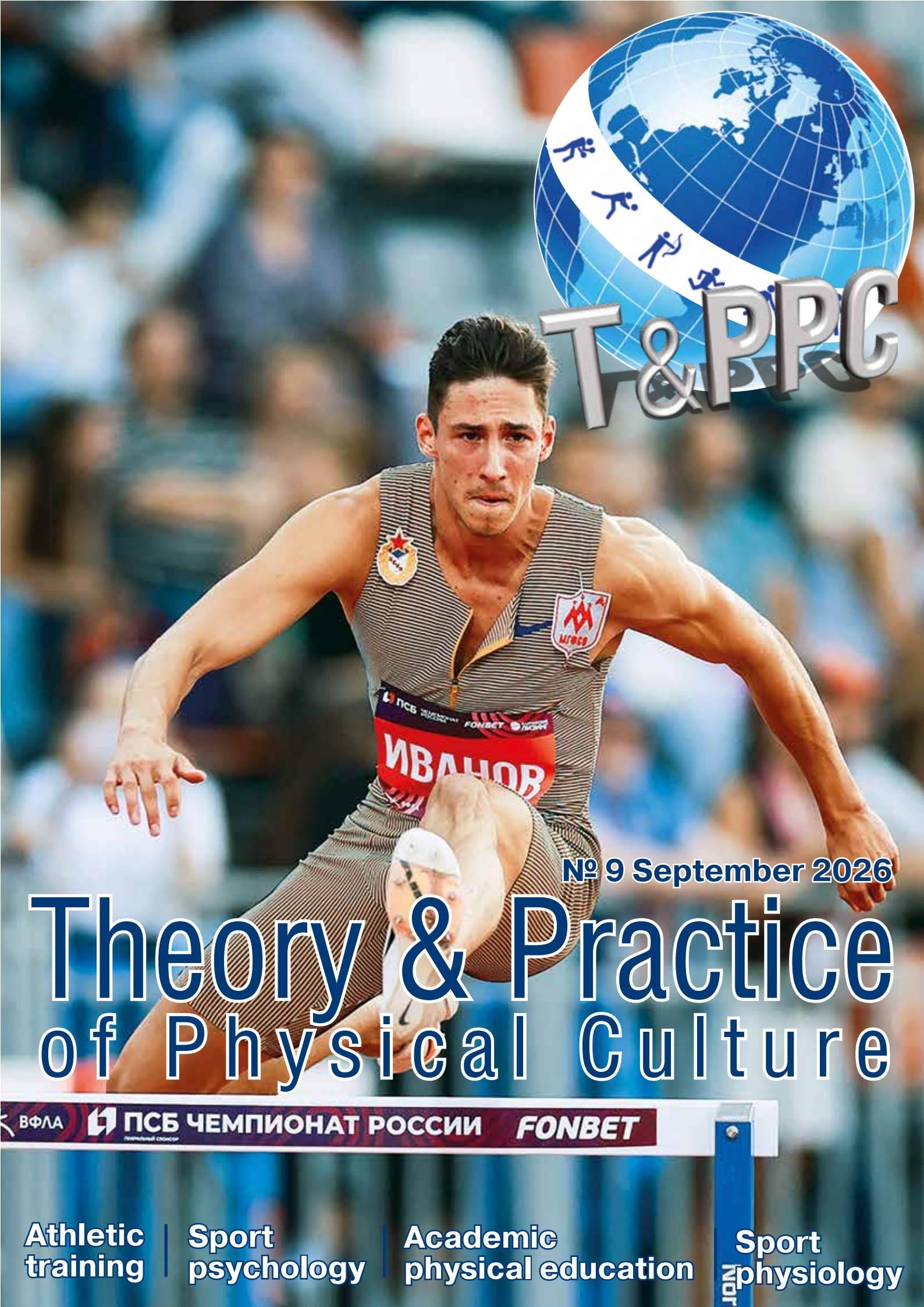


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Theory and Practice of Physical Culture

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Monitoring the dynamics of the tempo and accuracy of movement control in the improvement of individual tactical actions in basketball players of different qualification within the annual training cycle

UDC 796.323.2



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Abstract

Objective of the study is to identify and substantiate the indicators of the tempo and accuracy of movement control in the improvement of individual tactical actions in basketball players of different qualification.

Methods and structure of the study. The research was carried out in 2025-2026. The participants were 48 young and qualified basketball players from sports schools and student teams in the cities of Smolensk and Moscow. The indicators of movement tempo were assessed by means of the tapping test, while 'contact coordinationometry by profile' (CCP) was intended for studying the indicators of the accuracy of movement control in basketball players of different qualification.

Results and conclusions. Monitoring of the dynamics of movement tempo and of the control of movements in solving the tasks of the individual tactical preparation of basketball players of different qualification indicates that high indicators rationalise the structure of motor actions in the course of competitions, since they make it possible to change, in the links (phases) and details of the variants of performing technical techniques, the key parameters of the movements that ensure superiority over the opponent.

Keywords: *basketball, young and qualified athletes, annual training cycle, individual tactical actions, tempo and accuracy of movement control.*

Introduction. In the theory and practice of sports games [2], the work of the nervous system is of high importance for the improvement of the technical and tactical mastery of athletes in the training process and in competitions. The functional state of the nervous system largely determines the formation of the all-round and variable motor skills that make it possible to solve various tactical tasks in the course of competitive activity. However, as an analysis of the literary sources shows [4, 5], the dominance of particular processes determining the work of the central nervous system may reduce the effectiveness of the players' motor capabilities, especially the athlete's orientation in space and time, which are inalienable attributes of the playing activity of basketball players of different qualification.

When performing individual tactical actions of attack and defence, it is necessary not only to analyse the playing situation quickly and to take correct decisions, but also to perform motor actions with a high tempo and accuracy of movement control when solving various tactical tasks [1, 3]. Only in this case is it possible to achieve substantial progress in raising the individual tactical mastery of basketball players of different qualification.

Objective of the study is to identify and substantiate the indicators of the tempo and accuracy of movement control in the improvement of individual tactical actions in basketball players of different qualification.

Methods and structure of the study. During 2025-2026, four groups of basketball players from the cities of Moscow and Smolensk – IPS, the initial preparation stage (8-10 years); TS(SS), the training stage (sports specialisation) (11-13 years); SIS, the sports improvement stage (14-15 years); and HSMS, the highest sports mastery stage (15 years and older)

– with 12 persons in each (n=48 persons), took part in studies aimed at assessing movement tempo (the tapping test) and the accuracy of movement control ('contact coordinationometry by profile,' CCP) by means of the 'NS-PsychoTest' hardware-and-software complex developed by the specialists of Neurosoft LLC. The data obtained were subjected to mathematical processing and to a subsequent correlation analysis with the effectiveness of the individual tactical actions of basketball players of different qualification.

Results of the study and discussion. The tapping test characterises the strength of the course of the nervous processes. Higher indicators of movement tempo make it possible to speak of resistance to intensive and prolonged loads, which may directly influence the quantitative and qualitative parameters of the performance of individual tactical actions in the attacking and defensive phases by basketball players of different qualification.

The studies made it possible to establish that the minimum values of movement frequency in performing the tapping test are observed at the initial preparation stage, at rest and after the performance of a standard load – 6.12±0.3 and 6.04±0.3 Hz (t=0.19; p>0.01) – and the maximum values at the highest sports mastery stage – 7.56±0.5 and 7.93±0.6 Hz respectively (t=0.47; p>0.01; Table 1). Such dynamics are conditioned by the increase in the motor abilities of basketball players in the course of performing individual tactical actions as their sports mastery improves.

The application of the tapping test methodology made it possible to establish an increase in movement frequency after a standard training load at the sports improvement stage and at the highest sports mastery stage of basketball players – 7.47±0.5 and 7.93±0.6 Hz as compared with the indicators at rest – 7.03±0.4 and 7.56±0.5 Hz respectively (p>0.01). Such a change in the indicators may testify to the improvement of muscular and motor memory and to the development of speed abilities, which taken together make it possible to attain the maximum tempo of movement performance in the attacking phase and in the attack when carrying out an individual tactical action.

The accuracy of movement control when performing individual tactical actions by basketball players of different qualification was assessed at rest and after the performance of a standard training load, in solving the second task of the study, by means of the methodology 'contact coordinationometry by profile.'

An analysis of the data of Table 2 makes it possible to state that the total number of touches of the side walls of the aperture by the rod in basketball players at rest and after the performance of a standard training load has a tendency to decrease from the initial preparation stage – 50.3±2.6 and 59.1±2.9 times – to the highest sports mastery stage – 31.6±1.4 and 39.2±1.7 times. It should be noted here that the total number of touches of the aperture by the rod at rest is lower in comparison with that when the players performed a physical load, at all the stages of long-term sports preparation. This fact testifies that, as sports mastery grows, the accuracy of movement control in performing individual tactical actions by basketball players increases.

The total duration of touching of the aperture by the rod likewise has a tendency towards a decrease in the indicators as sports mastery improves, which is a sign of the improvement of the accuracy of the movements associated with the control of the 'sense of time' when performing motor actions.

The mean number of touches of the aperture by the rod per second during the procedure of 'contact coordinationometry by profile' decreases, both at rest and after the performance of a standard training load aimed at forming rational tactical actions in attack and defence, from the initial preparation stage to the highest sports mastery stage; these changes, however,

Table 1. Mean statistical indicators of the tapping test in basketball players of different qualification at rest and after a standard training load ($\bar{X}$±m)

Participants	At rest, Hz	After the load, Hz	t	p
Initial preparation stage (8-10 years; n=12)	6.12±0.3	6.04±0.3	0.19	>0.01
Training stage (sports specialisation) (11-13 years; n=12)	6.65±0.4	6.46±0.4	0.34	>0.01
Sports improvement stage (14-15 years; n=12)	7.03±0.4	7.47±0.5	0.69	>0.01
Highest sports mastery stage (15 years and older; n=12)	7.56±0.5	7.93±0.6	0.47	>0.01

Table 2. Mean statistical indicators of contact coordinationometry by profile at rest and after a standard training load ($\bar{X}\pm m$)

Indicators	Stages of preparation	At rest	After the load	t	p
Total number of touches, count	IPS	50.3±2.6	59.1±2.9	2.26	<0.05
	TS(SS)	46.3±2.4	55.1±2.6	2.49	<0.05
	SIS	40.2±2.3	47.4±2.5	2.12	>0.05
	HSMS	31.6±1.4	39.2±1.7	3.45	<0.01
Total duration of touches, s	IPS	2.09±0.2	2.22±0.3	0.36	>0.01
	TS(SS)	1.98±0.2	2.14±0.2	0.44	>0.01
	SIS	1.89±0.2	2.03±0.2	0.39	>0.01
	HSMS	1.77±0.1	1.95±0.2	0.57	>0.01
Mean number of touches per second, count	IPS	9.44±0.7	9.71±0.8	0.25	>0.01
	TS(SS)	9.26±0.7	9.65±0.8	0.37	>0.01
	SIS	9.02±0.6	9.57±0.7	0.60	>0.01
	HSMS	8.88±0.6	9.39±0.7	0.55	>0.01
Mean duration of touches per second	IPS	0.30±0.1	0.35±0.1	0.35	>0.01
	TS(SS)	0.26±0.1	0.32±0.1	0.42	>0.01
	SIS	0.23±0.1	0.30±0.1	0.57	>0.01
	HSMS	0.16±0.1	0.22±0.1	0.42	>0.01

IPS – initial preparation stage; TS(SS) – training stage (sports specialisation); SIS – sports improvement stage; HSMS – highest sports mastery stage.

are not as substantial, nor is the mean duration of touches per second (p>0.01).

