychologists (ASP) has developed a project aimed at creating a system of scientific and methodological support for the professional activities of sports psychologists, educational and educational support, and assistance in creating jobs.

ASP currently unites more than 150 specialists from all over Russia and representatives of the countries of the Commonwealth of Independent States (Armenia, Belarus, Kazakhstan). Together, members of the ASP, with the support of the Association of Higher Educational Institutions of Physical Culture and Sports, developed the professional standard "Sports Psychologist". ASP conducts educational events (“Psychological subbotniks”, “Psychological marathons”, “Psychological intensives”), together with partner universities - educational (advanced training, internships) and scientific projects (congresses, conferences, symposiums, seminars) for sports psychologists, coaches, athletes and their parents. The roadmap for the implementation of the project "sports psychologist - a profession of the near future" has been drawn up until 2025. As a result of the project, it is expected to increase the prestige of the profession of sports psychologist, create a system of scientific and methodological support for the professional activities of these specialists, which in turn will lead to a decrease in the level of anxiety among athletes, their parents and coaches, involving people of different ages in sports, improving sports results both in mass and professional sports.

At present, in the conditions of political and economic pressure on sports, the work of the ASP to build a system of psychological assistance in the self-realization of the individual in sports is reaching a new level of development and requires the search for effective evidence-based approaches in this direction.At present, in the conditions of political and economic pressure on sports, the work of the ASP to build a system of psychological assistance in the self-realization of the individual in sports is reaching a new level of development and requires the search for effective evidence-based approaches in this direction.

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Essence and content of informational competence of a future sport coach

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Abstract

Objective of the study was to reveal the essence and content of the information competence of the future sports coach.

Methods and structure of the study. The paper applies a theoretical analysis of scientific papers on the generalization of the classification features of the structure of information competencies of a sports coach.

Results and conclusions. The components of the manifestation of the information competence of a sports coach are shown, which include an understanding of how information and communication technologies (ICT) can support sports and training innovations, as well as the ability to use them and digital tools and equipment to facilitate analytical and sports and training activities in achieving high sports results.

Guided by the recommendations of various standards regarding the main ICT innovations, a system of information competencies of the future sports coach has been developed, among the components of which the essences of electronic educational resources, mobile technologies, "smart" sensors and devices of physical culture and sports orientation, virtual and augmented reality, artificial intelligence and knowledge mining systems (Data Mining) in sports and coaching activities. The scheme of the classification structure of the information competencies of the future sports coach is proposed.

Keywords: *information competence, sports coach, information and communication technologies, classification structure of information competences.*

Introduction. According to the well-established theory of physical culture and sports education, a high level of an athlete’s physical culture involves the integration of its four most important components: physical education, physical development, physical improvement and physical health protection. It is these four components that underlie the work of a sports coach, around which his professional activity is integrated, which means that the search for the most important professional competencies will be based on these elements.

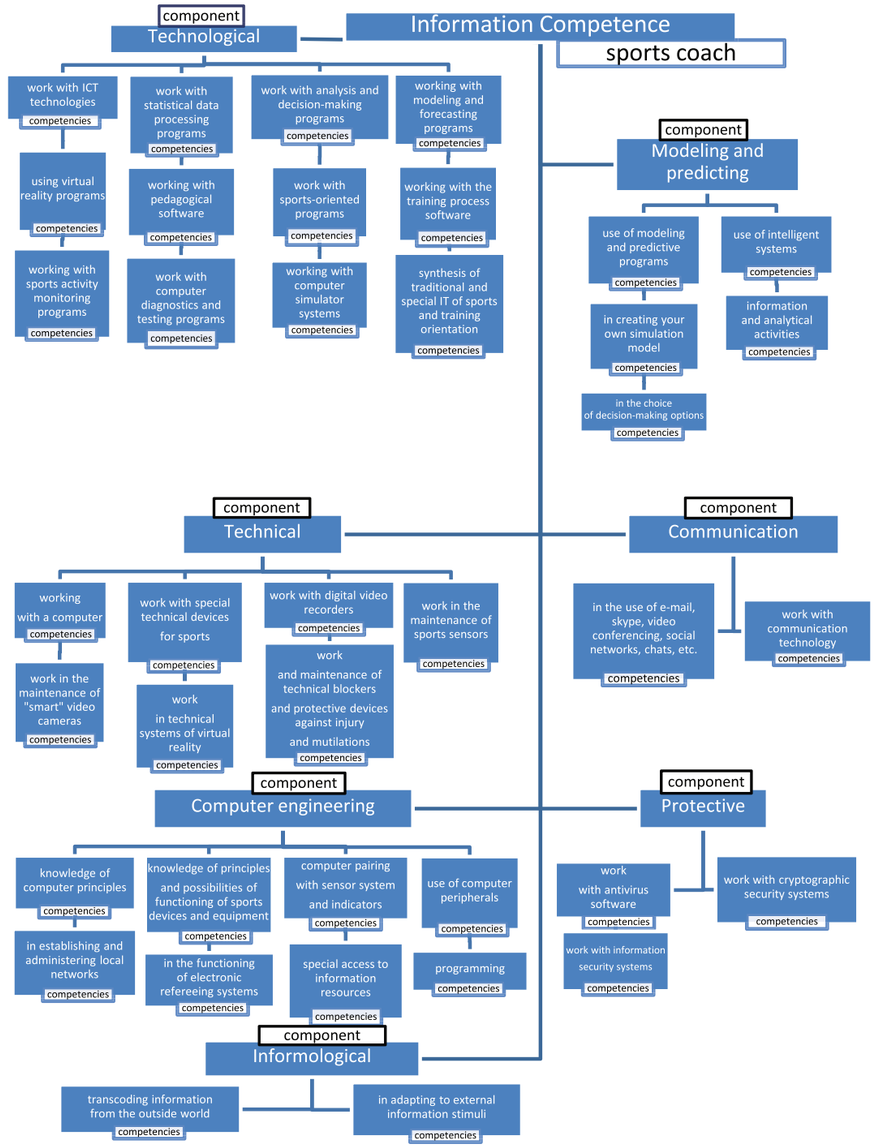
Objective of the study was to reveal the essence and content of the information competence of the future sports coach.

Methods and structure of the study. The paper applies a theoretical analysis of scientific papers on the generalization of the classification features of the structure of information competencies of a sports coach. Let us turn to the state educational standard of higher education 49.04.03 “Sport”, on the basis of which the process of professional training of future sports coaches is built. In it, the groups of categories of general professional competencies of a sports coach include the following areas: *planning of training preparation; sports selection; training of athletes, their education, upbringing, development; management of competitive activities; doping prevention; control and analysis of the preparedness of athletes; scientific research; regulatory and legal activities; organizational and methodological work*. Through information, the material environment of both the training and competitive processes of an athlete is formed.

Currently, pedagogical science has not yet developed a holistic definition of the concept of “information competence”. Many scientists have studied this concept and considered it in different aspects. So, N.I. Gendina, E.V. Danilchuk, S.D. Karakozov, N.I. Kolkova, I.L. Skipor, N.V. Khodyakova and others present it as a component of the information culture of the individu-

al. A.N. Zavyalov sees it as a user component in solving a certain range of professional tasks by means of new information technologies; O.M. Tolstykh includes it in the composition of compensatory, general cultural competence, which is a component of professional competence, as well as the willingness and ability of an individual to use information and communication technologies (ICT) in professional activities.

Most scientists (V.V. Vorobieva, O.A. Kizik, V.I. Petrova, E.V. Shalashov, etc.) understand *information competence* as a set of knowledge, skills and experience for carrying out pedagogical activities in the field of using ICT to collect, storage, transmission, processing of professionally significant information, as well as for the implementation of information interaction between students, those who teach and an interactive learning tool. Summarizing the definitions of most researchers, it can be argued that "information competence" acts either as an *integrative quality of a person*, or as an *integral characteristic of an individual*, or as a *complex individual psychological formation* that functions on the basis of the integration of theoretical knowledge, practical skills and experience.



The structure of information competencies of the future sports coach

Results of the study and their discussion. What are the information competencies of a sports coach? The following manifestations can be distinguished:

– in understanding how ICTs can support sports and training innovations; awareness of the limitations and risks of using these technologies; in understanding the ICT development strategy and its functionality; in knowing how special sports software is used; in the validity of the use of computer techniques and the objectivity of the results of the study; in understanding the significance of the data obtained on the basis of computer technology and digital tools; in knowledge of the legal and ethical principles associated with the use of ICTs;

– in the ability to use ICT and digital tools and equipment to support sports, training and analytical activities, as well as to achieve high sports results; in the ability to use special software of a sports-methodical, biological-physiological and psychological-analytical orientation; in the ability to correctly evaluate digital content coming from the database of competitive events, the Internet and other information systems and complexes; in the ability to protect the necessary information and data received through computer and communication devices; in the ability to use artificial intelligence systems and "smart" robotics;

– in working with ICT on the processing of information-sports and information-training content, which provides for a reflective and critical attitude to incoming information, as well as a safe, ethical and responsible approach to the use of this data.

