№ 3 March 2023

Theory & Practice of Physical Culture

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

Sportization in the realities of modernity

The mechanism of sportization is put in the genesis of the development of modern sports. It has been repeatedly proven that sport as a social phenomenon of modern life is a school for the formation of character, courage, will for young people, in which one can learn to win and lose. In sports, various problem situations and ways out of the difficulties that are encountered both in sports activities and in ordinary human life are modeled. Thus, already at the present time there is a phenomenon of sportization of physical education as a process of youth socialization.

The concept of sportization in modern education includes the conversion penetration of high sports technologies into the educational process in order to form young people's motivation and interest in sports. The sportization of physical education creates equal opportunities for self-development and self-improvement of the psychophysical qualities and motor abilities of each student through sports activities that promptly respond to the motivation, interests and needs of those involved.

At the same time, it is quite clear that it is impossible to transfer into physical education (especially children and adolescents) the system of competitions that has developed in the sport of the highest achievements with tough competitive relations between athletes, careful recording of results using complex technical devices, selection of athletes for competitions of a higher level, performance of sports categories and titles.

However, if it is currently impossible to refuse this in high-performance sports, then in physical education one should actively use the huge educational potential of competitions based on the basic values of sports: friendship, mutual assistance, fair competition, harmony of body and spirit. At the same time, I would like to emphasize that the competitive start, the focus on achieving victory, setting a record is the main distinguishing characteristic of sports, for example, from physical culture, where the competitive method is only one of the ways to increase the interest and motivation of those involved in physical activity.

Given the importance of the competitive aspect, the sportization of physical education should include, along with the introduction and adaptation of sports training technologies, the competitive principle based on the following conversion conditions: be generally accessible, do not require highly specialized sports training; allow a large number of young people to compete; provide equal opportunities for participation in competitions for those involved in different sex, age and physical abilities; evaluate results without the use of complex procedures and expensive equipment.

We invite scientists to publish the results of scientific research aimed at improving the methodology of the basics of physical education, the search and development of innovative sports technologies.

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

3'2023

Monthly Scientific-theoretical Journal, founded in 2013

ISSN 2409-4234

©ANO SPC «Theory and Practice of Physical Culture and Sport»

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Theory and Practice of Physical Culture

Contents

Implementation of an individual approach in sport

UDC 796.011

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Abstract

Objective of the study was to scientifically substantiate the methodological approach to the implementation of the principle of individualization in sports training.

Methods and structure of the study. The scientific work used: analysis and generalization of scientific and methodological literature, practical experience, pedagogical testing, ascertaining and shaping experiments. Quantitative indicators were processed using mathematical statistics with their subsequent logical interpretation. The study was conducted in the natural conditions of the training process on a group of middle-distance runners.

Results and conclusions. Athletes with different indicators of qualities that affect sports fitness can be at the same level in the sports hierarchy. This is due to the presence of individual compensatory capabilities. The same sports result has a different individual "value" and, therefore, it is obtained by each individual athlete at a different "price".

In the course of the study, it was determined that the implementation of the principle of individualization in sports training consists in organizing a pedagogi-cal process based on an individual assessment of the relationship between a sports result and the components of an athlete's preparedness that determine it, in build-ing a quantitatively expressed model of an athlete's preparedness for a certain time and the implementation of corrective actions on the level of preparedness of the athlete.

Keywords: *sports training, control, individual approach, management.*

Introduction. Among the most urgent problems of practical pedagogy and the theory of sports training is the development of methods for individualization of the pedagogical process [1]. Unfortunately, in the real conditions of training, an individual approach is more declared than methodologically worked out. Recommendations for its implementation are made on the basis of environmental generalizations of data obtained on a "typical contingent" and are only suitable for someone averaged "it" ("they"), and an individual is always unique and specific with individual characteristics.

Objective of the study was to scientifically substantiate the methodological approach to the implementation of the principle of individualization in sports training.

Methods and structure of the study. The following methods were used in the scientific work: analysis and generalization of scientific and methodological literature, practical experience, pedagogical testing, ascertaining and shaping experiments. Quantitative indicators were processed using mathematical statistics with their subsequent logical interpretation. The study was conducted in the natural conditions of the training process on a group of middle-distance runners.

Results of the study and their discussion. We have determined that the implementation of the principle of individualization in sports training consists in organizing a pedagogical process based on an individual assessment of the relationship between a sports result and the components of an athlete's preparedness that determine it, in building a quantitatively expressed model of an athlete's preparedness by a certain time and performing corrective actions on the level of an athlete's preparedness.

Assessment of the athlete's readiness level involves measuring indicators that reflect the state of the cardiorespiratory system (CRS), neuromuscular apparatus (NMA), psychomotor functions (PMF) and physical fitness (FP). Determination of the state of cattle is carried out by registering the reaction of the cardiovascular system (CVS) to standard work, the Stange test and the relative vital capacity (VC). As a specific standard running work, based on the position that the fatigue mechanism has a strict specificity, due to the type and nature of the work [2], 1000 m running at an average speed of 5.55 m/s is used for runners with sports achievements of two minutes and better in 800 m and 5.0 m/s for lower-skilled runners [3]. When running at such a speed, the specificity of work and the linear relationship between the intensity of work and the dynamics of vegetative processes in the body are preserved. The load is assessed by the dynamics of heart rate indicators taken during the run and the recovery time of heart rate.

To study the relationship of various indicators of preparedness with the level of qualification, a comparative (inter-group and longitudinal individual) correlation analysis was carried out. The first included athletes of higher qualification (MS - I category, n=13), the second - less qualified (II-III category, n=10). Testing conditions were maximally standardized. The indicators of FP, the state of the CRS were measured on Tuesdays, after the day of rest (on Sunday) and the retracting work on Monday 10-15 days before the competition, and the state of NMA and PMF was determined on the last day of training on the eve of the day of rest before the competition.

So, the most significant ($p \leq 0.05$) relationship with the sports result in both groups has only two indicators of FP - running at 60 and 400 m. differences in heart rate during running, recovery time and the Stange test. The condition of the CRS was assessed by the ability of the muscles to maximum tension and maximum relaxation, the muscles that take the main and direct part in running locomotion, namely: calf, biceps and quadriceps. Intergroup differences in these indicators were not revealed, as well as in the PMF indicators, although it is logical that such indicators as reaction time (RT), reaction to a moving object (RMO) and volitional muscle effort (VME) characterize tactical athlete's ability. The question is logical, why did the rest of the indicators recommended in the scientific and methodological literature turn out to be uninformative?

To resolve this contradiction, a two-year longitudinal study was conducted on runners (n=8, MS - I category) of the dynamics of sports results depending on the nature of changes in fitness indicators.

Informative significance ($p \leq 0.05$) of almost all indicators included in the test block was revealed, but at the individual level, some are informative, others are not (see table).

It is obvious that the indicators that characterize preparedness and readiness for competition show a fairly close relationship with sports results in some athletes, while others lack it. This, to a certain extent, explains the contradictions that exist in the literature on the degree of information content of indicators characterizing the state of the respiratory system. An analysis of the correlation relationship between heart rate indicators and sports results during work and the dynamics of its recovery shows that they have a high relationship with the level of preparedness in almost all subjects (75% at work and 87.5% during recovery). But even with such a high level of relationship, personal deviations are obvious, requiring individual retrogenesis in order to include (or not include) these indicators in the diagnostic block.

The relationship of diagnostic indicators with the effectiveness of competitive activity

Sportsman	Indicators / r x100											
	60 m	400 m	5th standing jump	VC, cm/kg	heart rate	Recovery time	AT of the 4-head muscle	AT of the 2-head muscle	calf muscle AT	RT	RMO	VME
1	-	88	-65	-90	92	85	66	-	-	-	-	-
2	-	93	-75	-75	79	77	-	-	-	64	-	-
3	78	83	-71	-69	92	97	-	-	-	-	-	-82
4	-	82	-70	-	90	88	-88	-82	-78	65	-	-
5	-	87	-	87	92	70	-66	-	-	74	-	-
6	-	95	-78	75	84	-	-77	-	-	-	75	-
7	-	79	-74	-	87	91	76	73	-	-	87	-81
8	-	95	-75	79	74	84	77	84	-	-	-	-68

Note: *AT - amplitude of tension*

The pronounced individual nature of the relationship between psychomotorics and the level of sports preparedness is also noted.

Consequently, *the model of the athlete's state*, based on the generalization of average group data, cannot take into account the individual compensatory capabilities of a particular person. Establishing an individual correlation relationship between the level of sports readiness and its various indicators made it possible to implement an integrated approach with operational, current and staged pedagogical control and calculate the regression coefficients for each indicator relative to a particular athlete. In the diagnostic block for the formative pedagogical experiment, the most "influential" indicators were selected individually.

The experiment, conducted in natural conditions of the training process, involved two groups of runners who did not have differences in the level of preparedness ($p>0.05$), formed by pairwise comparison with subsequent drawing of lots. The experiment was closed, comparative, and according to the scheme of evidence - parallel, direct.

For each participant of the experimental group, model characteristics of readiness were developed on the basis of regression dependences of sports results and the most informative indicators of readiness. When calculating the model characteristics, we proceeded from the need to ensure a guaranteed minimum level of preparedness, that is, the planned result was taken into account as the minimum possible. Pedagogical influences during the experiment were mainly aimed at increasing special physical fitness and CRS, and optimizing the state of NMA and PMF, which consisted in maintaining them at the level of the best indicators recorded in the preliminary study. In the control group, the diagnostic block included the most influential indicators on sports performance according to the average group data.

In the course of the experiment, *operational and current testing was carried out and the necessary adjustments* were made to the training program. The experiment showed the effectiveness of pedagogical control and the methodology for constructing a real functional model of the necessary state of an athlete to achieve the planned sports result. Through purposeful pedagogical influences, based on the desire to achieve compliance with the current state of the individual model, it was possible to bring the subjects to the main competitions in the state and the best preparedness and readiness. All this ultimately led to a greater increase in sports results in the experimental group. So, if in the groups before the experiment the results were 115.4±2.2 s and 115.7±2.5 s, ($p\geq0.05$), then after the experiment in the experimental group the results increased to 113.2±2.4 s, while in the control group it was up to 114.6±2.2 s. ($p\leq0.05$). It is obvious that a real consideration of the differences between actions and their results is possible only at the individual level.

Conclusions. The advantage of this approach to the implementation of the principle of individualization in sports training is obvious. It allows assessing the real state of preparedness and readiness of an athlete, predicting his sports result, bringing him in an optimal state to the main competitions of the season. The organization of the pedagogical process, based on the individual retrospective genesis of the relationship between a sports result and the components of preparedness that determine it, makes it possible to tangibly approach the solution of the problem of managing the training process, and in a broader sense, the human condition. Athletes with different indicators of qualities that affect sports fitness can be at the same level in the sports hierarchy. This is due to the presence of individual compensatory capabilities. The same sports result has a different individual "value" and, consequently, it is obtained by each specific athlete at a different "price".

Consequently, an individual (in the sense of concrete, "differentiated") approach is something required by the logic of things and objectively arising from the philosophical principle of determinism, from the philosophical dialectical-materialist doctrine of the concreteness of truth and the recognition of the dialectical connection between the general and the separate.

References

1. Vrublevsky E.P., Vrublevsky D.E. Vrublevskiy Metodologicheskiye osnovy individualizatsii podgotovki kvalifitsirovannykh sportsmenov [Methodological foundations of individualization of training of qualified athletes]. 2007. No. 1. p. 46.
2. Zimkin N.V. Ob obshchikh fiziologicheskikh mekhanizmakh razvitiya vynoslivosti [On the general physiological mechanisms of endurance development]. Proceedings XI All-Union scientific conference on physiology, morphology, biomechanics and biochemistry of muscle movements. Sverdlovsk, 1970. pp. 155-157.
3. Kostyuchenko V.F. Beg na 800 m: Otsenka urovnya podgotovlennosti [Running on 800 m: Assessment of the level of preparedness]. Legkaya atletika. 1982. No. 2. p. 6.

Gender differences of morphofunctional signs in persons engaged in single combats

UDC 796. 41

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Abstract

Objective of the study was to compare the degree of expression of sexual dimorphism of morphofunctional traits in athletes involved in taekwondo and martial arts in general. 101 athletes and 105 athletes aged 18-23 years old, specializing in martial arts (taekwondo, boxing, freestyle wrestling), performing in the qualification of the I adult category - Master of Sports were examined. All representatives of martial arts were combined into two groups of a single array (sportsmen and athletes). Taekwondo athletes made up two experimental groups (sportsmen and sportswomen).

Methods and structure of the study. With the help of anthropometry, all the necessary measurements were made in athletes (longitudinal, transverse, girth, thickness of skin-fat folds), body mass components and somatotype according to the Heath-Carter scheme were determined, indicators of VC, backbone strength and dynamometry of the leading arm were identified.

Results and conclusions. Differences in the sexual dimorphism of morphological and functional parameters in taekwondo fighters were revealed in comparison with a single array of martial artists. Gender differences in functional indicators in the examined athletes are more pronounced than in morphological parameters, regardless of the type of martial arts.

Keywords: *sexual dimorphism, morphofunctional indicators, taekwondo, boxing, freestyle wrestling.*

Introduction. It is known that in female athletes, many morphological and functional indicators approach or even exceed the corresponding parameters in male athletes. The physique features of athletes depend primarily on the biomechanical stereotype and energy characteristics of the sport. So, for example, there is a convergence of gender differences in body proportions in people involved in cyclic sports, in the ratio of muscle and fat components of body mass - in endurance trainees [4].

In our previous studies, it was shown that sexual dimorphism manifests itself to varying degrees in representatives of specializations with different biomechanics of motor activity [6]. At the same time, the question of how pronounced gender differences in morphofunctional characteristics are in athletes of closely related specializations remains unexplored.

Objective of the study was to reveal the sexual dimorphism of morphological and functional traits in athletes involved in taekwondo, and to compare the degree of its severity with the corresponding indicators in representatives of martial arts in general.

Methods and structure of the study. 101 athletes and 105 athletes aged 18-23 years old, specializing in martial arts (taekwondo, boxing, freestyle wrestling), performing in the qualification of the I adult category - Master of Sports (Table 1) were examined. All representatives of martial arts were combined into two groups of a single array (sportsmen and athletes). Taekwondo athletes made up two experimental groups (sportsmen and sportswomen). In all subjects, height, weight, longitudinal, transverse and girth dimensions of the body, as well as the thickness of skin-fat folds were measured, body mass components, somato-

Table 1. *Characteristics of study participants*

Type of martial arts	Gender of athletes		Number of persons
	Women	Men	
Taekwondo	36	40	76
Box	35	34	69
Freestyle wrestling	30	31	61
Total number	101	105	206

type, indicators of VC, backbone strength and dynamometry of the leading arm, physical development of athletes were determined [1, 5- 7].

Results of the study and their discussion. As a result of the study, gender differences in anthropometric and functional characteristics were noted both in taekwondo athletes and in all examined martial artists in general, however, the degree of severity of sexual dimorphism in the experimental groups and groups of the fused array was different (Table 2). As expected, athletes in all studied parameters outperform athletes of the same age and level of sportsmanship. At the same time, in representatives of taekwondo, gender differences in morphological features were revealed to a lesser extent, compared with the group of the fused array. This is especially true for indicators of the length of the limbs, the circumference of the chest and forearm, the average thickness of the skin-fat folds, the content of muscle mass of the body. Gender differences in the component composition of the somatotype in taekwondo athletes were revealed only in mesomorphy, while in athletes of the fused array - both in mesomorphy and ectomorphy. Comparison of the sexual dimorphism of the indicators of the mesomorphic component revealed significantly smaller differences among taekwondo fighters, compared with

Table 2. *Comparative analysis of gender differences in morphofunctional parameters in athletes (x+Sx)*

Morphofunctional indicators	Sportswomen		Sportsman	
	Taekwondo (n=24)	Fused array (n=101)	Taekwondo (n=28)	Fused array (n=105)
Body length, cm	164, 5±2,1	162,3±5,9	175,5±2,3*	174,7±6,1*
Upper limb length, cm	72,0±1,8	71,5±1,8	75,9±1,5*	77,5±2,7*
Lower limb length, cm	86,2±2,3	87,2±1,9	88,5±1,8*	91,1±2,8*
Chest girth, cm	87,8±1,3	88,9±1,3	91,6±1,3*	93,8±1,3*
Thigh girth, cm	56,2±2,4	55,3±2,1	60,4±3,1*	58,2±2,7*
Shoulder girth, cm	27,0±1,4	26,8±1,3	31,0±2,2*	30,5±1,6*
Forearm girth, cm	24,0±1,2	23,5±1,6	25,5±1,3	28,0±2,3*
Shin girth, cm	36,1±2,1	35,0±1,9	39,1±2,2*	37,9±2,1*
Acromial diameter, cm	38,4±2,2	38,3±2,0	40,5±2,1*	40,7±1,7*
Pelvic crest diameter, cm	27,9±1,6	27,2±1,1	26,0±1,3*	25,9±1,9*
Average thickness of skin-fat folds, mm	13,2±0,9	13,4±0,6	8,2±0,8*	7,1±0,7*
Bone component, %	17,8±1,4	17,1±1,6	20,4±1,1*	21,9±1,4*
Muscle component, %	45,8±2,2	44,7±2,8	51,2±2,3*	52,3±2,8*
Fat component, %	23,0±1,2	23,3±2,1	8,1±0,7*	6,8±0,9*
Endomorphy, points	3,0±0,3	3,4±0,5	3,0±0,1	3,5±0,4
Mesomorphy, points	5,0±0,6	4,8±0,4	5,5±0,2*	6,1±0,7*
Ectomorphy, points	2,9±0,2	2,6±0,3	3,0±0,4	3,2±0,1*
VC, l	3550±15,6	3780±20,8	4440±19,5*	4990±25,16*
Hand dynamometer, kg	24,5±1,5	25,3±1,2	56,8±2,4*	56,0±3,5*
Deadlift, kg	64,2±2,2	68,5±1,9	142,3±4,3*	145,5±6,0*

*Note: n - sample size, * - differences between persons of different sexes are significant, p<0.05.*

the corresponding indicators among representatives of martial arts in general.

It is interesting to note that the gender differences in functional indicators in the examined athletes are more pronounced than in anthropometric parameters, regardless of the type of martial arts.

Thus, the comparison of gender differences in morphofunctional characteristics in taekwondo fighters and in athletes of the fused array showed a lesser severity of sexual dimorphism of the studied indicators in taekwondo representatives, which is explained, on the one hand, by the result of the selection of athletes with a certain set of morphofunctional characteristics necessary for their successful competitive activity in taekwondo , and on the other hand, by the influence of the training process, which forms the necessary somatotype of an athlete [2, 3].

Conclusions. Differences in the sexual dimorphism of morphological and functional parameters in taekwondo fighters were revealed in comparison with a single array of martial artists. Gender differences in functional indicators in the examined athletes are more pronounced than in morphological parameters, regardless of the type of martial arts.

References

1. Pavlenko A.V., Rudenko G.V., Vinogradov Yu.I. Osobennosti podgotovki sportsmena i dinamika razvitiya studencheskogo tkhekvando g. Sankt-Peterburga [Features of athlete training and development dynamics of student taekwondo in St. Petersburg]. Teoriya i praktika fizicheskoy kultury. 2019. No. 4. pp. 65-67.
2. Rudenko G.V., Tkachuk M.G., Dorofeev V.A. Morfologicheskiye pokazateli uspeshnosti sorevnovatelnoy deyatelnosti v yedinoborstvakh [Morphological indicators of the success of competitive activity in martial arts]. Teoriya i praktika fizicheskoy kultury. 2020. No. 4. pp. 92-94.
3. Sobolev A.A., Tkachuk M.G., Levitsky A.A. Morfofunktsionalnyye kriterii bystroy treniruyemosti sambistov [Morphofunctional criteria for quick trainability of sambists]. Uchenye zapiski universiteta im. P.F. Lesgafta. 2018. No. 7. pp. 247-250.
4. Sologub E.B., Taymazov V.A., Afanaseva I.A. Sportivnaya genetika [Sports genetics]. St. Petersburg: Politekhnicheskiy universitet publ., 2017. 166 p.
5. Tkachuk M.G., Oleinik E.A., Dyusenova A.A. [Sports morphology]. Textbook. Lesgaft University, St. Petersburg. St. Petersburg: [n.p.], 2014.
6. Tkachuk M.G., Dyusenova A.A. [Sexual dimorphism of morphofunctional features in athletes]. Lesgaft University, St. Petersburg. St. Petersburg: [n.p.], 2021.
7. Carter J. The Heath-Carter anthropometric somatotype. Canada. 2002, 22 p.
8. Matiegka J. The testing of physical efficienc. American Journal of Physical Anthropology. 1921. Vol. 4. No. 3. pp. 223-230.

Influence of physical qualities on the efficiency of competitive activity of freestyle wrestlers

UDC 796.82

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Abstract

Objective of the study was to establish the dependence of the success of competitive activity on the level of development of the physical qualities of student freestyle wrestlers.

Methods and structure of the study. 112 students from four universities of St. Petersburg involved in freestyle wrestling took part in the scientific experiment. The following scientific methods were used in the work: theoretical analysis and generalization of data from special scientific and methodological literature, questioning, pedagogical observation (stenography, timing of fights and training sessions), testing, instrumental methods for assessing various aspects of readiness, methods of mathematical statistics.

Results and conclusions. The conducted correlation analysis made it possible to determine a group of indicators of special physical fitness, which largely determine the success of the competitive activity of student freestyle wrestlers. This complex included indicators of the quantity, quality and time of throws in special tests.

Keywords: *wrestling, freestyle wrestling, assessment of physical fitness of student-wrestlers.*

Introduction. Assessment of the physical qualities of wrestlers is an important link in the management of the training process and is based on identifying those qualitative features of the wrestlers' movement apparatus that determine their sports results [2, 3]. Information about the qualitative features of the physical fitness of students of freestyle wrestlers can be the starting point in predicting the success of competitive activity and determining the direction of the impact of training tasks on the improvement of certain qualities [1, 4].

Objective of the study was to establish the dependence of the success of competitive activity on the level of development of the physical qualities of student freestyle wrestlers.

Methods and structure of the study. To achieve this goal, the following scientific methods were used: theoretical analysis and generalization of data from special scientific and methodological literature, a survey in the form of a questionnaire, pedagogical observation (shorthand, timing of fights and training sessions), testing, instrumental methods for assessing various aspects of preparedness, methods of mathematical statistics. The study involved 112 student wrestlers from four universities in St. Petersburg.

Results of the study and their discussion. As a result of the correlation analysis, a set of indicators included in the definition of speed-strength qualities was determined (Table 1).

These are indicators interconnected with the effectiveness of the attack and the reliability of the won tactical actions: the time of squats with a partner on the shoulders ($r=-0.831$; $p<0.01$), the length of a triple jump from a place ($r=0.647$; $p<0.05$), the time shuttle run 4x10 m ($r=-0.818$; $p<0.01$). The effectiveness of the throws depends on the timely and fast execution of a technical action with the application of an "explosive"

Table 1. *Matrix of significant correlates of general physical fitness with indicators of competitive activity*

General physical fitness tests	Indicators of competitive activity					
	The quality of lost techniques	Attack efficiency	Protection efficiency	Activity	Reliability of won tactical actions	The quality of the actions won
10 pull-ups on the bar, s	398	597	470	-219	-054	-353
10 squats with a partner, s	-831	-317	-010	-498	-371	
10 forward bends with a partner, s	-356	-099	-381	-435	-056	-073
Triple jump, cm	379	647	-239	115	-711	-241
10 hanging leg raises on the bar, s	-349	-095	-321	-406	-023	-100
Shuttle run 4x10 m, s	-213	-818	-078	-313	006	-469
Rope climbing, s	126	-210	-348	008	-463	-513
The maximum number of pull-ups on the crossbar, number of times	364	210	648	653	317	018
Maximum number of squats with a partner, number of times	164	013	-034	690	-700	-216
The maximum number of slopes with a partner, number of times	301	-111	400	031	-107	28
Shuttle run 4x10 m, with a partner on the shoulders, with	-146	-030	171	-308	-100	-087
1600 m run, s	046	-071	005	-634	-024	-031

effort, which explains this correlation between the effectiveness of an attack and the reliability of tactical actions with indicators that determine speed-strength qualities. The obtained indicators are informative for assessing the speed-strength qualities of qualified student freestyle wrestlers.

The indicators of the maximum number of pull-ups on the bar and squats with a partner on the shoulders, the running time of 1600 m constitute a complex that is included in the definition of the activity and effectiveness of protection. The maximum number of pull-ups is associated with the effectiveness of protection ($r=0.648$; $p<0.05$) and activity ($r=0.653$; $p<0.05$). The maximum number of squats with a partner is significantly associated with activity ($r=0.690$; $p<0.05$) and negatively with the reliability of won tactical actions ($r=-0.700$; $p<0.05$).

The meaning of this relationship is that the wrestlers, who have an advantage in strength endurance, during the fight most successfully control the opponent's actions with the help of a grip and show high activity. During a competitive duel, they are mainly aimed at carrying out a technical action and are distinguished by a certain straightforwardness of wrestling. Therefore, they win very little duels on warnings, as evidenced by the negative relationship with the indicator of the reliability of tactical actions won.