Conclusions. The studies carried out make it possible to draw several conclusions regarding the results obtained with the application of the psychophysiological methodologies 'tapping test' and 'contact coordinationometry by profile':

– the tempo and the control of movements increase as sports mastery improves, which is conditioned by the system of long-term individual tactical preparation. In order to attain a high rate of individual tactical mastery, it is advisable to include in the training, from the early stages of preparation, exercises with constantly changing spatial, temporal and coordination parameters;

– at the early stages of preparation (initial preparation and sports specialisation) the indicators of movement tempo and of the control of movements at rest are higher than after a standard load; by the sports improvement stage and the highest sports mastery stage, however, the tendency changes, although it is not significant, which testifies to the need to develop and substantiate a psychophysiological component of the improvement of the individual tactical actions of basketball players of different qualification and age groups.

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Features of the structural components of competitive activity of young short-distance runners

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Abstract

Objective of the study is to identify the individual features of the structural components of the competitive activity of young short-distance female runners.

Methods and structure of the study. With the help of video analysis and photoelectronic timing, the individual features of the structure of the competitive activity of short-distance female runners aged 15-17 years were determined. The data obtained were subjected to correlation analysis.

Results and conclusions. It was established that the informativeness of individual elements of competitive activity in relation to the final result varies substantially between different athletes. The general factors and the individual features of the kinematic indicators of the technical mastery of short-distance female runners aged 15-17 years were determined. It was revealed that the character of the performance of the main exercise and of its individual elements under competitive conditions, being a complex indicator, reflects a distinctive 'synthesis' of the individual features of the athlete and of the level of her technical and physical preparedness. The need for the individualisation of the training process of the particular runner on the basis of an analysis of the structure of her competitive activity is demonstrated.

Keywords: *short-distance running, female athletes aged 15-17 years, competitive activity, individual features, kinematic indicators, variability.*

Introduction. The effectiveness of competitive activity may be judged by the sporting result at competitions. However, the latter contains little information about the course of the contest and does not make it possible to identify the strong and weak aspects of the athlete's preparedness in order to outline promising directions for his or her sporting improvement [4, 8]. These purposes are served by indicators that can be obtained in the process of the objective recording of competitive activity when analysing its composition (of which elements it consists) and its structure (how these elements are connected with one another and with the sporting result). Before preparing an athlete to achieve a specific result, it is necessary to know the conditions of the motor manifestations during the performance of the competitive exercise, the demands placed on the individual functions of the body, its energy expenditure and the features of the work of the neuromuscular apparatus under competitive conditions, and then, proceeding from this, to build the training process [1, 3, 7]. This determines the need to bring the content of the training process into correspondence with the requirements of real competitive activity.

Objective of the study is to identify the individual features of the structural components of the competitive activity of young short-distance female runners.

Methods and structure of the study. With the aim of comparing the group and individual models of the competitive activity of short-distance female runners whose range of results in the 100 m run was from 12.11 to 13.02 s (level of sporting qualification: First Category – Candidate for Master of Sport), two series of experiments were conducted. Using a video camera and an electronic timing system, the time of covering the 30, 60 and 80 m segments of the hundred-

metre distance was recorded in 26 athletes, and the frequency and length of the strides, their total number over the distance, and also the 'stride modulus' – the ratio of the length of the athlete's stride to the length of her leg – were measured. Then, over the course of the competition period, for each of 12 athletes from this group the time of covering the segments of the 100 m distance was determined 13-15 times in competitions and analogous indicators were calculated. The data obtained were subjected to correlation analysis. In the first case R-analysis was used, in the second P-analysis [2].

Results of the study and discussion. In examining the correlation relationship obtained from the group data of the runners aged 15-17 years (see the Table, highlighted in bold), it may be established that the sporting result in the 100 m run for athletes of this qualification depends to a greater degree on the time of covering the last 20 m (r = 0.869) and on the ability to maintain the frequency of the strides over the second half of the distance (r = –0.836 and –0.812). Poorly correlated with the result are the time of the starting acceleration (r = 0.218) and the number of strides expended on covering the whole distance (r = –0.249). If one proceeds from the structure of the group model, the training process should be oriented predominantly towards developing the abilities that provide the possibility of covering the second half of the distance quickly with a high frequency of running strides. Meanwhile, an analysis of the individual relationships shows that in none of the runners do the correlation coefficients between the time of running the 100 m distance and its structural components of competitive activity correspond to the group ones. This fact testifies to the influence of the individual data of each participant on the relationships under examination.

Thus, in two runners the intra-individual correlation coefficients between the time of running the last 20 m of the distance and the sporting result are close to the group ones; in three the magnitude of these coefficients is sufficiently high and significant at the 5 % level of significance. In the athletes L.Kh., Ch.K. and M.N. the result in the 100 m run statistically 'depends' on the ability to perform the starting acceleration in a short time and to reach their maximum speed. In four runners (A.R., Ch.O., L.S., K.D.) a close correlation relationship of the sporting result with the fast covering of the last metres of the distance through the maintenance of a sufficiently high running tempo is observed.

For S.D., Ch.E. and R.Kh. a dependence of the result on the individual capacity to maintain an optimal stride length over the second half of the distance is characteristic. At the same time, a low statistical relationship of the 100 m running time with the frequency of the strides at the end of the distance is observed in them (respectively r = –0.348; –0.330 and –0.109). Evidently, in training sessions, when selecting the means of the individual preparation of one or another runner, it is necessary to take into account the specific nature of these factors.

The coefficients of variation calculated testify that the greatest inter-individual differences in the kinematic indicators of the athletes' running technique are observed at the beginning of the distance, the dif-

Table. Group and individual correlation relationships of the sporting result and of the structural components of competitive activity in female 100 m runners (First Category – Candidate for Master of Sport)

Indicators	Group relationship	Individual relationship											
		A.R.	Ch.O.	S.Sh.	L.Kh.	L.S.	Ch.K.	S.D.	K.D.	Ch.E.	M.Sh.	M.N.	R.Kh.
t 0-30 m	218	168	236	340	810	482	732	161	381	108	118	836	380
t 30-60 m	683	482	583	462	780	650	806	620	486	210	331	622	408
t 60-80 m	786	330	728	310	436	736	668	366	732	366	402	316	422
t 80-100 m	869	740	730	390	280	692	436	422	840	410	566	622	806
s.m. 100 m	-736	-626	-620	-612	-321	-286	-720	-266	-686	-619	-680	-780	-336
s.m. 0-30 m	-658	-262	-226	-530	-722	-364	-321	-420	-631	-228	-122	-268	-309
s.m. 30-60 m	-786	-528	-380	-426	-683	-426	-480	-382	-766	-366	-171	-333	-266
s.m. 60-80 m	-332	-412	-521	-482	-422	-566	-266	-664	-301	-705	-408	-340	-660
s.m. 80-100 m	-485	-626	-328	-470	-381	-399	-620	-786	-582	-722	-609	-420	-712
f.s. 100 m	-685	-326	-632	-312	-726	-680	-326	-168	-660	-228	-402	-669	-333
f.s. 0-30 m	-363	-208	-208	-580	-480	-126	-162	-626	-366	-486	-106	-320	-162
f.s. 30-60 m	-711	-366	-202	-226	-426	-263	-680	-280	-720	-722	-288	-368	-336
f.s. 60-80 m	-836	-602	-726	-522	-412	-480	-636	-362	-736	-328	-569	-716	-426
f.s. 80-100 m	-812	-710	-802	-631	-336	-906	-322	-348	-802	-330	608	-619	-109
Number of strides	-249	-370	-521	-282	-502	-406	-250	-322	-630	-288	106	-212	-266

Note: t – running time; s.m. – 'stride modulus' = length of the stride / length of the leg; f.s. – frequency of the strides; zeros and decimal points are omitted; r ≤ 0.05 at 580.

ferences are somewhat smaller in the middle, and the maximum spread of the indicators is recorded at the finish of the hundred-metre distance.

It should be emphasised that when the individual indicators of the athletes are compared with the group model data, a discrepancy is often revealed: the athlete possesses capabilities exceeding the required indicators, while in individual characteristics she is quite far from them. Naturally the question arises: which path should be taken towards further improvement? According to the widespread point of view, the disproportion should be eliminated and the qualities lagging behind in development should be 'brought up' to the required values.

Meanwhile it is known from practice [1, 3, 5, 6] that such an apparently entirely logical approach is ineffective for athletes possessing a marked individuality. The coach not infrequently strives to raise those capabilities of his charges which are largely conditioned genetically or are constrained by an exceptionally high level of development of other qualities. In this case the training, as a rule, not only fails to produce results but also reduces the strongest aspects of preparedness, smoothing out the individual features that might have become the key to success. At the same time, the apparent shortcomings in the preparedness of many, even well-known, athletes are a natural continuation of their strong points, which ultimately ensure the achievement of outstanding results.

Thus, the studies conducted show that the individualisation of the training process should be based on information about the structure of the manifestation of motor abilities and about the indicators of the technique of the competitive exercise in each athlete. At the same time, the maximum development of individual aptitudes should be combined with a sufficiently harmonious and comprehensive preparation which does not, however, come into contradiction with her individuality.

Conclusions. The correlation coefficients between the sporting result and its structural components, calculated from the results of a single testing of the participants (mean group indicators), differ from the analogous values of the correlation coefficients calculated from the results of the repeated testing of a single participant (intra-individual indicators). At the same time, the distribution of the load, its magnitude and the target orientation of the training process for achieving the planned structure of competitive activity should be carried out on the basis of the individual features of one or another athlete, since the character of the performance of the main exercise and of its individual elements under competitive conditions, being a complex indicator, reflects a distinctive 'synthesis' of the level of the athlete's technical and physical preparedness and of her specific characteristics.