Guided by the "Recommendations of UNESCO" [3, p. 16-18] regarding the main ICT innovations that should be reflected in the content of training, we will try to adapt them taking into account the pedagogical orientation of the future sports coach. Among them are:

1) *open (electronic) educational resources*. The future sports coach must be taught how to use numerous electronic educational resources; these include: electronic presentations, electronic textbooks, electronic laboratory workshops, electronic monitoring complex, electronic dictionaries (encyclopedias, reference books), electronic logbook (attendance at classes (trainings), physical activity, competitions, etc.), electronic visual materials (correct performance of training exercises, complex motor elements, controversial sports situations, etc.), electronic guidelines. These materials are placed in the public domain, on special websites, forums, on the cathedral pages of educational organizations, on the Internet pages of sports federations, Internet resources of coaching communities, and other places;

2) *mobile technologies* that allow, using gadgets of various configurations and the presence of a wireless network operating via radio channels, to have almost instant access to educational, information and reference, sports and methodological, special (by sports) and other types of materials at any time, and from anywhere. The power of mobile technology saves time and improves the efficiency and productivity of practice and classroom sessions. Their peculiarity lies in the fact that they provide an opportunity to combine formal and informal approaches to the educational process;

3) *"smart" sensors and devices for physical culture and sports*. These include "smart" video cameras, various sensors and indicators that are built into sports items (equipment: balls, sticks; walls of gyms and arenas, shells, devices, etc.), which allow you to capture information about the psychophysiological characteristics of the body of athletes , unobtrusively, without losing their training or rest time. It should be noted that this kind of information can be recorded only with the permission of persons (or their representatives) who are subject to electronic surveillance, taking into account the protection of their personal data;

4) *artificial intelligence*. It can be implemented through specialized programs, or it can be an accompanying element in traditional monitoring, testing, or modeling systems. Most often, artificial intelligence recommendations are used to create individualized content for individual athletes, using adaptive learning systems, diagnostic tracking and monitoring tools, automated scoring systems, etc. Considering that intelligent systems work on precise, purely mathematical approaches, peeped from nature, the effectiveness of the recommendations received from them is very high;

5) *virtual reality*. This is a computer-generated artificial environment in which a person can interact with objects of training or competitive activity (for example, opponents on the court or sparring colleagues in the training process) in such a way that he cannot distinguish whether this environment exists in reality, or takes place only on the screen (in a helmet-mask) of an individual placed in this artificial reality. Virtual reality has a high didactic potential, since it can replace a sports or training situation that is very difficult for an athlete to organize by other means, it provides additional opportunities for teaching hard-to-reproduce nuances of real sports reality and is most often implemented in the form of virtual simulators;

6) *augmented reality*. This is an environment that complements the real physical world with virtual objects (computer models) in real time and can be considered as

a powerful visual tool that gives the coach and his wards not only the opportunity to perform this or that exercise correctly or to demonstrate on the computer screen the consequences of incorrect or dangerous movements (techniques, methods, ways). In fact, augmented reality scrupulously, balancedly shows all the positive and negative aspects of the training process or game situation that cannot be seen or evaluated in any other way;

7) *knowledge mining systems Data Mining*. At present, a huge factual material has been accumulated, both on sports and educational topics in physical culture and sports educational organizations. As a rule, this is diverse and motley information, and it is difficult to get any useful data from it. But now the so-called Data Mining systems have appeared, which in translation means systems of “extraction” (elicitation) or “excavation of data”. It is they who can revolutionize the search for new patterns. On the basis of the same intellectualization of big data processing processes, impressive results have already been achieved, which, in principle, cannot be obtained in other ways. Systems of “data mining” find completely new laws of sports functional systems that a person did not suspect before. For example, they reveal (“dig out”) absolutely new methods of sports rivalry, find previously unknown methods of training processes, etc. These discoveries are gradually making their way into pedagogical practice. This became possible because intelligent systems process colossally large amounts of information, in which, using special algorithms, most often working on the ideas of artificial neural networks, completely unusual innovations in sports are sought out.

For the selection of information competencies, the international ICT standard [2] was taken as the basis, which contains a detailed description of 722 blocks of informatics (related to the discipline “Informatics”, included in information) competencies and 61 sets of specialized professional skills. Considering that the level of the Russian physical education and sports bachelor’s degree corresponds to the eighth level (Graduate diploma, Graduate certificate, Bachelor honors degree) of the Australian qualifications framework [2] (for the European Higher Education Area, it corresponds to the seventh level - Bachelor degree), then from it we Information competencies suitable for this professional activity were selected.

The closest analogue of the bachelor’s program in terms of information competences is the ICT60120 standard - Advanced Diploma of Information Technology [1], which can be considered at the level of an additional specialty or practical specialization in the field of information and communication technologies. Other training programs offered at the undergraduate or graduate level are even more specialized in ICT.

The study of these international and domestic standards made it possible to clarify the system of informatic competences of a physical culture and sports worker (with a specialization of a trainer-teacher). Based on them, we proposed a classification structure of the information competencies of a sports coach (see figure). It included the following components of information competencies: *technological, communication, technical, modeling and predictive, protective, informational.*

It is this structure of information competencies that meets the modern requirements for a sports coach. It is only necessary to remember that it is possible to realize the best sports results not only with the formation of such competencies, but also with the methodically correct organization of training sessions and creating favorable pedagogical conditions in achieving high sports productivity.

C**onclusions.** Summarizing the theoretical material, from the point of view of the essence and content of the concept of *“information competence of a sports coach”*, we will present its following definition: it is an integrative quality of a person, which is knowledge, skills and abilities in the use of modern information and communication technologies, digital instruments and devices for sports training, competitive and judicial orientation, through the willingness to use them, taking into account professional culture, professional abilities, based on coaching and sports experience, leading to high sports results.

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Development of cognitive and creative abilities of students of the faculty of physical culture under the conditions of teaching complex-coordinated physical exercises

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Abstract

Objective of the study was to reveal the influence of the "operational-circular information model" of teaching physical exercises on the development of creative and cognitive abilities of future physical education teachers.

Methods and structure of the study. The work was carried out on the basis of the Moscow State Regional University in the period from 2018 to 2021. 24 students (boys and girls) of the Faculty of Physical Culture were involved in the study, who studied in the direction of training 44.03.01 "Pedagogical education" (training profile - Physical Culture). The technique was based on an operational-circular information model of training and was worked out by comparing the technique for performing a new exercise being learned with the technique of a reference sample.

Results and conclusions. A structurally organized methodology, which includes blocks of physical, technical and technological training, allows for the period of study from the 2nd to the 4th semester to improve the indicators of students' cognitive abilities from 22 to 41%, and creative - from 19% to 51%. During the period of the experiment, the creative potential of the students of the experimental group improved on average from 47.9±0.98 to 67.4±2.13 (≤ 0.05).

Keywords: *creative abilities, cognitive abilities, complex coordination physical exercises, future teachers of physical culture, operational-circular information model of education.*

Introduction. Currently, most experts believe that improving the quality of education in professional pedagogical institutions becomes possible if modern in-novative approaches and technologies are introduced into their educational process [2]. A similar judgment applies to the practice of professional education of future teachers of physical culture [3]. However, here, according to the literature, there is not only the problem of subject-oriented professional training of future teachers, but also the problem of the development of their mental processes associated with the formation of creative and cognitive abilities [7]. The need for the latter is dictated by the active introduction of innovative approaches and technologies, new educational content into general educational organizations of the Russian Federation, requiring from teachers not only subject-oriented professional knowledge, skills and abilities, but also a sufficiently high cognitive potential and creative thinking [5].

In modern literature, there are data on the positive impact of the process of teaching motor actions on the development of the cognitive abilities of those in-volved [4]. At the same time, the development process is more efficient if students, thanks to direct and feedback from the teacher (coach), actively participate directly in the learning process itself. At the same time, in recent years, separate judgments have appeared in the specialized literature about the need in the learning process, including teaching physical exercises, to single out the external and internal connection of information transfer.

Under the external direct "informational" connection, it is proposed to un-derstand the connec-

tion going from the teacher to the student, and under the feed-back - going from the student to the teacher. In turn, under the internal "infor-mation" connection, it is proposed to understand the connection that goes from the student himself to himself (the student).

Based on self-address, the student acts as a “learner”, reproducing infor-mation about the exercise he performed, and as a “teacher”, evaluating the perfor-mance of the exercise being learned and making the necessary correction to it. In the process of self-learning physical exercises, this connection can be defined as an operational-circular information model of training. In the construction of such a model, the student simultaneously increases the activity of cognitive processes, forming a mental image of action and creative processes, comprehending the ac-tion he performs and making the necessary corrections to it.

Thus, the judgments expressed on the basis of the analysis of special litera-ture gave grounds to assume that the use of an urgent circular information model in the process of teaching future physical education teachers the physical exercises of the school program allows you to develop cognitive and creative abilities and, means to positively influence their professional activity.

Objective of the study was to reveal the influence of the "operational-circular information model" of teaching physical exercises on the development of cretive and cognitive abilities of future physical education teachers.

Methods and structure of the study. The work was carried out on the basis of the Moscow State Regional University in the period from 2018 to 2021. The study was of a longitudinal nature, which was dictated by the need to trace the features of changes in the studied indicators in the same participants of the experiment over a relatively long time (the first and second years learning).

24 students (boys and girls) of the Faculty of Physical Education were in-volved in the study. To diagnose cognitive and creative abilities, we used: a test for the development of logical thinking (Raven D.) [6]; a test for determining the speed of thinking (B.D. Karvasarsky); a test to determine the speed of memoriza-tion (“Random Access Memory”) [5], a test to determine the level of development of semantic memory (“Reproduction of a story”) and a test questionnaire of personal creativity (E.E. Tunik) [9].