The use of selected informative indicators makes it possible to evaluate the endurance of qualified wrestlers.

Thus, the correlation analysis data made it possible to determine the most informative indicators of general physical fitness: the maximum number of pull-ups on the bar, the length of a triple jump from a place, the time of ten squats with a partner on the shoulders, a shuttle run of 4x10 m. Less informative, but important in assessing endurance turned out to be a 1600-meter run and the maximum number of squats with a partner. Such indicators as shuttle run time 4x10 m, with a partner on the shoulders, the maximum number of pull-ups on the crossbar in the hang, are not informative.

Evaluation of speed-strength qualities and endurance by a set of indicators adequately reflects the general physical fitness of wrestlers. The use of these tests also implies monitoring the development of endurance in wrestlers during the training process.

Table 2 presents statistically significant correlations of indicators of special physical fitness with competitive activity. The most informative indicators are the quality and quantity of throws in accelerations (special test No. 2). The quality of the execution of techniques has a highly informative relationship with the effectiveness of the attack ($p<0.01$); at the 5% significance level - the relationship with the effectiveness of the defense, the reliability of the won tactical actions and the quality of the won actions. The indicator of the number of throws in accelerations significantly correlates with the effectiveness of the attack ($r=0.630$; $p<0.05$) and the effectiveness of the defense ($r=0.750$; $p<0.05$).

Table 2. *Matrix of significant correlates of tests of special physical fitness with indicators of competitive activity*

General physical fitness tests	Показатели соревновательной деятельности					
	The quality of lost techniques	Attack efficiency	Protection efficiency	Activity	Reliability of won tactical actions	The quality of the actions won
Special test No. 1 - execution time, s	-341	-212	-164	093	248	-271
Special test No. 1 - quality of performance, c.u.	413	643	356	254	077	328
Special test No. 2 - the number of throws in acceleration, times	314	630	750	296	409	301
Special test No. 2 - the quality of the execution of techniques, c.u.	213	880	700	329	-780	639
Special test No. 3 - execution time, s	-128	-341	242	-651	-495	-501
Special test No. 3 - the quality of the execution of techniques, c.u.	461	730	568	323	124	590

The number of throws in acceleration reflects the functionality of the wrestlers and the ability to attack every minute of the fight, which is one of the requirements of the competition rules. If the wrestler does not carry out active attacking actions within a minute, he receives a warning for passivity.

The time and quality of the performance of 60 throws in the special test No. 3 is significantly related to the activity ($p<0.05$) and the effectiveness of the attack ($p<0.05$). Taking into account that this test (conditional name - pressing) models the tactics of a continuous offensive, this dependence is explained by the presence of special physical qualities in the wrestlers to maintain activity throughout the entire fight and conduct techniques that are evaluated by the judges.

The performance quality indicator of 18 tricks in the special test No. 1 (code name - spurt) has a significant relationship with the effectiveness of the attack ($r=0.643$; $p<0.05$). Completion of a special test No. 1 reflects the ability of wrestlers to attack an opponent unexpectedly and in a variety of ways, which significantly increases the effectiveness of the attack. It should also be noted the feedback, the influence of wrestlers' special motor skills on increasing the effectiveness of an attack in a competitive duel.

The conducted correlation analysis made it possible to determine a group of indicators of special physical fitness, which largely determine the success of the competitive activity of student freestyle wrestlers. This complex included indicators of the quantity, quality and time of throws in special tests.

Conclusion. The results of the analysis of the received data testify that for the characteristic of the general and special physical readiness of the qualified wrestlers the indicators revealed in the course of research can be used.

References

1. Levitsky A.G., Rudenko G.V., Simakov D.A. Algoritmy resheniya takticheskikh zadach dzyudoistami vysokoy kvalifikatsii [Algorithms for solving tactical problems by highly qualified judoists]. Teoriya i praktika fizicheskoy kultury. 2020. No. 4. pp. 80-83.
2. Rudenko G.V., Tkachuk M.G., Dorofeev V.A. Morfologicheskiye pokazateli uspeshnosti sorevnovatelnoy deyatelnosti v yedinoborstvakh [Morphological indicators of the success of competitive activity in martial arts]. Teoriya i praktika fizicheskoy kultury. 2020. No. 4. pp. 92-95.
3. Tarakanov B.I., Apoiko R.N., Petrov S.I., Vorobieva N.V. Sovershenstvovaniye sistemy kontrolya i otsenki sportivno-tekhnicheskikh pokazateley zhenshchin-bortsov vysokoy kvalifikatsii [Improving the system of control and evaluation of sports and technical indicators of women wrestlers of high qualification]. Teoriya i praktika fizicheskoy kultury. 2020. No. 9. pp. 3-5.
4. Tarakanov B.I., Apoiko R.N., Petrov S.I., Vorobieva N.V. Korrelyatsionnyy analiz kak metod opredeleniya informativnosti sportivno-tekhnicheskikh pokazateley sorevnovatelnoy deyatelnosti zhenshchin-bortsov [Correlation analysis as a method for determining the informativity of sports and technical indicators of the competitive activity of female wrestlers]. Nauchno-pedagogicheskiye shkoly universiteta. 2020. No. 5. pp. 177-190.

Methodology of differentiated finger training for armrestlers of initial training groups

UDC 796.015

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Abstract

Objective of the study was to develop a methodology for differentiated training of finger strength in armwrestlers aged 10-13 and to determine its effectiveness.

Methods and structure of the study. The experiment involved 32 arm wrestlers aged 10-13 years old in the weight categories 50 and 55 kg, with 0.5-1 year of training experience, without categories. Of these, 16 were the control and 16 experimental group. Tensodynamometry was used as the main testing method. The results of maximum efforts were recorded in the following basic anatomical movements of the young armwrestler's strength topography: finger flexors, four-finger flexors alternately (except for the thumb). Between the mount and the chain is a Grant Scalse brand electronic dynamometer to record the maximum force exerted by the test subject on the handle in static mode.

Results and conclusions. The study of the indicators of the strength of the muscles - the flexors of the fingers and its dynamics in arm wrestlers aged 10-13 years old in the initial training groups under the conditions of the formative experiment showed a more significant increase in the results in the experimental group. The greatest increase was established in terms of "Dynamometry of the strength of the middle finger" both on the left and on the right hand ($p<0.01$). Presumably, this is due to the fact that the middle finger, according to testing, is the strongest of all the fingers of the hand and therefore, in all complex exercises for hand strength, it receives the greatest load compared to other fingers. The use of differentiated finger training can become a predictor of an increase in the effectiveness of competitive activity, which deserves attention and further study.

Keywords: *arm wrestling, grip strength, finger flexor muscles, initial training, tenzodynamometry.*

Introduction. A feature of the physical training of arm wrestlers of any level is the increased attention to the development of strength not only of large muscle groups, which carry the main load during a competitive duel (muscles of the back, chest, shoulder girdle, shoulder), but also smaller ones, which allow you to impose your own fighting style on the opponent: the muscles of the forearm and brushes [5].

Numerous studies have established that the main discriminatory signs of mastery in arm wrestling are the strength of the hand and fingers [1, 3, 6, 8]. Conducted by L.V. Podrigalo et al., (2017) a comparative study of hand strength and strength endurance indicators among armwrestling athletes of different skill levels showed that the level of hand dynamometry is an important informative and adequate criterion that determines training in this sport, characterized by the maximum system-forming contribution. This model characteristic is of particular value at the level of the primary selection of athletes. At the same time, it is believed that grip strength, in comparison with other characteristics, is difficult to train, being to a greater extent genetically determined [4].

As observations of the training process and a survey of trainers show, training of the finger flexor muscles is often limited to only one or two exercises at the end of the workout, while at the same time, much more training time is devoted to working out other muscles of the forearm - brachioradialis, pronators and supinators, as well as shoulder muscles. - two-headed and three-headed. Therefore, the search for new methods of strength training of the muscles of the hand is an important area of scientific research in arm wrestling.

Objective of the study was to develop a methodology for differentiated training of finger strength in armwrestlers aged 10-13 and to determine its effectiveness.

Methods and structure of the study. The formative experiment was conducted from May 25 to October 25, 2022 at the arm wrestling section of the national team of the city Lukhovitsy, Moscow Region. The experiment involved 32 arm wrestlers aged 10-13 in the weight categories of 50 and 55 kg, with 0.5-1 year of training experience, who did not have any categories. Of these, 16 were the control and 16 experimental group.

Tensodynamometry was used as the main testing method. The force-measuring device was a height-adjustable rigid dynamometer hitch with various specialized handles. Between the mount and the chain is a Grant Scalse brand electronic dynamometer to record the maximum force exerted by the test subject on the handle in static mode. After the warm-up, the subject performed two attempts in each task, the best result is taken into account.

The results of maximum efforts were recorded in the following basic anatomical movements of the young armwrestler's strength topography: finger flexors, four-finger flexors alternately. The indicators were determined at the relevant point for the application of force (Table 1).

Athletes performed individual finger curls on an adjustable block with a handle with a thin rotating earring. Performed three or four sets of 15-18 repetitions with each finger. Weight was used 65-80% of a single maximum. Super series were performed with the finger of the left and immediately without rest of the right hand. The load increased due to an increase in intensity, in particular, due to an increase in the weight of the load. Weights increased as the number of repetitions in one approach began to exceed the specified number. In the training sessions, the method of repeated non-limiting efforts was used.

Results of the study and their discussion. The level of muscle strength - finger flexors in the experimental and control groups before the start of the study had no statistically significant differences.

The data in table 2 show a significant increase in all the presented indicators of finger strength in the experimental group. The greatest increase was established in terms of "Dynamometry of the strength of the middle finger" both on the left and on the right hand ($p<0.01$). Presumably, this is due to the fact that the middle finger, according to testing, is the strongest of all the fingers of the hand and therefore, in all complex exercises for hand strength, it receives the greatest load compared to other fingers. In addition, two exercises were performed for training the middle and index fingers, and one for all the others. At the end of the study, in the control group, the average value of the increase in carpal dynamometry indicators only tended to increase and amounted to only 7.5% ($p>0.05$), while in the experimental group it was 15.5% ($p<0.05$).

Conclusions. The study of the indicators of the strength of the muscles - the flexors of the fingers and its dynamics in arm wrestlers aged 10-13 years old in the initial training groups under the conditions of the formative experiment showed a more significant increase in the results in the experimental group. The use of differentiated finger training can become a predictor of an increase in the effectiveness of competitive activity, which deserves attention and further study.

Table 1. *An example of an exercise for the flexor muscles of the index finger in the experimental group*

Name of exercise / hand position	Hand in neutral position	Hand in supinated position
Flexion of the finger with the handle of the adjustable block		

Table 2. *Comparison of the results of the strength of the finger flexor muscles in the control and experimental groups at the end of the experiment, left and right hand*

Types of controltests	Hand	Control	Experimental	t	p
		X±m	X±m		
Wrist dynamometry, kg	Left	36,9±2,74	43,1±2,14	2,4	<0,05
	Right	36,6±3,69	42,2±3,69	2,3	<0,05
Index finger dynamometry, kg	Left	12,8±0,7	15,0±1,07	2,8	<0.05
	Right	14,2±1,07	16,9±1,07	2,7	<0.05
Dynamometry of the middle finger, kg	Left	15,9±1,31	22,0±1,43	3,2	<0.01
	Right	16,7±0,95	22,2±1,31	3,4	<0.01
Dynamometry of the ring finger, kg	Left	12,2±0,83	17,4±2,02	2,6	<0.05
	Right	12,7±1,31	17,7±1,31	2,2	<0.05
Dynamometry of the little finger, kg	Left	8,9±1,07	10,4±1,07	2,4	<0.05
	Right	8,1±0,83	10,5±1,07	2,3	<0.05

References

1. Voronkov A.V., Nikulin I.N., Filatov M.S. Osobennosti razvitiya sily myshts-sgibateley kisti i paltsev v armsporte [Features of the development of the strength of the flexor muscles of the hand and fingers in armwrestling Kultura fizicheskaya i zdorovye. 2010. No. 4. pp. 18-20.
2. Voronkov A.V., Nikulin I.N., Sobyanin F.I. K voprosu o kontrole sovershenstvovaniya silovoy podgotovlennosti studentov, zanimayushchikhsya armsportom [On the issue of control over the improvement of strength training of students engaged in armwrestling]. Fizicheskoye vospitaniye studentov. 2014. No. 2. pp. 3-7.
3. Dmitruk S.S. Biomekhanicheskiye kriterii ratsionalnosti tekhnicheskikh deystviy v armsporte [Biomechanical criteria for the rationality of technical actions in armwrestling]. PhD diss.: 01.02.08. Rossiyskaya gosudarstvennaya akademiya fizicheskoy kultury. Moscow, 1999. 144 p.
4. Matyushenko I.A., Nikulin I.N., Antonov A.V., Nikulin E.I. Modelnyye kharakteristiki silovykh pokazateley otdelnykh myshechnykh grupp armrestlerov razlichnoy kvalifikatsii [Model characteristics of strength indicators of individual muscle groups of arm wrestlers of various qualifications]. Teoriya i praktika fizicheskoy kultury. 2020. No. 8. pp. 19-21.
5. Nikulin I.N., Matyushenko I.A., Posokhov A.V., Voronkov V.A. Silovyye sposobnosti v armrestlinge: osnovnyye tendentsii, otsenka, osobennosti proyavleniya [Power abilities in arm wrestling: main trends, assessment, manifestation features]. Moscow: Torgovyy dom Sovetskiy sport publ., 2022. 120 p.
6. Podrigalo L.V., Galashko N.I., Galashko M.N. Ispolzovaniye ergonomicheskikh podkhodov dlya povysheniya effektivnosti podgotovke v armsporte [The use of ergonomic approaches to improve the efficiency of training in armwrestling]. Fizicheskoye vospitaniye studentov. 2012. No. 1. pp. 87-90.
7. Nikulin I.N., Matyushenko I.A., Antonov A.V., Posokhov A.V. Sravnitelnaya kharakteristika pokazateley spetsialnoy silovoy podgotovlennosti armrestlerov razlichnykh vesovykh kategoriy i urovnya sportivnogo masterstva [Comparative characteristics of indicators of special strength training of armwrestlers of various weight categories and levels of sportsmanship]. Teoriya i praktika fizicheskoy kultury. 2021. No. 5. pp. 9-11.
8. Podrihalo O.O., Podrigalo L.V., Bezkorovainyi D.O., Halashko O.I., Nikulin I.N., Kadutskaya L.A. Analiz sily khvata i osobennostey somatotipa atletov armreslinga raznogo urovnya masterstva [The analysis of handgrip strength and somatotype features in arm wrestling athletes with different skill levels]. Fizicheskoye vospitaniye studentov. 2020. No. 24(2). pp. 64-70. Available at: https://doi.org/10.15561/20755279.2020.0201

Ways to control and improve physical performance

UDC 612.769:796.015

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Abstract

Objective of the study was to reveal the relationship between the mobility of the cervical spine and the blood circulation of the vertebral arteries, neurohumoral regulation and the physical performance of the body.

Methods and structure of the study. A group of active athletes, polyathletes, track and field athletes (23 people, 17-22 years old), qualification Master of Sports, Candidate for Master of Sports, 1 sports category, was examined. The mobility of the cervical spine (CS) was assessed, an ultrasound scan of the brachiocephalic vessels (USV) was performed; if mobility disorders of the cervical spine were detected, each athlete underwent up to three sessions of individual myocorrection: acupressure, reflex, vacuum massage of the cervical spine. Heart rate (HR) indicators during the active orthostatic test and maximum exercise testing were assessed twice before and after myocorrection.

Results and conclusions. In all cases of changes in the mobility of the cervical spine, USV confirmed various degrees of disturbance and asymmetry of blood circulation in the basin of the vertebral artery (VA). A decrease in the diameter of the vertebral artery corresponded to a decrease in the linear, volumetric blood flow velocity and was manifested by a low level of the total spectral power of HR, with the actual absence of fast regulatory elements. After myocorrection, the degree of restoration of blood circulation was confirmed by USV. The HR analysis revealed an increase in the total power of the spectrum and its redistribution to the high-frequency region. The results of load testing before and after myocorrection revealed significant differences in the efficiency of overcoming the load maximum and recovery. Violation of the mobility of the cervical spine, leading to a decrease and asymmetry of the blood circulation of the vertebral arteries, is manifested by depression of neurohumoral regulation and physical performance. Restoration of blood circulation after myocorrection improves the functional state and exercise tolerance.

Keywords: *mobility of the cervical spine, blood circulation, vertebral arteries, neurohumoral regulation.*

Introduction. The physical performance (PP) of an athlete is largely determined by the functional state (FS) of the body, in other words, by its neurohumoral regulation [1, 7, 8]. The latter is mainly determined by the viability of the blood supply to the brain stem. At the same time, the brain stem, which is responsible for maintaining life support functions and, accordingly, their neurohumoral regulation, is supplied exclusively from the vertebrobasilar basin. Its insufficiency is associated with a change in the cross section, volumetric and linear blood flow velocity of the vertebral arteries. Since these arteries pass through the transverse processes of the cervical vertebrae, the orientation and position of the latter will have a direct effect on the hemodynamics of these vessels. In turn, an increase, asymmetry of the tension of the muscles of the neck and the corresponding section of the spine can cause impaired mobility of the vertebrae and, accordingly, changes in the hemodynamics of the vertebral arteries. At the same time, an increase, asymmetry of muscle tone may be the result of a constant readiness to perform physical activity due to insufficient recovery, overload, overtraining or the formation of a forced (habitual) posture due to special physical activity (cyclists, rowers, athletes, weightlifters and others), as well as due to an untreated injury.

A change in the mobility of the cervical spine, expressed in a decrease and asymmetry of the angles of inclination and rotation of the head relative to the

physiological axes, is an external manifestation of a probable circulatory disorder of the vertebral arteries. The latter circumstance will probably be manifested by a violation of neurohumoral regulation and a decrease in the physical performance of the body. In turn, the restoration of blood supply in the basin of the vertebral artery is likely to lead to an improvement in neurohumoral regulation and physical performance of the athlete's body.

Objective of the study was to reveal the relationship between the mobility of the cervical spine and the blood circulation of the vertebral arteries, neurohumoral regulation and the physical performance of the body.

Methods and structure of the study. A group of active athletes, polyathletes, track and field athletes (23 people, 17-22 years old), qualification Master of Sports, Candidate for Master of Sports, 1 sports category was examined. The study included: ***firstly***, an assessment of the mobility of the cervical spine in the sagittal, frontal and vertical axes.

Secondly, in case of identified mobility disorders, an ultrasound scan of the brachiocephalic vessels (USV) was performed, the diameter and linear velocity of the blood flow of the vertebral arteries were assessed in areas V1 (from the beginning to the transverse process of the 6th cervical vertebra (C-6)), 2 (from C-6 to C-2), 3 (from C2 to the entrance to the spinal canal C1) on the left and right.

Thirdly, after identifying mobility disorders and their objective confirmation by ultrasound, each athlete underwent up to three sessions of individual myocorrection, including acupressure, reflex, and vacuum massage of the cervical region.

Fourth, an active orthostatic test (AOT) was performed, during which the electrocardiogram was recorded for 5 min in the supine position (clinostasis), and then in the standing position (orthostasis), including an active transition from the clinostasis position to orthostasis. The current functional state was assessed by the TP indicator (total power of the spectrum), taking into account the contribution of fast oscillations (HF-component), reflecting the activity of the parasympathetic division of the autonomic nervous system, slow oscillations (LF-component) - a marker of the activity of sympathetic influences and very slow oscillations (VLF -component) - reflective, humoral-metabolic and cerebral ergotropic effects on the heart rhythm. The LF/HF ratio was regarded as sympathetic reactivity. The reactivity of the parasympathetic division was assessed by a ratio of 30:15 [1, 2, 7, 8].

Fifth, the maximum bicycle ergometric testing was carried out according to an individual protocol. The power W1(Watt) of the 1st stage (3 min) was calculated from the value of the proper basal metabolic rate (BMR): W1(W)=BMR × 0.1. Next - ramp-protocol, increment 30W per minute, until failure - an individual maximum (Wmx), causing the end of the load and the beginning of the recovery period - 7 minutes [3-6].

Exercise tests were carried out in the first half of the day on a Lode Corival bicycle ergometer (7-1000 W). During the entire testing, the digitized ECG (PolySpectr-12, Neurosoft) was converted into a sequential time series of RR-intervals (CI) - a cardiorhythmogram (CRG). Physical exercise tolerance (Watts) was determined by the difference between the achieved

Table 1. *Results of USV of the vertebral artery before correction*

Results		Smaller diameter			Larger diameter		
	Pz	C1	C2	C3	C1	C2	C3
Diameter, mm	25	2,9	2,0	2,7	3,3	3,3	3,1
	50	3	2,7	2,8	3,6	3,6	3,2
	75	3,1	2,8	2,9	3,7	3,7	3,3
Vs sm/s	25	40	23	37	45	33	47
	50	44	27	40	53	41	48
	75	48	36	43	55	45	49

Table 2. *Results of USV of the vertebral artery before correction*

Results		Smaller diameter			Larger diameter		
	Pz	C1	C2	C3	C1	C2	C3
Diameter, mm	25	2,8	2,8	2,8	3,2	3,2	3,45
	50	3,1	3	2,9	3,4	3,3	3,5
	75	3,6	3,4	2,97	3,5	3,6	3,55
Vs sm/s	25	42	36	34,5	41	30	34,3
	50	46	38	35,5	44	38	39,5
	75	49	45	37,7	46	51	44,3

Table 3. *HRV spectrum in the clino- (C) orthostasis (O) position before correction*

HRV	Pz	30/15	Ps	TPмс²	VLFмс²	LFмс²	HFмс²	LF/HF	%VLF	%LF	%HF
C	25		68,7	517,2	260,9	104,7	80,78	1,2	34,58	20,66	10,8
	50		75,5	798,4	318,5	273,2	110,6	1,99	44,88	31,76	14,1
	75		88,2	1054,7	370,5	471,9	180,0	3,46	64,33	40,64	20,1
O	25	1,05	88	725,73	263,6	234,3	54,78	4,26	29,05	28,42	4,02
	50	1,15	100	1231,9	619,0	404,8	72,59	5,04	61,53	32,62	7,08
	75	1,22	111	1762,9	1230	515,2	113,0	7,39	66,73	61,68	8,7

Table 4. HRV spectrum of clino- (C) orthostasis (O) after correction

HRV	Pz	30/15	Ps	TPмс²	VLFмс²	LFмс²	HFмс²	LF/HF	%VLF	%LF	%HF
C	25		64	1212,5	355,1	287,4	501,3	0,5	22,34	22,32	31,1
	50		69	2168,3	587,8	601,5	727,6	0,65	31,01	30,08	37,8
	75		74	2518,7	732,3	818,0	945,4	1,11	37,4	36,37	52,2
O	25	1,28	78	1491,9	754,1	445,0	160,6	1,58	41,24	22,74	8,43
	50	1,35	88	2232,8	1121,5	619,3	286,1	2,74	52,64	32,09	12,3
	75	1,46	92	2783,6	1474,2	1098	466,3	4,85	64,22	45,05	19,2

maximum physical activity (Wmx) and power W1. The indicator W/Ps - according to the formula: W/HRpm, where HRpm is the sum of CI of the last minute of the load. The duration of recovery was determined by the integral indicator (II), as the sum of CI for 7 minutes of the recovery period.

Sixth, after myocorrection, repeated ultrasound scanning of brachiocephalic vessels was performed, the functional state was assessed by the frequency spectrum of HR during an AOT, and stress testing. The results of the study were processed using the statistical package Statistica 10.0.

Results of the study and their discussion. In all cases (12 people) of changes in the mobility of the cervical spine, ultrasound scanning confirmed various degrees of disturbance and asymmetry of blood circulation in the basin of the vertebral artery.

For the correctness of the analysis and simplification of perception, the results are grouped according to the size (larger/smaller) of the cross section of the vessels detected by ultrasound scanning of the vessels. The classical representation (right/left vertebral arteries) would complicate perception and analysis, since circulatory disorders in athletes were detected with equal frequency from different sides. In turn, we did not establish differences in neurohumoral regulation in the presence of predominant circulatory disorders in the left or right vertebral arteries in this work (Table 1).

At the same time, a decrease in the diameter of the vertebral artery, detected in V1, 2, 3 areas, corresponded to a decrease in the linear and volumetric blood flow velocity in them. The asymmetry of the blood supply during the initial examination is manifested by a low level of the total power of the spectrum, which actually lacks fast regulatory elements, and is based on humoral-metabolic waves in both ortho- and clinostasis (Table 2).

After individual myocorrection, partial restoration of blood circulation was confirmed by repeated ultrasound scanning. The frequency analysis revealed an increase in the total power of the spectrum and its redistribution to the high-frequency region.