Information about the athlete's activity at competitions therefore serves as the basis for the choice of the means and methods and of the volume and intensity of the training influences. Without revealing the cause-and-effect relations of the training process and sporting achievements, an analysis of the level of the latter provides only descriptive information.

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Study of the dependence of the sports result in the 400 metres hurdles on the time of covering the inter-hurdle sections of the distance

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Abstract

Objective of the study is to determine the dependence of the sports result in the 400 metres hurdles on the time of covering the inter-hurdle sections of the distance.

Methods and structure of the study. The material of the study was the results of a video analysis of the competitive running of Fyodor Ivanov, five-time champion and record holder of Russia in hurdling over the 400 and 300 metres distances.

Results and conclusions. A total array of 32 starts by F. Ivanov was collected. Table 1 and all the calculations below use 10 of them: 22 recordings contain video defects because of which some of the inter-hurdle sections cannot be read frame by frame, and for the sake of data quality these starts were excluded. A control calculation over all 32 starts yields similar coefficients and does not alter the same conclusions.

Keywords: *hurdling, world championship, training process.*

Introduction. The level of sporting achievement in hurdling over the 400 metres hurdles distance and the competition in the struggle for the world championship require a constant increase in the quality and effectiveness of the training process. The growth of achievement is determined by the continuous refinement of the technique of economical and rational hurdle clearance. The study of the temporal parameters of the 35-metre inter-hurdle sections of the distance makes it possible to predict the sports result in the 400 metres run with a high degree of accuracy. The time of each inter-hurdle section allows the dynamics of the onset of fatigue to be traced. Comparing the time of an individual section with the mean hurdle time over the whole sample makes it possible to characterise, in quantitative terms, the degree of fatigue and the individual qualities of the hurdler's technical and special physical preparation.

Most major athletics competitions are held with electronic timing and video recording, which allows athletes, coaches and researchers to analyse sporting events. The analysis of the 400 m hurdles is based on the sports result; it depends on a multitude of factors of the training process, which are examined in dissertations and in teaching and methodological works on hurdling and on the special preparation of hurdlers (Shchennikov 1982; Shchennikov 1983; Chistyakov 1975; Stepanova 1996).

Objective of the study is to determine the dependence of the sports result in the 400 metres hurdles on the time of covering the inter-hurdle sections of the distance.

Methods and structure of the study. The material of the study was the results of a video analysis of the competitive running of Fyodor Ivanov, five-time champion and record holder of Russia in hurdling over the 400 and 300 metres distances (Table 1). His indicators are compared with the running of the world's strongest hurdlers – Karsten Warholm, the world record holder, and Rai Benjamin, the 2024 Olympic champion in Paris. The hurdle-section times of the foreign athletes were taken from the open database of hurdle-clearance times of the Athletes First website (https://www.athletefirst.org/). The kinematic parameters of hurdling over the 400 metres distance were analysed in the Coach My Video Pro application for high-precision

Table 1. Results of Fyodor Ivanov in 400 m hurdles competitions

Event	Date	Round	H1-45	H2	H3	H4	H5	H6	H7	H8	H9	H10	F-40	Result	T9	t AvgH
RC	24.06.2022	Heat	5.93	4.01	4.06	4.20	4.31	4.41	4.54	4.67	4.80	4.94	6.04	51.92	39.95	4.44
RC	25.06.2022	Semi-final	5.80	3.85	3.98	4.09	4.24	4.32	4.40	4.34	4.70	4.73	5.78	50.23	38.65	4.29
RC	26.06.2022	Final	5.66	3.99	3.78	3.82	4.14	4.18	4.30	4.41	4.55	4.67	6.00	49.49	37.83	4.20
RJC	01.07.2023	Final	6.08	3.83	3.83	3.82	3.90	4.25	4.25	4.37	4.55	4.61	5.38	48.86	37.40	4.16
RCup	14.07.2023	Final	6.34	3.88	3.84	3.96	4.07	4.25	4.45	4.66	4.82	4.75	5.09	50.09	38.67	4.30
RC	04.08.2023	Heat	6.09	3.91	3.98	4.00	4.05	4.21	4.45	4.51	4.66	4.63	5.06	49.54	38.39	4.27
RC	05.08.2023	Final	6.07	3.87	3.90	3.91	4.17	4.26	4.40	4.32	4.53	4.55	5.09	49.06	37.91	4.21
RTC	18.08.2023	Final	6.16	3.84	3.74	3.80	4.10	4.25	4.34	4.45	4.26	4.52	5.19	48.64	37.29	4.14
RTC	11.06.2025	Final	6.28	3.66	3.85	3.86	3.98	4.17	4.33	4.33	4.37	4.47	5.01	48.30	37.01	4.11
RC	09.08.2025	Final	5.94	3.77	3.77	3.76	3.83	3.99	4.31	4.31	4.60	4.56	5.11	47.94	36.89	4.10

RC – Russian Championship; RJC – Russian Junior Championship; RCup – Russian Cup; RTC – Russian Team Championship.

frame-by-frame viewing of video; the capture settings were 1080 points, 120 frames per second (individual indicators were taken from the screen at 60 frames per second). Statistical processing involved correlation and regression analysis in Excel. All times in the text, the tables and the diagrams are rounded to 0.01 s.

When the database was created, the following times were determined:

H1-45 – the time of the 45 m starting section including the clearance of the first hurdle (hurdle height 914 mm) up to the touchdown of the lead leg on the track;

T9 – the time from the placement of the lead leg beyond the first hurdle to its placement beyond the tenth hurdle (nine 35-metre inter-hurdle sections of the distance);

t 35 – the time of one 35-metre inter-hurdle section of the distance;

t AvgH – the mean time of the nine 35-metre inter-hurdle sections, t AvgH = T9 / 9;

t Dev. – the deviation of the time of an individual section from the mean hurdle time, t Dev. = t 35 – t AvgH (a positive value means the section is slower than the mean, a negative one that it is faster); there is no established name for this indicator, and hereafter only the designation t Dev. is used;

F-40 – the time of the 40 m finishing section after the tenth hurdle;

t 400 h – the time of the whole 400 m hurdles distance (the sports result).

Table 2. Results of the regression estimation.

No.	Y	X	A	B	R-squared
1	t 400	T9	1.207	3.545	0.97
2	T9	t 400	0.805	–1.757	0.97
3	t 400	t AvgH	10.862	3.545	0.97

Note: A – dimensionless slope coefficient, B – intercept, s. T9 – the total time of the nine inter-hurdle sections (from the descent from the first hurdle to the placement beyond the tenth hurdle); t AvgH – the mean time of one 35-metre section (T9 / 9); t 400 – the sports result

Results of the study and discussion. A total array of 32 starts by F. Ivanov was collected. Table 1 and all the calculations below use 10 of them: 22 recordings contain video defects because of which some of the inter-hurdle sections cannot be read frame by frame, and for the sake of data quality these starts were excluded. A control calculation over all 32 starts yields similar coefficients and does not alter the same conclusions.

The analysis shows that the sports result over the 400 m hurdles distance is closely related to the total time of the nine 35-metre inter-hurdle sections (T9): the correlation coefficient is r = 0.98. Under the present conditions it is not possible to use portable devices for recording and transmitting hurdlers' kinematics, which are employed in laboratory conditions and whose cost is high and so far beyond the reach of the coach. The dependence of the result over the 400 m hurdles distance is expressed by a linear regression equation of the form $Y = T9 \cdot A + B$.

The role of the individual sections of the distance is not equal. The total time of the nine inter-hurdle sections T9 accounts for the result almost completely (r = 0.98 for the pair t 400 h – T9). The starting and finishing sections are linked to the result considerably more weakly: for H1-45 the relationship is practically absent (r = -0.25), for F-40 r = 0.68, and for their sum H1-45 + F-40 r = 0.81. It is also telling that the start and the finish are poor predictors even of the middle part of the run: the correlation of T9 with the sum H1-45 + F-40 amounts to only r = 0.70, as against r = 0.98 for the pair t 400 h – T9. In other words, the fate of the result is decided on the nine hurdle sections and not on the approach run and the finish.

For comparative analysis and for finding the temporal parameters (Y) from a known indicator (X), Table 2 gives the calculated values of the coefficients A and B of the linear regression equation.

Table 3. Forecast of the inter-hurdle section times from the sports result (equation No. 1: T9 = (t 400 h – 3.545) / 1.207, t AvgH = T9 / 9)

Reference point	t 400 h, s	T9, s	t AvgH, s
CMS standard	55.74	43.24	4.80
MS standard	51.78	39.96	4.44
MSIC standard	49.31	37.92	4.21
Russian record (F. Ivanov)	47.94	36.78	4.09
World record (K. Warholm)	45.94	35.12	3.90

CMS – Candidate for Master of Sport; MS – Master of Sport; MSIC – Master of Sport of International Class.

Table 2 should be read as a set of ready-made calculation instructions: each row makes it possible to compute the sought value (Y) from one known indicator (X) – substitute the value into the formula Y = AX + B and obtain the forecast. The high values of R2 (0.97) mean that such a forecast can be used in planning: the mean forecast error under equation No. 1 is approximately ±0.2 s (a check on 10 starts gave discrepancies of 0.06–0.15 s). This allows the coach to set a seasonal target for the result and reference markers of pace along the distance, and to treat the table as a guide to action.

Equations No. 1 and No. 3 describe one and the same dependence: t AvgH = T9 / 9, and therefore A3 ≈ 9A1, while the intercept coincides.

As an example of its use: starting from the current standards of the Unified All-Russian Sports Classification (EVSK) in the 400 m hurdles (men, electronic timing) and solving equation No. 1 with respect to T9, we obtain the target values of the time of the nine hurdle sections and of the mean hurdle (Table 3). Each row is a reference point for planning: in order to show a result at the level of the standard, the athlete must cover the nine hurdle sections in the time T9 and maintain the mean hurdle t AvgH of the corresponding row.

Equation No. 2 is a marker of the hurdler's technical and special preparedness, since it predicts with a high degree of accuracy the time of covering the nine 35-metre hurdle sections from the result over the 400 metres distance. The indicator t AvgH – the mean time of the 'hurdle' (equation No. 3) – is the principal reference point when choosing the intensity and the number of hurdle sections of the distance to be run in the training process, and a key value when planning the result in competition.