To achieve this goal, we studied the nature of the change in the main indicators of cognitive and creative abilities under the influence of an experimental methodology for mastering complex-coordinating physical exercises by students of the school program in physical culture, developed on the basis of an operational-circular information model of education.

The experimental methodology included consistently physical, technical and technological training of students, where each type of training was characterized by the solution of relatively independent pedagogical tasks. The first block was subordinated to the solution of physical training problems, which was necessary to ensure the functional readiness of students to master new physical exercises. The main content of this block was the physical exercises of special physical training, which was included in the invariant part of the curriculum in the first and second semesters of students' professional education.

The second block of the experimental methodology included teaching stu-dents the technique of physical exercises taken from the line of textbooks on physical culture for students in grades 8-9 by A.P. Matveeva (2019). While learning the technical actions of sports games (volleyball and basketball) and the exercises from the "gymnastics and acrobatics" section, students performed training tasks that were different in their target orientation. The first group of tasks included a comparative analysis of the technique of the same exercises, but taken from different sources. Students had to highlight the differences and either agree with one of the proposed options, or offer their own version. But in both the first and second cases, they had to justify their choice based on the available knowledge. Upon completion of the tasks, students were given the opportunity to discuss their options.

Tasks of the second type were focused on the formation of students' skills to independently learn the technique of physical exercises using an operational-circular information model of training. Here the students were offered to get ac-quainted with the written description of the technique of the sample of the exercise being learned. After reading the text, the students were offered three attempts at practical implementation of the sample, without looking into the text. After the last attempt, the students were asked to describe the technique of the performed action and compare it with the technique of the sample. When comparing, students identified "inconsistencies" and made the necessary correction. After that, the students again tried to reproduce the given sample of the technique of the exercise being learned and again recorded their action with its subsequent comparison with the sample. At the same time, by identifying discrepancies between the emerging mental image of the exercise technique and its given text sample, the students made the necessary correction, both in the execution technique and in the self-study methodology. Here it was allowed to learn a sample of technique “in parts”, which were allocated by the students themselves.

Learning tasks of the third type included the formation of skills for self-assessment of the technique of the learned exercise, which was achieved on the basis of highlighting its elements that determine the qualitative characteristics of the performance. This group of tasks assumed joint activities of students, when one student controlled the performance of another and evaluated his technique according to a jointly developed scale of marks (the task was performed, as a rule, in pairs or groups). At the same time, the supervisor identified errors and suggested ways to eliminate them, which were discussed with the performing student.

The third block of the experimental methodology included technological training of students, within the framework of which the tasks of developing the skills to design the process of teaching new physical exercises were solved. The implementation of the tasks of this block took place during the passage of peda-gogical practice by students on the basis of the content of the planned results of the exemplary work program of a physical education teacher. The design assumed:

1) the choice of the exercise to be learned in accordance with the content of the subject planned result and its textual description;

2) description of "intermediate" results, ways and methods of achievement;

3) a plan for the phased achievement of the planned result.

During practice, students independently mastered the developed sample of physical exercise technique and demonstrated it for evaluation at the reporting conference.

With such a structural organization of the experimental methodology, we assumed that with the content of the second block we would promote the predominant development of cognitive abilities, and with the technological block, the predominant development of the creative abilities of the participants in the experiment.

Results of the study and their discussion. As the results of the study showed, the experimental technique had the most noticeable effect on increasing the indicators of logical thinking and semantic memory, where the increase was about 40%. The remaining indicators of cognitive abilities also significantly im-proved over the period of the pedagogical experiment (≤ 0.05).

Showed creative abilities at the end of the pedagogical experiment improved in comparison with the initial values. The most significant increase in future teachers of physical culture is the indicator of imagination, which is one of the main indicators in the characteristic of creative abilities [1]. It should also be noted that there were significant increases in other indicators of creativity, which averaged from 19 to 33% (≤ 0.05) over the period of the pedagogical experiment.

Completing the analysis of the results obtained on the development of cognitive and creative abilities in the experimental group of future physical education teachers, it should be noted that they significantly outperformed their peers from the control group. Thus, future teachers of physical culture indicators of logical thinking by the end of the pedagogical experiment amounted to 8.1±1.12 points, and future teachers of the control group - 6.8±0.73 (p≤0.05); indicators of working memory were 8.8±0.86 and 7.0±0.76 points, respectively (p≤ 0.05); thinking speed - 7.8±1.01 and 6.6±0.58 points (p≤ 0.05); semantic memory - 8.6 ± 0.74 and 6.9 ± 0.56 (p≤ 0.05).

According to most indicators of creativity, the experimental group signifi-cantly outperformed their peers from the control group. Thus, the index of curiosity in the experimental group was 16.4±1.68, and in the control group it was 11.4±1.80 (p≤0.05); the indicator of interest in the knowledge of complex phenomena was 15.6±1.74 and 12.1±1.44, respectively (p≤0.05).

Conclusions. The conducted research showed that in the process of teaching future teachers of physical culture complex coordination physical exercises, there is an opportunity to actively influence the development of creative and cognitive abilities.

Such an opportunity is provided thanks to the methodology, which is based on the operational-circular information connection, which is one of the varieties of internal communication, when the teacher independently reproduces, independently analyzes and independently corrects the performance of the physical exercise being learned. At the same time, the experimental methodology structured according to three basic blocks allows not only to positively influence the development of mental abilities, but also to ensure a sufficient level of physical fitness of future physical education teachers, which is necessary for successful teaching of complexly coordinated exercises.

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Modern trends in the development of health physical culture

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Abstract

Objective of the study was to experimentally prove the effectiveness and safety of using the method of forming a neutral position of the spine in fitness for the abdominal muscles.

Methods and structure of the study. The experiment was carried out on the basis of the “Ratiborets” fitness club in Yekaterinburg. It was attended by 14 women aged 30 to 38 years. For the experimental group, a training program was developed that included exercises that strengthen the abdominal muscles by stabilizing the spine in a neutral position. The experiment took place in three stages. The first stage was aimed at the development of static stabilization, the second - dynamic stabilization, the third - integrated stabilization.

Results and conclusions. The introduction of training in the work of fitness clubs for the development of static and dynamic stabilization with the control of execution technique strengthens the posture, axial muscles, increases the strength and endurance of the abdominal muscles. Moreover, such training is safe for the spine, since the main task of the method of forming the neutral position of the spine is to maintain the physiological (natural) curves of the spine and distribute the load optimally over all joints, thereby protecting them from injury.

Keywords: *health-improving physical education, fitness, digitalization, pandemic, neutral position of the spine, safety.*

Introduction. In the field of physical culture and sports, quite a lot of attention is paid to health-improving physical culture. In recent years, this direction has become increasingly relevant. This is due, on the one hand, to the deterioration of the health status of various segments of the population, the rejuvenation of a number of diseases, the deterioration of the environment, and so on. On the other hand, it has become fashionable to lead a healthy lifestyle, engage in various types of physical activity, and attend fitness clubs. As a result, new fitness technologies began to appear, combining both traditional and innovative means and methods of health-improving physical culture (A.G. Furmanov, 2003). At the same time, learning the correct technique for performing movements is a key factor in preventing injuries during the training process.

Recently, the topic of choosing the right and effective exercises for body alignment, improving its functionality and biomechanics of movements has become important for discussion in the instructor environment. The neutral position of the spine is directly related to the preservation of physiological curves (lordosis and kyphosis). The skill of building a neutral position helps to stabilize the spine both during daily activities and during the training process and protect the joints from injury. In this regard, the training of the abdominal muscles and the choice of effective exercises that will help develop the skill of maintaining a neutral position of the spine become relevant. The main criterion in the selection of exercises is their safety for the spine (E.A. Bespamyatnykh, 2021).

Objective of the study was to experimentally prove the effectiveness and safety of using the method of forming a neutral position of the spine in fitness for the abdominal muscles.

Methods and structure of the study. The experiment was carried out on the basis of the Ratiborets fitness club in Yekaterinburg. It was attended by 14 women aged 30 to 38 years. The composition of the experimental and control groups - seven people each.

Reliability of the final averages of the control and experimental groups

Statistical indicators	Test No. 1, s.	Test No. 2, s.	Test No. 3, s.	Test No. 4, s.	Test No. 5, s.
$\bar{X}э$	55,4	74,14	54	45,42	88,14
$\bar{X}к$	40,14	68,42	47,85	39,42	83,14
t	5,48	1,72	2,38	2,5	1,4
P	<0,001	>0,05	<0,05	<0,05	>0,05

For the experimental group, a program was developed that included exercises that strengthen the abdominal muscles by stabilizing the spine in a neutral position. The program excludes the traditional approach to working out the abdominal muscles and classic exercises for the abdominal muscles (lifting the torso into a sitting position, lifting straight legs from the starting position lying down, etc.).

The program is divided into three training stages, the duration of each stage is two months. Training - three times a week for 60 minutes each. The stages correspond to the level of difficulty of the exercises. At each stage, adjustments were made to the training program.

Stage I - the development of static stabilization, holding a posture in which it is required to maintain a neutral position of the spine (NPP) for a certain amount of time.

Stage II - the development of dynamic stabilization, the addition of movement of the upper and lower limbs, the neutral position of the spine is maintained.