In clinostasis, the role of rapid regulation increases, which already makes up 2/3 of the entire spectrum. In orthostasis, despite the predominance of humoral-metabolic activity, the sympathetic component occupies a third of the total power, and together with parasympathetic activity makes up 44.4%. The Ewing index increases significantly (from 1.15 to 1.35), which indicates an increase in parasympathetic reactivity (Tables 3, 4).

When comparing the results of stress testing before and after myocorrection, no significant differences in achieving the maximum physical performance were found, however, statistical significance was confirmed by the effectiveness of exercise tolerance (W/HR in the last minute of exercise: 159.1 vs. 146.9) and recovery (II - 819 .8 vs. 759.5).

Conclusions. Thus, impaired mobility of the cervical spine, leading to a decrease and asymmetry of the blood circulation of the vertebral arteries, is manifested by depression of neurohumoral regulation and physical performance. Restoration of blood circulation after myocorrection improves the functional state and exercise tolerance.

References

1. Abdullaeva K.G.K., Akulina M.V. Osobennosti serdechnogo ritma v predstartovyy, nagruzochnyy i vosstanovitelnyy periody stress-testa

[Features of the heart rhythm in the pre-start, load and recovery periods of the stress test]. Teoriya i praktika fizicheskoy kultury. 2019. No. 7. pp. 55-58.
2. Golubeva N.K., Petrov A.B., Shuliko Yu.V., Kalinin A.V. Vliyaniye trenirovochnoy raboty na adaptatsionnyye kharakteristiki organizma [The influence of training work on the adaptive characteristics of the body]. Teoriya i praktika fizicheskoy kultury. 2020. No. 11. 100 p.
3. Lapkin M.M., Trutneva E.A., Petrov A.B. Prognosticheskiy potentsial vremenn go ryada kardioritmogrammy stresstesta [Prognostic potential of the time series of stress test cardiorhythmogram]. Fiziologiya cheloveka. 2019. Vol. 45. No. 3. pp. 48-60.
4. Lapkin M.M., Birchenko N.S., Pozhimalin V.N. Prognosticheskiy potentsial nagruzochnoy kardioritmogrammy rannego adaptatsionnogo perioda [Prognostic potential of the load cardiorhythmogram of the early adaptation period]. Chelovek. Sport. Meditsina. 2018. No. 1 (18). pp. 46-59.
5. Lapkin M.M., Mikhailov V.M., Petrov A.B. Patent 2613921 RF. Sposob opredeleniya vosstanovitelnogo potentsiala u sportsmenov, razvivayushchikh aerobno-anaerobnuyu vynoslivost [Patent 2613921 RF. A method for determining the recovery potential of athletes developing aerobic-anaerobic endurance]. No. 2015137142; appl. 09.01.2015.
6. Lapkin M.M., Mikhailov V.M., Petrov A.B., Reksha Yu.M. Patent 2613937 RF. Sposob opredeleniya potentsialnogo urovnya fizicheskoy rabotosposobnosti pri submaksimalnom nagruzochnom testirovanii [Patent 2613937 RF. A method for determining the potential level of physical performance during submaximal load testing]. No. 2015136686; appl. 08.29.2015.
7. Pokhachevsky A.L., Lapkin M.M., Trutneva E.A., Melnikov D.S., Shubin K.Yu. Adaptatsionnyye mekhanizmy predelnoy rabotosposobnosti [Adaptive mechanisms of limiting working capacity]. Teoriya i praktika fizicheskoy kultury. 2021. No. 8. pp. 17-19.
8. Filipchenko A.I., Kulagin P.A., Pozhimalin V.N., Petrov A.B. Osobennosti formirovaniya fizicheskoy rabotosposobnosti v molodezhnoy vyborke [Features of the formation of physical performance in the youth sample]. Teoriya i praktika fizicheskoy kultury. 2022. No. 1. p. 41.

Manifestation of respiratory functions of hockey players under training impacts of different directions

UDC 612.769:796.015

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Abstract

Objective of the study was to identify the features of the reaction of the respiratory system of hockey players to a special physical load.

Methods and structure of the study. The survey involved 25 qualified hockey players of various types of energy metabolism at the age of 16-18 years. On the basis of indicators of the response of the respiratory system of athletes to loads of varying intensity, additional reserves for increasing fitness were studied.

Results and conclusions. The gradation of the reactivity of the respiratory system of hockey players, depending on the parametric algorithmization of the load, makes it possible to stimulate the deployment of additional reserves to increase fitness. Variation of non-specific load parameters is expedient in order to activate recovery based on a combination of aerobic and anaerobic mechanisms of energy metabolism of qualified hockey players.

Keywords: *respiratory functions, hockey players, metabolism, load intensity.*

Introduction. The impact of the training load on the activation of physiological functions is manifested in the mobilization of the adaptive reserves of the body of athletes [1, 3]. An increase in the level of fitness is accompanied by an increase in reserve capabilities and the effectiveness of their implementation in the main sports result. The basis for improving adaptive mechanisms is the activation of metabolic processes in the body of hockey players in the annual cycle of sports training [2].

The growth of sports results is ensured not only by an increase in the ability to tolerate physical activity, but also by the ability to quickly and fully restore body functions reduced under the influence of sports training [7].

Optimal planning and implementation of the systemic use of special training means activates the processes of working capacity recovery after completing the volume of training work [5].

The training process control function ensures the achievement of planned indicators during sports training and thus ensures the achievement of the required sports result in hockey [4]. An informative indicator of adaptive shifts on the physiological contour of the training process regulation is the features of the individual reaction of the respiratory system of athletes to the experienced training load [6].

Objective of the study was to identify the features of the reaction of the respiratory system of hockey players to a special physical load.

Methods and structure of the study. In order to improve the methods of managing the training of hockey players of various sports specialization, a study was made of the characteristics of the reaction of the respiratory system of athletes to a special physical load. Physiological monitoring parameters were recorded in 25 qualified athletes aged 16-18 years. The study involved hockey players with an aerobic type of energy metabolism (7 people), an anaerobic type of energy metabolism (8 people), a mixed type of energy metabolism (8 people).

The main part of the training sessions was differentiated by the focus on increasing anaerobic power, aerobic-anaerobic productivity, aerobic work support mechanisms. Testing was carried out on replicators of special training in hockey.

At the first stage, exercises aimed at increasing the anaerobic power of work were used. The task consisted of four series of six segments of 15 m of skating at maximum speed. Rest after each segment was carried out until the pulse was restored to 120 beats/min, the rest between series was 5 minutes.

At the second stage, the indicators of the reaction of the respiratory system of hockey players to the load in the aerobic-anaerobic zone were studied. To do this, the task was performed in skating four segments of 200 m each. 30 seconds were allotted for rest between segments.

At the third stage, research was carried out on the reactivity of hockey players to polarized training in an aerobic mode at the level of maximum oxygen consumption (MOC). The effects of aerobic metabolism were achieved by an exercise in moving 3000 meters while dribbling the puck.

The study of the functions of the respiratory system of hockey players was carried out using a spirometer (spirograph) Spirolab-3.

The three most informative spirometric markers were measured: lung capacity (VC); forced vital capacity (FVC); forced expiratory volume in the interval of the first second (FEV1).

To measure FVC, before the test, several even breathing movements were performed, then a slow deep breath, and then a full exhalation. This was followed by the informative part of the test - the fastest and deepest breath.

When measuring the volume of intensively exhaled air in the first second, the subject performed several active breathing cycles at a rate of 30 breaths and exhalations per minute.

Results of the study and their discussion. Table 1 shows the indicators of the reactivity of the respiratory function of hockey players under the influence of physical activity in the anaerobic mode of training.

The results obtained indicate that the respiratory system of athletes reacts differently to physical activity, depending on the predominant type of metabolism of hockey players.

Table 1. *Dynamics of indicators of respiratory functions during training for the development of anaerobic performance of hockey players, $\bar{x} \pm m$ (l)*

Dominant type of metabolism	Indicator	Before load	After load	Growth, %
Anaerobic	VC	4,78±0,6	5,04±0,4	5,43
	FVC	4,81±0,2	4,83±0,5	0,41
	FEV1	3,66±0,5	4,51±0,6	25,27
Mixed	VC	4,87±0,4	5,05±0,7	3,69
	FVC	4,81±0,7	4,83±0,2	0,41
	FEV1	3,91±0,6	4,13±0,5	5,62
Aerobic	VC	5,25±0,7	4,71±0,3	-10,28
	FVC	5,13±0,1	5,00±0,8	-2,53
	FEV1	4,76±0,4	4,59±0,8	-3,70

Table 2. *Dynamics of indicators of respiratory functions of hockey players during aerobic-anaerobic training, $\bar{x} \pm m$ (l)*

Dominant type of metabolism	Indicator	Before load	After load	Growth, %
Anaerobic	VC	4,45±0,4	4,87±0,2	9,43
	FVC	4,54±0,2	4,86±0,5	7,04
	FEV1	3,95±0,3	4,49±0,1	13,61
Mixed	VC	4,24±0,1	4,52±0,6	6,60
	FVC	4,61±0,7	4,74±0,8	2,80
	FEV1	3,91±0,4	4,13±0,7	5,62
Aerobic	VC	4,87±0,2	5,05±0,6	3,69
	FVC	4,01±0,8	4,11±0,7	2,49
	FEV1	4,11±0,1	4,23±0,2	3,17

Table 3. *Dynamics of indicators of respiratory functions of hockey players during training for the development of basic endurance, $\bar{x} \pm m$ (l)*

Dominant type of metabolism	Indicator	Before load	After load	Growth, %
Anaerobic	VC	2,84±0,02	3,41±0,10	20,07
	FVC	3,96±0,06	4,14±0,11	15,0
	FEV1	3,6±0,05	3,79±0,06	5,27
Mixed	VC	4,71±0,06	4,85±0,04	3,11
	FVC	5,57±0,09	5,77±0,02	5,26
	FEV1	4,09±0,12	4,78±0,05	18,78
Aerobic	VC	4,79±0,08	4,95±0,06	3,34
	FVC	5,47±0,06	5,78±0,07	5,66
	FEV1	4,04±0,07	4,88±0,02	20,79

It was found that the work performed in the anaerobic mode causes a different reaction of the body of hockey players of different types of energy metabolism. Hockey players of the 1st group showed the highest increase in forced expiratory volume in the interval of the first second (FEV1) - 25.27%. The increase in the FEV1 indicators of hockey players of the 2nd group for physical activity was 5.62%. Hockey players of the 3rd group showed a decrease in the FEV1 by 3.70%.

The reaction of the respiratory system of hockey players of the 2nd and 3rd groups turned out to be significantly less compared to the results of the athletes of the 1st group. Anaerobic algorithmization of loads causes greater reactivity of hockey players with an anaerobic type of metabolism in the utilization of air oxygen in the first seconds of work (Table 2).

The reactivity of the respiratory functions of athletes in the aerobic-anaerobic regime ensured the deployment of functional reserves in all experimental groups.

Hockey players of the 1st group have a higher reaction to the load than athletes of the 2nd and 3rd groups. There is an optimal activation of the respiratory function of the body of hockey players.

In table 3 shows changes in the indicators of the respiratory functions of hockey players under the influence of training on the development of basic endurance.

The impact of aerobic load volumes leads to a positive reactivity of the respiratory functions of hockey players related to all types of energy metabolism. Hockey players of all experimental groups recorded a significant increase in the FEV1. It was revealed that the respiratory system of hockey players with a predominance of aerobic and mixed types of metabolism reacts intensively to physical activity in the aerobic zone at the level of the MOC. Hockey players with a predominance of the aerobic type of metabolism have more powerful oxidative mobilization resources. With an increase in the duration of work, hockey players of anaerobic and mixed types form a high oxygen debt, which leads to pronounced fatigue. This indicates insufficient fitness when performing work with an aerobic orientation of training. Indicators of respiratory functions indicate the need to perform the amount of work in the zone of high power for 30-40 minutes. Due to the increase in the intensity of the work of the cardiorespiratory system of hockey players, the percentage of MOC and the saturation of blood hemoglobin with oxygen increases to a physiological maximum.

Conclusions. The gradation of the reactivity of the respiratory system of hockey players, depending on the parametric algorithmization of the load, makes it possible to stimulate the deployment of additional reserves to increase fitness. The use of aerobic load mobilization stimuli in the training process will improve the functioning of the aerobic capabilities of the energy metabolism of hockey players with a predominance of anaerobic and aerobic types of metabolism.

Variation of non-specific load parameters is expedient in order to activate recovery based on a combination of aerobic and anaerobic mechanisms of energy metabolism of qualified hockey players.

References

1. Bolotin A.E., Bakaev V.V., Van Zvieten K.Ya. et al. Differentsirovannaya podgotovka plovtsov-marafontsev k sorevnovaniyam na otkrytoy vode s uchetom tipov energeticheskogo metabolizma [Differentiated training of marathon swimmers for competitions in open water, taking into account the types of energy metabolism]. Teoriya i praktika fizicheskoy kultury. 2020. No. 10. pp. 37-39.

2. Bolotin A.E., Ponimasov O.E., Aganov S.S. et al. Selektivnost vosproizvedeniya obraznykh predstavleniy v trenirovochnom protsesse legkoatletov-studentov [Selectivity of reproduction of figurative representations in the training process of student athletes]. Teoriya i praktika fizicheskoy kultury. 2022. No. 1. pp. 51-53.
3. Zyukin A.V., Ponimasov O.E., Bolotin A.E. et al. Kontrol perifericheskoy gemodinamiki plovtsov kategorii «Masters» [Control of peripheral hemodynamics in swimmers of the "Masters" category]. Teoriya i praktika fizicheskoy kultury. 2020. No. 12. pp. 67-69.
4. Ponimasov O.E., Romanenko N.V., Barchenko S.A. et al. Sensomotornaya integratsiya v sovershenstvovanii slozhnykh igrovykh koordinatsiy khokkeistov [Sensorimotor integration in improving the complex game coordination of hockey players]. Teoriya i praktika fizicheskoy kultury. 2022. No. 2. pp. 97-99.
5. Ponimasov O.E., Pugachev I.Yu., Paramzin V.B. et al. Kinematicheskiy analiz tekhniki plavaniya na osnove sinkhronnoy videozapisi lineynogo dvizheniya [Kinematic analysis of swimming technique based on synchronous video recording of linear motion]. Teoriya i praktika fizicheskoy kultury. 2023. No. 1. pp. 14-16.
6. Pugachev I.Yu., Paramzin V.B., Raznovskaya S.V. et al. Formirovaniye ustoychivosti polozheniya dlya strelby v sluzhebnom dvoyeborye [Formation of position stability for shooting in service biathlon]. Teoriya i praktika fizicheskoy kultury. 2022. No. 6. pp. 49-51.
7. Shtamburg I.N., Ponimasov O.E., Grachev K.A. et al. Ekonomizatsiya tipologicheskikh kombinatsiy tekhniki prikladnogo plavaniya pri obuchenii kursantov voyennykh vuzov [Economization of typological combinations of applied swimming technique in teaching cadets of military universities]. Teoriya i praktika fizicheskoy kultury. 2016. No. 2. pp. 16-17.

Features of the influence of physical loads of different directions on the performance indicators of female students of different somatotypes

UDC 796.011.3

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Abstract

Objective of the study was to identify the features of the influence of physical loads of various directions on the physical fitness of female students of different somatotypes.

Results and conclusions. Within the framework of this work, the features of the influence of loads of various sports orientations on the physical fitness of female students of different somatotypes are determined.

The pilot study involved female students involved in volleyball, basketball, swimming and fitness as part of elective physical education courses. All participants in the experiment were identified body type: asthenic, thoracic, muscular and digestive. For a comparative assessment of physical performance under the influence of loads of different sports directions, the following methods were used: functional test PWC_{170} and determination of the magnitude of the intensity of accumulation of pulse debt (IAPD).

Keywords: *body types, types of physical activity, working capacity, physical education of students.*

Introduction. Physical performance is a part of general physical fitness, therefore specialists and researchers in the field of university sports pay special attention to its assessment. Currently, studies devoted to the study of the influence of various sports on the performance of female students, in particular fitness aerobics, Pilates, cheerleading and other popular types of physical activity, are in great demand in science and practice. In this regard, the search for effective methods for assessing the physical condition of students under the influence of loads of various sports orientations becomes an important direction in solving the problems of increasing physical and mental performance, acquiring by students the necessary theoretical knowledge and skills in their future professional activities.

Objective of the study was to identify the features of the influence of physical loads of various directions on the physical fitness of female students of different somatotypes.

Methods and structure of the study. The experimental work involved female students involved in volleyball, basketball, swimming and fitness as part of elective physical education courses. All participants in the experiment were identified body type: asthenic, thoracic, muscular and digestive. For a comparative assessment of physical performance under the influence of physical loads of different directions, the following methods were used: functional test PWC_{170} and determination of the magnitude of the intensity of accumulation of pulse debt (IAPD).

Results of the study and their discussion. Table 1 shows the dynamics of indicators of physical performance of female students of different somatotypes under the influence of basketball lessons. As can be seen from the table, basketball lessons

had the most favorable effect on the physical performance of girls with asthenic and thoracic body types. This is evidenced by a significant increase in the absolute and relative values of PWC_{170} by 12.14% and 10.54% in representatives of the asthenic body type, which indicates an increase in the aerobic performance of female students in this category. However, in this case, an increase in the intensity of accumulation of pulse debt was revealed, which indicates a high physiological cost that the body spent when performing stepergometric loads. When using *basketball lessons* during the semester, an increase in muscle performance was also found in female students of the thoracic body type. This is indicated by an increase in the absolute and relative values of PWC_{170} by 8.09% and 10.54%, respectively. The magnitude of the IAPD in this case remained unchanged.

The female students of muscular and digestive body types showed a tendency to decrease in aerobic performance. This, in particular, is evidenced by an unreliable decrease in the absolute and relative values of PWC_{170} by 7.16% and 3.01%, respectively, in girls of the muscular somatotype. A similar picture was also found in female students of the digestive body type - the decrease in PWC_{170} was 3.13% and 6.86%, respectively. At the same time, it should be noted that when performing stress testing, its physiological cost decreased in girls of the muscular somatotype by 8.7%, and the digestive one - by 18.18%.

In table 2 shows the dynamics of indicators of physical performance of girl students of different somatotypes under the influence of *volleyball lessons*.

As can be seen from table 2, a significant increase in absolute and relative values was found in representatives of the muscular body type. It amounted to 15.41% and 17.24%. This indicates a favorable effect of volleyball lessons on the aerobic performance of female students. However, the increase in the intensity of accumulation of pulse debt in this case indicates a high physiological cost of the performed standard physical activity, which turned out to be 12.5% higher than it was in the previous semester.

In girls of other body types, volleyball lessons mainly had a negative impact on their functional capabilities. This is evidenced by a decrease in the relative value of PWC_{170} in female students of asthenic, thoracic and digestive body types. At the same time, the decrease in the indicator under consideration amounted to: 3.3%, 5.52% and 5.93%, respectively. Which indicates the presence of a negative trend in the influence of volleyball classes on the aerobic performance of girls with asthenic, thoracic and digestive somatotypes.

Table 3 shows the dynamics of physical performance indicators of girl students of different somatotypes under the influence of *swimming lessons*.

Table 1. *Dynamics of indicators of physical performance of female students of different body types under the influence of basketball lessons*

Body type	Indicators	Beginning of experiment	End of experiment	Changes, %
Asthenic	$PWC_{170\ abs,}$ kg/m/min	537,36±36,1	602,59±18,17	12,14 *
	$PWC_{170\ rel,}$ kg/m/min/kg	10,82±0,55	11,96±0,47	10,54 *
	IAPD, c.u.	0,46±0,01	0,53±0,03	15,22
Thoracic	$PWC_{170\ abs,}$ kg/m/min	657,28±48,59	693,27±63,01	8,09
	$PWC_{170\ rel,}$ kg/m/min/kg	11,81±0,84	12,44±1,43	8,46
	IAPD, c.u.	0,53±0,03	0,53±0,05	-1,85
Muscular	$PWC_{170\ abs,}$ kg/m/min	726,31±15,98	674,34±43,72	-7,16
	$PWC_{170\ rel,}$ kg/m/min/kg	11,96±0,32	11,6±0,71	-3,01
	IAPD, c.u.	0,69±0,05	0,63±0,03	-8,70
Digestive	$PWC_{170\ abs,}$ kg/m/min	734,93±36,18	711,89±4,11	-3,13
	$PWC_{170\ rel,}$ kg/m/min/kg	11,52±0,53	10,73±0,31	-6,86
	IAPD, c.u.	0,55±0,05	0,45±0,03	-18,18 *

Table 2. *Dynamics of indicators of physical performance of female students of different body types under the influence of volleyball lessons*

Body type	Indicators	Beginning of experiment	End of experiment	Changes, %
Asthenic	$PWC_{170\ abs,}$ kg/m/min	609,48±42,11	587,78±24,09	-3,56
	$PWC_{170\ rel,}$ kg/m/min/kg	12,11±0,75	11,71±0,4	-3,30
	IAPD, c.u.	0,51±0,04	0,51±0,02	0,00
Thoracic	$PWC_{170\ abs,}$ kg/m/min	724,42±36,41	690,38±25,13	-4,70
	$PWC_{170\ rel,}$ kg/m/min/kg	13,04±0,67	12,32±0,57	-5,52
	IAPD, c.u.	0,57±0,04	0,6±0,03	5,26
Muscular	$PWC_{170\ abs,}$ kg/m/min	676,58±57,0	780,85±35,65	15,41 *
	$PWC_{170\ rel,}$ kg/m/min/kg	10,67±0,86	12,51±0,66	17,24 *
	IAPD, c.u.	0,48±0,04	0,54±0,04	12,5
Digestive	$PWC_{170\ abs,}$ kg/m/min	783,66±43,95	814,33±88,84	3,91
	$PWC_{170\ rel,}$ kg/m/min/kg	10,28±1,01	9,67±0,87	-5,93
	IAPD, c.u.	0,5±0,06	0,54±0,04	8,00

Table 3. *Dynamics of indicators of physical performance of female students of different body types under the influence of swimming lessons*

Body type	Indicators	Beginning of experiment	End of experiment	Changes, %
Asthenic	$PWC_{170\ abs,}$ kg/m/min	627,93±41,36	646,03±19,92	2,88
	$PWC_{170\ rel,}$ kg/m/min/kg	12,24±0,69	13,35±0,49	9,07
	IAPD, c.u.	0,55±0,03	0,53±0,07	-3,64
Thoracic	$PWC_{170\ abs,}$ kg/m/min	625,81±21,26	679,67±21,64	8,61 *
	$PWC_{170\ rel,}$ kg/m/min/kg	11,44±0,21	12,28±0,34	7,34 *
	IAPD, c.u.	0,57±0,02	0,52±0,03	-8,77
Muscular	$PWC_{170\ abs,}$ kg/m/min	727,58±21,18	706,6±32,44	-2,88
	$PWC_{170\ rel,}$ kg/m/min/kg	12,16±0,51	11,19±0,58	-7,98
	IAPD, c.u.	0,65±0,05	0,56±0,04	-13,85 *
Digestive	$PWC_{170\ abs,}$ kg/m/min	832,7±17,49	838,33±39,0	0,68
	$PWC_{170\ rel,}$ kg/m/min/kg	10,37±0,45	11,2±0,65	8,00
	IAPD, c.u.	0,57±0,02	0,5±0,09	-12,28

As can be seen from table 3, a significant increase in absolute and relative values was found in female students of the thoracic body type. It amounted to 8.61% and 7.34%. This indicates a positive impact of swimming lessons on the aerobic performance of female students of this body type.

The female students of asthenic and digestive body types showed a tendency to increase physical

performance in absolute and relative values of PWC_{170}. The increase in the above indicators, respectively, was 2.88% and 9.07% in representatives of the asthenic somatotype and 0.68% and 8.0% in the digestive body type.

When studying the effect of swimming on the aerobic performance of students of the muscular type, an unreliable decrease by 2.88% and 7.98% (in absolute and relative values of PWC_{170}) was revealed. However, there is a noticeable significant decrease in the physiological cost of the tested physical activity.

Table 4 shows the dynamics of indicators of physical performance of girl students of different somatotypes under the influence of *fitness classes*.

As can be seen from table 4, a significant increase in the absolute and relative values of PWC_{170} was found in representatives of the digestive body type - it amounted to 21.8% and 24.89%, respectively.

Fitness classes have a positive effect on aerobic performance and the physiological cost of standard steppergometric loads in female students of thoracic and muscular somatotypes.

The only body type that reacted negatively to fitness classes is the asthenic body type, which showed a decrease in aerobic performance according to the absolute and relative values of PWC_{170}. In this case, these values decreased by 7.9% and 9.27%, respectively. But at the same time, the physiological cost of standard physical activity, which was used during testing, decreased by 5.36, which is a positive fact of the influence of fitness on the functional capabilities of female students in this category.

Conclusions. Basketball classes had the most favorable effect on the physical performance of girls with asthenic and thoracic body types. The female students of muscular and digestive body types showed a tendency to decrease in aerobic performance.

Volleyball classes have a positive effect on the aerobic performance of female students of a muscular body type. In girls of other body types, volleyball lessons mainly had a negative impact on their functional capabilities.