The choice of T9 or t AvgH in the role of X (or of Y, if the comparison is made in the reverse direction) is a question not of statistics but of convenience of interpretation and transferability: it is one and the same quantity up to a factor of 9, and equations No. 1 and No. 3 are interchangeable. T9 is more convenient as the outcome of the section 'first–tenth hurdle,' while t AvgH is more convenient as a reference point for the pace over one hurdle in training.

It should be noted that the regression equations obtained are individual in character and refer to the sports results of F. Ivanov.

It is known from sporting practice that the covering of the hurdle sections of the distance proceeds in two stages – first at a high tempo, and then with a gradual reduction of running speed, which is associated with an almost maximal concentration of lactate (lactic acid) in the muscles. Competitive loads are associated with aerobic and anaerobic supply processes, which are characterised by intensity (power) and by their duration (capacity). Glycolytic power reaches its maximum in the interval of 20-40 s, with a rapid expenditure of the energy sources in the muscles and a considerable rise in the lactate concentration (La). Glycolytic energy metabolism may predominate at a high intensity of the load, from 30 s to 2 min. In this case we are dealing with the so-called glycolytic capacity, which is characterised by the maximal concentration of lactate formed in the muscles during the work, which leads to a decline in working capacity – fatigue.

To describe the dynamics of fatigue, the indicator t Dev. is used (see the list of designations) – the deviation of the time of each 35-metre section from the mean hurdle t AvgH. It is presented by fragments of a cascade diagram (a waterfall, 'flying bricks,' a 'bridge'). This type of visualisation, transformed into coloured 'bricks,' clearly demonstrates the successive contribution of the positive and negative values of t Dev., vividly showing the dynamics of the hurdler's oncoming fatigue.

The transition from the absolute time of the sections to the deviations t Dev. removes the difference in the runner's general level of speed and leaves only the 'shape' of the run – where the athlete accelerated and where he lost speed. The diagrams of different athletes are therefore directly comparable with one another. The deviations are also useful for a separate regression precisely on the 'shape of fatigue' – for example, how strongly t Dev. increases towards the end of the distance; such a model may account for part of the residuals of the main equation.

The diagrams of F. Ivanov and K. Warholm (Figures 1 and 2) show the classical dynamics of an increase in running speed over the first six hurdle sections, denoted by green 'bricks,' with a subsequent decrease in speed over four hurdle sections under the influence

of fatigue – denoted by red 'bricks.' The diagram of F. Ivanov (Figure 1) is constructed from the times of the inter-hurdle sections (t 35) of his run at the Russian Championship on 26.07.2026 (result 48.10 s) – from the same indicators as in Table 1.

The diagram of Rai Benjamin (Figure 3) shows that the first sign of fatigue appeared only after the section at the 255 m mark of the 400 m distance, and after eight hurdle sections – at the 290 m mark – the deviation from the mean hurdle time amounted to 0.07 s. Rai cleared his tenth hurdle easily, without straining, preparing for his next start – the 4×400 m relay, which was held the following day. Having become Olympic champion in the relay as well, Rai Benjamin recorded a time of 43.18 s on the final leg.

It is advisable to direct further research towards forecasting the shape of fatigue itself: the regression of the deviations t Dev. on the ordinal number of the hurdle (a linear and a quadratic trend), the estimation of the rate of increase of fatigue towards the end of the distance, and also the verification of the transferability of individual equations to other hurdlers and the accumulation of a sample of starts free from recording defects.

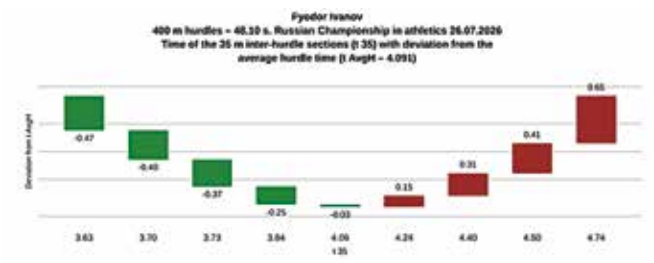


Figure 1. Fyodor Ivanov. Time of the 35-metre inter-hurdle sections of the distance (t 35) with the deviation from the mean hurdle time (t Dev.): green 'bricks' – sections faster than the mean, red ones – slower

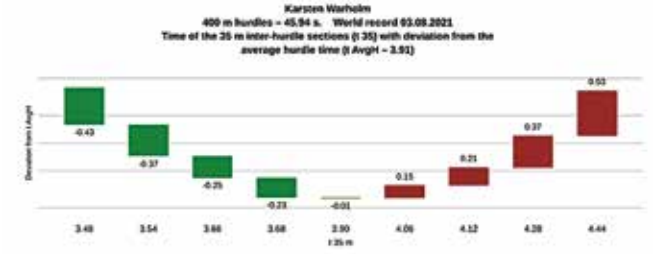


Figure 2. Karsten Warholm. Time of the 35-metre inter-hurdle sections of the distance (t 35) with the deviation from the mean hurdle time (t Dev.)



Figure 3. Rai Benjamin. Time of the 35-metre inter-hurdle sections of the distance (t 35) with the deviation from the mean hurdle time (t Dev.)

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Apparatus training with clubs as a means of increasing the speed of motor reactions in gymnasts

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Abstract

Objective of the study is to develop means of increasing the speed of motor reactions on the basis of elements of apparatus training with clubs, and to verify experimentally the effectiveness of the means developed in the training process of gymnasts.

Methods and structure of the study. In the course of the research the following methods were used: theoretical analysis of the literature on the problem under study; pedagogical observation of training sessions and competitions; surveys of respondents in order to determine the structural groups of club movements that improve the speed of reaction to a moving object; pedagogical testing to assess the effectiveness of the methodologies developed; a pedagogical experiment; and mathematical and statistical analysis of the data.

The study involved gymnasts competing in group exercises at the Candidate for Master of Sport and Master of Sport level (n=20).

Results and conclusions. The article provides a theoretical substantiation of the importance of applying apparatus training with clubs in the training process, and identifies the structural groups of movements that make it possible to increase the speed of motor reactions. Means of increasing the speed of motor reactions have been developed on the basis of elements of apparatus training with clubs. The high effectiveness of applying the means developed in the training process of gymnasts has been demonstrated.

Keywords: *rhythmic gymnastics, apparatus training, speed of motor reaction, speed abilities.*

Introduction. At the present time the basic concept of the development of rhythmic gymnastics is directed towards increasing the difficulty of competitive routines through the application of dynamic elements with rotation (R), apparatus difficulty (DA) and difficulty with exchange (DE). The vector of apparatus training is shifting towards the mastering of complex coordination movements with a high accuracy and speed of performance [2, 3]. Clubs are a paired apparatus consisting of a barrel-shaped body, a narrowing neck and a spherical head. The weight of each club is a minimum of 150 grams and its length 40-50 cm. Clubs are considered the most difficult apparatus to master in rhythmic gymnastics. The apparatus is held with a firm and with a loose grip: by the small and the large head, and also by the middle. Exercises with clubs require of gymnasts a high level of visual-motor coordination and also the ability to switch attention from one object to another within fractions of a second. In order to perform complex coordination movements at a rapid tempo, it is necessary to contract and relax the muscles with virtuosity and to engage the antagonist muscles extremely quickly. In gymnasts capable of performing movements at a rapid tempo, the latent time of muscle contraction and relaxation is shorter than in gymnasts performing movements at a slow tempo.

Objective of the study is to develop means of increasing the speed of motor reactions on the basis of elements of apparatus training with clubs, and to verify experimentally the effectiveness of the means developed in the training process of gymnasts.

Methods and structure of the study. At the first stage of the study, a survey of specialists (n=18) was conducted with the aim of an optimised selection of the structural groups of movements based on elements of apparatus training with clubs. The question-

naire consisted of questions devoted to the technique of work with the apparatus, with a view to studying the practical experience of specialists and also to improving the system of apparatus training in group exercises. It can be seen from the figure that the principal structural groups contributing to the development of the speed of motor reactions are throwing actions with the apparatus of various kinds.



Figure. Optimal structural groups of movements with clubs according to the results of the survey of specialists

Throwing actions with the apparatus are considered the most impressive and the most difficult to master. The apparatus moves along a parabola. The height and speed of the movement depend on the initial conditions of release – the direction and the speed. In order to carry out this technical action successfully, the gymnast must:

- visually see and assess the direction of flight of the apparatus (the sensory phase);
- select a plan for carrying out the throwing action (the premotor phase);
- begin its execution (the motor phase).

On the basis of the data obtained, means of increasing the speed of motor reactions have been developed on the basis of elements of apparatus training with clubs (Table 1). The main attention is paid to the performance of throwing actions and the subsequent catch. The gymnasts perform the exercises proposed during the preparatory period of the annual cycle of sports training.

With a view to improving apparatus preparedness and also to developing the speed of motor reaction, the following methods were applied:

- the repetition method (provides for the repeated performance of a motor action on a sudden signal);
- the game method (provides for the performance of tasks under conditions of a sudden change in the situation, of deliberate interference by a partner or of a distracting factor);
- the sensory method (provides for the performance of exercises based on the interrelation between the speed of motor reaction and the ability to control time intervals).

Table 1. Means of developing the speed of motor reactions on the basis of apparatus training with clubs

Structural groups of movements	Means	Methodological recommendations
Small and large throwing actions	- alternating; - successive; - parallel; - symmetrical; - asymmetrical	Small and large throwing actions are performed individually. The speed of performance of the technical movements acquires particular importance. The repetition and the sensory methods of developing the speed of motor reaction are applied
Figure movements combined with small throwing actions	- with mills in various planes; - with rotations in various planes; - with circular movements in various planes; - with snails in various planes	Figure movements are performed individually. Throwing movements of different heights are applied. The speed of performance varies and is changed at the coach's signal. The repetition, the game and the sensory methods of developing the speed of motor reaction are applied
Juggling of various kinds	- with two, three and more clubs	Juggling is performed both individually and in subgroups. Throwing actions are carried out to different heights. The speed of performance varies and is changed at the coach's signal. The repetition, the game and the sensory methods of developing the speed of motor reaction are applied
Exchanges of various kinds	- with one club; - with two; - by the cascade method; - with and without difficulty criteria	Throwing actions are performed in pairs, in subgroups and in the group. Particular attention is paid to the technical execution of the throwing action. The repetition and the game methods of developing the speed of motor reaction are applied

Table 2. Control exercises for assessing the speed of motor reactions

Assessment of the speed of motor reactions	Control exercises	Description
Assessment of the simple motor reaction	'Ruler drop'	A ruler (50 cm) is held vertically by a partner. The participant holds the fingers at the level of the zero mark. The partner releases the ruler without warning. The participant's task is to catch the ruler as quickly as possible. The distance from the zero mark to the fingers is measured
Assessment of the simple motor reaction	'Reaction to a visual signal'	The time between the signal and the beginning of the movement is measured by means of a computer programme
Assessment of the complex motor reaction	'Exchanges with two or more partners.' High throwing action	On command, the participant turns her back to two partners at a distance of 6 metres. At a sound signal the gymnasts perform a high throwing action with different apparatus (hoop, ball or clubs, as chosen). The participant's task is to catch the required apparatus as agreed in advance. The number of successful attempts out of 10 is measured
Assessment of the complex motor reaction	'Exchanges with two partners.' Low throwing action	The difference lies in the reduction of the time of the motor response to the moving object by increasing the speed of movement of the apparatus and lowering the height of flight. The number of successful attempts out of 10 is measured

The exercises may be performed under facilitated, variable and competition-like conditions. If the performance of an exercise involves reacting to a sound signal, it is important to apply a variety of signals: from the very quietest to loud ones. The relationship between the latent and the motor period depends on age, on the character of the reaction, on the state of physical and technical preparedness, on fatigue and on the gymnasts' level of sports mastery. This fact must be taken into account when developing the speed of motor reaction. The means developed correspond both to the general pedagogical principles applied to a pedagogically organised process and to the principles of sports training, which determine the necessary connections between the training influence and its effect [1].