Stage III - the development of integrated stabilization, the neutral position of the spine in conditions close to those that we encounter in sports and everyday life, with asymmetric weight lifting.

During the experiment, functional tests were used to assess the state of the abdominal muscles of the participants at the beginning, middle and end of the experiment: test No. 1 “Lying emphasis”; test No. 2 “Hunting dog”; test No. 3 “Lateral endurance”; test No. 4 “Maintaining the neutral position of the spine during flexion of the hip joints”; test No. 5 “Maintaining the neutral position of the spine during extension of the hip joints.”

Results of the study and their discussion. At the beginning of the experiment, the participants underwent functional testing of the state of the abdominal muscle group. Comparison by Student’s t-test showed that the differences are not significant ($p>0.05$). The results of the final testing are shown in the table.

The table shows that the final indicators in the experimental group are better than in the control group, and the difference between them is significant in three out of five tests ($0.001<p<0.05$). This allows us to conclude that the technique of forming a neutral position of the spine in fitness is effective in order to strengthen the muscular corset, namely the abdominal muscles.

Comparison of the studied indicators within the groups also showed higher rates of increase in results in the experimental group. So, in the experimental group, there were significant (significant) changes in four out of five tests. Changes in the results in the control group are less significant and are not significant ($p>0.05$).

During the study, none of the participants was injured, some had pain in the back and joints, others achieved high-quality technique for performing complex exercises, and all participants improved their general well-being. Thus, the conducted study proved the effectiveness of the experimental technique, a positive trend was revealed in increasing the functionality of the abdominal muscles in the experimental group. Indeed, the method of formation of the neutral position of the spine can improve the functional state of the abdominal muscles, increase their strength and endurance. Based on the results of the study, it can be seen that the developed method can be considered safe and effective, as well as competitive. The proposed technique can become the basis for health training in fitness clubs.

C**onclusions.** As a result of the study, it was revealed that the method of forming the neutral position of the spine is more effective for training the abdominal muscles than the traditional approach to working out the abdominal muscles. Indeed, the introduction of systematic training in the work of fitness clubs to develop static and dynamic stabilization with control over the execution technique improves the well-being of those involved, strengthens posture, axial muscles, increases the strength and endurance of the abdominal muscles. Moreover, such training is safe for the spine, since the main task of the method of forming the neutral position of the spine is to maintain the physiological (natural) curves of the spine and distribute the load optimally over all joints, thereby protecting them from injury. This indicates the practical significance of the study.

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Account of the functional state indicators of men 40-60 years old leading a sedential life during physical and recreation classes with elements of martial arts

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Abstract

Objective of the study was to take into account and evaluate the indicators of the functional state of men aged 40-60 years, leading a sedentary lifestyle, in the process of physical education and recreation classes with elements of martial arts.

Methods and structure of the study. The method of cardiointervalometry was used to monitor the functional state. The experiment involved 60 men aged 40-60 years (48.07±6.22), who were divided into experimental (EG) and control (CG) groups of 30 people. The EG attended physical culture and health-improving classes with elements of martial arts. Representatives of the CG were engaged in a different program, the basis of which was running in an aerobic mode.

Results and conclusions. At the end of the one-year experiment, significant differences were revealed in 13 out of 15 HRV parameters of men from the EG and one parameter of HRV in representatives of the CG ($p<0.05$; $p<0.01$). The analysis of intergroup differences in HRV indicators after the experiment showed that in men from the EG, compared with the representatives of the CG, 10 of the 15 studied parameters changed significantly. Special attention should be paid to such an indicator of HRV as the Stress Index (SI), which differs significantly between groups, the difference was 131.55% ($p<0.01$). The most pronounced changes affected the indicator of the activity of regulatory systems, the difference in the average parameters for the group was 155.7% ($p<0.01$). Thus, the positive effect of physical culture and health-improving activities with elements of martial arts on the cardiovascular system of men aged 40–60 years who lead a sedentary lifestyle was determined.

Keywords: *functional state, heart rate variability, physical culture and health-improving classes, martial arts, pedagogical experiment.*

Introduction. Issues related to maintaining the health of the population are of significant socio-economic importance for the state. In particular, the category of people aged 40-60 years, which is able-bodied, active and at the same time experienced, is of particular interest to scientists from the standpoint of increasing the functional capabilities of the body, the level of health, prolonging working capacity and working capacity [1, 2, 4, 5]. Physical inactivity is the fourth leading risk factor for global mortality, accounting for 6% of global mortality. According to data provided by WHO, most men in the second period of adulthood, starting from the age of 40, are overweight and obese [8]. This phenomenon is directly related to the lifestyle of men of this age period, which is characterized by physical inactivity, bad habits (smoking, alcohol consumption), poor nutrition, and stress [3, 6, 7, etc.].

Objective of the study was to take into account and evaluate the indicators of the functional state of men aged 40-60 years, leading a sedentary lifestyle, in the process of physical education and recreation classes with elements of martial arts.

Methods and structure of the study. The method of cardiointervalometry was used to monitor the functional state. The control of trainees included monitoring of the functional state, which allows to reveal the predominance of the type of vegetative regulation of the heart rate, the state of regulatory systems, the stress index, indicators of the psycho-emotional state and a number of other parameters, as well as a comprehensive indicator of the functional state, characterizing the activity of the cardiovascular, autonomic nervous systems.

The experiment involved 60 men aged 40-60 years (48.07±6.22), who were divided into experimental and control groups of 30 people. The subjects gave their written consent to the examination, and they also had no contraindications to attend physical education and health classes. Classes were held five times a week under the guidance of a qualified instructor. Each session lasted 90 minutes. The men of the experimental group attended physical culture and health-improving classes with elements of martial arts. It includes classes with Muay Thai elements, including shock and defensive technical actions that made up the aerobic block, exercises for developing the strength of individual muscle groups that are included in the power block, as well as exercises aimed at accelerating recovery processes, reducing psycho-emotional stress “18 forms tai chi qigong”, meditation, exercises to increase joint mobility, elasticity of ligaments. Representatives of the control group were engaged in a different program, the basis of which was running in an aerobic mode.

Results of the study and their discussion. The first examination of the functional state in terms of HRV in men did not reveal significant differences between 15 HRV indicators in the representatives of the experimental and control groups ($p>0.05$) (Table 1).

At the end of the one-year experiment, significant differences were found in 13 out of 15 HRV parameters of men in the experimental group and one parameter of HRV in the control group ($p<0.05$; $p<0.01$). The most pronounced changes in HRV parameters in the experimental group affected five spectral indicators: TP, LF, HF, VLF, LF/HF and two statistical indicators: SI, indicator of activity of regulatory systems (IARS). They significantly differ from the original data ($p<0.05$; $p<0.01$). On average, the group showed a significant decrease in humoral-metabolic effects on the regulation of heart rate, which occurred due to a decrease in the VLF index. After a year-long experiment in men, on average in the group, pronounced sympathotonia was replaced by a moderate predominance of the sympathotonic type of heart rhythm regulation. Significantly increased indicators such as total spectrum power (TP) - the increase was 54.6% of the original data, LF - 119.9%, HF - 191.8% ($p<0.01$). A statistically significant decrease in the SI index was noted, which, on average for the group at the end of the experiment, decreased by 61.4% ($p<0.01$). The IARS indicator also significantly decreased, the difference amounted to 2.03 r.u. ($p<0.01$).

An analysis of intergroup differences in HRV indicators showed that in men from the EG, compared with the representatives of the CG, 10 of the 15 studied HRV parameters changed significantly (Table 2).

Table 1. *Changes in heart rate variability in men aged 40–60 who lead a sedentary lifestyle*

Parameter	Statistic $\bar{X}\pm\sigma$			
	Experimental group (n=30)		Control group (n=30)	
	Before the experiment	After the experiment	Before the experiment	After the experiment
HR, bpm $^{-1}$	72,71±7,53	65,10±4,33*	70,88±6,56	70,12±5,47
SDNN, ms	38,00±12,42	44,27±6,15*	39,21±15,23	39,88±4,12
RMSSD, ms	26,08±16,55	28,10±10,58	25,34±14,55	26,22±6,78
PNN50, %	47,56±5,11	48,47±4,38	47,34±6,77	47,22±10,13
Mo, s	633,17±15,36	738,44±11,16*	658,28±24,67	672,45±12,44
AMo, %	38,34±6,25	32,36±4,44*	36,88±6,33	36,14±6,44
SI, o.e.	264,42±57,23	102,00±26,20**	258,66±48,78	236,18±23648
TP, ms^2	1479,25±1189,2	2286,65±814,34**	1491,87±989,4	1461,87±433,22
LF, ms^2	434,45±112,45	955,22±110,25**	488,32±104,46	510,20±88,56
HF, ms^2	249,33±65,35	727,55±110,84**	257,37±57,88	337,44±48,10
VLF, ms^2	795,37±98,21	603,88±111,12*	746,37±101,12	646,16±102,44*
%LF, %	63,13±10,67	57,12±12,12*	65,51±8,67	64,14±20,20
%HF, %	36,84±11,23	42,88±10,66*	34,44±10,44	35,86±10,68
LF/HF	2,24±0,46	1,39±0,45*	1,90±0,37	1,79±1,24
IARS, point	3,23±1,68	1,2±0,36**	3,32±0,78	3,12±1,21