The positive impact of swimming lessons on the aerobic performance of female students of the thoracic body type was revealed. The female students of asthenic and digestive body types showed a tendency to increase physical performance in absolute and relative values of PWC_{170}. When studying the effect of swimming on the aerobic performance of students of the muscular type, an unreliable decrease by 2.88% and 7.98% (in absolute and relative values of PWC_{170}) was revealed. However, there is a noticeable significant decrease in the physiological cost of the tested physical activity.

As a result of fitness classes, a significant increase in the absolute and relative values of PWC_{170} was found

Table 4. *Dynamics of indicators of physical performance of female students of different body types under the influence of fitness classes*

Body type	Indicators	Beginning of experiment	End of experiment	Changes, %
Asthenic	$PWC_{170\ abs,}$ kg/m/min	664,3±42,19	611,83±20,76	-7,90
	$PWC_{170\ rel,}$ kg/m/min/kg	13,49±0,92	12,24±0,51	-9,27
	IAPD, c.u.	0,56±0,03	0,53±0,03	-5,36
Thoracic	$PWC_{170\ abs,}$ kg/m/min	624,05±40,87	664,54±19,13	6,49
	$PWC_{170\ rel,}$ kg/m/min/kg	11,24±0,85	11,93±0,31	6,14
	IAPD, c.u.	0,6±0,04	0,57±0,04	-5,00
Muscular	$PWC_{170\ abs,}$ kg/m/min	749,6±63,47	772,68±49,25	3,08
	$PWC_{170\ rel,}$ kg/m/min/kg	11,26±0,7	12,34±0,82	9,59
	IAPD, c.u.	0,62±0,07	0,58±0,04	-6,45
Digestive	$PWC_{170\ abs,}$ kg/m/min	726,76±39,81	885,01±62,47	21,77 *
	$PWC_{170\ rel,}$ kg/m/min/kg	9,12±0,91	11,39±0,52	24,89 *
	IAPD, c.u.	0,63±0,04	0,55±0,09	-12,70

in representatives of the digestive body type. Fitness classes have a positive effect on aerobic performance and the physiological cost of standard steppergometric loads in female students of thoracic and muscular somatotypes. The only body type that reacted negatively to fitness classes is the asthenic body type, which has a decrease in aerobic performance according to the absolute and relative values of PWC_{170}.

References

1. Golomolzina V.P., Levushkin S.P. Vliyaniye nagruzok razlichnoy napravlennosti na fizicheskoye sostoyaniye i zabolevayemost studentok spetsialnoy meditsinskoy gruppy [Influence of loads of various directions on the physical condition and morbidity of female students of a special medical group]. Uchenye zapiski universiteta im. P.F. Lesgafta. 2008. No. 6 (40). pp. 24-28. EDN JHMKVP.
2. Kotova G.V., Proshlyakov V.D., Levina E.A. Step-aerobika kak odno iz effektivnykh sredstv povysheniya vynoslivosti i fizicheskoy rabotosposobnosti studentok [Step aerobics as one of the effective means of increasing the endurance and physical performance of female students]. Fizicheskaya kultura i sport v XXI veke [Physical culture and sport in the XXI century]. Proceedings interregional scientific-practical conference, Ryazan, March 25, 2020. Erikova V.M., Petrygin S.B. [ed.]. Ryazan: Ryazanskiy gosudarstvennyy universitet imeni S.A. Yesenina publ., 2020. pp. 62-64. EDN BMXDIW.
3. Loiko T.V., Zhilko N.V. Vliyaniye aerobnykh fizicheskikh nagruzok na gemodinamicheskoye sostoyaniye, vegetativnuyu regulyatsiyu serdechnoy deyatelnosti i fizicheskuyu rabotosposobnost studentok-sportsmenok [The influence of aerobic physical activity on the hemodynamic state, autonomic regulation of cardiac activity and physical performance of student-athletes]. Uchenyye zapiski Belorusskogo gosudarstvennogo universiteta fizicheskoy kultury. 2018. No. 21. pp. 203-210. EDN YNWEJF.
4. Frolov E.V., Sentyabrev N.N., Potapov A.N., Khrishchaty A.E. Vliyaniye dopolnitelnykh vnetrenirovochnykh sredstv na obshchuyu i spetsialnuyu rabotosposobnost devushek-studentok, zanimayushchikhsya basketbolom [Influence of additional non-training means on the general and special performance of female students involved in basketball]. Sovremennyye problemy nauki i obrazovaniya. 2016. No. 6. p. 428. EDN XIBLDN.

Coping strategies of student-athletes with different level of emotional burnout

UDC 159.9.072

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Abstract

Objective of the study was to reveal the relationship between coping strategies and the level of emotional burnout among student-athletes.

Methods and structure of the study. The following research methods were used: the questionnaire "Emotional burnout" (author V.V. Boyko); method "Coping behavior in stressful situations" (authors S. Norman, D. Endler, D. James, M. Parker, adapted by T.A. Kryukova), method for determining the psychophysical potential of the body (authors G.V. Rudenko, Yu .A. Dubrovskaya, I.V. Bobrov). The study involved 92 2nd-4th year students of St. Petersburg universities aged 19 to 22 who actively participate in sports competitions in swimming and cross-country skiing.

Results and conclusions. A high risk of developing a symptom complex of emotional burnout in student-athletes was determined. Relationships between the used coping strategies and the level of emotional burnout of students are revealed. The results of the study indicate that the mechanisms of coping strategies and stress resistance of an individual are interrelated and affect the adaptive potential of an individual. The use of problem-oriented coping strategies as a mechanism for coping with stressful situations is more effective than the use of “emotionally oriented”, “distraction” and “avoidance” coping strategies, which give the individual temporary relief, but are not aimed at eliminating the stressful situation.

Keywords: *coping strategies, emotional burnout, stress, stress factors, stress resistance, behavior patterns.*

Introduction. Modern concepts of emotional burnout interpret it as a multidimensional phenomenon, as a specific form of personality deformation, as a complex of psychological, psychophysiological and behavioral components caused by prolonged stress and adverse reactions to them [3]. Coping with stress is a key mechanism for human adaptation to changing social conditions and requires active, flexible, effective ways of coping. The psychological significance of coping (overcoming mechanism) is to adapt the individual to difficult situations as effectively as possible through mastering, weakening or mitigating the requirements of the situation, thereby reducing the stressful impact of the situation.

In modern psychology, three models of coping behavior of a person are popular. The first model is based on the psychoanalytic tradition of analyzing coping behavior and searching for an effective adaptive response of the individual to stressful situations (Haan, 1977). The second model (Antsiferova, 1994) interprets coping behavior from the standpoint of personality psychology. In this model, coping mechanisms are relatively stable strategies for coping with the situation, which are greatly influenced by the individual psychological characteristics of the individual [4]. The third, situational model is based on the theoretical principles of cognitive psychology, where copings are considered as strategies for overcoming behavior in a stressful situation, that is, the situation is decisive in considering coping [6]. Each of the models of coping behavior is characterized by certain shortcomings, which creates the need for further research that will expand our understanding of the features of the formation and use of the psychological mechanisms of coping behavior.

As you know, sports activity is associated with many stress factors (increased physical and emotional stress, high training intensity, preparation for

competitions, the desire to win, control of emotions, etc.), which have a negative impact on the results and efficiency of activity [5]. Long-term stress experienced by athletes negatively affects their well-being, performance, social contacts, which can lead to exhaustion of the body, the risk of diseases, and withdrawal from sports [4].

In modern scientific literature, issues related to the influence of adaptation mechanisms on the risk of emotional burnout in athletes remain poorly understood. In this regard, the study of adaptive coping strategies of athletes, the relationship between coping mechanisms and the risk of emotional burnout in them seems relevant.

Objective of the study was to reveal the relationship between coping strategies and the level of emotional burnout among student-athletes.

Methods and structure of the study. The study process was attended by students studying at various faculties of universities in St. Petersburg and actively participating in sports competitions in swimming and skiing. The study covered 92 students aged 19 to 22 (55 boys and 37 girls).

The study of the level of emotional burnout of students was carried out using the questionnaire "Emotional burnout" by V.V. Boyko. According to the concept of V.V. Boyko, emotional burnout is interpreted as “a psychological defense mechanism developed by a person in the form of a complete or partial exclusion of emotions in response to selected psycho-traumatic influences” (Boiko, 1999). The first phase of burnout - the phase of "tension" - "starts the mechanism" of the formation of the symptom complex of emotional burnout, is characterized by dynamics, constancy and increased exposure to psychotraumatic factors. This phase is expressed in the following symptoms: 1) experiencing psycho-traumatic circumstances - a process when events related to studies have a psycho-traumatic effect on the student; 2) dissatisfaction with oneself - a symptom that manifests itself in a sense of one's own insolvency, in a feeling of dissatisfaction with one's specialty, position, work performed; 3) "driven into a cage" - a feeling of hopelessness among students, a state of "intellectual-emotional impasse"; 4) anxiety and depression caused by educational activities [1, 2, 3].

The second phase is “resistance”, that is, resistance to the growing influence of psycho-traumatic factors. At this phase, according to V.V. Boyko, the following symptoms appear: 1) selective and inadequate emotional response (when an individual has a reduced ability between adequate expression of emotions and inadequate emotional response); 2) emotional and moral disorientation (the inability of the student to show his emotions in time or to show them sufficiently, which manifests itself in some detachment, rudeness and coldness towards people associated with studies); 3) "expansion of the sphere of saving emotions" (expansion of the sphere of emotional indifference beyond professional or educational activities to personal relationships (family, friends, etc.); 4) "reduction of professional duties", that is, removal from duties that require emotional costs .

The third phase - the phase of "exhaustion" - is the final link in the formation of the burnout syndrome. This phase is associated with a decline in the student's physical and moral strength, as well as with a weakening of the nervous system, and is characterized by the following symptoms: 1) "emotional deficit" - lack of compassion, empathy and complicity for other people (especially those associated with study), a rarity of receiving positive emotions , as well as the inability to emotionally support other people; 2) "emotional detachment" - the almost complete removal of emotions from learning activities; 3) "personal detachment (depersonalization)" - dehumanization, complete or partial lack of interest in the problems or requests of other people; 4) "psychosomatic and psychovegetative disorders" - symptoms that adversely affect the psyche and physical condition of the student [3].

Using the methodology "Coping behavior in stressful situations" (S. Norman, D. Endler, D. James, M. Parker, adapted by T.A. Kryukova), coping behavior strategies used by students in difficult and stressful situations were studied. In the methodology, the authors identify five main personality coping strategies: emotionally oriented (aimed at the manifestation of emotions in stressful situations); problem-oriented (associated with solving the problem and changing the current situation); avoidance-oriented (characterized by the denial of the problem); coping strategies of "distraction" (associated with abstracting from the problem and directing one's forces and emotions to another kind of activity); search for social support (aimed at communication with close and surrounding people) [4].

Results of the study and their discussion. With the help of the questionnaire "Emotional burnout" V.V. Boyko calculated the levels of emotional burnout. It

was revealed that only 48.6% of students do not show symptoms of emotional burnout. The other half of the students either have initial symptoms of "burnout", or the symptoms of "burnout" are at the stage of formation. Thus, the “tension” phase with its characteristic anxiety state was formed in 27% of students, in 24.3% of students it is in the formative stage. The phase of "resistance" with the corresponding symptoms was formed in 16.2% of students and is at the stage of formation in 18.9% of students. The final phase of burnout - "exhaustion", with its characteristic symptom complex, was found in 10.8% of students, in 16.0% of students it is in the formative stage.

Since, based on the test indicators [5], the arithmetic mean values of the levels of emotional burnout among students involved in cross-country skiing and swimming are quite close to each other, we divided the entire sample of respondents participating in the study according to the number of points scored into three approximately equal groups - students with high, medium and low levels of emotional burnout.

Using the Pearson correlation coefficient, we analyzed the relationship between the levels of emotional burnout and coping strategies of students.

Students without burnout symptoms are dominated by problem-oriented coping strategies ($R=0.45$, $p\leq0.05$) and coping strategies seeking social support ($R=0.43$, $p\leq0.04$).), which are characterized by cognitive processing of information, focus on changing situations, communication with others and loved ones.

Students with high and medium levels of emotional burnout are dominated by coping strategies focused on avoidance ($R=0.42$, $p\leq0.05$) and distraction ($R=0.65$, $p\leq0.03$), which indicates about their desire to avoid the problem, to abstract from it, to avoid responsibility for its solution. Negative correlations were found between a high level of emotional burnout and coping strategies aimed at seeking social support ($R=-0.42$, $p\leq0.01$) with a predominance of emotionally-oriented coping strategies ($R=0.36$, $p\leq 0.05$), which are characterized by pronounced manifestations of emotions, thoughts and actions in order to reduce the impact of stress factors. However, such actions give a temporary sense of relief and are not aimed at changing the stressful situation.

Conclusions. Students with a high level of emotional burnout show a tendency to passively adapt to stressful factors of activity and prefer to use emotionally oriented copings, as well as copings focused on avoiding situations and distracting from them, as coping strategies. Students who do not have symptoms of emotional burnout, and with a low propensity for it in difficult and stressful situations, tend to use problem-oriented coping strategies and social support coping.

Thus, close relationships were found between the stress resistance of a person and the mechanisms of coping used by him: the higher the stress resistance of an athlete, the more often he uses active coping strategies - problem-oriented and the search for social support. In this regard, an important link in the psychological preparation of athletes is the formation and development of proactive coping strategies, effective behavior patterns, and the ability to search for resources to help overcome stressful situations.

References

1. Vakhnin N.A., Makhovikov A.B., Sharok V.V. Rol fizicheskoy kultury i sporta v udovletvorennosti studentov obucheniyem v vuze [The role of physical culture and sports in student satisfaction with training at the university]. Teoriya i praktika fizicheskoy kultury. 2019. No. 4. pp. 28-30.
2. Vakhnin N.A., Makhovikov A.B., Sharok V.V. Sotsialno-psikhologicheskaya otsenka sportivnoy deyatelnosti kak faktora udovletvorennosti studentov obucheniyem v vuze [Socio-psychological assessment of sports activities as a factor in student satisfaction with training at a university]. Teoriya i praktika fizicheskoy kultury. 2020. No. 3. pp. 43-45.
3. Vodopyanova N.E. Psikhodiagnostika stressa [Psychodiagnostics of stress]. St. Petersburg: Piter publ., 2010.
4. 4.Vodopyanova N.E., Starchenkova E.S. Sindrom vygoraniya: psikhodiagnostika i profilaktika [Burnout syndrome: psychodiagnostics and prevention]. 2nd ed. St. Petersburg: Piter publ., 2009.
5. Rudenko G.V., Dubrovskaya Yu.A., Bobrov I.V. Metodika opredeleniya psikhofizicheskogo potentsiala organizma [Methodology for determining the psychophysical potential of the organism]. Teoriya i praktika fizicheskoy kultury. 2018. No. 4. pp. 8-10.
6. Lazarus R.S., Folkman S. Stress, appraisal, and coping. New Yorк. Springer, 1984.
7. Maslach C. Jackson S.E. The Cost of Caring. Englewood Cliffs, NJ: Prentice-Hall.1982.

Systemic approach to incentive athletes in bullet shooting

UDC 796+06

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Abstract

Objective of the study was to determine the most effective methods of stimulation for those involved in bullet shooting.

Methods and structure of the study. The experiment involved two groups involved in bullet shooting, at the Army Sports Club (ASC) in St. Petersburg, 100 athletes (50 in the experimental and 50 in the control groups) with I and II sports categories.

Results and conclusions. The physical preparation of the shooter is necessary, first of all, for psychological stability when aiming, when certain muscle groups are activated and every action must be coordinated at the subconscious level, up to the shot itself. Therefore, the universality of a systematic approach to stimulating those involved in shooting, when special attention is paid to psychological motives. Consequently, the universality of a systematic approach to stimulating those involved in shooting, when special attention is paid to psychological motives, spiritual qualities, character development, will and concentration, including on the basis of Zen philosophy, is the most productive.

Keywords: *bullet shooting, sport, health, zen philosophy, psychology, stimulation, motivation.*

Introduction. Bullet shooting is a modern type of shooting sport in which shooting is carried out with a bullet from pneumatic, small-caliber and large-caliber rifles and pistols [1].

Shooting requires a person's accuracy and good reaction, which is necessary to hit the target. A developed sense of dynamics and balance is also needed to capture the movement of the target. When shooting with one hand, you need sufficient strength and shooting skills at the same time - the development of strength and the necessary skills is provided through regular training and competition. The most successful shooters often have such qualities as high self-control and endurance.

Specialists in bullet shooting note the great psychologism of this sport, in which it is important to understand the philosophy of shooting. In particular, beginners are not advised to worry too much about their shooting ability - it is more important that shooting is fun. In this philosophy, the Japanese phrase "Issha Zetsumei" is applicable, which describes the situation when the shooter takes the last shot before dying. This phrase in many ways reflects the Zen philosophy of bullet shooting, it is supposed that a good shooter before shooting should create a setting for himself: there is no other goal or concern in life than to make the perfect shot here and now. As you know, Zen philosophy recognizes that there is no second chance in life, so whatever a person does, he must do it perfectly, or not do it at all. In bullet shooting, this philosophy is very stimulating for shooters, psychologically setting them up to make any shot as good as if each shot was fired by a man convinced that he was the last in his life.

The philosophy of bullet shooting believes that it is not limited to applied meaning: it helps to give a person a sense of freedom, in the physical and mental senses. According to the famous popularizer of the Zen teaching in the West, Shunryu Suzuki Roshi, with a sufficiently strong concentration on some activity, the state of mind changes so much that a person no longer feels the boundary between the inner "I" and the external object (his activity): in this state, a person

is like would itself become activity, and vice versa. This seems to be an important understanding of the philosophy of bullet shooting, where the ability to enter into such a state, which develops in the course of practice, is very important for success [2].

Equally important is another Eastern concept, "mushin" - the state of mind in which martial artists reside during meditation or during combat. Professor Daisets Suzuki describes it psychologically as a state of "conscious unconsciousness". During the practice of bullet shooting, the mind should become completely calm and empty, "like the surface of the water." A person should be able to clear himself of all thoughts at the moment of shooting, which does not require reaching a "special" state and even special knowledge - theoretically, any person is capable of doing this. As with yoga or meditation, you need to focus all your attention on what is happening, and all the processes in the body, physiological and psychological, should occur on their own, in harmony with the state achieved, contributing to the perfect shot. All this is somehow connected with the practice of instilling high concentration, which is of paramount importance in bullet shooting.

Among the general physiological and psychological effects of bullet shooting, the following are known: strengthening the muscle corset, which allows you to maintain the correct posture; increasing the strength of the arms and hands; development of logical, mathematical abilities (it is believed that successful shooting is 90% dependent on the mind and 10% on abilities); the production of adrenaline, relaxes the bronchioles in the lungs, which makes it easier to breathe; improved concentration; improving endurance; stress relief; character development; increasing self-discipline, self-control and responsibility [2].

Objective of the study was to determine the most effective methods of stimulation for those involved in bullet shooting.

Methods and structure of the study. For the experiment, two groups of people engaged in bullet shooting were selected at the Army Sports Club (ASC) in St. Petersburg. The experiment involved 100 athletes (50 in the experimental and 50 in the control

Table 1. *Results of the control group*

Parameters		In training activities	In competitive activity
Average reaction time, ms		231,6±29,03	235,4±56,22
Stability of attention, c.u.		1,42±0,10	1,31±0,09
Concentration of attention, c.u.		0,85±0,04	0,83±0,06
Loskutova's criteria	Functional level of the system	4,21±0,09	4,11±0,17
	Reaction stability	2,02±0,08	1,5±0,03
	Functionality level	3,38±0,02	3,01±0,15
Noise immunity		355,91±21,3	367,2±13,8
Attention score		324,37±32,41	311,02±14,16

Table 2. *Results of the experimental group*

Parameters		In training activities	In competitive activity
Average reaction time, ms		224,1±20,05	226,9±33,19
Stability of attention, c.u.		1,54±0,3	1,491±0,18
Concentration of attention, c.u.		0,88±0,11	0,86±0,7
Loskutova's criteria	Functional level of the system	4,26±0,13	4,22±0,25
	Reaction stability	2,03±0,27	1,7±0,11
	Functionality level	3,38±0,18	3,14±0,3
Noise immunity		362,25±21,3	369,1±0,3
Attention score		328,11±24,12	320,18±12,47

groups) with the first and second sports category. The experiment was conducted from September to December 2022, the end of the experiment coincided with the final competition at the end of the year.

In the control group, those involved were stimulated by common traditional methods, without a systematic approach. In particular, stimulation implied a periodic impact on such motives as gaining recognition (due to achieving high results), the motive of health and physical activity.

In the experimental group, a systematic approach to stimulating shooting was provided. Here, more attention was paid to psychological motives, spiritual qualities, education of character, will and concentration, including on the basis of Zen philosophy, in relation to bullet shooting. Among the specific methods, it should be noted autogenic training according to the Schultz method, which provides for a psychological effect that contributes to the normalization of higher nervous activity, relieving tension, anxiety and emotional discomfort, which, in our opinion, corresponds to the general description of the influence of Zen philosophy on training in bullet shooting. [1].

Results of the study and their discussion. Indicators of the effectiveness of stimulation measures for athletes in the control and experimental groups and their values are shown in tables 1, 2.

As can be seen from the comparison of the data for both groups, the athletes of the experimental group showed higher results than the athletes of the control group.

The decrease in the main physiological indicators in those involved in competitive shooting in both groups is mainly due to progressive fatigue. However, it is important to note that the difference between the indicators in the training and competitive activities in the experimental group is much smaller than in the control group. In our opinion, this directly indicates the effectiveness of a universal systematic approach to the methods of stimulation of those involved in bullet shooting, related to the education of character, patience and strong-willed qualities, which in practice greatly simplifies self-control and reduces the influence of the stress factor, both during training and during training. competition time.

Conclusions. The results of the study indicate that the physical preparation of the shooter is needed, first of all, for psychological stability when aiming, when certain muscle groups are activated and every action must be coordinated at the subconscious level, up to the shot itself. Therefore, the universality of a systematic approach to stimulating those involved in shooting, when special attention is paid to psychological motives, spiritual qualities, education of character, will and concentration, including on the basis of Zen philosophy, is the most productive.

References

1. Gritsik A.A., Grigan S.A. Vliyaniye fizicheskoy kultury na stressoustoychivost organizma [The influence of physical culture on the stress resistance of the body]. Fizicheskaya kultura, sport i turizm v vysshem obrazovanii. [Physical culture, sport and tourism in higher education]. Proceedings national scientific-practical conference. Rostov-on-Don, 2021. pp. 110-113.
2. Muraviev I.V., Vakhnina E.G. Nachalnoye obucheniye tekhnike pulevoy strelby iz pnevmaticheskoy vintovki [Initial training in the technique of air rifle shooting]. Professionalno-lichnostnoye razvitiye studentov v obrazovaniye prostranstve fizicheskoy kultury [Professional and personal development of students in the education space of physical culture]. Collection of materials. B.F. Balashova, T.A. Khoroshevo [ed.]. Tolyatinsky State University, 2017. pp. 72-76.

Motivation to achievement and overcoming stress situations by student-athletes

UDC 159. 92

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Abstract

Objective of the study was to assess the relationship between achievement motivation and personal factors that determine the overcoming of stress among students with mass sports categories.

Methods and structure of the study. The experiment involved 25 girls and 32 boys, 1st year students of the Faculty of Physical Culture and Sports of the Pedagogical University, with mass sports categories. Achievement motivation was assessed using the methodology "Motivation for success and fear of failure" (MSF) by A.A. Rean, regulatory-personal properties were determined according to Yu.V. Shcherbatykh and the technique of "Strategy of coping with stressful situations" (SACS) Hobfall S.

Results and conclusions. In the group of athletes, higher rates of stress sensitivity were recorded compared to boys. It has been established that all subjects, characterized by a high level of motivation to achieve success, simultaneously have a higher level of stress resistance. In the group of young men, a connection between achievement motivation and preference for the strategy of assertive actions was revealed. The connection between the motivation to achieve success and the preference for the strategy of cautious actions and the avoidance of the strategy of impulsive actions in sportswomen is considered by us as a manifestation of their desire to control their individual personality traits, which reduce stress resistance. In both groups of athletes, an inhibitory effect of the motivation to achieve success on the frequency of the strategy of impulsive actions was noted.

Helping athletes develop effective coping strategies to control stress sensitivity and resist stress creates additional opportunities to increase their motivation and athletic performance.

Keywords: *success motivation, stress resistance, strategies for overcoming stressful situations, students, athletes.*

Introduction. The daily life of student-athletes is full of various stressful situations associated with both educational activities and sports [3]. In various studies of recent years, in particular in the work of O.A. Svilina, it is noted that one of the important factors that allow athletes to cope with stress is a high level of achievement motivation [5]. On the one hand, the desire for high results, achievements prompts the need to systematically overcome difficulties, prepare for competitions, which forms certain regulatory personal qualities of athletes, and on the other hand, leads to high psycho-emotional and physical stress, which manifests itself in a decrease in performance in sports, an increase in occupational injuries and illnesses [1, 2]. Under these conditions, the optimal balance between the desire for success and the ability to withstand stress becomes especially relevant. In this study, we proceed from the assumption that the high motivation of sports activities not only contributes to the development of constructive coping behavior, but also allows us to develop such coping strategies that allow compensating for some individual-personal characteristics of an athlete that impede sports achievements. Understanding these factors will allow athletes to increase the effectiveness of sports training and the effectiveness of competitive activities.