In order to assess the effectiveness of the means developed for increasing the speed of motor reaction on the basis of elements of apparatus training with clubs, pedagogical testing was carried out at the second stage of the study, at the beginning and at the end of the pedagogical experiment; it included control exercises for determining the level of the gymnasts' speed of motor reactions (Table 2).

At the third stage of the study, mathematical and statistical processing of the data was carried out. The significance of the differences was determined between the means of two samples by Student's t-test at a significance level of $p<0.05$.

Results of the study and discussion. The pedagogical experiment was conducted with the aim of piloting the means developed for increasing the speed of motor reaction on the basis of elements of apparatus training with clubs. The means and the meth-

Table 3. Comparative indicators of the speed of motor reactions before and after the experiment (n=20)

Control exercises	Group of participants		P-value
'Ruler drop' (cm)	Before	12.28±1.31	>0.05
	After	8.43±0.45	<0.05
'Reaction to a visual signal' (s)	Before	0.27±0.012	>0.05
	After	0.21±0.004	<0.05
'Exchanges with two or more partners' (no. of times)	Before	4.47±1.29	>0.05
	After	8.52±0.55	<0.05
'Exchanges with two partners' (no. of times)	Before	4.8±1.86	>0.05
	After	8.57±0.61	<0.05

odological procedures are based on the results of the theoretical analysis, including the survey of respondents and pedagogical observation of the course of the training and competitive process. After the pedagogical experiment, repeated testing was carried out. A comparative superiority of the results obtained after the experiment was established at a significance level of $p<0.05$ (Table 3).

It has been established that perceptual and motor processes are relatively independent, and that the individual differences in the time of the latent component are considerably greater than the time of the movement. The latent period of the reaction serves as an informative indicator of the state of the CNS. In rhythmic gymnastics the speed of decision-making is of determining importance. Under conditions of a possible change in the trajectory and speed of flight of the apparatus, gymnasts require the ability to switch attention immediately and to select the most effective variant of motor response from those available. The possession of this ability depends on a large store of technical and tactical mastery developed in the training process, which makes it possible to anticipate the success of the performance. The means developed for increasing the speed of motor reactions make it possible to form cognitive structures that are closely interrelated with the productivity of the gymnasts' training and competitive activity.

Conclusions. As a result of the study carried out, a theoretical substantiation has been provided of the importance of applying apparatus training with clubs in the training process, and the structural groups of movements that make it possible to increase the speed of motor reactions have been identified. Means of increasing the speed of motor reactions have been developed on the basis of elements of apparatus training with clubs. The high effectiveness of applying the means developed in the training process of gymnasts has been demonstrated.

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Development of physical qualities in track-and-field runners at the stage of sports improvement

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Abstract

Objective of the study is to provide a theoretical substantiation of a comprehensive methodology for the directed development of speed-strength abilities, special endurance, strength and flexibility in qualified runners within the annual cycle.

Methods and structure of the study. An analysis of the scientific and methodological literature, a systematisation of the approaches to the periodisation of loads and the identification of the optimal means of developing the leading qualities were carried out. The analysis of the sources showed that in highly qualified athletes the limiting factors are special endurance and running economy. The main approaches rest on the principles of wave-like periodisation. The methodology is built on the integration of running-training means, speed-strength exercises, plyometrics and gymnastic complexes. The theoretical generalisation made it possible to determine a rational distribution of loads: the predominance of aerobic work in the preparatory period with a gradual increase in the share of high-intensity means in the pre-competitive cycle. Attention is paid to the individualisation of the influences with account of the morphofunctional features of the athletes and to the monitoring of the recovery of the organism. The mechanisms of adaptation to combined loads and the influence of strength training on push-off power are considered.

Results and conclusions. The results confirm the effectiveness of an integral approach in which the development of physical qualities is carried out in close interrelation with the improvement of technique. The need to observe the principles of variability and of the correspondence of the loads to the level of preparedness is substantiated. It is proposed to use the stated ratios of the volumes and intensity of the loads with obligatory monitoring of the athlete's condition.

Keywords: *development of physical qualities, track-and-field runners, stage of sports improvement, speed-strength training, special endurance, periodisation of training.*

Introduction. The relevance of studying the methodology of developing physical qualities in track-and-field runners at the stage of sports improvement is determined by the modern requirements for the preparation of highly qualified athletes, under which the attainment of stable high results over middle and long distances is impossible without the purposeful improvement of speed-strength abilities, special endurance, strength and flexibility. At this stage of preparation, qualified runners face the need to optimise the training process under conditions of growing competition and limited resources for the recovery of the organism. An analysis of the scientific and methodological literature shows that the questions of the rational construction of training loads with account of the individual features of athletes and of the principles of periodisation remain at the centre of specialists' attention. The works of Russian authors emphasise the importance of an integral approach to the development of physical qualities within the annual cycle of preparation. The theoretical substantiation of the subject rests on a generalisation of the data on the mechanisms of adaptation of the organism to combined loads, in which attention is paid to the balance between the volume of aerobic work and purposeful speed-strength influences. The degree of elaboration of the problem in the scientific literature confirms the presence of fundamental studies on the periodisation of the training process; the aspects of the individualisation of the means and methods specifically at the stage of sports improvement for runners over distances from 800 to 5000 metres, however, are insufficiently covered. Such an approach makes it possible to identify the gaps in the existing methodologies and to substantiate the need for further theoretical generalisation with the aim of raising the effectiveness of preparation.

Objective of the study is to provide a theoretical substantiation of a comprehensive methodology for the directed development of speed-strength abilities, special endurance, strength and flexibility in qualified runners within the annual cycle.

Methods and structure of the study. The research methodology is based on the theoretical analysis and generalisation of the scientific and methodological literature on the theory and methodology of sports training, including works on periodisation, on the means of developing physical qualities and on the specific features of the preparation of middle- and long-distance runners. The methods of systematisation of scientific data, of comparative analysis of the approaches to the construction of the training process, and also of logical modelling of the optimal ratios of the volumes and intensity of loads were applied. The organisation of the study provided for the examination of publications with an emphasis on sources devoted to the stage of sports improvement. In the course of the work, the leading physical qualities limiting the result in running were identified, with the subsequent determination of the rational means of their development: running exercises of various orientations, plyometric complexes, work with weights of moderate intensity and gymnastic exercises for maintaining flexibility and strength endurance [1]. Attention was paid to the principles of wave-like periodisation, in which the preparatory period is focused on creating a base of aerobic endurance, the competitive period on the integration of speed-strength and interval loads, and the transition period on active recovery. The methodology includes recommendations on the distribution of training volumes within the range of 120-180 kilometres a week depending on the period of the cycle, with a pyramidal intensity profile in which 70-80 per cent of the load falls within the low-intensity zones. The individual morphofunctional features of the athletes are taken into account through the monitoring of the functional state with the use of pedagogical observations and analysis of the dynamics of the indicators.

The modelling of the methodology was carried out by the successive generalisation of the literature data and the construction of a logical scheme of the annual cycle, in which each period has clearly defined emphases in the development of physical qualities. Attention is paid to the harmonisation of the training means with the principles of gradualness, variability and individualisation of the loads (Table 1).

The ratios of the means make it possible to ensure the successive and interconnected development of all the leading physical qualities, while preserving the necessary balance between load and recovery at each stage of the annual cycle [6].

Results of the study and discussion. The theoretical analysis and generalisation of the literary sources made it possible to establish that, at the stage of sports improvement, the development of physical qualities in track-and-field runners is most effective with an integral combination of means ensuring the simultaneous improvement of speed-strength abilities and special endurance [2]. The results obtained show that the optimal distribution of loads within the annual cycle presupposes a predominance of long cross-country runs and tempo running in the preparatory period, with the gradual introduction of interval training and plyometric exercises in the pre-competitive phase. The data confirm that such a sequence contributes to raising running economy through the improvement of push-off power and of movement coordination, and also minimises the risk of overtraining thanks to strict control of the recovery measures. Examination of the mechanisms of adaptation of the organism revealed the positive influence of moderate weights and multiple-jump exercises on the development of the strength endurance of the muscles of the legs and trunk, which correlates directly with the improvement of results over the 1500-5000 metre distances. The modelling showed the expediency of using variable training (fartlek) for maintaining the variability of the loads and preventing monotony, which is necessary for qualified athletes with long experience. The generalisation of the approaches to the individualisation of preparation highlights the need to adjust the volumes depending on sex, age and the current level of preparedness. Women demonstrate a greater sensitivity to aerobic loads, and men to speed-strength influences. The conclusions obtained accord with contemporary tendencies in the construc-

Table 1. Main means of developing physical qualities by the periods of the annual cycle

Period of the cycle	Speed-strength abilities	Special endurance	Strength and flexibility
Preparatory	Plyometrics (low intensity), multiple jumps	Long cross-country runs, tempo running	Exercises with weights, gymnastic complexes
Pre-competitive	Plyometrics (medium and high intensity), running with weights	Interval training, fartlek	Strength exercises of moderate intensity, stretching
Competitive	Speed sections, jumping exercises	Special running sections at competitive speed	Maintenance gymnastic complexes
Transition	Light plyometrics (recovery)	Low-intensity cross-country runs	Active recovery and flexibility

Table 2. Distribution of the volumes and intensity of training loads by the periods of the annual cycle

Period of the cycle	Running volume, km/week	Share of low-intensity loads, %	Share of high-intensity loads, %	Number of plyometric sessions per week
Preparatory	150-180	75-80	10-15	1-2
Pre-competitive	120-140	60	25-30	2-3
Competitive	80-110	50	35-40	1-2
Transition	60-80	85-90	5-10	0

tion of the training process and open up prospects for the practical application of the recommendations developed (Table 2) [3, 4].