Note: ** – $p<0.05$; ** – $p<0.01$.*

Table 2. *Indicators of heart rate variability in men aged 40–60 years, leading a sedentary lifestyle, after the experiment*

Parameter	Statistic $\bar{X} \pm \sigma$		
	Experimental group (n=30)	Control group (n=30)	Values of differences
HR, bpm $^{-1}$	65,10±4,33	71,12±5,47	-6,02*
SDNN, ms	44,27±6,15	39,88±4,12	4,22
RMSSD, ms	28,10±10,58	26,22±6,78	1,88
PNN50, %	48,47±4,38	47,22±10,13	1,25
Mo, c	738,44±11,16	672,45±12,44	65,99
AMo, %	32,36±4,44	36,14±6,44	-3,78*
SI, o.e.	102,00±26,20	236,18±23,48	-134,18**
TP, ms^2	2286,65±814,34	1461.87±433,22	824,87**
LF, ms^2	955,22±110,25	510,20±88,56	445,02**
HF, ms^2	727,55±110,84	337,44±48,10	390,06*
VLF, ms^2	603,88±111,12	646,16±102,44	-42,28
%LF, %	57,12±12,12	64,14±20,20	-7,02*
%HF, %	42,88±10,66	35,86±10,68	7,02*
LF/HF	1,39±0,45	1,79±1,24	-0,40*
IARS, point	1,22±0,36	3,12±1,21	-1,90**

Note: ** – p<0,05, ** – p<0,01.*

The indicator of the total spectrum power (TP) after the experiment increased in men from the EG by 93.6% (p<0.01) and, on average for the group, corresponds to the norm, the optimal level of functioning. In turn, this HRV spectral indicator in CG men was below 200 ms2, which indicates a decrease in body resources. Differences between the mean HF values in the EG and CG were 53.6% (p<0.01). Special attention deserves such an HRV indicator as SI, which differs significantly between groups, the difference was 131.55% (p<0.01).

It should be noted that the regular performance of physical activity in health-improving classes with elements of martial arts made it possible to reduce the mental stress of men whose professional activity is intellectual work, accompanied by a constant significant impact on the central nervous system, stress, and mental stress. In men from the CG, positive dynamics was also noted, but not as pronounced as in the representatives of the EG. Regarding the components of the functional state, the CG showed positive dynamics, but no significant differences were found.

Conclusions. The positive influence of physical culture and health-improving classes with elements of martial arts on the cardiovascular system of men aged 40–60 years, leading a sedentary lifestyle, characterized by overweight and obesity, in whom the optimization of the tension of regulatory systems, a decrease in humoral and metabolic effects on the regulation of heart rhythm, a decrease in indicator SI, which also indicates the economization of the activity of the heart.

An analysis of the complex indicators of the functional state of men aged 40–60 allowed us to state that the representatives of the EG showed positive changes, since they were absent in the men of the CG. Positive changes were also noted in the components of the functional state in men from the EG - the regulation of heart rate, the state of the myocardium, and the psycho-emotional state.

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Preferences in physical recreation of students of higher education institutions of the republic of adygea

UDC 796.011.1(460)

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Abstract

Objective of the study was to identify preferences in the physical recreation of students of universities of the Republic of Adygea.

Methods and structure of the study. A set of scientific methods was used: analysis of scientific papers on the subject under consideration, online questioning, processing of the obtained information using the Statistica 12 software package, Microsoft Office Excel 2007, Yandex.Forms service, statistical processing method, graphical interpretation. The study was conducted with students of universities of the Republic of Adygea from October to December 2021. 3,400 students (58.6% women, 41.4% men) took part in it. The questionnaire contained questions aimed at identifying the basic indicators of the respondents' choice of forms of physical recreation: factors, motives, criteria.

Results and conclusions. The conducted research made it possible to accumulate information concerning the motives for students' choice of forms of physical recreation, its preferred types, the specifics of the organization of active recreation, the dominant sources of information about sports and health-improving services and the criteria for consumer choice. The study revealed a fairly large group of respondents showing an increased interest in physical recreation, which confirms the success of the work on creating a positive image of sports, recreational and recreational activities among the youth.

Keywords: *physical recreation, preferences, university students, Republic of Adygea, online survey.*

Introduction. The federal project "Sport is the norm of life" within the framework of the national project "Demography" provides for "the creation of conditions for all categories and groups of the population to engage in physical culture and sports, mass sports, including increasing the level of provision of the population with sports facilities, as well as the preparation of a sports reserve » [6]. Physical recreation is considered among the main directions for the implementation of this project. A number of studies in the field of organization of free time, leisure preferences of students, the advantage is aimed at studying social activity, communication in various communities, in the virtual space. At the same time, there is a clear tendency to replace live communication with virtual communication in social networks [3, 4, 7].

Meanwhile, it is well known that the demanded technology for the production of healthy physical qualities, the emotional-volitional sphere of a person is physical recreation, which is understood as “a set of measures that meets the needs of the recreant in active recreation and informal communication outside of production, educational and other activities aimed at restoring strength. after exercise, ... as well as allowing him to strengthen and maintain his health” [5, p. 6]. Physical recreation as a type of activity represents a variety of areas of human activity: outdoor activities, leisure, game activities, sports activities, mass sports work at all levels, focused on the desire to maintain and improve health. An obligatory element of its consumption is the study of recreational preferences of potential consumers, since the study of customer needs directly affects the development of ergonomic recreational programs that are in demand by a wide audience of students, as well as the formation of a competitive and attractive product.

The physical recreation of student youth is focused on the pronounced recreational needs of this age group: the need for physical development and self-affirmation, for restoring strength and working capacity after the educational process, the desire to treat one's health wisely, and the desire to spend free time for the benefit of oneself [2]. The choice of preferences in the ways of physical recreation depends on a number of factors, such as place of residence, the mentality of the population, age and gender composition, financial capabilities, the degree of development of the sports and recreation infrastructure, the level of education, the range of offers of the sports and recreation industry, the fashion of the wellness industry and etc. Therefore, the preferences of young people in physical recreation as potential consumers are considered a dynamic category, influenced by many factors, which in a special way actualizes the feasibility of this study.

Objective of the study was to identify preferences in the physical recreation of students of universities of the Republic of Adygea.

Methods and structure of the study. The work was carried out from October to December 2021. The basic empirical method was used - online questionnaire. The main working tool was a specially designed questionnaire. The survey involved 3400 respondents - students of universities of the Republic of Adygea. An empirical study made it possible to identify preferences in the physical recreation of student youth, the results of which are presented below.

Results of the study and their discussion. By age and gender, the respondents were distributed as follows: 84% - students aged 18-25, 16% - students aged 26-30; 58.6% women, 41.4% men. The choice of physical recreation is determined by internal motives: the need for physical development and self-affirmation, as indicated by 61.2%, for recuperation (58.4%), for knowledge and spiritual development (55.1%), for health improvement (17.5%). %), treatment and prevention of diseases (11.5%), which is largely due to the young age of the respondents and the predominant absence of diseases.

The most popular are active and combined forms of physical recreation - 43.1% and 46.8%, respectively; extreme recreation is interesting for 26.3%, passive recreation - for 30.7% of students. 12.7% of respondents in the list of preferred types of recreation indicated short-term types of recreation (fishing, airsoft, recreation by the reservoir, outdoor recreation) (Figure 1). The increased interest in active, combined and extreme recreation is largely due to the age of the respondents and the craving for adventure, new emotions, adventurism.

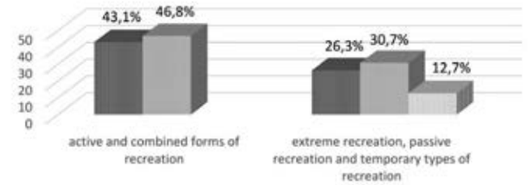

Figure 1. *Structure of types of recreation, % (compiled by the authors)*

82.6% support organized types of physical recreation (group classes at the university, collective trips, recreational activities and events in sports and fitness organizations, corporate holidays, etc.), the rest (17.4%) prefer to independently organize this type of activity. Students learn about sports and recreational services from the global Internet (95.8%), advertising in social networks (74.3%), from friends and acquaintances (36.9%).

The defining criteria influencing the choice of the type of physical recreation are revealed. The dominant criteria for students are its compliance with the natural need for various types of physical activity (82.4%), the possibility of strengthening physical health (63.2%) and the price (61.8%). An interesting program is important for 46.7%, a good company - for 43.8%, appropriate sports and recreational infrastructure - for 29.5% of respondents. Least of all students indicated the criteria of comfort and quality of service (26.3%), aesthetic enjoyment of beauty (24.1%).

Students love to travel (82.6%). The majority travel once a year (36.5%), 29.2% travel once every few years, 26.3% travel several times a year, and 8.0% do not travel (Figure 2). Preferences to include health-improving physical exercises in the travel program were found in 87.9% of respondents, which confirms the demand for physical recreation among young students.

Students expressed a desire to participate in collective types of physical recreation: 53.0% of respondents preferred the company of more than four people, 41.6% prefer to relax in the company of two to four people, and only 5.4% - in the company of one person.