Objective of the study was to assess the relationship between achievement motivation and personal factors that determine the overcoming of stress in athletes and female athletes: stress tolerance and coping

strategies.

Methods and structure of the study. The experiment involved 25 girls and 32 boys, students of the Faculty of Physical Culture and Sports of the Pedagogical University, with mass categories. The average age of the subjects was 18 years. Achievement motivation (AM) was assessed using the methodology "Motivation for success and fear of failure" (MSF) by A.A. Reana [4]. Questionnaire of stress resistance Yu.V. Shcherbatykh was used to determine an increased reaction to circumstances that a person cannot influence (RC), a tendency to unnecessarily complicate everything (TUC), a predisposition to psychosomatic illnesses (PPI); destructive (DC) and constructive (CC) ways of coping with stress [6]. The basic indicator of stress resistance is considered as the inverse of the general indicator of stress sensitivity (GISS). The indicator of dynamic stress sensitivity (DSS) is defined as the sum of the indicators on the first four scales, from which the value of the CC indicator is subtracted. Using the Hobfall SACS methodology (the Russian version of which was proposed by N.E. Vodopyanova, E.S. Starchenkova), strategies for coping with stressful situations were studied: cautious actions (CA), entering into social contact (ESC), seeking social support (SSS), antisocial actions (ASA), aggressive actions (AgrA), impulsive actions (ImpA), manipulative actions (MA), assertive actions (AssertA) and avoidance (Avoid) [1]. The significance of differences between the study groups was assessed using the Mann–Whitney U test. Spearman's correlation coefficient rs was used to determine the relationship between motivation indicators and regulatory personality traits.

Results of the study and their discussion. The results of the MSF methodology showed that 100% of girls and 96.3% of boys found a clear orientation towards success: the average value of the achievement motivation indicator in the group of boys is 16.34±1.74 and 15.76±0.79 in the group of girls, without significant differences between the groups (Uemp=327.5).

The results of diagnostics of stress resistance are presented in the table.

The values of indicators of stress sensitivity in the groups of athletes are in the lower range of average values, with the exception of the low value of the indicator of the tendency to complicate everything unnecessarily in the group of young men. It should be noted that in the group of girls, the indicators of stress sensitivity are significantly higher than the corresponding indicators in the group of boys.

The results of the correlation analysis of indicators of motivation and stress sensitivity are presented in Figures 1 and 2.

In both groups of athletes, there is a significant negative correlation between the indicator Achievement motivation and the general indicator of stress sensitivity and, therefore, a significant relationship between motivation to achieve success and stress resistance. Let us pay attention to the significant negative correlations between the Achievement Motivation (AM) indicator and the RC indicator in both groups of athletes. Of all three primary indicators of stress sensitivity, the intensity of the reaction to frustration is most determined by psychophysiological characteristics, in particular, emotional sensitivity and, accordingly, is much less amenable to self-control. Thus, a pronounced emotional response to circumstances that cannot be changed makes the greatest contribution to the relationship between stress sensitivity and AM, having a negative impact on the level of the latter.

In both groups of athletes, significant relationships were recorded between the indicator of achievement motivation and the indicators of CC, and in the group of young men - with the indicator of DC. This result indicates that the effect of AM is manifested, apparently, in the ability to develop more adequate strategies for coping behavior, and in young men, in the ability to avoid various destructive ways of coping with stress.

The absence of significant differences in the AM indicator (Uemp=327.5) in the studied groups suggests that the high level of this motivation in athletes actualizes additional mechanisms to compensate for stress sensitivity.

Correlation analysis of indicators of motivation and coping strategies made it possible to fix a number of rare, but important, from the point of view of this study, relationships. So, in the group of girls, a significant positive correlation was established between the indicator Achievement motivation (AM) and the frequency of using cautious actions (CA), in the group of boys

*Average values of the indicators of the method of diagnosing stress resistance in groups of athletes (significance of U-criterion: * - p≤0.05; ** - p≤0.01)*

Sportsman	RC	TUC	PPI	DC	CC	DSS	GISS
Youths	18,1**	11,2**	13,5**	16,6	31,0	28,1**	59,1**
Girls	22,3	21,3	19,6	16,8	30,8	48,2	79,9

- a significant positive correlation between MA and the frequency of using the assertive action strategy (AssertA), and in both groups - a significant negative correlation. correlation of the MA indicator and the frequency of using the Impulsive Actions (ImpA) strategy (Figure 1, 2).

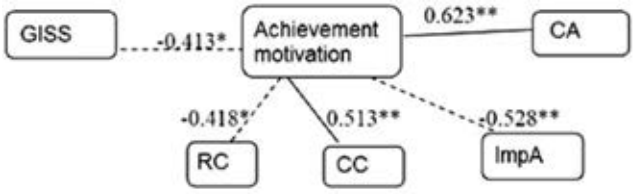

Figure 1. *Correlation galaxy of the analyzed indicators in the group of female athletes (* – the significance of the correlation at the level of 0.05;*

*** - the significance of the correlation at the level of 0.01)*

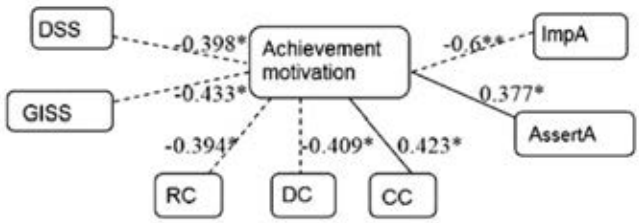

Figure 2. *Correlation galaxy of the analyzed indicators in the group of young men (* - the significance of the correlation at the level of 0.05;*

*** - the significance of the correlation at the level of 0.01)*

In both groups, as already noted, there is a positive relationship between AM and CC indicators. Pankratova I.A. believes that it is productive coping strategies that affect the motivation of athletes [2]. In our opinion, the established ratios of motivation and coping strategies have ambiguous causal relationships. Thus, a positive correlation of MA and AssertA in the group of young men can be understood as a manifestation of self-confidence and high self-esteem in both indicators. In turn, the positive correlation between the CA strategy and the AM indicator in the group of girls is probably due to the desire of female athletes with a high level of motivation to achieve success to control their more pronounced, compared to boys, stress sensitivity. Significant negative correlations between MA and the strategy of ImpA in both groups can also be considered as a manifestation of the influence of achievement motivation on the processes of coping with stress, requiring from the athlete not an impulsive reaction, but endurance.

Conclusion. Thus, if in the group of young men the connection between achievement motivation and the strategy of AssertD can be explained by the simultaneous influence of self-confidence on these indicators, then in the group of girls, apparently, the influence of a high level of AM on the preference of those strategies that allow you to control your own individual personality traits that impede achievement. This result makes it possible to understand the absence of significant differences in AM in the studied groups of athletes.

We believe that the individual-personal characteristics of student-athletes, which determine the desire for achievements and help to increase the effectiveness of productive activities - sports, educational, professional, despite physical and psycho-emotional stress, stress, failures, must be taken into account by coaches and teachers in their sports and educational activities. professional training.

References

1. Vodopyanova N.E. Psikhodiagnostika stressa [Psychodiagnostics of stress]. St. Petersburg: Piter publ., 2009. 336 p.
2. Pankratova I.A. Vliyaniye koping-strategiy na motivatsiyu u sportsmenov-professionalov [Influence of coping strategies on the motivation of professional athletes]. Mir nauki. Pedagogika i psikhologiya. 2021. No. 4. Available at: https://mir-nauki.com/PDF/25PSMN421.pdf.
3. Povzun V.D., Povzun A.A., Apokin V.V., Usaeva N.R. Analiz urovnya stressoustoychivosti studentov sportivnykh napravleniy universiteta [Analysis of the level of stress resistance of university students in sports areas]. Teoriya i praktika fizicheskoy kultury. 2016. No. 9. pp. 89-91.
4. Rean A.A. Psikhologiya lichnosti [Psychology of personality]. St. Petersburg: Piter publ., 2016. 288 p.
5. Svilina O.A. Otsenka vliyaniya strukturnoy organizatsii motivatsii dostizheniya sportsmenov na rezultativnost ikh deyatelnosti [Evaluation of the influence of the structural organization of motivation for the achievement of athletes on the effectiveness of their activities]. Pedagogika i prosveshcheniye. 2022. No. 1. pp. 68-76.
6. Shcherbatykh Yu.V. Psikhologiya stressa i metody korrektsii [Psychology of stress and methods of correction]. St. Petersburg: Piter publ., 2006. 256 p.

Formation of professional competences of students of the training direction "adaptive physical culture" in the framework of the project "school of health for children with mental disabilities"

UDC 796; 376; 378.1

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Abstract

Objective of the study was to determine the degree of formation of professional competencies among students of the direction of training adaptive physical culture in the process of implementing the project "School of Health for Children with Mental Disabilities".

Methods and structure of the study. During the implementation of the project "School of Health for Children with Mental Disabilities "Expand Boundaries" it was attended by 100 children with mental disabilities from boarding schools in the Ivanovo region, 40 students and 19 teachers of the Shuya branch of the Ivanovo State University. Experimental (EG) and control (CG) groups of 20 people were formed from among the students. In the process of implementing the project, two groups of tasks were solved: to form professional competencies among students enrolled in the educational program "Physical rehabilitation in the direction of training 49.03.02 Physical culture for people with disabilities (adaptive physical culture)", for the organization and conduct of various forms physical culture and health-improving and sports activities with children with mental disorders; creation of an educational environment that ensures the availability of quality education and successful socialization for people with disabilities.

Results and conclusions. During the pedagogical experiment, APC students got the opportunity to effectively develop professional competencies, personal growth, and creativity. It was noted that students from the EG had a qualitatively increased degree of professional competencies in comparison with students from the CG.

Keywords: *professional competencies, students, children with mental disorders, physical culture and wellness work.*

Introduction. The regulatory documents regulating the training of future specialists for the system of adaptive physical culture indicate the need to organize practice-oriented training in order to form competencies that meet modern requirements [1, 2]. It is noted that when graduating from a university, students do not have the necessary professional competencies, which leads to a decrease in interest in work and social responsibility [1]. The solution to this problem is possible on the basis of the activation of the social partnership of the university, which trains future specialists in the field of adaptive physical culture, both with correctional educational organizations where children with disabilities study, and with organizations that implement charitable programs in the field of physical culture.

Objective of the study was to determine the degree of formation of professional competencies among students of the direction of training adaptive physical culture in the process of implementing the project “Health School for Children with Mental Disabilities”.

Methods and structure of the study. To assess the degree of formation of professional competencies among students, materials from the fund of assessment tools presented in the main educational program were used. The students of the Shuisky branch of the Ivanovo State University, who are studying in the direction of “Physical Education for Persons with Health Disabilities (Adaptive physical culture - APhC)” of the 2nd and 3rd courses, took part in the testing. The study

was conducted from May to December 2022. During this period, the project "School of Health for Children with Mental Disabilities "Expand the Boundaries!"" was implemented. The project involved 100 children with mental disabilities from boarding schools in the Ivanovo region, 40 students and 19 teachers of the Shuya branch of the Ivanovo State University. From the number of students of two courses, experimental (EG) and control (CG) groups of 20 people were formed, homogeneous in terms of the degree of formation of professional competencies.

In the process of the project implementation, two groups of tasks were solved: 1 - to form professional competencies among students studying under the educational program "Physical culture for people with disabilities (adaptive physical culture)"; 2 - creation of an educational environment for children with mental disabilities, ensuring the availability of quality education and their successful socialization. Classes with children were held on the basis of 18 correctional boarding schools in the Ivanovo region, as well as at the Faculty of Physical Education of the Shuya branch of the Ivanovo State University, on the basis of which the site was equipped with specialized sports equipment and inventory for adaptive physical education. Students, together with teachers from boarding schools and the Faculty of Physical Education, twice a week conducted physical education and recreation classes and sports training in: adaptive basketball, unified football, boccia and unified boccia, volleyball, fitness, table tennis, special athlon, prepared children for participation in regional and national competitions. Classes were held under the supervision of full-time specialists of organizations (doctor, psychologist, trainer).

As part of the project, regional competitions in unified football, unified boccia were held; "Festival of Unified Sports"; the All-Russian seminar "Development of adaptive sports for children with mental disabilities" was held. The experimental work was carried out in close cooperation with the Ivanovo regional branch of the All-Russian Public Charitable Organization for Assistance to the Disabled with Mental Retardation "Special Olympics of Russia", whose programs are aimed at the socialization of children with mental disabilities through sports activities, the development of an inclusive culture through systematic training and competitions of healthy children and children with disabilities (competitions of the united unified teams). Together with the Ivanovo branch of the Special Olympics of Russia, educational and methodological seminars were held for students and teachers of correctional schools in the region on organizing inclusive training and holding mass inclusive sports events, which is undoubtedly important for future specialists.

In the process of preparing students from the EG for classes with children, the problems associated with the development of methods for conducting physical culture and recreation activities with children with disabilities were considered, the experience of using modern technologies for the formation of a culture of a healthy and safe lifestyle was studied and analyzed, as well as the features of the implementation of inclusive physical culture and sports education in the activities of institutions and organizations that implement physical education and sports programs for children with problems in the mental sphere.

Results of the study and their discussion. During the pedagogical experiment, students of the

Table 1. *Results of assessing the degree of competencies formation among students from the CG and the EG of the direction of training "Adaptive physical culture" (max = 10 points)*

Professional competencies according to the Federal State Educational Standard of Higher Education	CG (n = 20 people)		EG (n = 20 people)	
	Start	Ending	Start	Ending
Able to plan individual and group work on the APhC program with persons with disabilities	4,6±0,8	5,9±0,8	4,4±0,8	8,4±0,4
Able to carry out social interaction and realize his role in a team, carry out business communication, conduct classes and physical culture and sports events in APhC for motor and cognitive learning and physical training of persons with disabilities	4,7±0,9	6,1±0,9	4,5±0,5	8,5±0,6
Able to form recommendations on APhC, compliance with the regime of work and rest of the practitioner, conduct correctional and developmental classes and activities for the socialization of those involved, household self-service, the formation of interest in systematic adaptive physical education	4,4±0,7	6,4±0,7	4,3±0,5	8,2±0,5
Able to conduct pedagogical observation, testing, diagnosis of the mental and physical condition of students	4,9±0,7	6,5±0,7	4,5±0,6	8,3±0,5
Average value	4,6±0,7	6,2±0,7	4,4±0,5	8,4±0,5

Table 2. *The results of assessing the formation of skills and abilities of students during the implementation of the project "Health School for Children with Mental Disabilities" (max = 10 points)*

Types of activities in the process of project implementation	Timing of the experiment	The degree of formation of skills and abilities of students	
		Self-esteem students	Evaluation by teachers
Organization of games and relay races with a group of children	Start	3,6±0,8	3,4±0,8
	Ending	6,7±0,9	6,3±0,9
Assistant referee and refereeing in the types of competitions	Start	3,6±0,8	3,2±0,8
	Ending	7,7±0,9	6,7±0,9
Accompanying a participant with disabilities at competitions and classes	Start	3,6±0,8	3,2±0,8
	Ending	7,7±0,9	7,1±0,9
Information support in the media	Start	3,6±0,8	3,3±0,8
	Ending	7,7±0,9	7,1±0,9
Preparation of class notes, protocols, regulations on competitions, etc.	Start	3,6±0,8	3,3±0,8
	Ending	7,7±0,9	6,8±0,9
Class maintenance	Start	3,6±0,8	3,7±0,8
	Ending	6,7±0,9	8,3±0,9
Conducting classes and trainings, including inclusive	Start	3,6±0,8	3,3±0,8
	Ending	7,7±0,9	7,8±0,9
Conducting observations, testing, diagnostics of the psychophysical state of children	Start	3,6±0,8	3,3±0,8
	Ending	7,7±0,9	7,1±0,9

"Adaptive physical culture" training direction received the opportunity for the effective development of professional competencies, personal growth, and creative potential. It was noted that students from the EG had a qualitatively increased degree of professional competencies in comparison with students from the CG (Table 1).

In the course of the study, it was determined that the students from the EG consider their participation in the project as a significant stage in their professional training. According to the results of self-assessment, students from the EG showed a significant increase in points in terms of the formation of skills and abilities in working with children with disabilities, which is also confirmed by the data of teachers who highly appreciated their activities within the project at the end of the pedagogical experiment (Table 2).

It has been established that the majority of teachers (94.7%) and all students believe that such a form of participation in practice-oriented activities in the framework of projects with children with disabilities is a necessary condition for high-quality preparation for future professional activities.

Conclusions. The results obtained allow us to state the fact of the positive impact of practice-oriented activities within the framework of the implementation of the project "Health School for Children with Mental Disabilities" on increasing the degree of formation of professional competencies among students of the "Adaptive Physical Culture" training direction.

The study was conducted within the framework of agreement No. 091-15-2022-098 dated April 25, 2022 (on the provision of grants from the Federal budget in the form of subsidies to legal entities - winners of the All-Russian competition of youth projects among educational institutions of higher education in 2022) and with the support of the Ivanovo regional branch "Special Olympics Russia"

References

1. Gilmutdinova R.I., Parfenova L.A. Formirovanie professionalnyh kompetenciy studentov v processe realizacii grantovyh proektov [Formation of professional competencies of students in the process of implementation of grant projects]. Teoriya i praktika fizicheskoy kultury. 2018. No. 11. p. 5.
2. Manoylov A.A. Harakteristika komponentov specifiki lichnosti studentov napravleniya «Fizicheskaya kultura dlya lic s otklonenijami v sostoyanii zdorovya» [Characteristics of the components of the personality specifics of students of the direction «Physical culture for persons with health problems»]. Teoriya i praktika fizicheskoy kultury. 2015. No. 6. pp. 45-47.

Intensification of teaching the technique of competitive exercises with kettles to students of higher education institutions of physical and pedagogical profile

UDC 378:796

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Abstract

Objective of the study was to substantiate the effectiveness of the method of intensive training in kettlebell lifting competitive exercises for students of the Faculty of Physical Education.

Methods and structure of the study. 52 people (28 boys and 24 girls) took part in the scientific experiment. There were 16 boys and 12 girls in one group. There are 13 boys and 11 girls in the other group. The study of the section "Kettlebell lifting" in accordance with the curriculum of the discipline "Athletics" was given 8 hours of classroom work and 8 hours of independent work. A formative experiment was carried out, during which two different approaches to teaching students of the Faculty of Physical Education were applied. The first approach assumed the mastery of three competitive exercises at each practical session, and the second one - the sequential study of competitive exercises in the following order: clean and jerk; long cycle push; jerk. In one group, where the first approach to training was implemented, the classes were structured as follows: at the first lesson, there was a theoretical introduction to the technique of performing all competitive kettlebell lifting exercises, after which the students began to master the technique; in the second or third lesson, students mastered the technique of lead-up exercises; at the fourth lesson there was a mastering of all competitive exercises in full coordination and their performance for evaluation. In another group, where the second approach to learning was implemented, the classes were structured as follows: at the first lesson, students mastered the push exercise; the second lesson - a long cycle push; the third is a jerk; on the fourth - there was a development of all competitive exercises in full coordination and their implementation for evaluation.

Results and conclusions. The results of the study showed the effectiveness of using the methodology, which is based on the sequential study of first a push, then a long cycle push and a jerk of the kettlebell, as evidenced by the results of athematical processing using White's T-criterion.

Keywords: *kettlebell lifting, power sports, athleticism, kettlebell snatch and jerk.*

Introduction. Kettlebell lifting is a national sport in Russia. It is affordable, does not require significant costs for equipment and equipment. At the same time, classes with kettlebells affect the development of all physical qualities of a person. Power abilities develop especially effectively [2].

In the GTO complex, revived in Russia in 2014, among the tests for determining strength abilities for boys and men, one of the exercises was borrowed from kettlebell lifting - this is a kettlebell snatch [3]. This circumstance confirms the importance of future teachers of physical culture mastering the technique of performing and teaching methods of competitive kettlebell lifting exercises.

At the Faculty of Physical Education of the Belgorod State National Research University within the discipline "Athletics" the module "Kettlebell lifting" is being implemented. Given the small amount of hours of classroom work that involves the study of this section, it becomes necessary to optimize the learning process.

Objective of the study was to substantiate the effectiveness of the method of intensive training in kettlebell lifting competitive exercises for students of the Faculty of Physical Education.

Methods and structure of the study. The experiment involved 52 people (28 boys and 24 girls). In one group there were 16 boys and 12 girls, in the other group there were 13 boys and 11 girls. The study of the section "Kettlebell lifting" in accordance with the curriculum of the discipline "Athletics" was given 8 hours of classroom work and 8 hours of independent work.

The first approach assumed the mastery of three competitive exercises (snatch, clean and jerk, long cycle jerk) at each practical lesson assigned to the “Kettlebell lifting” section. The second approach involved the sequential study of exercises in the following order: 1. Push; 2. Long cycle push; 3. Jerk.

In one group, where the first approach to learning was implemented, the classes were structured as follows. At the first lesson, there was a theoretical introduction to the technique of performing all competitive kettlebell lifting exercises. After that, the students began to master the technique, using lead-up exercises. For each competitive movement, 2-3 lead-up exercises were performed. In the second lesson, some lead-up exercises were replaced by others. The same thing happened in the third session. At the fourth lesson, all competitive exercises were mastered in full coordination and their performance was assessed by experts. In another group, where the second approach to learning was implemented, the classes were structured as follows. At the first lesson, the students performed all the lead-up exercises for the clean and jerk and the mastery of the clean and jerk in full coordination. In the second lesson, they also mastered the push in a long cycle. On the third - a jerk. On the fourth stage, all competitive exercises were mastered in full coordination and their implementation was assessed by experts.

The following exercises were used as leading exercises for the push: jumping onto a pedestal (20-40 cm high) and jumping off it, with the adoption of a vertical position with completely straight legs, both after jumping and after jumping off; discus push from the bar (disc weight 2.5-5 kg) with a jump (with legs off the platform). Gradually, the height of the jump decreases and the exercise is performed without taking off the socks from the platform; holding kettlebells (weight of kettlebells from 8 to 16 kg) on the chest in the starting position; semi-squat with a barbell on the chest (the barbell is held on the deltoid muscles with arms bent crosswise); jumping out of a semi-squat with a barbell on the back.

The following lead-up exercises were used for the long cycle clean and jerk: kettlebell swing (one kettlebell is held with both hands); undermining weights from the platform; lifting one weight on the chest (the weight is held with one hand); lifting one kettlebell followed by a push; lifting two kettlebells to the chest without placing kettlebells on the platform.

Among the leading exercises for the snatch, the following were used: undermining the kettlebell from the platform without a swing (the kettlebell stands near the heel of the left leg when performing the exercise with the right hand); undermining the kettlebell from the platform with a swing; swing the kettlebell to chest level with one hand; swinging the kettlebell to chest level with the kettlebell placed on the forearm at top dead center (at top dead center we move from a regular grip to a deep grip); performing a snatch in full coordination with a change of working hand every five repetitions.

Results of the study and their discussion. Competitive movements were performed by girls with 8 kg kettlebells, and by boys with 16 kg kettlebells. The students alternately performed first a push, then a push in a long cycle, then a snatch. In each exercise, it was necessary to perform from 10 to 15 repetitions. Experts evaluated the technique of each exercise on a 10-point scale. The ratings of the three experts were summed up and divided by three. For grading, criteria were developed, according to which for small single errors there was a deduction of

Table 1. *The results of the expert evaluation of the technique in boys of both groups*

	n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	amount
K1	16	5,7	5,7	5,7	6	6	6	6,3	6,3	6,7	6,7		7	7	7	7	7		7,7												
K2	13											6,7						7,3		7,7	7,7	8	8	8	8	8	8,3	8,7	9	9,3	
R1		2	2	2	5	5	5	7,5	7,5	10	10		14	14	14	14	14		19												145
R2												10						17		19	19	23	23	23	23	23	26	27	28	29	290

Table 2. *Results of expert evaluation of technique in girls of both groups*

	n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	amount
K1	12	5,7	5,7	5,7	6	6	6	6		6,3	6,3	6,7			7				8						
K2	11								6				6,7	6,7		7	7	7,7		8	8	8,3	8,7	9	
R1		2	2	2	6	6	6	6		9,5	9,5	12			15				19						95
R2									6				12	12		15	15	17		19	19	21	22	23	181

1 point, for small, constantly repeating errors, a deduction of 2 points. For gross errors, the deduction could be from 2 to 4 points [4].

In table 1, 2 presents the results of mathematical processing of the expert assessment obtained during the study. Processing was carried out using White's T-test [1].