The analysis demonstrates a gradual reduction of the total running volume from the preparatory to the competitive period with a simultaneous growth in the share of high-intensity loads. Such a profile makes it possible to preserve the aerobic base at the initial stages and to move to peak form closer to the main starts [7]. The parameters of the plyometric sessions are selected so as to ensure the development of push-off power without exceeding the recovery capacities of the organism.

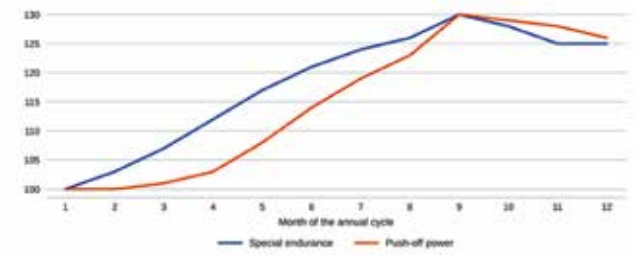


Figure. Dynamics of the indicators of special endurance and push-off power over the course of the annual cycle

The graph reflects a positive dynamic of both indicators throughout the annual cycle. Special endurance demonstrates steady growth from the very beginning of the preparatory period and reaches its maximum by the 10th month. Push-off power begins to rise actively from the 4th month and reaches its peak simultaneously with endurance, which corresponds to the optimal moment for competitive starts [5].

Conclusions. The methodology of developing physical qualities in track-and-field runners at the stage of sports improvement, developed on the basis of theoretical analysis, ensures the harmonious development of speed-strength abilities, special endurance, strength and flexibility within the annual cycle. The results of the theoretical study obtained confirm the effectiveness of an integral approach with wave-like periodisation and an individual distribution of loads, which leads to an increase in running economy and in the stability of competitive results. The proposed methodology may be recommended for introduction into the practice of preparing qualified runners at Olympic reserve sports schools and in national teams, with obligatory monitoring of the functional state.

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Diagnosis of motivation for learning activity and the formation of the academic abilities of students of physical culture universities under conditions of the invigoration of the educational process

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Keywords: *students, diagnosis of motivation for learning activity, academic abilities, invigoration of cognitive activity.*

A necessary component of the professional education of students of universities of physical culture and sport is the formation of a complex of pedagogical abilities and of its leading constituent – academic abilities. The most important mechanism for 'launching' the progressive development of academic abilities is the stable academic motivation of first-year students.

The article presents the results of a psychological diagnosis of the academic motivation of first-year students of a university of physical culture and sport, which testify to the correspondence of the data obtained to the results of measurements of the academic motivation of students of other Russian higher educational institutions. Among the types of internal motivation, the indicators of cognitive motivation and of self-development motivation predominate. The dominant type of external motivation is indicated by the values obtained for self-respect motivation [1-3].

An in-depth study of the motivation for the learning activity of first-year students on the basis of a level-by-level approach to the examination of the indicators of the types of motivation revealed the presence, in half of the respondents, of a frustration of the need for autonomy in learning activity. The results obtained testify to the necessity of invigorating the cognitive activity of the students from the moment of their entry into the sports university.

The results of the complex of scientific studies carried out at the Department of Pedagogy of RUS 'GTSOLIFK' make it possible to assert that the invigoration of the contemporary educational process at a university of physical culture and sport is directly connected with the wide use of diverse teaching technologies, in particular: developmental, problem-based, personality-oriented, modular, project-based, game-based and distance technologies, and of the teaching methods corresponding to them, which ensure the maximum involvement of every student in the educational process and his or her academic interaction with fellow students in the creative solution of practice-oriented tasks. The effectiveness of the application of the following interactive teaching methods has been experimentally proved: 'brainstorming,' 'group reflection,' 'case study,' discussion in a small study group, debates, whole-class academic discussion, the project method, the method of group research in a small study group, didactic games and role-playing games.

Thus, the application of the approach to invigorating the educational process at a university of physical culture and sport set out in the article makes it possible to raise the indicators of students' academic motivation and contributes to the successful formation of the professionally significant academic abilities of the students.

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Training devices as a tool for the individualisation and for increasing the density of technical preparation in student volleyball

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Abstract

Objective of the study is to assess the influence of the use of specialised training devices on the technical and tactical indicators and on the final result of a student volleyball team in the competition period.

Methods and structure of the study. The research was conducted within the framework of the educational and training process and of competitive activity over the course of the season from October 2025 to May 2026. Twenty-eight volleyball players took part in the educational experiment: 14 in the experimental group and 14 in the control group. The age of the athletes ranged from 18 to 25 years, with sporting qualifications from Second Category to Candidate for Master of Sport.

Results and conclusions. An analysis of the data obtained in the course of the educational experiment revealed a significant ($p<0.05$) advantage of the experimental group, which used the training devices, over the control group. The athletes learned to vary the type of serve depending on the game situation, promptly adjusting their tactics on the basis of the data of the 'speed radar' device – this made it possible to raise the coefficient of effectiveness of the power serve and the float serve. A considerable contribution to the growth of effectiveness was made by the use of the 'volleyball cannon': the device made it possible to standardise the speed, trajectory and spin of the ball, which raised the percentage of high-quality reception of the ball in competitive activity. The use of the 'block for technique' device made it possible to improve purposefully the synchronisation of the jump and the accuracy of hand placement when blocking. For the setters, the 'ring for the setter' was of great importance: the accuracy of the overhead and underhand pass into the designated zones increased.

The present methodology ensures the individualisation of preparation through the purposeful correction of weak links on the basis of objective instrumental data.

Keywords: *volleyball, training devices, student sport, technical and tactical preparation.*

Introduction. Contemporary student volleyball is characterised by increasing competition, a reduction in the time available for preparing for tournaments, and high demands on the stability of technical and tactical actions. Under these conditions, traditional training methods, despite their fundamental importance, often do not make it possible to ensure the necessary density of practice of individual elements. Specialised training devices for volleyball players therefore act as a promising instrument that makes it possible to increase the density of training, to ensure objective monitoring of the parameters of movement and to accelerate the formation of motor skills [2, 5]. The novelty of the present study consists in the empirical verification of the effectiveness of the comprehensive application of training devices of various orientations (from mechanical stabilisers to digital measuring instruments) within the framework of the annual macrocycle of a student team [4, 5]. In contrast to works focusing on individual devices or on short-term experiments, the present study demonstrates the interrelation between the systematic use of equipment in pre-season and competitive preparation and the final statistical indicators in decisive matches [6, 7].

Objective of the study is to assess the influence of the use of specialised training devices on the technical and tactical indicators and on the final result of a student volleyball team in the competition period.

Methods and structure of the study. The research was conducted within the framework of the educational and training process and of competitive activity over the course of the season from October 2025 to May 2026. Twenty-eight volleyball players took part in the educational experiment, distributed into two groups of 14: the experimental group – a team into whose training process a complex of training devices was integrated – and the control group – a second team that trained by the standard methodology without the use of specialised devices [1].

The age of the athletes varied from 18 to 25 years, and their sporting qualification ranged from Second Sports Category to Candidate for Master of Sport. The criteria of the comparability of the groups were the level of sporting qualification and a length of volleyball training of not less than 5 years.

In the experimental group the devices were applied differentially at all stages of the annual cycle (preparatory, pre-competition and competition) with account taken of the tasks of the microcycles and of the current state of the athletes. The total share of time allocated to work with the devices amounted to 30–40 % of the overall volume of technical preparation in the microcycle [2].

A specialised complex of devices oriented towards the precise development of key game elements was used in the methodology of preparing the volleyball players. The players learned to vary the type of serve flexibly depending on the game situation, promptly adjusting their tactics on the basis of the data of the 'speed radar' device [3] – this made it possible to raise the coefficient of effectiveness of the serve to 0.48 through the optimal alternation of float and power serves (Figure 3).

A considerable contribution to the growth of effectiveness was made by the use of the 'volleyball cannon': the device ensured the standardisation of the input parameters of reception (the speed, trajectory and spin of the ball), which accelerated the formation of a stable motor skill and raised the percentage of high-quality delivery of the ball under conditions of competitive stress (Figure 2).

The use of the 'block for technique' device made it possible to improve purposefully the synchronisation of the jump and the accuracy of hand placement in group blocking. As a result, the effectiveness of the block in the experimental group rose to a coefficient of 0.52, and the number of direct points won by the block almost doubled; in the control group the growth was considerably lower (Figure 4).

A substantial influence on the stability of the setters' actions was exerted by the 'ring, or umbrella, for the setter': work with it contributed to raising the accuracy of the overhead and underhand pass into the designated zones, to stabilising the trajectory of the ball and to reducing the time needed to take a decision under conditions of changing game parameters. In matches this was expressed in a reduction in the number of errors in the second pass and in a growth in the percentage of attacks performed as first-tempo attacks: 0.97 against 0.80 (Figure 4).

The 'movable block' training device was designed and manufactured as part of an experimental development by the research group itself, without recourse to external production facilities. Its key purpose is the improvement of the attacking actions of the attacking players: the practice of variants of completing an attack under conditions of opposition from the block (Figure 1).

Movable block



Figure 1.

Volleyball cannon



Figure 2.

Speed radar



Figure 3.

Ring for the setter

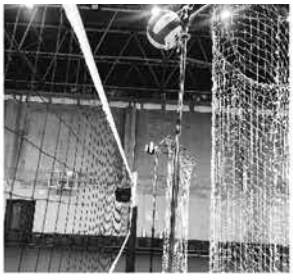


Figure 4.

Table. Statistics and data analysis by the method of V.Ya. Bunin from the final match of the Moscow Student Games 2025-2026

Indicator	Experimental group	Control group
Serve: 1.0 – won; 0.48 – made difficult; 0.35 – simple; 0 – lost.	0.48	0.43
Reception: 0.65 – delivered; 0.55 – ball not delivered, without a first tempo; 0 – ball lost.	0.59	0.55
Attacking hit: 1 – won; 0.47 – kept in play; 0 – lost.	0.78	0.69
Block: W – won.	W – 13	W – 6

The systematic application of the complex of devices (volleyball cannon, block for technique, movable block, radar, jump meter and others) at all stages of the annual cycle of preparation significantly raised the technical and tactical indicators of the team: the percentage of the team's effectiveness in attack increased by 25 %, and the reliability of the serve grew through a reduction in the share of gross errors.