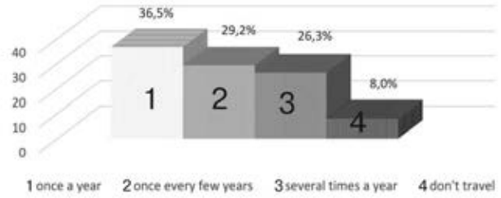

Figure 2. *Distribution of students by travel frequency, % (compiled by the authors)*

In the course of statistical processing of the obtained results, the method of single-factor analysis of variance was used. The influence of motives on the chosen forms of physical recreation was considered [1]. For convenience, the data were grouped by the number of observations. Based on the data on the motives and forms of physical recreation, the sums for the options, the sums of squares for the options, and the average values for the options were calculated. In the Statistica 12 software package, the values of the criterion were calculated to determine the reliability. The calculated values of the factor and residual variance made it possible to evaluate the influence of the respondents' motive criterion on the preferred form of physical recreation. The factor dispersion was 69.4%. The contribution of the residual dispersion due to random influences was 30.6%.

Conclusions. Physical recreation is a significant socio-cultural phenomenon and a productive option for the rational organization of students' free time. Educational universities are an important segment of consumers of physical recreation services, as they feel the need for physical development and self-affirmation, recuperation, knowledge and spiritual development, the desire to maintain and develop physical fitness. Students prefer active, combined forms of physical recreation and its organized types; the main source of information about sports and recreational services is the global Internet and advertising in social networks; The dominant criteria when choosing physical recreation are the correspondence to the natural need for various types of physical activity, health promotion opportunities, price, interesting program, appropriate sports and recreational infrastructure, and the presence of a company.

Thus, taking into account the recreational needs of students of universities in the region as potential consumers of physical recreation services will allow developing new proposals, expanding the range of sports and recreational recreational services in the region, increasing its competitiveness, which should be taken into account when choosing the correct orientation for the development of sports and recreational and tourist and recreational activities in region. Taking into account the needs of the student audience in physical recreation is necessary to develop programs for the effective recovery of students after the educational process, which corresponds to the strategy for implementing the federal project "Sport is the norm of life."

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Factors of variability of indicators of complex physical fitness of students

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Abstract

Objective of the study was to determine the values of the contributions of various factors in the variability of indicators of the complex physical fitness of university students.

Methods and structure of the study. The article used methods for determining body types, the formation of healthy lifestyle skills, the harmony of physical development, somatic health and complex physical fitness: 100 m run, standing long jump, 3×10 m shuttle run, torso forward tilt, 3000 run m (women - 2000 m). The study was conducted in September-October 2019 at the Russian State Social University, in which 349 students took part.

Results and conclusions. The research materials made it possible to determine the values of the contributions of various factors to the variability of the indicators of the complex physical fitness of university students. The greatest influence was exerted by such factors as body type, medical group, physical health. This gives grounds for differentiating the estimated indicators of the complex physical fitness of university students, taking into account these factors. The results of the study indicate that the traditional generalized method of assessing the indicators of complex physical fitness of university students is not objective and requires consideration of the factors under consideration.

Keywords: *significance of factors, complex physical fitness, body type, health, healthy lifestyle skills, physical development.*

Introduction. Until now, the issue of objective assessment of indicators of physical fitness of university students has not been resolved [1, 2, 5]. Teachers of physical culture departments are mainly guided by the requirements for assessing the level of complex physical fitness of students, which they developed within the framework of the Federal State Educational Standard of Higher Education without taking into account the influence of various factors [3, 4].

Objective of the study was to determine the values of the contributions of various factors in the variability of indicators of the complex physical fitness of university students.

Methods and structure of the study. The article used methods for determining body types, the formation of healthy lifestyle skills, the harmony of physical development, somatic health and complex physical fitness: 100 m run, standing long jump, 3×10 m shuttle run, torso forward tilt, 3000 run m (women - at 2000 m). The study was conducted in September-October 2019 at the Russian State Social University, 349 students took part in it.

Results of the study and their discussion. Based on the analysis of variance, the contributions of various factors (body type, passport age, belonging to a medical group, the formation of healthy lifestyle skills, the harmony of physical development, somatic health, regional and gender characteristics) on the variability of indicators of complex physical fitness of students of 1-4th grade were determined. courses of basic and preparatory medical groups.

In men of the main medical group, the factor “Body type” has the greatest influence on the variability of indicators of complex physical fitness (24.6%). In women, the significance of this factor is also quite high - 22.1%. According to our data, the results of men of thoracic and digestive body types differed most significantly in the 3000-meter run, muscular and digestive ones - in pull-ups on the bar, and in women of thoracic and digestive body types - in the 2000-meter run.

In men, the influence of the "Passport age" factor on the results of the complex physical fitness of students of the main medical group was 4.6%, and in women - 5.8%. According to the data, in men the significance of the factor under consideration is most pronounced, which manifests itself in the 3000-meter run, and in women - in pull-ups on the low bar.

For students of the main and preparatory medical groups, the influence of the "Medical group" factor in the variability of indicators of complex physical fitness is quite high: men - 17.5%, women - 14.8%. In men and women, the greatest influence of this factor was found on the results of endurance running.

The importance of the factor "Harmony of physical development" in assessing the level of complex physical fitness in men was 8.6%, in women - 7.4%. The greatest differences in the indicators of complex physical fitness in men of harmonious and sharply disharmonious types of development were manifested in the long jump from a place, and in women - in the shuttle run 3×10 m.

The factor "Formation of healthy lifestyle skills" had a certain impact on the effectiveness of indicators of complex physical fitness in both men (9.3%) and women (6.5%). The greatest differences in endurance running indicators were found in students with high and low levels of healthy lifestyle skills.

The factor "Somatic health" also influences the level of complex physical fitness of students (men - 9.9%, women - 7.7%). The greatest influence of this factor was manifested in students in endurance running.

The "regional factor" (students of the Moscow, Tula, Tver, Yaroslavl and Ryazan regions, Moscow city) also affects the variability of the indicators of the students' complex physical fitness (men - 4.5%, women - 3.7%), but their significance is less pronounced compared to other factors.

The results of the complex physical fitness of university students depend on many factors, their significance of the impact varies significantly, but mainly depends on the type of physique.

Conclusions. The results of our study indicate that the traditional average method of assessing the physical fitness indicators of university students is not objective and requires, first of all, taking into account body length and weight indicators.

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Development of cognitive skills of children with hyperactive and hyperkinetic disorders on the basis of developing horse riding

UDC 796.077-056.266

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Abstract

Objective of the study was to develop and substantiate a program of developing riding using the "Harmony in Motion" manual.

Methods and structure of the study. The development was carried out on the basis of the equestrian club "Mininsky Castle" in the indoor arena, the organization of the ANO "Center for Rehabilitation Riding "Harmony in Motion" from 08/01/2021 to 02/01/2022. Empirical research methods were used, namely, comparison and observation over five months of continuous training in developing riding twice a week. Tests were also used to evaluate the effectiveness of the applied methods.

The observation group included 10 children (6-8 years old) with the following diagnoses: - hyperactive disorder, combined with mental retardation and stereotyped movements F84.4; hyperkinetic disorders F90.

Results and conclusions. The conducted studies showed that the method of developing riding without the aid and with the use of the aid "Harmony in motion" equally positively affected the impulsivity, lack of active attention, and motor disinhibition of children. The use of the aid had a greater impact on the development of cognitive skills in children with hyperactive and hyperkinetic disorders than the method of developing riding without the use of the aid.

Keywords: *hippotherapy, physical rehabilitation, animal therapy, developmental delay, developmental aid, exercises.*

Introduction. In corrective classes of adaptive physical culture, with the help of certain physical activity, the child not only learns to be aware of his “I”, himself in space, but also learns to plan certain actions to achieve results, interact with other people, develop memory, attention. But there are some difficulties in conducting such classes in the AFC hall [3]. Firstly, this is due to the low motivation of children to perform exercises, and secondly, at the initial stage of rehabilitation, a lot of time is spent on organizing interaction between the child and the instructor.

In the lessons of developing horseback riding, there are no such difficulties, if you gradually approach the organization of classes, then as a result, children have a strong motivation to perform motor tasks, and interaction with the instructor begins faster due to well-built relationships through communication with the horse. The horse itself serves as a powerful motivation, which is expressed in the desire of the child to attend classes.

The effect of the “Harmony in Motion” manual on praxis, body scheme and spatial orientation is presented in the article [2]. The manual consists of laminated sheets with images of a rider in various positions, circles with the same image are located on the Velcro on top, two “blank sheets” with three and six empty cells for a separate study of positions, building individual tasks.

We assume that the use of the “Harmony in Motion” manual will allow us to increase the effectiveness of rehabilitation within the framework of developing riding. In order to test this hypothesis, we selected two tests to confirm or refute this assumption, which were

conducted before the start of the first stage and after the fifth stage of the courses.

Objective of the study was to develop and substantiate a program of developing riding using the "Harmony in Motion" manual.

Methods and structure of the study. The Alvord and P. Baker test for hyperactivity of a child was used in the work, where, according to the selected options (max - 17 p.), the following are assessed: active attention deficit, motor disinhibition, impulsivity. The test was carried out by parents assessing the behavior of the child in everyday life.

A test was also used for the level of development of cognitive and motor abilities of children, assessed in points (max - 13 p.) the level of sensation of one's body, orientation in space, praxis, a sense of tempo and rhythm, auditory attention, body scheme.