With a given number of observations, $T_{(tabular)}$=150. The smallest sum of ranks is 145. Since $T_{(tabular)} > T_{(smaller\ sum\ of\ ranks)}$, we can talk about the reliability of differences between the expert assessments of the students of the two groups. It can be argued that the methodology, which is based on the consistent study of kettlebell lifting exercises, is more effective.

The average result for boys in the first group is 6.5 points, and in the second group - 8.0.

Similar results were found in girls (Table 2).

With a given number of observations, $T_{(tabular)}$ =99. The smallest sum of ranks is 95. Therefore, for girls, the method, which is based on the consistent study of kettlebell lifting exercises, also turned out to be more effective.

The average result for girls in the first group is 6.3 points, and in the second group - 7.6.

Conclusions. When mastering the technique of performing and teaching methods of kettlebell lifting competitive exercises, it is advisable to use a methodology based on the sequential study of first a point, then a push in a long cycle, then a jerk of the kettlebell. It is recommended to repeatedly perform 5-6 lead-up exercises and then a competitive exercise in full coordination at each lesson.

References

1. Ashmarin B.A. Teoriya i metodika pedagogicheskikh issledovaniy v fizicheskom vospitanii [Theory and methodology of pedagogical research in physical education]. Manual for students, graduate students and teachers Institute of Physics culture. Moscow: Fizkultura i sport publ., 1978. 223 p. ill.
2. Vinogradov G.P. Girevoy sport kak sredstvo atleticheskoy podgotovki podrostkov i yunoshey [Kettlebell lifting as a means of athletic training for adolescents and young men]. Guidelines. Leningrad: GDOIFK im. P.F. Lesgafta publ., 1988. 24 p.
3. Gosudarstvennyye trebovaniya Vserossiyskogo fizkulturno-sportivnogo kompleksa «Gotov k trudu i oborone» (GTO) [State requirements of the All-Russian physical culture and sports complex "Ready for Labor and Defense" (GTO)]. Approved by order of the Ministry of Sports of Russia dated February 12, 2019 No. 90. [Electronic resource]. Federal portal "GTO.RU". Available at: https://www.gto.ru/files/uploads/documents/5c8a217b493d.pdf
4. Pravila vida sporta «Girevoy sport» [Rules of the sport "Kettlebell lifting". Approved by order of the Ministry of Sports of the Russian Federation No. 68 dated January 29, 2018] [Electronic resource]. Available at: https://www.garant.ru/products/ipo/prime/doc/71789582/

Motivation of teachers to participate in project activities on physical culture in the university conditions

UDC 37.013

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Abstract

Objective of the study was to identify measures and specific solutions to increase the motivation of teachers to the technology of project management in the sports and educational space of the university, based on sociological research data.

Methodology and organization of the study. The sociological survey "Diagnostics of the management system of the physical culture and educational space of universities" covered seven universities in the Belgorod, Kursk and Lipetsk regions. The survey touched upon the main actors of the physical culture and educational space of the university and their in-depth interviewing using the focus group method. The study involved 300 teachers and researchers of the university, 140 employees of the university administration. The peculiarities of respondents' attitude to the use of the project approach were revealed.

Results and conclusions. The technology of project management in the development of the physical culture and educational space of the university can arouse considerable interest on the part of teachers, subject to the implementation of a number of organizational and technological measures proposed by the authors. All projects should be interconnected and form a “ring of projects”, at the same time, each project should be focused on solving a problem regarding the specific disposition of the sports and educational space of the university (values, needs, level of awareness, etc.). It is necessary to form a system for ensuring project activities, which includes: information support; formation of readiness for project activities; skills formation; incentive system. A project management system should be created, which will be based on the principle of interaction between administrative structures and the university community through a system of councils. The criteria for evaluating the effectiveness of project activities have been identified in relation to various groups: 1) student youth; 2) teachers and researchers; 3) employees of the university administration. At the same time, the evaluation system should be based on such criteria as the level of involvement, scale, level of satisfaction.

Keywords: *sports and educational space of the university, project management technology, motivation, management system barriers, systemic approach.*

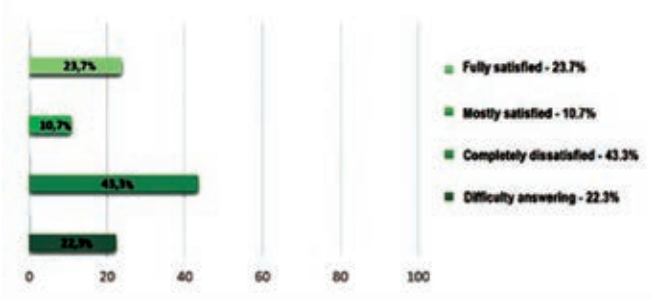
Introduction. Project management is an activity aimed at realizing specific goals and solving specific problems, the results of which are expressed in terms of time, costs, productivity or quality of the result. This is a complex process, the possibilities of applying which in relation to the development of the sports and educational space of the university should be justified both by theoretical provisions and empirical data [1]. Unfortunately, in most universities of the country, the practice of the project approach to managing the development of the sports and educational space of the university is fragmented and is characterized by the lack of the necessary system and formalization of the process. Consequently, the recognition of project management technology is hampered by the presence of fuzzy ideas about its advantages both among university administration employees and teachers and researchers. It is reasonable to assume that in universities where the use of project technologies is practiced, the system of managing the physical culture and educational space can be rated much higher than in universities that do not use this technology. As

the main barriers to the development of the system of management of the physical culture and educational space of universities, it seems possible to consider: the lack of consistency and consistency in the processes of implementing management methods; insufficient theoretical training of management personnel; insufficient level of formalization of project management processes [2, 3].

Objective of the study was to identify measures and specific solutions to increase the motivation of teachers to the technology of project management in the sports and educational space of the university.

Methodology and organization of the study. The starting point was the data obtained during the sociological study "Diagnostics of the management system of the sports and educational space of universities" (2018-2021). Study area: Belgorod, Kursk and Lipetsk regions. Research methods: university professors and researchers (n=300), university administration employees (n=140); focus group interviewing: university professors and researchers (n=12) and university administration employees (n=12) [2].

Results of the study and their discussion. As the study showed, less than half of the respondents recognize the existing system of managing the sports and educational space of the university as one of the best (see figure). Among the main reasons that impede the effective management of the physical culture and educational space of the university, experts identify: the untimely development of the material base, the level of wages, the attitude to physical culture as a subject of secondary importance, the personnel issue. Secondly, an insufficient level of understanding of the specifics of each individual management technology and, as a result, the lack of a common opinion about the methods and approaches to managing the development of the sports and educational space of the university among teachers and researchers. Thus, the existing system of managing the development of the sports and educational space of the university requires improvement [3].



Satisfaction of teachers, researchers of universities and employees of the administration of the university with the currently used procedures for managing the development of the sports and educational space of the university

At the same time, a study of the motivation of teachers, researchers and employees of the university administration showed that most of them are ready to participate in project activities related to the development of sports and educational space, only if there is sufficient material incentives. Among the possible forms of non-material incentives, actors distinguish: incentive documents; additional rest; non-interference at work.

Among the most relevant and effective measures to increase the motivation of university administration employees, as well as teachers and researchers to apply the project approach to managing the development of the sports and educational space of the university, we singled out: 1) affirming the value of project activities; 2) the transformation of system work on projects into a need and a goal setting; 3) increasing interest in participating in project work.

Validation of the value of project activities is possible through a number of measures:

- opening a project office that will provide support for the project management process using the fundamental principles of project management, focused on achieving the strategic goals of the university;

- approval of the value of project activities by management. At meetings, management can demonstrate the results of project activities and talk about opportunities to take part in the following projects;

- analysis of foreign experience of project activities for the development of the sports and educational space of the university. The attention of employees should be focused on the possibility of borrowing best practices;

- continuous information support, which will demonstrate, explain and emphasize the priority of employees participating in the project activities of the university;

- involvement of employees in the study of the theory of project activity through the provision of an opportunity to participate in conferences, forums, seminars, as well as in writing research papers.

The transformation of systematic work on projects into a need and a target setting involves the following measures:

- introduction of an effective system of material incentives for employees participating in project activities. Members of the project team must be aware of the amount of material remuneration for the work done. This monetary payment should correspond to the ideas of the actors of the sports and educational space of the university and satisfy them. Also, participants in project activities can be provided with preferential conditions for using the base of the sports and educational space of the university (use of gyms, swimming pools, etc.);

- development of the practice of non-material incentives for employees participating in project activities. Participants in project activities should be noticed by the university management and awarded with certificates of honor and gratitude, which in turn will affect the rating of university administration employees or teachers within the university.

Increasing interest in participating in project work can be carried out through the following measures:

- organization of joint work of employees to achieve a common goal. Offer employees to solve problems on their own, using the tools and methods that they consider optimal;

- providing an opportunity for the actors of the physical culture and educational space to offer non-standard, creative solutions to current problems.

Conclusions. The solution of problems identified in the course of sociological diagnostics should be carried out on the basis of project activities. At the same time, project activities should be built in accordance with a number of principles and rules.

Firstly, project activities should fit into the general strategy for the development of the sports and educational space of the university, and the entire university as a whole. All projects should be interconnected and form a “ring of projects”, at the same time, each project should be focused on solving a problem regarding the specific disposition of the sports and educational space of the university (values, needs, level of awareness, etc.).

Secondly, it is necessary to form a system for supporting project activities, which includes: 1) information support; 2) formation of readiness for project activities; 3) the formation of skills; 4) incentive system.

Thirdly, a project management system should be created, which will be based on the principle of interaction between administrative structures and the university community through a system of councils.

Fourthly, it is necessary to develop a system of criteria for evaluating the effectiveness of project activities, in relation to various groups: 1) student youth; 2) teachers and researchers; 3) employees of the university administration. At the same time, the evaluation system should be based on such criteria as the level of involvement, scale, level of satisfaction, etc.

References

1. Babintsev V.P., Goncharuk S.V., Peresypkin A.P., Goncharuk Ya.A. Rol proyektnogo upravleniya v razvitii fizkulturno-obrazovatelnogo prostranstva vuza [The role of project management in the development of the physical education space of the university]. Teoriya i praktika fizicheskoy kultury. 2022. No. 3. pp. 59-60.
2. Goncharuk S.V., Goncharuk Ya.A., Mironova T.A., Zhilina L.V. Upravleniye fizkulturno-ozdorovitelnoy deyatelnostyu v vuze na osnove proyektnogo podkhoda [Management of physical culture and health-improving activities at the university based on the project approach]. Teoriya i praktika fizicheskoy kultury. 2022. No. 5. pp. 66-68.
3. Goncharuk Ya.A. Teoreticheski-metodologicheskiye osnovy proyektnogo upravleniya razvitiyem fizkulturno-obrazovatelnogo prostranstva vuza [Theoretical and methodological foundations of project management of the development of the physical culture and educational space of the university]. Gumanitarnyye, sotsialno-ekonomicheskiye i obshchestvennyye nauki. 2018. No. 10. pp. 36-39.

Relationship of motor development of children and adolescents with body type and morphofunctional features

UDC 796.01

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Abstract

Objective of the study was to evaluate the relationship between the motor development of children and adolescents and the body type and their morphofunctional features.

Methods and structure of the study. The experiment involved 1415 children aged 4-7, 25 schoolchildren aged 7(8) to 10 years and 45 teenagers aged 11-16 playing handball. The work used: anthropometry according to P.N. Bashkirov and somatotyping according to R.N. Dorokhov, tapping test and RMO, assessment of morphometric parameters of the muscles of the lower extremities "MORFOMETR", digital dermatoglyphics according to the method of T.F. Abramova, bioimpedance analysis and a battery of motor tests.

Results and conclusions. A correlation was established between the development of the physical qualities of children of different ages and their body types. In addition, the dependence of somatotypes and morphometric parameters of the muscles of the upper and lower extremities, the speed of muscle contraction and indicators of digital dermatoglyphics, as well as hereditary predisposition, has been established.

Keywords: *somatotype, children and adolescents, morphofunctional features, motor development, motor qualities, muscle morphometry.*

Introduction. Motor loads are a powerful external environmental factor that affects the age-related processes in the younger generation, while the “dose effect” is manifested - the optimal number of movements stimulates, and insufficient and excessive ones inhibit growth processes almost equally [7].

The current actual demands of the time require socially oriented results of activity from physical culture, moving away from the formal expectation of normative results of schoolchildren. This is justified by the need to maintain a healthy lifestyle and level of physical activity at later stages of life. The solution of this problem is the most rational at the stage of school education, since it is at this age that sensitive periods of development of basic motor abilities are noted [6].

One of the solutions offered by specialists is a humanistic approach to the education and upbringing of children and adolescents within the framework of physical education and sports training. But this is only possible taking into account the individual heterochronous development, namely the morphofunctional, physical and mental characteristics of the student. Body type (somatotype) has a high prognostic and practical significance, determines the rate of human ontogenesis, is widely used in sports practice and physical education of children, adolescents and adults [2, 4, 5].

Modern educational technologies recommend optimizing the physical education of children and adolescents in accordance with their genetic, morphological and psychophysiological characteristics. Accounting for morphofunctional typology in physical education and sports formed the basis for the development of several recent concepts of an individual approach and

training regimes, taking into account these characteristics of schoolchildren [5].

Objective of the study was to evaluate the relationship between the motor development of children and adolescents and the body type and their morphofunctional features.

Methods and structure of the study. The experiment involved 1415 preschool children, 25 children of primary school age and 45 adolescent boys involved in handball.

All examined patients underwent anthropometry according to P.N. Bashkirov and the somatotyping method according to R.N. Dorokhov [3]. It was determined that the examined children belong to three main body types (somatotype): microsomatic (MiS), mesosomatic (MeS) and macrosomatic (MaS) and transitional micromesosomatic type (MiMeS).

In children of preschool age, on the basis of generally accepted pedagogical tests, an assessment of their motor development was carried out, neurodynamic indicators were studied (tapping test and RMO).

In school-age children, the method of genetic markers was used - digital dermatoglyphics. The qualitative sign of skin patterns of the distal phalanges of the fingers was evaluated with the calculation of the frequency of occurrence (%) of a particular skin pattern, and the delta index (DL10) was calculated. Basic steps were filmed at a frequency of 25 frames per second. An assessment of the morphometric parameters of the muscles of the lower extremities was carried out using the MORFOMETR program [9].

In the examined adolescents, digital dermatoglyphics was studied according to the method of T.F. Abramova [1]: delta index (DL10), total ridge count (TRC), ratio of TRC and DL10 (TRC/DL10); conducted clinical and physiological testing, as well as applied bioimpedance analysis to determine the composition of body weight (diamond-AIST body structure analyzer) and pedagogical testing (motor test battery).

The obtained results were processed using Microsoft Excel 7.0 software, morphometric synthesis method and factor analysis procedure using SPSS 15.0 for Windows.

Results of the study and their discussion. In girls of the MiS type, at the age of 5, the quality of speed begins to actively develop, and from the age of 6 - dexterity. The quality of speed is closely associated with the dominant of excitation processes (r=0.62), and the development of dexterity is associated with the processes of excitation and endurance of the nervous system (r=0.6) (P≤0.05). In boys of the MiS type, a significant increase in motor maturity is associated with the strength characteristics of the muscles of the trunk and lower extremities. An average correlation was noted between the indicators of dexterity and the dominant effect of excitation processes r=0.5, as well as the endurance of the nervous system, the quality of speed is associated with the amount of the muscle component of body mass r=0.62 (P≤0.05). The high motor development of boys and girls with the MeS type primarily depends on the dynamic strength of the muscles of the trunk and both limbs; at the age of 5–7 years, children showed an intensive development of motor qualities of dexterity and speed. These qualities are associated with neurodynamic parameters and dynamic strength of the muscles of the lower extremities (r=0.73), as well as an increase in muscle mass (r=0.7) (P≤0.05). Girls and boys of the MaS type have low motor development throughout the entire period of the first childhood, and only by the end of this period at 6-7 years old, they demonstrate significantly high values of motor qualities of dexterity, dynamic strength of the muscles of the lower extremities and torso (r=0.75) (P≤0.05). Thus, the motor development of preschool children is closely related to the body type and proceeds heterochronously.

As part of the calculation of the morphometric characteristics of the muscles of the lower extremities when performing basic steps in the overcoming mode in the complex of children's recreational aerobics, the computer program "MORFOMERT" was used [9]. We analyzed the features of the morphometric parameters of the muscles of the lower limb, namely the gluteus maximus, rectus femoris, biceps femoris and calf muscle of the leg. In junior schoolchildren of the MiS- and MeS type, the largest range of the length of the rectus femoris was found. A high maximum speed of muscle contraction was noted in those engaged in the MeS type, children of the MaS- and MiS types have the same values of this morphometric indicator. Schoolchildren with the MaS type are characterized by extremely low range of variations in the length of the biceps femoris muscle and the time between max and min muscle length during contraction compared to children of the MeS- and MiS types. It has been established that children with the MiS type have a high range of variations in the length of the gastrocnemius muscle.

An analysis of the image of the phase trajectories of the muscles of the lower extremities prompted the

search for conjugation with indicators of body type, digital dermatoglyphics and morphometric indicators of muscles using factor analysis. For the gluteus maximus and rectus femoris, the first factor (43% and 39%) combined the predictors of DL10, body type, and contraction rate of these muscles (r=0.48, P≤0.05). The first factor (41%) contains predictors of body type, contraction speed and range of variation in the length of the head of the biceps femoris muscle (r=0.43; P≤0.05). For the gastrocnemius muscle, factor analysis revealed two factors: the first (36%) combined predictors of body type, range of muscle length variation, and muscle length change; the second (25%) - the values of DL10 and the speed of contraction of the gastrocnemius muscle (r=0.45; p≤0.05). The results obtained are consistent with the data of B.A. Nikityuk, V.I. Filippov [8] and T.F. Abramova [1].

Thus, in children of primary school age, the body type, skin finger patterns, are closely related to the morphometric characteristics of the muscles of the lower extremities.

Boys handball players are conditionally divided into two groups: extreme players and players of the central zone. Somatotyping according to the method of R.N. Dorohova [3] revealed that the players of the central zone have MaS and MeS types in the period of 11-16 years, the outer players have representatives of three types: MaS, MeS and MiMeS. Factor analysis (values of the first and second factors 40%-45.1%) in the extreme players combined indicators of complex coordination actions, speed-strength qualities, dynamic strength of the lower limbs, which are interconnected with a genetic marker (TRC/DL10), somatotype, explosive strength of the nervous system and energy potential (r= r=0.51-0.85).

In the players of the central zone, the development of speed and agility was found to be associated with the dynamic strength of the upper and lower extremities (r=0.51-0.79), as well as with their hereditary predisposition (TRC/ DL10, TRC/DL10) to these qualities, functionality nervous system (r=0.48-0.84), body type, content of active cell mass (r=0.42-0.67).

Thus, the formation of motor qualities in young handball players is closely related to morphological features, functional capabilities of the nervous system and the implementation of the hereditarily given potential.

Conclusions. The examined children belong to three main body types (somatotype): microsomatic (MiS), mesosomatic (MeS) and macrosomatic (MaS) and transitional micromesosomatic type (MiMeS).

A correlation was established between the development of the physical qualities of children of different ages and their body types. Also, the dependence of somatotypes and morphometric parameters of the muscles of the upper and lower extremities, the speed of muscle contraction and indicators of digital dermatoglyphics, as well as with hereditary predisposition, was established.

Thus, we can draw the following conclusion: the motor development of preschool children is closely related to the body type and proceeds heterochronously; in children of primary school age, body type, skin finger patterns are closely related to the morphometric characteristics of the muscles of the lower extremities; and the formation of motor qualities in young handball players is in close relationship with morphological features, functional capabilities of the nervous system and the implementation of the hereditarily given potential.

References

1. Abramova T.F. Paltsevaya dermatoglifika i fizicheskiye sposobnosti [Finger dermatoglyphics and physical abilities]. PhD diss. abstract. Moscow, 2003. 51 p.
2. Vengerova N.N., Komissarova E.N. Proyektirovaniye fizkulturno-ozdorovitelnykh zanyatiy s uchetom konstitutsionalnykh osobennostey studentok [Designing physical culture and health-improving classes, taking into account the constitutional features of female students]. Obshchestvo: sotsiologiya, psikhologiya, pedagogika. 2022. No. 2. pp. 144-148.
3. Dorokhov R.N. Opyt ispolzovaniya originalnoy metricheskoy skhemy somatotipirovaniya v sportivno-morfologicheskikh issledovaniyakh [Experience in using the original metric scheme of somatotyping in sports and morphological studies]. Teoriya i praktika fizicheskoy kultury. 1991. No. 1. pp. 14-20.
4. Komissarova E.N., Ponomarev G.N., Rodichkin P.V. Dvigatelnaya aktivnost zhenshchin i muzhchin zrelogo vozrasta s uchetom tipa telosloz-heniya i nozologii [Motor activity of women and men of mature age, taking into account body type and nosology]. St. Petersburg: SPbGETU «LETI» publ., 2020. 143 p.
5. Komissarova E.N., Saykina E.G., Shchurpach

M.V. Differentsirovannyy podkhod k razvitiyu dvigatelnykh sposobnostey u detey 7-8 let na urokakh fizicheskoy kultury na osnove ucheta tipa teloslozheniya [A differentiated approach to the development of motor abilities in children aged 7-8 years at physical education lessons based on body type]. St. Petersburg: SPbGETU «LETI» publ., 2022. 144 p.

6. Kostov F.F., Ponomarev G.N., Rodichkin P.V. Korrektsiya fizicheskoy rabotosposobnosti zanimayushchikhsya fizicheskoy kulturoy i sportom [Correction of physical performance of those involved in physical culture and sports]. St. Petersburg: SPbGETU «LETI» publ., 2022. 219 p.
7. Nikityuk B.A., Kogan B.I. Adaptatsiya skeleta sportsmenov [Adaptation of the skeleton of athletes]. Kyiv: Zdorovya publ., 1989. 125 p.
8. Nikityuk B.A., Filippov V.I. Dermatoglificheskiye priznaki kak geneticheskiye markery pri sportivnom otbore i oriyentatsii [Dermatoglyphic features as genetic markers in sports selection and orientation]. Moscow: GTSOLIFK publ., 1989. 29 p.
9. Samsonova A.V. Motornaya i sensornaya funktsii myshts v biomekhanike lokomotsiy [Motor and sensory functions of muscles in the biomechanics of locomotion]. St. Petersburg, 2007. 152 p.

Basic and associated categories of physical recreation

UDC 796.011.3

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Abstract

Objective of the study was to highlight the basic and related categories of physical recreation.

Methods and structure of the study. The methodological basis of the study was carried out on the lines of theoretical and empirical methods based on a comparative analysis of the practice of organizing physical recreation.

Results and conclusions. The authors have singled out such basic categories of physical recreation as a subject - an object, motor activity, spatio-temporal conditions of its functioning and the final result achieved. The presented basic categories of physical recreation in varying degrees and meaningful interpretation are indicated in almost all scientific concepts, in various scientific disciplines studying it, and are of a universal nature. Related categories are identified on the basis of the system of knowledge accumulated in related scientific disciplines. The authors include such accompanying categories: social recreation, biological recreation, recreational geography, ecological recreation, cultural recreation, resort and sanatorium recreation and many others. The allocation of related categories in scientific research occurs on the basis of taking into account specific areas of application of physical recreation in human life.

The selected basic and accompanying categories form a single recreational system in which they are represented in close interaction and interrelation.

Keywords: *physical recreation, subject-object, motor activity, spatio-temporal conditions, object-practical activity.*

Introduction. The subject-object category is the key definition of physical recreation. There are many different opinions regarding the analysis of the concepts of “subject”, “object”, the relationship between them and their place in the structure of the phenomenon of physical recreation. The question of the subject - the object of physical recreation has a multifaceted significance and is little studied.

Objective of the study was to highlight the basic and related categories of physical recreation.

Methods and structure of the study. The methodological basis of the study was based on theoretical and empirical methods based on a comparative analysis of the practice of organizing physical recreation.

Results of the study and their discussion. Isolation of the *subject* “man” and the *object* “physical recreation”, substantiation of the nature of the relationship between them is of great theoretical and practical importance. An integrative approach allows you to clarify who is acting and what this impact is aimed at. A person as a subject of physical recreation is a source of cognitive and subject-practical activity, realizing his need for a healthy lifestyle, reasonable organization of his leisure time, prevention and prevention of deviant behavior, etc. Physical recreation as an object, based on the needs of the subject, provides the means to restore the physical and mental strength of a person after labor, educational, household, sports, scientific, creative activities with the help of physical culture and sports. As part of physical recreation, a person can engage in various types of physical activity.

Motor activity is the most important category of physical recreation, and without it the existence of this phenomenon is impossible [2]. With all the variety of existing views on the end result of the functioning of physical recreation, which is considered one of its basic categories, it should be noted that the result may

not always coincide with the goal and is considered only as desired.

From the whole variety of signs and concepts of physical recreation, a group is singled out, which reflects the *spatio-temporal conditions* of its functioning. Space is perceived through the objects located in it relative to each other, time - through a series of successive events. In most of the given definitions of physical recreation, such spatio-temporal conditions are considered to be a person's free time. Since there is working time for creating a material product that ensures human life, it is logical to assume that there is time for rest after work, restoration of psychophysical forces spent in the process of professional work, satisfaction of various needs, time to "be yourself". Spatio-temporal conditions for the functioning of physical recreation are characterized by a set of features and concepts and constitute the content of one of its categories.