The methodology proposed makes it possible to individualise the training process under the conditions of limited time characteristic of student teams, through the precise correction of deficient links of preparation on the basis of the objective data of instrumental monitoring.

The statistical processing of the data was carried out using a combination of the modified method of V.Ya. Bunin and Student's t-test.

Results of the study and discussion. In the course of an educational experiment lasting 24 weeks, a complex of specialised devices was integrated into the training process of the experimental group – team (n=14): a volleyball cannon, a movable block device, a block for technique, a ring-umbrella for the setter, a speed radar and others. The control group – team (n=14) trained according to the standard programme without the use of instrumental monitoring. The key quantitative results, assessed by the method of V.Ya. Bunin and verified by Student's t-test ($p<0.05$), are presented below.

Effectiveness of the serve. The coefficient of effectiveness of the serve in the experimental group grew from 0.40 to 0.49, whereas in the control group the gain amounted to only 0.39 to 0.43. The differences revealed are statistically significant ($t=3.87$, $p<0.01$). The growth of the indicator in the experimental group is due to the ability formed in the volleyball players to vary the type of serve flexibly (power/float) and to direct the ball purposefully into the zones of maximum pressure on the opponent. This became possible through the integration into the training process of instrumental monitoring and of the practice of tactical decisions under standardised conditions (see the Table).

Effectiveness of the block. The effectiveness of group blocking in the experimental group reached 0.520±0.025, whereas in the control group the indicator amounted to 0.380±0.030. The differences between the groups are statistically significant ($t=4.12$; $p<0.001$), which confirms the effectiveness of the methodology proposed. The use of the 'block for technique' device contributed to the synchronisation of the actions of the blockers, which was directly reflected in game effectiveness. Thus, the number of direct points won by the block in the final game increased in the experimental group: 13 successful blocks were recorded against 6 in the control group (Figure 1, Table).

Attacking hit. In the experimental group the indicator reached a value of 0.78, which reflects a high share of successfully completed attacking actions when using the variable techniques practised on the device. In the control group – team the coefficient in attack amounted to 0.69 – also a statistically significant result, confirming the reproducibility of the effect under different conditions of preparation (Table).

Accuracy of the setter's passes. Work with the ring for the setter led to a reduction in the number of errors in the second pass by 37 % and to an increase in the percentage of first-tempo attacks from 28 % to 46 %. Kendall's coefficient of concordance ($W=0.89$) confirmed the high reliability of the expert assessment of the quality of the passes.

The results obtained confirm the effectiveness of the methodology proposed and its potential for practical application in the preparation of volleyball players.

Conclusions. Thus, the results of the study confirm that the application of specialised devices and of the means of instrumental monitoring is an effective instrument for improving the technical and tac-

tical preparation of volleyball players and may serve as a basis for the development of modern training programmes.

The role of instrumental monitoring in the formation of technical skills has been demonstrated; the application of the means of immediate feedback ensured an objective assessment of the parameters of the motor actions and accelerated the formation of stable skills. This was manifested, in particular, in a reduction in the number of errors in the second pass by 37 % and in a growth in the share of first-tempo attacks from 28 % to 46 % through work with the ring-umbrella for the setter.

The approach proposed may be integrated into the training process of student and youth volleyball teams in order to increase the effectiveness of preparation. The methodology makes it possible to act purposefully on the weak aspects of the game and to correct technique and tactical decisions promptly on the basis of the objective data of instrumental monitoring.

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Powerlifting as an example of a socio-pedagogical system in the strength sports

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Abstract

Objective of the study is to carry out an analysis of the principal moments of the history of the emergence and development, and of the foundations of the theory, methodology and methods of the training and competitive processes, of powerlifting, on the basis of which powerlifting can and should be regarded as a socio-pedagogical system of strength sport.

Methods and structure of the study. The research was organised in accordance with the norms and rules for the preparation and conduct of a descriptive study by the method of document analysis. The material is presented in the format of a scientific article.

Results and conclusions. The historical heterogeneity of the formation of powerlifting under differing socio-ideological conditions predetermined the dominance of the American model, whereas the Russian system, having passed through late institutionalisation, ideological pressure and a change of context, today retains an internal contradictoriness as a natural reflection of the complexity of the social background itself.

Keywords: *socio-pedagogical system, strength sports, powerlifting, American and European versions, weightlifting, athleticism, strength triathlon, transformation of the social context, contradictoriness of a socio-pedagogical system.*

Introduction. By virtue of the labour-intensive nature of its training process, one of the most recognised and professional forms of strength preparation is deservedly powerlifting, which might be called the right-flank leader of the strength direction of sport. The danger to health and the consequent obligatory systematic organisation of powerlifting sessions call for it to be viewed as a pronounced, if by no means universally recognised, socio-pedagogical system.

The appearance in the specialist literature of the concept of the socio-pedagogical system of a sport or of a whole sporting direction is determined, firstly, by the fact of the unconditional and pronounced socio-historical origin of absolutely any sport. Secondly, the concept of the socio-pedagogical system makes it possible to identify and take into account by what pedagogical means, and precisely which parameters of the personality, one or another sport is called upon explicitly or implicitly to form and/or to correct. Thirdly, the application of the concept of the socio-pedagogical system of a sport and/or of a direction of sport, as of sport as a whole, makes it possible to build social policy and social forecasting in the field of physical culture and sport on a scientifically grounded basis, which is especially topical in a situation of competition and struggle between states in the external political arena.

An analysis of powerlifting as an example of a socio-pedagogical system in the strength sports must, beyond all doubt, touch upon the principal moments of its history, the characteristics of the social context of its emergence and development, and the foundations of the theory, methodology and methods of its training and competitive process.

Objective of the study is to carry out an analysis of the principal moments of the history of the emergence and development, and of the founda-

tions of the theory, methodology and methods of the training and competitive processes, of powerlifting, on the basis of which powerlifting can and should be regarded as a socio-pedagogical system of strength sport.

Methods and structure of the study. The work was organised in accordance with the norms and rules for the preparation and conduct of a descriptive study by the method of document analysis; the material is presented in the form and in the format of a scientific article.

Results of the study and discussion. Today powerlifting, as a specific bodily and motor culture uniting millions of people, belongs not to sport alone. In addition to the already traditional sporting model, powerlifting simultaneously has several further social models and prospects of development, known as:

- a discipline of physical culture and upbringing;
- a form of festive and recreational mass leisure;
- a programme for maintaining the physical health and active longevity of veterans, that is, of people of advanced age, in their seventies and even eighties;
- a form and programme of social rehabilitation for people with physical disabilities;
- a subculture of professional strength show or of strength-extreme show.

What, then, unites all these models? In the apt expression of N.N. Vitkevich – one of the respected veterans and organisers of powerlifting and armlifting competitions – all these models are represented by 'stern people who, in gloomy basements, achieve power over metal by heavy, persistent labour.' It seems to us that this phrase expresses very precisely and succinctly the socio-psychological portrait of the typical 'lifter,' and consequently also the pedagogical influence exerted on the personality by systematic powerlifting sessions.

As for scientific publications in the field of powerlifting, the majority of them concern only methodological matters. Publications on the socio-pedagogical system of powerlifting, on its philosophy and psychology, are with extremely rare exceptions absent altogether, which calls into question the very existence of a scientific methodology of powerlifting [3]. An analysis of the historical formation of powerlifting in the context of the subject of the study shows the following:

- according to one version, the birthplace of powerlifting is the USA, the weightlifting beauty club of Leo Stern in San Diego (date of opening – 1939; competitions in non-traditional weight lifting and bodybuilding – 1947; competitions in the odd lift – 'unusual lifts,' which included the bench press, the squat and the deadlift – 1948);
- according to another version, the birthplace of powerlifting is Great Britain, where as early as before 1950 competitions in the Strength Set were held, including the biceps curl, the bench press and the squat. In 1965 the biceps curl was replaced by the deadlift, after which the term 'powerlifting' (power – strength, lift – to raise), or 'strength triathlon,' appeared, that is, the lifting of a barbell of maximum weight in the sum of three movements: the squat with the barbell on the shoulders, the press of the barbell lying on a horizontal bench, and the deadlift. The first international powerlifting meeting between the teams of Great Britain and France took place in Bristol in 1968. The following year the international meeting was already held in France;
- until 1970 the national powerlifting championships in the USA and Great Britain were held in parallel; the first international meeting of American and English powerlifters took place in Los Angeles. The first world powerlifting championship of 1971 between the American and the English teams was likewise held in the USA, in the city of York, Pennsylvania. And in 1972, in the city of Harrisburg (Pennsylvania), the second world championship was held and the International Powerlifting Federation – the IPF – was created, with representatives of the USA, Great Britain, Canada, Puerto Rico, Jamaica and Zambia;
- by the end of the 1970s, teams from two dozen countries of Europe, Africa, Asia, North America, South America and Oceania were already taking part in the world powerlifting championships. In the 1970s and 1980s the athletes of the USA held indisputable leadership;
- the first women's world powerlifting championship likewise took place in the USA, in Lowell, Massachusetts, in 1980. Subsequently, up to 1988, the United States women's team won eight of the nine world championships (only in Adelaide in 1983 did the States yield to Australia);
- the initiators of the addition of a separate 'veterans' class with separate world championships were likewise the USA, although competitions in

'combined' (men's and women's) powerlifting were held for the first time in Canada, in Sydney, in 1989;

- only in the 1990s did the national affiliation of the men's world powerlifting champions change. Americans and Scandinavians gradually yielded leadership to athletes from Eastern Europe: Russians, Ukrainians and Poles. And Russian women athletes, with literally two exceptions, won practically all the weight categories at the world championships from as early as 1991. On the whole, the 1990s were a time of indisputable leadership for the powerlifting of Russia, Ukraine and Poland;

- in 2006 the national teams of Russia and Ukraine were disqualified for the use of doping. And only in 2009 did the Russian team, weakened by the disqualifications, once again achieve a triumphant victory.

It should be particularly noted that private investment and sponsorship played an enormous role in the organisation and conduct of the national competitions and world championships in powerlifting. For example, one of the best known and most respected sponsors was the American Bob Hoffman.