Results and conclusions. The conducted studies showed that the method of developing riding without the aid and with the use of the aid "Harmony in motion" equally positively affected the impulsivity, lack of active attention, and motor disinhibition of children. The use of the aid had a greater impact on the development of cognitive skills in children with hyperactive and hyperkinetic disorders than the method of developing riding without the use of the aid.

Classes on developing riding were held in several stages.

At the first stage of the training, much attention was paid to exercises to develop a sense of one's own body. Children at the beginning of this stage are usually passive, motor activity is reduced, but even with such a manifestation of involvement in the lesson, the child is happy to perform simple exercises, hug a horse, scratch, remove the rubber bands from the mane. At this stage, due to the constant transmitted impulses from the horse, warmth, and the constant maintenance of balance, the "muscle feeling" improves in the child. But without additional exercises, there will be no concretization in sensations and awareness, which relates to body schema and kinesthesia.

This stage is represented by exercises in developing riding, which involve working with the body diagram with the help of cards, exercises to change the child's sensations by interacting with objects in various parts of the body and being in close contact with them (in pockets, under clothes). Also, the lessons include interaction with the horse, when the child gives a verbal or non-verbal command, repeating after the instructor, which involves stopping, starting, and the direction of the horse's movement.

Acquaintance with the manual should not from the very beginning cause hindering actions in the child, therefore the instructor takes several circles with the image of the rider and always in the position in which the rider is located - the starting position (S.P.) sitting in front. Since the child's motivation for action at this stage is often reduced, the instructor himself starts a simple game and takes out pictures, talks about the positions, and sculpts them on a sheet. After analyzing the reaction, the instructor begins to gradually include the child in the game. It is important to separate two concepts, the automatic memorization of positions and the analytical activity of the child in working with the manual.

At the second stage, the child's activity in the lesson increases. In developing riding, exercises are added with sorting objects according to various tactile properties. Actual exercises are when the child repeats simple exercises after the instructor.

The child is already familiar with the S.P. in front of the manual, when he takes out a circle with the image of a horseman, for example, "hands up", he is already doing them. At the end of the stage, the S.P. clause is added. on the side. Only those positions are taken in which the usual position is shown (without changing the position of the hands). In order for the instructor to understand whether the child has recognized the difference in the S.P. front or S.P. side, give the task of sorting positions, side or front.

The third stage, compared with the previous one, is characterized by the activity of the child in moving his own body relative to the horse. The position of S.P. is added to the development. sit back. In the classroom in various starting positions, tasks are added to control the child's movements and follow complex instructions. For example, a large and a small soft ball is taken, at first you can simply try to squeeze the balls with your palms and knees. Then the instruction to the child follows: "you need to live a small ball between your knees, and a large ball between your palms, squeeze a small ball with your knees", etc.

So that the tasks are not just a transplant (this will quickly reduce the motivation of the child), we supplement this task with various complicated tasks. For example, after transplantation, the child needs to put a kinesio bag on himself on a certain part of the body, repeating the position after the instructor's action. Also with children, it is possible to sort cards with positions already on three grounds.

At the fourth stage of the lesson, the child gets acquainted not only with the position of his body relative to the horse, but also with the position of objects relative to the body.

The use of objects - toy animals (fruits) - is very important, since the child's motivation for this is higher than for studying the position of kinesio bags. For example, the instructor distributes various objects around the child and we study what lies in front, behind, on the right side and on the left side, and on instructions the child changes the position of the objects around him. By the end of the stage, exercises are added to search for objects throughout the work area.

We use the sheets from the manual, where the location of the kinesio bags is shown relative to the body of the rider. First, a picture is shown and the bag is placed passively based on the picture, then the rider learns to lay them out on his own, at the same time transplanting according to the picture into positions relative to the horse. We are also starting to study the manual, where, in addition to the provisions regarding the horse, you need to take into account what color and in which hand (right / left) the kinesio bag is located.

At the fifth stage, all the above exercises are done, which are brought under the specifics of studying the account - movements and memory exercises, as well as the horse's step is well suited for learning the rhythm.

When working with the manual, at first it is better to perform memory exercises using an "empty sheet" with three empty cells, the child takes a circle out of the bag and sculpts them on his own in the order he wants, then tries to complete tasks from memory. Also, color-movement can be organized using colored chips and colored clothespins with pictures of the positions on the horse's mane, it will be easier for children to memorize the sequence by seeing the images.

Further, for exercises with the manual, a "sheet - six empty cells" is used, where there will be positions on the left and numbers on the right. First, the numbers 1, 2, 3 are used. The exercises are chosen the simplest to perform, the rider takes out the cards and sculpts them, and the numbers on the left, and at first they perform them together with the instructor, the instructor keeps score. Then, numbers up to 10 are gradually added to the lessons, and the motor tasks provided by the images from the manual become more difficult.

When the child easily completes this task, you can use the count to teach the rhythm and pace of the movements.

Table 1. *Results of changes in testing indicators for children with hyperactive and hyperkinetic disorders, points*

Test	Experimental group (n=5) (X±m), points		Control group (n=5) ($\bar{X}$±m), points		p
	Before	After	Before	After	
The level of development of cognitive and motor abilities of children	5,20±0,64	10,80±1,04	5,40±0,72	8,60±0,88	>0.05
Alvord and P. Baker on child hyperactivity	5,40±0,88	11,80±1,84	5,40±0,88	12,20±1,44	<0.05

Results of the study and their discussion. According to the results of the tests, it can be seen that according to the Alvrod test, the two groups have almost the same results (Table 1), which means that these methods of work within the framework of developing riding equally favorably affect the deficit of active attention, motor disinhibition and impulsivity of children.

According to the results of the test on the level of development of cognitive and motor abilities of children, we see (Table 1) that the children of the two studied groups began to perform well even the third and fourth blocks of the test, where the child uses the acquired skills in the body scheme, spatial orientation, memory. But in the control group, only 1-2% of children perform task 4 of the test well, while in the experimental group 6-7% of children cope with this task. 1% of children in the control group cope with task 5, having received a mark of 1 point, in the experimental group 5% of children receive 1 point and 2% of children completely cope with the task.

Conclusions. The conducted testing proved the positive effect of the influence of the program of developing riding on such states of children as impulsivity, motor disinhibition, active attention. The use of the manual "Harmony in motion" contributed to the improvement of the cognitive and motor abilities of children.

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Professionalism of the head of a sports organization

UDC 796.062

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Abstract

Objective of the study was to determine the criteria for the professionalism of the head of a sports organization.

Methods and structure of the study. In the course of the study, an analysis of literary sources was carried out, which makes it possible to identify the most significant managerial qualities of a sports leader. To rank these qualities, a survey method was used - a questionnaire. The survey was conducted in Nizhny Novgorod in September 2021, in which managers and specialists of ten physical culture and sports organizations took part.

Results and conclusions. The vast majority of employees and managers of sports organizations see in the leader a strong personality with pronounced leadership qualities, manifested in organizational skills, discipline and self-control, sociability, psychological skills, indisputable authority, responsibility and the ability to defend the interests of the organization, forming a single, systemic concept of leadership. These personal qualities determine the professional competence of a sports leader, which is an integrated result of special education, socialization, practical skills and psychological characteristics.

Keywords: *physical culture and sports organization, sports management, leader, professionalism, personal qualities.*

Introduction. The development of the system of modern Russian sports largely depends on the professional competence of managers and specialists working in sports organizations. The effectiveness of the work of a physical culture and sports organization is largely due to the professional qualities of the leader [1, 2, 5].

The new economic conditions allowed sports organizations to gain greater independence, which influenced the interest in labor efficiency. Much in the work began to depend on the personal qualities of the leader. This suggested that the activities of the organization, the results of its work depend on the professionalism of the head, which determined the relevance of our study, aimed at identifying the most important professional qualities of the head of a sports organization.

Objective of the study was to identify professionally important personality traits of the head of a physical culture and sports organization, which are more pronounced in the conditions of the modern development of physical culture and sports as a branch of the economy.

Methods and structure of the study. As part of the study, an analysis of literary sources [1-6] was carried out, which made it possible to identify significant managerial qualities of a sports leader, such as the ability to form the economy of an enterprise, that is, to extract economic benefits, to show leadership, expressed in gaining the trust of the team, the ability to lead themselves, defending the interests of the organization.

To rank these qualities, a survey method was used - a survey, in which managers and specialists of ten sports organizations of Nizhny Novgorod in the amount of 30 people took part. Basically, the questions of the questionnaire were aimed at identifying the activity aspects of a sports leader, such as the ability to convince, self-control, etc.

Results of the study and their discussion. In the course of the survey, a unity of opinion was revealed, both among employees and managers of physical culture and sports organizations, on the issues of significance and importance of individual professional qualities of a sports leader. If we bring these indicators to the arithmetic mean and arrange the available answers in descending order of their importance, then we get the following characteristics of the professional qualities of a sports leader, which, according to the results of the study, are the most important:

- the ability to defend the interests of the organization (85% of respondents);
- the ability to derive economic benefit for the purposes of the organization; the ability to make money in the market of sports goods and services (75% of respondents);
- ability to lead (70% of respondents).

Further, a comparative analysis of the opinions of employees and heads of sports organizations was carried out on the requirements that are components of the professional characteristics of a sports leader. All respondents are similar in their opinions on the subject of such professional characteristics of a sports leader as:

- compliance with new tasks - 80% of the average response rate;
- organizational skills - 80% of the average response rate;
- presence of authority - 70% of the average response rate;
- sociability and ability to understand people, self-discipline, responsibility and independence - these professional characteristics received 65% of the average response rate.