Summarizing the existing idea of physical recreation, the following basic categories can be distinguished:

- *subject - object;*
- *motor activity;*
- *spatio-temporal conditions of its functioning and the final result achieved.*

The presented basic categories of physical recreation in varying degrees and meaningful interpretations are indicated in almost all its scientific concepts, in various scientific disciplines that study it, and are of a universal nature. It can be argued that they are system-forming categories around which the construction of her theory is going on.

Physical recreation is the goal, method, process and result of the transformation of the natural and socio-psychological essence of a person, the formation and expansion of informal communication skills.

Of the categories of physical recreation listed above - subject - object, activity and spatio-temporal conditions of its functioning, the category of the *result of its functioning* is the least studied. The selection of the result as one of the basic categories of physical recreation is quite logical, any activity is always purposeful and involves the achievement of a certain result.

The identified basic categories of physical recreation are the core around which its basic concepts are formed, its theory is being built. But there are categories that are *related*, and without which it is impossible to build a holistic theory of physical recreation. Related categories are identified on the basis of the system of knowledge accumulated in related scientific disciplines. Such related categories include: social recreation, biological recreation, recreational geography, ecological recreation, cultural recreation, resort and sanatorium recreation and many others. The allocation of related categories in scientific research occurs on the basis of taking into account specific areas of application of physical recreation in human life [1].

Conclusions. The definition of the basic and accompanying categories of physical recreation allows you to create a generalized idea of a cognizable phenomenon, highlight its essence, subject and subject areas of its scientific research. It should be noted that the selected basic and related categories form a single recreational system in which they are represented in close interaction and interconnection.

References

1. Elmurzaev M.A., Ponomarev G.N. Sotsiokulturnyy potentsial fizicheskoy rekreatsii [Sociocultural potential of physical recreation]. Teoriya i praktika fizicheskoy kultury. 2014. No. 2. pp. 52-55.
2. Yarchikovskaya L.V., Tokareva A.V., Mironova O.V., Kovalenko V.N., Ustinova O.N. Formirovaniye elementov zdorovogo obraza zhizni u studentov v protsesse zanyatiy fizicheskoy kulturoy [Formation of elements of a healthy lifestyle among students in the process of physical education]. Teoriya i praktika fizicheskoy kultury. 2018. No. 2. pp. 85-87.

Influence of motor modes on indicators of physical fitness of junior schoolchildren

UDC 796.011.3

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Abstract

Objective of the study was to evaluate the effectiveness of motor modes of younger schoolchildren and their influence on the optimization of motor activity and the level of physical fitness of children aged 9-10 years.

Methods and structure of the study. The experiment involved students of secondary schools in Belgorod (n=60, 32 girls, 28 boys aged 9-10 years). Scientific work was carried out from September 2021 to May 2022. The students of the experimental group attend a full-time school with a variable system of physical education, and the students of the control group attend a school with a traditional model of organizing the educational process.

Results and conclusions. As a result of the analysis of the correlation dependence of the studied indicators, it was revealed that the weakest correlation is observed between the indicators of the volume of motor activity and the results of running 1000 meters in all the studied children aged 9-10 years. The revealed data, according to the authors, are due to the age-related features of the development of endurance, as well as the insufficient attention of teachers to the development of this physical quality in classroom and extracurricular physical education classes with primary school students.

Keywords: *motor activity, physical fitness, correlation, primary school students.*

Introduction. The problem of a decrease in physical activity in primary school age is more relevant than ever at the present time, since there are objective socio-pedagogical factors that negatively affect its performance: frequent transitions to distance learning during and after the pandemic and, as a result, limitation of organized physical activity; deformation of independent forms of motor activity; destruction of the playing space; reorientation of children's interests and preferences from motor-playing activities to games in gadgets and a computer; lack of gaming experience among young teachers and parents, and as a result - insufficient transmission of gaming culture in educational organizations and families; the orientation of the modern education system towards the ideas of early development, without taking into account the natural conformity of these ideas [2, 7].

Scientists have proven that in children, most of the health limitations arise directly from the lack of motor activity in the mode of daily life. A large number of authors single out movement as a natural need for children at primary school age. As noted by M.A. Pravdov, (2003), I.M. Bakanov (2007), N.A. Silaeva (2009), L.N. Voloshina et al, (2018, 2021), L.A. Kadutskaya, et al, (2021), hypokinesia in childhood prevents the normal and timely development of the functional capabilities of a growing organism. Inhibition in the development of organs and functions of the body leads to the appearance of various deviations in the state of health.

It should be noted that 80% of first graders have a sharp (more than 70%) decrease in motor activity compared to the preschool period of childhood. These losses negatively affect the indicators of health, physical fitness and physical development of children [3, 8].

Objective of the study was to evaluate the effectiveness of motor modes of younger schoolchildren and their influence on the optimization of motor ac-

tivity and the level of physical fitness of children aged 9-10 years.

Methods and structure of the study. Students of comprehensive schools in Belgorod (n=60, 32 girls, 28 boys aged 9-10 years) took part in the pedagogical study. The experimental work was carried out during the academic year from September 2021 to May 2022. The students of the experimental group (EG n=30, 16 girls, 14 boys) attended a full-time school with a variable system of physical education. The students of the control group (CG n=30, 15 girls, 15 boys) attended a school with a traditional model of educational process organization.

The traditional model of organizing the educational process is training, which is carried out in the mode from 8^{00} to $13h^{00}$ hours, including extracurricular activities. Students can receive the possibility of additional education of a physical culture and sports orientation both on the basis of an educational organization and in organizations of additional education for children.

In the experimental full-day school with a variable system of physical education, the organization of the educational process is carried out in the mode from 8^{00} to 18^{00} hours and assumes the presence of two blocks: an educational block from 8^{00} to 14^{00} (class activities and extracurricular activities) and a developing block from 14^{00} to 18^{00} (self-study), additional education, leisure activities, outdoor activities). The schedule at a full-time school is implemented nonlinearly, that is, the lessons alternate during the school day with the following sports and recreational activities: gymnastics before classes, physical education minutes during lessons, a walk in the open air with the use of physical exercises during an extended break, a dynamic hour with predominant using mobile games. In the afternoon, students are given the opportunity to choose classes within the framework of extracurricular activities and additional education of a physical culture and sports orientation, which in turn also helps to increase the motor activity of younger students.

In order to study the relationship between indicators of motor activity and physical fitness of children aged 9-10 years, a correlation analysis was carried out. The data obtained give an idea of the average daily volume of physical activity of children studying in experimental and traditional schools (Tables 1-2).

Results of the study and their discussion. It was found that in 90% of primary school students the average daily volume of physical activity is below the age norm (14-20 thousand steps per day according to A.G. Sukharev, 1991) (Tables 1, 2). At the same time, there were no significant differences in the indicators of the volume of physical activity of boys and girls both in the CG and in the EG.

The analysis of the indicators of the average daily pedometer indicates that in children 9-10 years old (boys and girls) studying in a full-time school, the volume of motor activity is significantly higher than in girls and boys from a traditional school ($p<0.05$).

Comparison of indicators of physical readiness from the CG and the EG revealed that in four indicators the boys from the EG are significantly better than the boys from the CG (30 m run, shuttle run 3x10, tilt from a sitting position, pull-ups). Comparative analysis of indicators of physical readiness in the CG and the EG allowed revealing significant differences in four indicators among girls. Girls from the EG have an advantage in tests that require the manifestation of speed-strength qualities (30 m run, 3x10 m shuttle run, standing long jump), flexibility and endurance.

Table 1. *Correlation between the average daily volume of physical activity and indicators of physical fitness of boys aged 9-10*

Indicators of physical fitness	Groups		P between EG and CG	Correlation with pedometer	
	CG n=15	EG n=14		CG	EG
	M ± m	M ± m		n=15	n=14
30 m run, s	6,56±0,61	5,34±0,14	#	0,78***	0,66**
Shuttle run 3x10 m, s	9,83±0,29	8,37±0,29	#	0,62**	0,78***
1000 m run, s	374,43±19,20	366,14±9,48		0,65**	0,42*
Tilt from a sitting position, cm	0,6±2,95	4,29±0,99	#	0,4*	0,97***
Standing long jump, cm	145,57±7,1	159,71±7,87		0,41*	0,38*
Pull-ups, number of times	0,71±0,47	8,86±2,19	#	0,73***	0,8***
Pedometer (steps/day)	9373,43±421,35	12115,29±1329,45	#		

- $p \leq 0.05$ according to t - Student's test

* - weak correlation

** - average correlation

*** - strong correlation

Table 2. *Correlation between the average daily volume of motor activity and indicators of physical fitness of girls aged 9-10*

Indicators of physical fitness	Groups		P between EG and CG	Correlation with pedometer	
	CG n=15	ЭГ n=16		CG n=15	EG n=16
	M ± m	M ± m			
30 m run, s	6,05±0,22	5,46±0,18	#	0,79***	0,27*
Shuttle run 3x10 m, s	9,36±0,21	8,16±0,12	#	0,72***	0,37*
1000 m run, s	371,4±19,06	364,5±18,03		0,26*	0,6**
Tilt from a sitting position, cm	7,63±1,02	9,63±2,45		0,57**	0,71***
Standing long jump, cm	145,38±5,98	158,63±5,92	#	0,53**	0,39*
Pull-ups, number of times	19,0±2,85	6,88±1,34	#	0,25*	0,78***
Pedometer (steps/day)	10374,75±365,02	13663±774,62	#		

- $p \leq 0.05$ according to t - Student's test
* - weak correlation
** - average correlation
*** - strong correlation

According to the results of the analysis of the correlation dependence of indicators of physical fitness and the volume of physical activity, it was revealed that the highest correlation coefficient of the volume of physical activity is observed with the results in the 30-meter run (for girls and boys from the CG), shuttle run 3x10 (for boys from the EG and girls CG), tilting from a sitting position and pulling up (in girls and boys from the EG). Correlation of average strength is observed between the indicators of pedometer and results in 30 m run (for boys from EG), shuttle run 3x10 (for boys from CG), 1000 m run (for girls from EG and boys from CG), tilt from a sitting position (for girls from CG) and in the standing long jump (for girls from the CG). The remaining indicators have a weak relationship with the volume of physical activity.

Discussion. Motor activity of schoolchildren is subject to a significant influence of external and internal factors, which in turn create conditions and opportunities for the realization of the necessary daily potential of motor locomotion [4]. Factors that directly affect motor activity are divided into biological, social, climatic and hygienic.

The results obtained by us are consistent with the data presented by scientists from different countries, investigating the relationship of motor activity, physical fitness and health. So, for example, T.F. Abramova, T.M. Nikitina, A.V. Polfutikova, D.N. Pukhov (2021) analyzed changes in the morphofunctional development and physical fitness of 6-10 year old boys depending on age and physical activity. In these studies, the conditionality of indicators of morphofunctional development and physical fitness in boys aged 6-10 years by physical activity was proved [1].

In the studies of modern scientists, it is also noted that the optimal motor mode has a positive effect on the indicators of physical fitness of younger schoolchildren and contributes to advanced physical development [3, 5, 8].

Ewa Polak & Bernadetta Wojtuń-Sikora (2021) prove in their work that girls of primary school age, who regularly dance, develop motor skills faster and demonstrate a higher level of physical fitness [6].

Conclusions. As a result of the analysis of the correlation dependence of the studied indicators, it was revealed that the weakest correlation is observed between the indicators of the volume of motor activity and the results of running 1000 meters in all the studied children aged 9-10 years. The revealed data, in our opinion, are due to the age-related features of the development of endurance, as well as the insufficient attention of teachers to the development of this physical quality in classroom and extracurricular physical education classes with primary school students.

We believe that the problem of optimization of motor modes and their influence on the level of physical fitness at this age level requires additional in-depth study.

References

1. Abramova T.F., Nikitina T.M., Polfutikova A.V., Pukhov D.N. Morfologiya, funktsionalnost i fizicheskaya gotovnost malchikov 6-10 let izmeneniya s vozrastom i fizicheskoy aktivnostyu [Morphology, functionality and physical readiness of boys aged 6-10 years changes with age and physical activity]. Teoriya i praktika fizicheskoy kultury. 2021. No. 9. pp. 78-80.
2. Bakanov I.M. Gigiyenicheskoye obosnovaniye dvigatelnogo rezhima uchashchikhsya nachalnykh klassov shkol polnogo dnya [Hygienic substantiation of the motor regimen of primary

school students of full-time schools]. PhD diss. abstract. Moscow, 2007. 26 p.
3. Voloshina L.N. Sotsialno-pedagogicheskiye determinanty razvitiya dvigatelnoy aktivnosti rastushchego cheloveka [Socio-pedagogical determinants of the development of the motor activity of a growing person]. Belgorod: Literaturnyy caravan publ., 2020. 165 p.
4. Kadutskaya L.A., Voloshina L.N., Kondakov V.L., Kopeikina E.N. Osobennosti dvigatelnoy aktivnosti uchashchikhsya mladshikh klassov v usloviyakh distantsionnogo obucheniya [Peculiarities of physical activity of primary school students in conditions of distance learning]. Teoriya i praktika fizicheskoy kultury. 2021. No. 5. pp. 43-44.
5. Silaeva N.A. Formirovaniye ratsionalnogo dvigatelnogo rezhima uchashchikhsya 10-12 letnego vozrasta v protsesse shkolnogo fizicheskogo vospitaniya [Formation of a rational motor mode of 10-12 year old students in the process of school physical education]. PhD diss. abstract. Moscow, 2009. 253 p.
6. Ewa Polak & Bernadetta Wojtuń-Sikora. Changes in motor skills among early school aged girls under the influence of regularly practiced dance, Research in Dance Education, 2022. 23:3, 300-315. DOI: 10.1080/14647893.2020.1867089.
7. Kondakov V.L., Voloshina L.N., Kopeikina E.N., & Kadutskaya L.A. Daily assessment of physical activity in 6-11-year-old children. Journal of Physical Education and Sport, 2020. 20(4): 1673 – 1780. DOI:10.7752/jpes.2020.04227.
8. Voloshina L.N., Kondakov V.L., Tretyakov A.A., Kopeikina E.N., Cretu M., & Potop V. Modern strategies for regulating the motor activity of preschool and school age children in the educational space. Pedagogics, psychology, medical-biological problems of physical training and sports, 2018. 22(2), 114-119.

Evaluation of the technical parameters of sports activity of the women's team of the mongolian student basketball league

UDC 796.012

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Abstract

Objective of the study was to conduct a statistical analysis of the main technical parameters, such as the accuracy of the throw, the effectiveness of the transfer and possession of the ball, among the players of the women's team "Shonkhoruud" (falcons) of the "Student League" of the Mongolian State University.

Methods and structure of the study. We determined and compared the performance and results of accurate shots, the effectiveness of passes, interceptions and blocking of balls of the last 12 games of the Student League season based on statistics and match facts.

Results and conclusions. In terms of the offensive performance of the "Shonkhoruud" team, 46.1% of the players made two-point shots, that is, indicators below the team average, 15.3% did not make three-point shots at all, and 30.7% made these shots, but did not hit the target, which indicates that the offensive team was insufficient. In terms of assists, the team completed 50% of assists out of 12 matches, above the team average, and 30.7% of players assisted other players, increasing the possibility of high scores.

Keywords: *team sport, accurate throw, ball passing, dribbling technique, interception.*

Introduction. The development of basketball is inextricably linked with the main indicators of the technique of athletes. During a basketball tournament, specialists are faced with the task of analyzing the statistics of each match, optimally organizing training sessions, preparing and planning training programs, plans and methods. In recent years, basketball performance statistics, in addition to such indicators as the number of points and assists per game, began to include an assessment of the results of the offensive and defensive strategies of the team (James E. Kozy, 2011).

Objective of the study was to assess the technical parameters of the sports activities of the women's team of the Mongolian student basketball league.

Methods and structure of the study. The analysis of the competitive activity of 13 players of the student team of the Mongolian women's league "Shonkhoruud" Mongolian State University for 2019-2020 was carried out. All participants have an average age of 20 years, height 173 cm. The league is held in a round robin system, consisting of four quarters, each lasting 10 minutes.

Results of the study and their discussion. Figures 1-3 and Table 1 show the results of each player's throws.

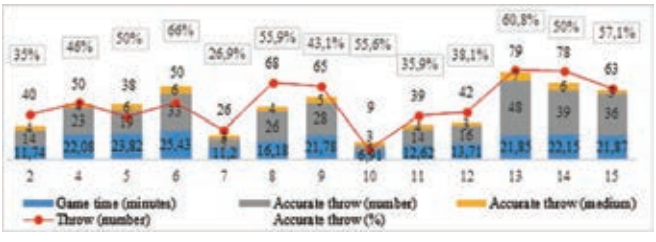

Figure 1. *Two-point shooting performance of the players of the Shonkhoruud team of Mongolian State University*

Accurate throw. Based on two-point shots in 12 games of the league season, the No. 6 forward averaged 25.43 hours on the field, had a 66% success

rate and scored 12 points per game. The number 13 forward averaged 21.85 minutes on the pitch, 60.8% offense, 12 points per game. From the results of the study, we can see that the team is 47.99% successful in a two-point ball throw. From this we can conclude that the team's two-point offensive throw of the ball, the attacking throw, is performed successfully.

Three-point shot stats. Of the three-point shots in 12 games of the quarter-final team, the number 11 centre-back played an average of 12.62 minutes on the field with a 55.6% success rate, the number 6 striker with 33.3%. But the team's three-point throw is only 20.69%, so it needs to be improved and worked out.

Free throw scores of each player of the Shonkhoruud Mongolian State University team. As you can see from the graph above, the number 10 guard averaged 6.91 minutes on the field and had a 100% free throw hit rate, the number 11 center 81.8%, the number 12 center 73.3%, the number 1 8 - 72.2%, the team made 59.6% of successful free throws in 12 games.

Based on shot scoring in 12 games of the 2019-2020 season. the team made 673 two-point shots, of which 314 were accurate, the effectiveness of the attack was 47.99%.

Three-point shots were made 221 times in 12 games this season, 52 shots were successful, and the average was 20.69%. The percentage of free throws in 12 games of the season shows that the team makes an average of 20 shots, 12 of which are successful, and the percentage of effective and accurate shots is 59.6, the percentage of successful free throws adds extra points to the team. Of the number of shots made in 12 games of the season, there are three types of shots on average that have a significant impact on the success of the team, attacking evenly and effectively.

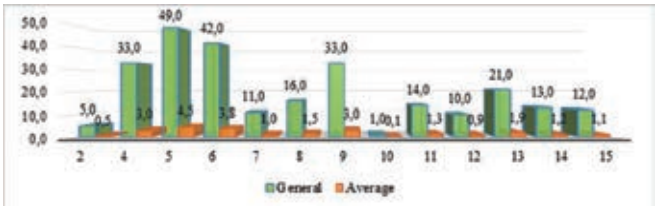

Figure 2. *Comparative indicators of accurate passes of the athletes of the "Shonkhoruud" team of Mongolian State University*

Accurate passes. As can be seen from fig. 2, point guard number 5 had 49 passes in 12 games of the season, averaging 4.5 assists per game, forward number 6 had 42 assists averaging 3.8 assists per game, point guard number 4 had three assists per game, and the number 9 center averaged three assists per game. Players numbered 5, 6, 4 and 9 of the team actively participated in the attack, made accurate passes, increased the chances of other players to score points, and led the team in the number of accurate passes.

Picking up the ball from under the shield. The ability to rebound the ball defensively and offensively during a game is one of the most important indicators of a team's offense, allowing them to start an offense and continue with a second offense. Rebounds are statistically ranked as offensive rebounds and defensive rebounds.

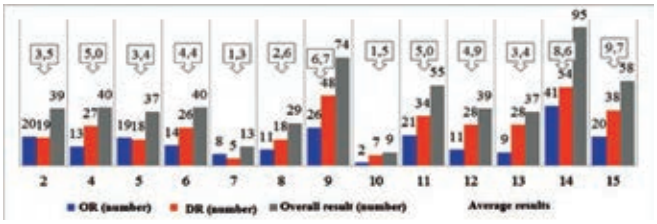

Figure 3. *Comparison of the rebounds of each player of the Shonkhoruud team of Mongolian State University*

Note: OR - offensive rebound, DR - defense rebound.

Let's take a look at the rebound metrics for each player. The number 14 center grabbed just 95 rebounds, of which 41 offensive rebounds and 64 defensive rebounds, averaging 8.6 per game. The number 15 center appeared in six games and grabbed just 58 rebounds, including 20 offensive rebounds and 38 defensive rebounds, averaging 8.6 per game. Based on the number of rebounds in 12-team league games, the team completed 17.7 offensive rebounds, 29.2 defensive rebounds, for a total of 46.8 rebounds per game, creating offensive second chance opportunities but not being able to use them effectively in some games.

Defense technique and skills

Interception of the ball. Analyzing the interceptions for each player, we can say that the defense of players numbered 4, 5 and 6 is very good. 5 - an average of 3.27 interceptions. The team averaged 21.58 steals per game, limiting the opposing team's ability to play freely and allowing the team to continue the offense successfully.

Ball blocking. Blocking the ball is one of the important indicators to restore the game of the team by blocking the ball thrown by the player of the opposite team, limiting the possibility of the ball getting into the ring, showing the advantage in defense during the game. Blocking the ball is usually performed with high efficiency by post players with good reaction speed and explosive power, with high growth.

Shonkhoruud Mongolian State University team's ball blocking figures: The height of our team players is 162-183 cm, the average height is 173 cm. Based on ball blocking rates in 12 games of the

2019-2020 season of the Student League, the center player is 178 cm tall number 9 made a total of 25 blocks or 2.27 times per game, leading the team and the league's center in this indicator. This player plays well on the court with markings, is actively working on defense, he has better footwork, explosive jumps and it is noticed that the sense of ball movement is more developed than others.

Conclusions. In terms of offensive performance, 46.1% of players made two-point shots, i.e. below the team average, 15.3% of them did not make three-point shots at all, and 30.7% made these shots but missed the target. This indicates that the team's offensive was insufficient.

In terms of assists, the team completed 50% of assists out of 12 matches, above the team average, and 30.7% of players assisted other players, increasing the possibility of high scores.

During the game, a total of 46.8 rebounds per game were thrown, creating opportunities for second chance offense, but in some matches it was not possible to use them effectively.

Successfully defending, he averaged 21.58 interceptions per game. During the game, the defense of the players in the 1st, 2nd and 3rd positions of the back line of the team was excellent, which limited the ability of the players of the opposing team to play freely and allowed the team to continue the attack successfully.

The team made an average of eight successful blocks per game and it can be seen that the role of the team's post players was very important in the effectiveness of blocking the ball.

In terms of further training, it is necessary to optimally plan the coordination, content and methodology of physical training, technical and tactical training and psychological training. It is concluded that it is necessary to use effective training methods to improve the technique of throwing players at medium and long distances, planning shots, dribbling and passing training for several options, increase footwork and sudden explosive power, it is also necessary to use effective training methods to stabilize psychology, such like self-confidence, concentration and decision making.

References

1. Gomelsky A.Ya. Basketbol [Basketball]. Moscow, 2000.
2. Gooshookhu.D. Teoriya i metodika basketbolnoy trenirovki [Theory and methodology of basketball training]. Ulaanbaatar,2002.
3. Damba B. Bazovoye basketbolnoye uprazhneniye «Napadeniye» [Basic basketball exercise "Attack"]. Ulaanbaatar, 2014. Sodnom.
4. Annis D. Optimalnaya strategiya endgeyma v basketbole [Optimal endgame strategy in basketball]. Zhurnal kachestvennogo analiza v sporte. 2006. No. 2 (2).
5. Macur P. Predlozheniye po didakticheskomu posobiyu po otrabotke broskov v banke v basketbole [Proposal for a didactic manual for practicing bank shots in basketball]. Obzor sportivnoy nauki. No.19 (1-2). 47 p.
6. Mohaimin Abdul, Kishore Y. Postroyeniye testa na sposobnost kontrolirovat dribling v basketbole [Building a test for the ability to control dribbling in basketball]. Mezhdunarodnyy zhurnal fizicheskogo vospitaniya, sporta i zdorovya. 2014. No. 1(2). pp. 14-16.
7. James E. Kozy Teoretiko-igrovoy analiz preimushchestva domashney ploshchadki i optimalnoy strategii napadeniya v basketbole [Game-theoretic analysis of the advantages of the home court and the optimal offensive strategy in basketball]. 2011.
8. Skinner B. Tsena anarkhii v basketbole [The price of anarchy in basketball]. Zhurnal kachestvennogo analiza v sporte. 2010. No. 6 (1). 3 p.

Bipolarity in understanding the genesis of the sportization phenomenon

UDC 796.011.1

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Abstract

Objective of the study was to substantiate the bipolarity of the genesis of the development of the phenomenon of sportization from the standpoint of the historical context.