Thus, the results of the survey made it possible to determine the most important professional qualities of a sports leader (see table) in the context of the opinions of employees and heads of organizations.

Having calculated the variances on the basis of the processed data during the survey, it turned out that the ratio of variances is **2.28**, and less than the tabular value of the Fisher criterion **F=3.18.** This suggests that the variances differ insignificantly and the samples can be pooled. Consequently, the opinions of employees and employers on the issue of the main professional characteristics of a sports leader coincide.

Conclusions. The vast majority of employees and managers of sports organizations see in the leader a strong personality with pronounced leadership qualities, manifested in organizational skills, discipline and self-control, sociability, psychological skills, indisputable authority, responsibility and the ability to defend the interests of the organization, forming a single, systemic concept of leadership.

The above personal qualities determine the professional competence of a sports leader, which is an integrated result of special education, socialization, practical skills and psychological characteristics.

Professional qualities of a sports leader based on the results of a survey

Professional qualities of a sports leader	Employees (% of sample)	Leaders (% of sample)
Organizational skills	70	90
The ability to understand people and sociability	70	60
Self-control and discipline	70	60
Indisputable authority	70	70
Fit for new challenges	90	70
Responsible and independent	60	70
Ability to lead	80	60
The ability to extract economic benefits for the purposes of the organization (the ability to earn in the sports services market)	80	70
Ability to defend the interests of the organization	70	100
Persistence on the way to the goal	50	40

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System of criteria and indicators for the development of mass sports

UDC 796.011

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Abstract

Objective of the study was to formulate the concept of "mass sport" based on the analysis of Russian legislation, scientific literature and statistical data and develop a system of criteria and indicators for the development of mass sports to assess the quality of services provided by sports and recreation organizations and individual entrepreneurs in the field of mass sports.

Methods and structure of the study. When writing the article, general scientific and private scientific methods were used, including the method of analysis and synthesis, statistical (relative to quantitative indicators), survey methods (using google forms for ease of processing and minimizing time), expert assessment and self-assessment (the participants themselves act as experts classes).

Results and conclusions. The authors, after analyzing modern legislation and scientific literature, formulated proposals for amending paragraph 4 of art 2 of the Federal Law "On Physical Culture and Sports". The authors propose to consider the provisions on physical culture and mass sports enshrined in this Law as indicators of a meaningful criterion for the development of mass sports. The result of a sociological study on the Microsoft Forms platform (550 respondents from all federal districts of the Russian Federation took part in the survey) is the author's system of criteria and indicators of mass sports, which can serve as guidelines for organizing work with youth in organizations and enterprises, developing programs for organizing family leisure activities, in the activities of trade union organizations in various industries, as well as in assessing the quality of socially useful activities for the provision of services to the population in the field of mass sports.

Keywords: *mass sports, sports, legislation, indicators and evaluation criteria, etymology of concepts.*

Introduction. In accordance with the global trend, the issues of the development of mass sports (hereinafter referred to as MS) are today becoming one of the priority fields of the social policy of Russia. In conformity with the current legislation, mass sports is one of the areas of human social and cultural activity, it satisfies the needs of people in the development of physical abilities, promotes preventive health care, reduces a significant number of diseases and promotes a healthy lifestyle [2, 4, 5]. In par. 4 of Art. 2 of the Federal Law "On Physical Culture and Sports in the Russian Federation" dated December 4, 2007 No. 329-FZ, the following concept of mass sports is fixed: "mass sports is a part of sports aimed at physical education and physical development of citizens through organized and (or) self-dependent activities, as well as participation in physical culture and mass sports events. In principle, it is difficult to agree with this definition of mass sports as a part of sports. If sports are one of the areas of social activity, then mass sports is also an activity. Moreover, according to par. 12 of Art. 2 of the Federal Law No. 329, "sports" is a sphere of social and cultural *activity*, the whole complex of sport disciplines developed in the form of competitions and special practice in training a person for them. In the opinion of the authors of the article, etymologically, the concept of "mass sports" needs to be clarified, and therefore they suggest to state par. 4 of Art. 2 of the Federal Law No. 329 in the following wording "mass sports is *a type of activity* aimed at physical education and physical development of *various population groups* through organized and (or) self-dependent activities, as well as participation in physical culture and mass sports events." It is also advisable to replace the term "citizens" with the phrase "various population groups", because the concept "population" is broader than the concept "citizens". Thus, mass sports may be characterized as a type of socially useful activity for the provision of services, and a system of criteria and indicators applicable for the assessment of the results of providing services to the population in the field of mass sports may be developed. Decree of the President of the Russian Federation No. 398 dated August 8, 2016 "On Approval of Priority Areas of Activities in the Sphere of Provision of Socially Beneficial Services" states activities for providing services in the field of physical culture and mass sports.

Objective of the study was to formulate the concept of "mass sport" based on the analysis of Russian legislation, scientific literature and statistical data and develop a system of criteria and indicators for the development of mass sports to assess the quality of services provided by sports and recreation organizations and individual entrepreneurs in the field of mass sports.

Methods and structure of the study. The following methods serve as a basis for the development of criteria for the assessment of physical culture and sports: analysis of the current legislation and statistical reports, and methods of survey (using Microsoft Forms for ease of processing and minimization of time investment), expert assessment and self-assessment (participants of physical culture and mass sports activities act as experts).

Results of the study and their discussion. The clarification of the concept of "mass sport" as a type of activity suggested by the authors of the article determines the possibility of characterizing not only the means of implementation, but also the result of such an activity. From the standpoint of the provisions stated in the regulatory documents, the result of mass sports is the preparedness of a person for certain sport disciplines, a certain level of physical development and physical education. What are the criteria and indicators for evaluating their efficiency then?

The outlined subject field of contemplation and scientific research has determined the need to refer to the works of such researchers as N.Yu. Goncharova, A.V. Kalinchuk, who single out the following as crite-

Criteria and indicators of the development of MS

Criteria	Indicators	
	qualitative	quantitative
environmental	consolidation of efforts of various organizations and partners in the development of MS	One can include indicators reflecting the conditions of the MS development, namely: availability of a material and technical facilities and resources, stadiums, outdoor areas for activities, availability of trained professionals to organize activities, amount of partner institutions and/or cooperation agreements of an institution, organization with sports institutions, or lease agreements for sports facilities, etc.
	consolidation of efforts of various organizations and partners in the development of MS	
	environment compliance with the Sanitary Regulations and Norms, requirements of supervisory authorities	
	variety of opportunities to practice various activities and sports	
substantial	focus of activities on health preservation and promotion, organization of socially significant leisure activities for various population groups	growth of fields and types of MS activities
	availability of MS activities to general public	availability of a level system of MS activities - for amateurs and athletes
	availability of MS activities to general public	amount of activity sessions per week
	focus on organizing socially significant forms of leisure	predominance of MS activities
	combination of physical activity, and health-improving, sanitary-educational activities	amount of activities for various population groups, combining physical activity, recreational and sanitary-educational activities
resultative	change of individual physical health indicators	growth of motor activity of general public
	change of the quality of life of an individual, satisfaction of a person with MS activities and life in general	amount of people satisfied with the quality of life, MS activities and life in general
	regularity of MS activities	duration of activity sessions
	willingness to promote the idea of MS activities in the family, and the nearest community	growth of the number of people regularly engaged in MS

ria for evaluating the efficiency of administration of the development of physical culture and mass sports: population coverage, equipment and material support, availability of sports venues and facilities [3]. G.A. Androsova, E.Ya. Mikhailova consider as such the conceptual program of industry development, the level of involvement of the population in regular physical education and sports activities [1]. E.A. Savenkova, S.A. Simkacheva, M.V. Tikhomirov, considering the expert assessment method of the development of physical culture and mass sports, single out a system of criteria and indicators which mainly reflect quantitative characteristics [7]. The above cited authors' positions regarding the characteristics of the criteria and indicators of the development of mass sports tend to specify mainly quantitative variables. Therefore, it is necessary to emphasize the need to specify not only quantitative, but also qualitative results of the development of this system, considering the ongoing economic, social and cultural, political, demographic and other changes. At the same time, it would not be entirely correct to assess individual physiological, psychological, and other differences between people from the standpoint of existing averaged physiological indicators, in the context of voluntary and independent nature of MS activities.

The results of the scientific and theoretical analysis of the problem under study and the conducted sociological survey have allowed the authors of the article to introduce in a generic form the following criteria and indicators for the assessment of the development of and mass sports.

The introduced criteria and indicators of the development of mass sports make it possible to specify the selection of forms and methods of organizing physical culture and health improvement activities. When considering the problem of organizing mass sports among the adult population engaged in labor activities, these criteria and indicators may serve as guidelines for organizing work with young people in companies and enterprises, developing family leisure programs, and in the activities of trade union organizations in various industries. These criteria and indicators are also relevant and correct with regard to the ageing population.

Conclusions. Thus, the development of mass sports is a problematic field from the standpoint of addressing the problems of state policy, law, educational theory and practice. The clarifications and changes in the current legislation indicated in the article, as well as the criteria and indicators of the development of mass sports may serve as a basis for developing a corresponding system at the level of educational organizations, labour collectives of companies and enterprises of various forms of ownership.

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