Results and conclusions. Sport and physical culture as two social phenomena have gone through a complex historical path of development from bodily-motor practices to a modern social institution, creating a dualistic nature of sportization.

Following the philosophical paradigm of the bipolarity of any phenomenon, modern sportization is realized, on the one hand, using the potential of the historical genesis of this phenomenon, on the other hand, subject to the adaptation of conversion technologies to the new conditions of sports activity based on the preservation of its internal mechanisms and the evolution of the means and methods used throughout over the course of its development.

Keywords: *historical context, physical culture, sport, sportization mechanism.*

Introduction. Sport is an important part of the general culture of society, its natural phenomenon, inherent in social life and inseparable from it.

This thesis has a historical content, since sport in its formation has gone through a difficult path of development from a single combat phenomenon to sports activities, including a system of competitions, preparation for them and many social relations that contribute to the implementation of training practices for people of different sex, age, nationality, status and etc.

Objective of the study was to substantiate the bipolarity of the genesis of the development of the phenomenon of sportization from the standpoint of the historical context.

Results of the study and their discussion. The ancient agonal (playing) and sports (entertaining) practice initially acted as a systemic religious ritual of performing physical exercises, which was based on sports competition - a special form of competitiveness, characteristic of the religious and cult life of peoples. At the same time, sport from ancient times to the present day has become, in its content, a culturally civilized substitute for physical education and the culture of martial arts. The historical institutionalization of sports was facilitated by the periodic strengthening of religious influence in the systems of physical education, caused not by their nature, but by politicization in the context of exacerbation of social class and ethnic conflicts [2]. Historical prerequisites determined the process of adaptation of physical education to sports through the mechanism of sportization. These changes have transformed the social essence of the species diversity of martial arts and physical exercises into their institutional design as a sport activity.

The mechanism of sportization is put in the genesis of the development of modern sports. It has been repeatedly proven that sport as a social phenomenon of modern life is a school for the formation of character, courage, will for young people, in which one can learn to win and lose. In sports, various problem situations and ways out of the difficulties that are encountered both in sports activities and in ordinary human life are

modeled. Thus, already at the present time there is a phenomenon of sportization of physical education as a process of youth socialization.

The concept of sportization in modern education includes the conversion penetration of high sports technologies into the educational process in order to form young people's motivation and interest in sports. The sportization of physical education creates equal opportunities for self-development and self-improvement of the psychophysical qualities and motor abilities of each student through sports activities that promptly respond to the motivation, interests and needs of those involved [1].

At the same time, it is quite clear that it is impossible to transfer into physical education (especially children and adolescents) the system of competitions that has developed in the sport of the highest achievements with tough competitive relations between athletes, careful recording of results using complex technical devices, selection of athletes for competitions of a higher level, performance of sports categories and titles.

Until now, the idea of mass competitions has been very ambiguously perceived by many scientists and coaches, linking competitions with such negative phenomena as injuries, personality deformation, the penetration of the spirit of commercialization into sports, the destructive effect of overload on the health of athletes, dishonest play, and disrespect for the opponent. However, if it is currently impossible to refuse this in the sport of the highest achievements, then in sportsized physical education one should actively use the huge educational potential of competitions based on the basic values of sports: friendship, mutual assistance, fair competition, harmony of body and spirit. At the same time, I would like to emphasize that the competitive start, the focus on achieving victory, setting a record is the main distinguishing characteristic of sports, for example, from physical culture, where the competitive method is only one of the ways to increase the interest and motivation of those involved in physical activity.

The historically established cult religious aggressiveness of the competitive beginning of body-motor practices still introduces into the phenomenon of sportization the inconsistency of competitive activity, which can be expressed in violation of the rules, "star fever of athletes", cruelty towards an opponent, contractual victories, etc.

Nevertheless, given the importance of the competitive aspect, the sportization of physical education should include, along with the introduction and adaptation of sports training technologies, a competitive principle based on the following conversion conditions:

- be public, do not require highly specialized sports training;
- allow a large number of young people to compete;
- to provide equal opportunities to participate in competitions for people of different sex, age and physical abilities;
- evaluate results without the use of complex procedures and expensive equipment.

Conclusions. Following the philosophical paradigm of the bipolarity of any phenomenon, modern sportization will be successfully implemented, on the one hand, using the value potential of the historical genesis of this phenomenon, on the other hand, subject to the adaptation of conversion technologies to the new conditions of sports activity based on the preservation of its internal mechanisms and the evolution of the means used and methods throughout the entire period of its development.

References

1. Lubysheva L.I. Konversiya vysokikh sportivnykh tekhnologiy kak metodologicheskiy printsip sportizirovannogo fizicheskogo vospitaniya i «sporta dlya vsekh» [Conversion of high sports technologies as a methodological principle of sportsized physical education and "sport for all"]. Fizicheskaya kultura: vospitaniye, obrazovaniye, trenirovka. 2015. No. 4. pp. 6-8.
2. Peredelsky A.A. Dvulikiy Yanus. Sport kak sotsialnyy fenomen: sushchnost i ontologicheskiye osnovaniya [Two-faced Janus. Sport as a social phenomenon: essence and ontological foundations]. Moscow: Sport publ., 2016. 312 p.

Social transformation of olympism from the position of historical analysis

UDC 796.011

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Abstract

Objective of the study was to reveal new ideas about its social essence and role in modern society based on a critical analysis of the traditional understanding of Olympism.

Methods and structure of the study. In the course of the experimental work, an analysis of theoretical sources was carried out and a generalization of the scientific literature on the history of Olympism was carried out.

Results and conclusions. Like the movement of humanism, Olympism should by no means be described unequivocally as a socially homogeneous democratic movement. In different eras, Olympism, manifesting itself as a social institution, fulfilled and continues to fulfill fundamentally different social class orders.

Keywords: *Olympism, historical roots, historical forms, traditional stereotypes, social heterogeneity, concrete social analysis.*

Introduction. Nowadays, in the views of the general world and Russian public, Olympism is presented as an unshakable symbol and practical embodiment of the ideals of humanism, a hymn to human perfection and heroism in the highest achievements that go beyond human capabilities [1]. Meanwhile, scientists, researchers of the history and modern practice of Olympism, have different opinions about the economic, social, political essence of this world phenomenon [2-5].

It would be wrong to associate the assessment of the place and role of Olympism in the ancient and modern history of mankind only with changes in state-political courses and with the changeability of ideological interpretations. Apparently, in the very social nature of Olympism, in its real history, there is something that makes scientists try to discern the far from cloudless, not always unambiguous, contradictory essence of this phenomenon behind a beautiful signboard and festive shell [1-5].

And this, in turn, means that our knowledge of Olympism is not as accurate and complete as we would like. This suggests that we judge him too abstractly, not seeing his complex and changing social essence [1-5].

The relevance of the research topic lies in the realization of the fact that the well-established not entirely correct retrospective ideas about the history of Olympism give rise to an unambiguous and narrow understanding of its modern social role and, accordingly, create prerequisites for an erroneous forecast of the socio-political existence of the international Olympic movement in the near future.

Objective of the study was to reveal new ideas about its social essence and role in modern society based on a critical analysis of the traditional understanding of Olympism.

Methods and structure of the study. In the course of the experimental work, an analysis of theoretical sources and a generalization of scientific literature on the history of Olympism were carried out.

Results of the study and their discussion. Let's present a number of traditional provisions about the essence of Olympism, which today are presented as unshakable truths:

• The ancient Greek Olympic Games were sacred competitions that had a pan-Greek character, that is, they played the role of a symbol of the unity and rallying of the Greek people. The modern Olympic Games have a universal character and take a position that is outside politics, above economic and social contradictions.

• Ancient Greek Olympic Games preached humanism and selfless heroism of sporting achievements. Modern Olympism is based on the same principles.

• During the Olympic Games, the Greeks did not fight among themselves. It was a period of general truce. The modern Olympic Games also act as a champion of peace among peoples.

• The ancient and modern Olympic Games gave rise to a special philosophy, a special “world view” (or the idea of the world order), praising the perfection and harmonious development of man.

• Ancient Olympism as a pagan religion was in irresolvable conflict with the Christian religion, with the Catholic Church, which was the main reason for its death. Modern Olympism, as a secular movement, is indifferent, neutral to the Christian and any other religion.

• Olympism was and remains far from any imperial ambitions, from imperialist principles of enrichment and suppression.

For a critical analysis of these provisions, as a historical and methodological basis, we present the conclusions from the study of P.V. Nesterov, who identifies the following historical forms of Olympism:

- proto-Olympism, which became widespread in the eastern regions of the Mediterranean in the Aegean period;

- ancient Olympism, within which at least two opposing varieties can be distinguished: Greek democratic and Roman imperial;

- medieval Christian Olympism, which found its expression both in socio-political practice and in the traditions of Latin church hymnography of the 9th - 15th centuries;

- Olympism of the New Age, most vividly represented by the Olimpick games in the Cotswolds, which have been going on since 1612 (a break in these games for 111 years, 1852-1963) to the present;

- modern Olympism, which in a relatively short time of its existence has gained worldwide fame, but at the same time has undergone a number of very significant transformations, having made a difficult path from praising disinterested amateurism in sports to unconditional recognition of the "religion of the market" [2].

Presented by P.V. Nesterov, the historical forms of Olympism allow us to get away from the stereotypical characteristics of the phenomenon of Olympism that has passed through three millennia, and consider it from the following positions:

- Olympism arises much earlier than the traditional reference points of historians and, in addition, has its historical roots even outside the Greek ethnos [4, 5];

- Olympism is not only a cultural and civilizational product of Antiquity, but in its historical movement captures several historical eras at once;

- Olympism does not have millennial gaps in its development, but it has a clear and obvious continuity, characterized by both similarity and originality of its forms;

- Olympism in its early historical forms was closely connected either with the Greek heroic-democratic, or with the Roman imperial religious-mythological worldview, in the medieval form - with the Christian religious-mythological worldview. At the same time, starting from the ancient confrontation between the Phoenician and Greek city-states (and later between Carthage and Rome), until the New Age, inclusive, Olympism carried the germs of the so-called "religion of the market", that is, the capitalist formation [2, 4, 5].

The above statements reveal the essence of the capitalist transformation of modern Olympism, which has a socially heterogeneous heterogeneous character. Any attempts to somehow circumvent, ignore this fact unequivocally lead to abstract images of Olympism and further to absolutizations of the following type of reasoning:

- that "the new Olympic movement should become a religion with its own church, dogma and cult" (P. Coubertin, 1946, p. 431);

- about the confrontation between Olympism and Christianity (A.V. Kylasov, 2009);

- about the religious and pagan essence of modern Olympism (ibid.);

- about the uniqueness of Olympia as the center of the Olympic Games.

Particularly interesting, in our opinion, is the documentary refutation cited by P.V. Nesterov about the

last, seemingly familiar and undoubted thesis about the only center for the Olympic Games [2]. As a document refuting this thesis, for example, the text of the Parian Chronicle (created around 264 BC) is cited, that is, a chronology of the main historical events of antiquity carved on a marble slab, where there is a mention of the Panathenaic, but there is no mention of the Olympic Games [6]. What Isaac Newton, who thoroughly studied the specified text, mentioned with surprise in the work “Brevia Chronica” [8]. This circumstance most clearly refutes the all-Greek status of the Olympic Games. And the well-known researcher of the history of the Olympic Games, Ferenc Meze, as P.V. Nesterov, "quite cautiously states" that some signs of the "pan-Hellenic nature" of the games of Elis Olympia appeared only "in a short period of time, covering sixty-eight years - from 468 to 400 BC." [7]. P.V. Nesterov believes that such a status of the Games of Olympia manifested itself only during the three-decade fratricidal Peloponnesian War for the entire Greek world, which the Games still could not "neither prevent nor stop" [2].

The socially heterogeneous nature of Olympism is also emphasized by far from simple ups and downs of continuity between the ancient antique and medieval Christian variants of the development of this movement and social institution. To obtain evidence of the existence of this continuity, it is enough to look up the works of the Archbishop of Constantinople John Chrysostom, other Byzantine historians and philosophers, which contain indications of the “ascension of Christ to Olympus”, where he sits on the throne of the judge as the “ruler of Olympus”; about the apostles - "the keys of Olympus"; on the analogy between the bodily achievement of the Olympionists and the higher spiritual achievement of the Christian ascetics [5]. P.V. Nesterov points out that only the Reformation interrupts this continuity and creates the conditions for the restoration of the ancient (including religious) version of the Olympism of the New Age and the modern Olympism of Pierre de Coubertin, in which the social and ideological influence is no longer feudal-clerical, but capitalist [2, 4, 5].

As for the very principle of “one Olympus - one Olympia”, then, as P.V. Nesterov, this is definitely not a democratic, but a pronounced imperial principle, originating from the influence of the Roman Empire and flourishing in the so-called "Olympic imperialism" [2].

Conclusions. Like the movement of humanism, Olympism should not be unequivocally described as a socially homogeneous democratic movement. In different eras, Olympism, manifesting itself as a social institution, fulfilled and continues to fulfill fundamentally different social class orders.

One of the most proven mechanisms for concealing this fact has always been the method of abstraction in conjunction with the method of absolutization: the creation of an abstract image of Olympism was a condition for the successful absolutization of its principles and values. Therefore, until we begin to adhere to the line of a specific social analysis of Olympism, we will remain captive to mythologemes and ideologems that distance us from understanding the really changeable essence of this phenomenon of world culture and civilization with all the ensuing negative consequences.

References

1. Melnikova N.Yu., Treskin A.V. [History of physical culture and sports]. Textbook. I.Yu. Melnikova [ed.]. 2nd ed., rev., sup.. Moscow: Sport publ., 2017. 432 p.
2. Nesterov P.V. [Historical forms of Olympism]. [Olympic movement, physical culture and sport in modern society]. Proceedings national scientific-practical conference with international participation, November 12-13, 2020. Moscow State Academy of Physical Culture. Yu.A. Fomina, P.V. Nesterov [ed.]. Malakhovka, 2021. pp. 3-13.
3. Nesterov P.V. Kulturno-istoricheskoye znacheniye i smysl Konstantinopolskogo edikta Feodosiya I Velikogo (393 g. n.e.) o «zaprete» Olimpiyskikh igr [Cultural and historical significance and meaning of the Edict of Constantinople by Theodosius I the Great (393 AD) on the "ban" of the Olympic Games]. Teoriya i praktika fizicheskoy kultury. 2009. No. 2. pp. 29-37.
4. Nesterov P.V. Opyt postroyeniya gipotezy o severo-zapadnoy semitskoy etimologii ponyatiya «Olimp» s uchetom dannykh o protoolimpiyskikh traditsiyakh Sredizemnomorya [Experience in constructing a hypothesis about the northwestern Semitic etymology of the concept of "Olympus", taking into account data on the proto-Olympic traditions of the Mediterranean]. Mezhdunarodnyy zhurnal sotsialnykh i gumanitarnykh nauk. Moscow, 2016. Vol. XVIII (Issue 1-2. No. 89–90). pp. 220-228.

5. Peredelskiy A.A. Dvulikiy Yanus. Sport kak sotsialnyy fenomen: sushchnost i ontologicheskiye osnovaniya [Two-faced Janus. Sport as a social phenomenon: essence and ontological foundations]. Moscow: Sport publ., 2016. 312 p.
6. Muller C., Muller T. Fragmenta historicorum graecorum. Vol. 1. Parisiis; editore Ambrosio Firmin Didot, 1841. pp. 533-590.
7. F. Mező; előszavával K. Klebelsberg. Az Olympiai játékok története. Budapest: Országos testnevelési tanács, 1929. O. 259. (az 1928. évi Amsterdami Olympiai játékok irodalmi versenyén győztes munka).
8. Newtonius I. Opuscula mathematica, philosophica et philological. Tomus tertius. Lausannae et Genevae: apud M. M. Bousquet & socios, MDCCXLIV (1744). p. 4.

Influence of current refereeing rules on the content of competitive activity of judokas

UDC 796.063

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Abstract

Objective of the study was to assess the negative impact of the current competition rules on the content of the competitive activity of judokas.

Methods and structure of the study. The object of study is the individual judo tournament among men as part of the 2020 Olympics in Tokyo. Based on the analysis of the competitive activity of judoists, an attempt was made to assess the nature of the existing shortcomings and identify trends in the development of modern judo. The analysis of the protocols of weighing and competitions made it possible to establish the extreme values of the duration of fights and the percentage of judges' marks and punishments in each weight category.

Results and conclusions. The vast majority of refereeing decisions account for the punishment of athletes for prohibited actions. 339 shido penalties and 26 hansoku-make disqualifications. Changes are needed in the rules of the competition for the period 2022-2024, aimed at increasing the effectiveness, the growth of entertainment and, due to this, the popularity of judo.

Keywords: *judoka, Olympic Games, category, meeting.*

Introduction. Judo has been part of the Olympic Games since 1964. It was then, at the Olympics in Tokyo, that a judo tournament was held for the first time. After 57 years, judo returned to its homeland, having undergone significant changes over this long period, causing lively disputes and ongoing discussions among specialists and amateurs around the world.

Objective of the study was to assess the negative impact of the current competition rules on the content of the competitive activity of judokas.

Methods and structure of the study. The analysis of the protocols of the competitions of the 2020 Olympics in Tokyo was carried out, which made it possible to establish the extreme duration of fights and the percentage of judges' marks and punishments in each weight category (Tables 1-7) [1, 3]:

• Weight category up to 60 kg. The number of participants is 23 athletes (Table 1).

In 14 meetings the winner was determined in extra time (Golden score). The fastest fight took place between an athlete from the Netherlands Tornike Tsjakadoea and Ukrainian Artem Lesiuk - 58 sec. Naohisa Takato from Japan and Yeldos Smetov from Kazakhstan competed the longest for the right to pass through the tournament bracket - 11 min 02 s.

• Weight category up to 66 kg. Athletes from 27 countries met in the fight for medals. 14 matches moved to the Golden score (Table 2).

The shortest fight took place between the Israeli Baruch Shmailov and the athlete from Mozambique Kevin Loforte - 1 min 45 s. The duel between the Moldavian Denis Vieru and the Uzbek master Sardor Nurillaev lasted the longest - 12 min 15 sec.

• Weight category up to 73 kg. The number of participants is 36 judokas. 15 meetings moved to the Golden Score (Table 3).

Kosovar Akil Gjakova won the fastest victory (in 16 s) against Ahmed Ayash, a judoka from Yemen.

The longest fight for the right to bear the title of two-time champion of the Olympic Games was fought by two Olympic champions - the host of the tournament, the Japanese Ono Shohei and the representative of Georgia, Shavdatuashvili Lasha.

• Weight category up to 81 kg. Athletes from 35 countries took part in this weight category. There were 38 fights, 17 of them went to the Golden Score (Table 4).

Table 1. *Estimates and punishments in the weight category up to 60 kg, the number of participants is 23 athletes*

Grades, penalties and disqualifications	Quantity	Quantity in percent %
Ippon	18	25,00
Waza-ari	8	11,11
Shido	42	58,33
Hansoku-make	4	5,56

Table 2. Estimates and penalties in the weight category up to 66 kg

Grades, penalties and disqualifications	Quantity	Quantity in percent %
Ippon	18	21,18
Waza-ari	14	16,47
Shido	45	52,94
Hansoku-make	8	9,41

Table 3. Estimates and punishments in the weight category up to 73 kg

Grades, penalties and disqualifications	Quantity	Quantity in percent %
Ippon	23	23
Waza-ari	19	19
Shido	56	56
Hansoku-make	2	2

Table 4. *Estimates and punishments in the weight category up to 81 kg*

Grades, penalties and disqualifications	Quantity	Quantity in percent %
Ippon	27	25,71
Waza-ari	18	17,14
Shido	55	52,38
Hansoku-make	5	4,76

The fastest (in 28 seconds) was able to achieve the Ippon score in the confrontation with the Argentinean Emmanuel Lucenti - the Bulgarian Ivaylo Ivanov. He, in the confrontation with the Uzbek master Sharofiddin Boltaboev, had the longest fight of 9 minutes 50 seconds.

• Weight category up to 90 kg. Judoists from 33 countries took part in the fight for medals. There were 36 meetings, 14 of them moved to the Golden Score (Table 5).

The shortest meeting took place between a judoka from Germany Eduard Trippel and a judoka from Korea Donghan Gwak - 17 sec. The longest between the Uzbek Davlat Bobonov and the Spaniard of Georgian origin Nikoloz Sherazadishvili is 8 min 36 s.

• Weight category up to 100 kg. 25 judokas competed for medals. Eight matches went into extra time.

The shortest fight took place between Jorge Fonseca and Toma Nikiforov - 17 s. The finalists of this weight category, the Japanese Wolf Aaron and the Korean Cho Guham, contested the leadership the longest - 9 min 35 s.

• Weight category over 100 kg. 22 judokas took part in the medals (Table 7).

Of the 25 fights held, 6 went to the Golden score. The shortest meeting took place between the Uzbek Bekmurod Oltiboev and the Dutchman Henk Grol - 25 s. The meeting between the future champion from the Czech Republic Krpalek Lukas and the representative of Japan Harasawa Hisayoshi dragged on for 7 minutes 59 seconds.

Punishments (shido, hansoku-make) and scores (ippon, waza-ari) are considered by us in aggregate as judicial decisions and are listed in tables in order to assess the ratio of prohibited and effective technical actions carried out in modern judo.

For clarity, this ratio is graphically presented in the figure (in all weight categories).

Distribution of Judicial Decisions by Weight Categories

Results of the study and their discussion. It does not inspire optimism that the lion's share of judicial decisions was determined by the need to punish athletes for their prohibited actions. 339 shido penalties and 26 hansoku-make disqualifications. The minimum value is 57% of penalties from general decisions (in the WC over 100 kg), the maximum number is 65% of penalties from the general decisions (in the WC up to 100 kg).

Table 5. *Estimates and penalties in the weight category up to 90 kg*

Grades, penalties and disqualifications	Quantity	Quantity in percent %
Ippon	20	21,28
Waza-ari	18	19,15
Shido	53	56,38
Hansoku-make	3	3,19

Table 6. *Estimates and punishments in the weight category up to 100 kg*

Grades, penalties and disqualifications	Quantity	Quantity in percent %
Ippon	14	17,28
Waza-ari	14	17,28
Shido	51	62,96
Hansoku-make	2	2,47

Table 7. *Estimates and penalties in the weight category over 100 kg*

Grades, penalties and disqualifications	Quantity	Quantity in percent %
Ippon	16	23,53
Waza-ari	13	19,12
Shido	37	54,41
Hansoku-make	2	2,94

Moreover, in many cases, it was not the effective attacking actions, but the punishments that ultimately determined the winner of the match.

The duration of some of the meetings that moved to the Golden-score, more than 2-2.5-3 (!) times exceeded the time regulated by the rules (9, 10, 12 minutes!).

It is difficult to draw final conclusions about the state of a sport based on the analysis of the Olympic Games [2]. Judoists experience great mental stress, so we can not always see spectacular fights full of beautiful throws and combinations. At present, the nature of the confrontation is different, tension and static prevail. The price of victory and any mistake at the main competitions of the four-year cycle of preparation and selection is extremely high. The mobilization and striving for victory of each athlete can bring to the podium not obvious leaders.

Conclusions. According to the presented data, it can be concluded that the following phenomena are the result of the current judo rules.

The prohibition of technical actions with grabs below the belt significantly limited the competitive arsenal.

Unlawful increase in the duration of competitive fights. Unfortunately, at the Tokyo Olympics, out of 222 fights, 88 went to the Golden Score.

Determining the winner of the meeting is not due to effective attacking actions, but fixing violations of the rules. Many coaches have inspired the athletes that it is possible to win tactically, only at the expense of punishments announced to the opponent.

It is rare to see an original technique, such as, for example, the one demonstrated at this tournament by a judoka from Georgia - Lasha Bekauri. Shortly before the Olympics, Russian judoka Yago Abuladze won the 2020 World Championship in a similar style. In the same Olympic cycle, the Iranian Saeid Mollaei won the world championship, outplaying the Japanese in the final with a rare technique for modern judo. Their style is a symbiosis of non-standard wrestling with real sports anger, coupled with the highest level of endurance. These athletes are aimed precisely at the winning throw. This is the kind of fight that judo fans want to see.

It remains to be hoped that the changes in the rules of the competition for the period 2022-2024. will change the situation for the better, will contribute to an increase in performance, an increase in entertainment and, due to this, the popularity of judo.

References

1. Vserossiyskaya federatsiya dzyudo [All-Russian Judo Federation]. Site. 2004. Available at: https://www.judo.ru/ (date of access: 09.17.2021).
2. Levitsky A.G., Kuvanov V.A., Dorofeev V.A. Otbor v dzyudo na Olimpiyskiye igry 2020 g. v Tokio: strategiya i varianty, perspektiva [Judo Selection for Tokyo 2020 Olympic Games: Strategy and Options, Perspective]. Teoriya i praktika fizicheskoy kultury. 2019. No. 4. pp. 80-93.
3. Mezhdunarodnaya Federatsiya dzyudo [International Judo Federation]. Site. 2007. Available at: https://www.ijf.org/ (date of access: 09.17.2021).