An analysis of the Russian history of the formation of powerlifting made it possible to establish the following:

- during the years of its formation in the West, in the USSR it fell under a ban (along with the Eastern martial arts and bodybuilding as a model of bourgeois culture) and was forced to go underground – more precisely, into the basements. In order at least partially to legalise it, powerlifting was renamed athletic gymnastics and was ideologically opposed to the bodybuilding of the West, which, as was written at the time, was based on profitable business, advertising, competition and the cult of individualism, strength and the superman. In the USSR athletic gymnastics was initially regarded as one of the directions of the unified complex of physical education of the harmoniously and comprehensively developed Soviet person, namely as exercises with weights. From this an entirely false conclusion was drawn, namely that athleticism must on no account adopt the 'bourgeois' methods and means of training and competitive practice of bodybuilding, in particular those supposedly directed exclusively at the effective building of muscle mass;

- however, despite all the bans and obstacles, the popularity of athleticism in the USSR continued to grow, which compelled the All-Union Conference on Gymnastics (Moscow, 1968) to assign the new sport to the section of general developmental forms of gymnastics and to place it under the ideological control of the organs of the Komsomol. And in order not to contradict too strongly the conception of the harmonious and comprehensive development of the personality, the ideologists of sport began to devise various ways of 'correcting' the one-sidedness of athletic gymnastics, for example by including pull-ups and standing jumps in the competition programme, and also by excluding the deadlift from the programme;

- the project for the domestic development of methodological recommendations and competition rules for athletic gymnastics, entrusted to the All-Union Scientific Research Institute of Physical Culture (VNIIFK), was drawn out over 10 years (from 1966 to 1974) and was approved only in 1978;

- the All-Union Commission of Athletic Gymnastics under the Weightlifting Federation of the USSR was created only in 1979, opening up the prospect of the development of this discipline not just anywhere, but in the Baltic republics. And in the same year, in iauliai (Lithuanian SSR), one of the first All-Union tournaments in strength exercises was held. At these competitions juniors in three weight categories competed in the bench press and the triple jump, and men in four categories in the bench press and the squat. It was precisely the open championships of the Lithuanian SSR, which subsequently became annual, as well as the championships of the Estonian SSR, that were considered the most prestigious and progressive (five weight categories and the inclusion of the deadlift for men), at least up to 1985;

- in 1987 the USSR State Committee for Sport approved the competition rules for athletic gymnastics submitted by a special commission of the Weightlifting Federation of the USSR. Despite the terminological amendments, it was already recognised that the order of the exercises must correspond to the norms of the world and European powerlifting championships, that the USSR championships in strength triathlon should be conducted separately, and that the organisational work should be carried out by an independent federation for the sport;

- the first RSFSR championship in athleticism (strength triathlon) in 8 weight categories was held in Krasnoyarsk in 1988. In the same year the Ath-

leticism Federation of the USSR held the USSR Cup in athleticism in Tyumen and the international meetings USSR – USA in Leningrad and Moscow. At these, only one Soviet athlete (Vladimir Mironov), in Leningrad, managed to get the better of his American colleagues. The American athletes, while rating the potential of their rivals highly, noted their lack of normal training equipment, of special gear and, above all, of experience of participation in international competitions. There was also entirely justified talk of serious errors in training methodology and competitive practice, limiting achievement and fraught with injury, which were a legacy of the outdated weightlifting style;

- in 1990 the independent Strength Triathlon Federation of Russia was created, having split off from the Athleticism Federation of the RSFSR. And from that same year the triumphant ascent of Russian powerlifters at the world championships began.

Conclusions. Summarising the above, it may be stated that the socio-pedagogical system of strength triathlon was historically formed in parallel in the USA, Western Europe and Eastern Europe under conditions of differing socio-economic structures and ideological attitudes, which predetermined its internal contradictoriness and ambiguity. At the same time, the most organic version, and the one most authentic to the particular social context at all stages of development, was the American version of powerlifting, oriented towards private capital, market competition, self-advertisement and the cult of individualism, whereas the Western European and Eastern European variants were gradually transformed in its direction, including the technical procedures and methodologies, which, if only implicitly, proved dependent on a worldview-level pragmatism. The deepest and most painful transformation was undergone by the Russian model, which was conditioned by its late (by 25-30 years) emergence from under the influence of weightlifting, by the prolonged attempts of the Soviet leadership to adapt an alien discipline to socialist ideology and to the traditions of physical education, and also by the emphasis of Soviet science on theoretical and methodological developments as opposed to Western technological and equipment-related pragmatism. As a result, contemporary Russian powerlifting practice has been brought into correspondence with the changed social context, which is connected with the restoration of capitalist relations in the country; the persisting complexity and contradictoriness of the Russian system, however, is determined precisely by this last circumstance, in combination with the inertia of the Soviet worldview and ideological survivals, so that the general ambiguity of the social environment is inevitably reflected in the particular aspects of the functioning of this system.

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Comparative analysis of mothers' and fathers' attitudes toward their child's sports activities

UDC 159.9



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Abstract

Objective of the study is a comparative analysis of the specifics of attitudes, value orientations, and behavioral models of parents in relation to their children's sports activities.

Methods and structure of the study. The organization of the empirical study included testing a sample of 60 parents (30 fathers and 30 mothers) of child athletes aged 5 to 18 years, predominantly engaged in ice hockey at various sports institutions (children's and youth sports schools, specialized children's and youth sports schools of Olympic reserve, and commercial teams). Standardized psychodiagnostic methods were used: the questionnaire of types of parental attitudes by O.G. Lopukhova and L.R. Nurkhamitova, the questionnaire of typology of parental behavior by I.O. Smoldovskaya, as well as the scale of value attitude towards children by K.V. Karpinsky. Statistical analysis was performed using the Mann-Whitney U test.

Results and conclusions. In the studied sample, both parents predominantly demonstrate a constructive, involved, and supportive type of attitudes. At the same time, mothers reliably more often exhibit a type of behavior based on empathy and unconditional acceptance, whereas fathers show more pronounced indicators of overprotection, detachment, and unrealized parental ambitions. The data can be used by sports psychologists and coaches to organize targeted pedagogical support for the family, as well as to develop recommendations for preventing psychological pressure on young athletes in order to maintain the stability of sports motivation.

Keywords: *athlete's parent, youth sports, parental attitudes, sports motivation.*

Introduction. The problem of preserving and strengthening children's health acquires particular significance in connection with the decline in their level of motor activity, the growth of the academic load and the increase in the time spent in the digital environment [5]. Sports activities are regarded as an important resource for the physical, psychological and social development of the child [1-3]. At the same time, parents play a key role in the child's choice of sporting activity, in the level of his or her involvement and in the stability of motivation [6, 7]. At present there is a contradiction between the declared value of sport as a means of strengthening health and the practice of using it as a way of achieving prestige or of realising parental ambitions [2, 4]. This may be reflected in the child's emotional well-being and in his or her attitude towards the sessions.

Thus, the study of the attitudes and types of behaviour of parents in relation to their children's sports activities is topical for understanding the psychological factors that determine the character of the child's sporting socialisation, and for the development of recommendations on forming a supportive parental position [10].

Objective of the study is a comparative analysis of the specifics of attitudes, value orientations, and behavioral models of parents in relation to their children's sports activities.

Methods and structure of the study. The following were used: the questionnaire 'Types of parental at-

titudes in the psychological support of a child athlete' by O.G. Lopukhova and L.R. Nurkhamitova [8]; the questionnaire 'Typology of the behaviour of parents of children engaged in sports' by I.O. Smoldovskaya [9]; and the 'Scale of value attitude towards children' by K.V. Karpinsky.

The study involved 60 parents (30 fathers and 30 mothers) of children engaged in sport. The age of those examined varied from 29 to 50 years. The age of the children ranged from 5 to 18 years. Among them there were 45 boys (75 %) and 15 girls (25 %). All the children are involved in sporting activity, predominantly ice hockey: 38 children (63 %) train at children's and youth sports schools; 15 children (25 %) train in professional teams and specialised children's and youth sports schools of Olympic reserve; and 7 children (12 %) train regularly in commercial teams. The length of sports experience varies from 4 to 14 years, the mean duration of training being about 4.7 years. A sports category is held by 36 children (60 %).

The significance of the differences in the indicators of attitudes towards their child's sports activities between mothers and fathers is confirmed by a comparative mathematical and statistical analysis using the non-parametric Mann-Whitney U test.

Results of the study and discussion. In both the mothers and the fathers of athletes the type «involved, supportive parent» predominates (Figure 1). Both mothers and fathers strive to take an active part in the child's life, display emotional involvement and interest in sporting achievements, and provide psychological support and assistance. The somewhat higher result in mothers reflects the tendency typical of them towards emotional care, empathy and the maintenance of warm interpersonal relations with their children. Mothers are more often distinguished by emotional stability; they create an atmosphere of trust and psychological comfort for the child athlete, understanding his or her load.

The second most pronounced indicator is 'unrealised parental ambitions'; its value proved to be higher in fathers than in mothers. The data obtained may be connected with the fact that fathers are more often inclined to project their own unfulfilled sporting or professional expectations onto the child. Such attitudes not infrequently lead to excessive demandingness and an orientation towards results. The level of expression of this indicator remains moderate, but it points to the possibility of pedagogical support and of work with parental motivation.

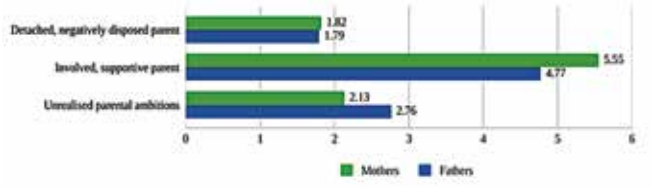


Figure 1. Mean values of the indicators on the scales of the questionnaire 'Types of parental attitudes in the psychological support of a child athlete'

The results of the questionnaire 'Typology of the behaviour of parents of children engaged in sports' are presented in Figure 2. The scores on the scales 'caring positive behaviour' and 'dominant positive behaviour' indicate that parents strive simultaneously to provide emotional support and to maintain order in their children's activity, especially in the field of sport.

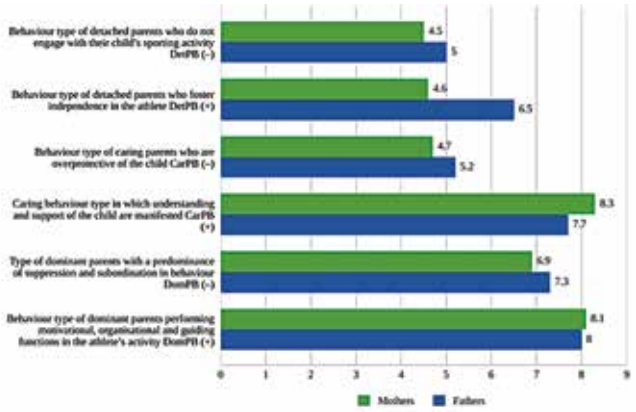


Figure 2. Mean values of the indicators on the scales of the questionnaire 'Typology of the behaviour of parents of children engaged in sports'; DomPB – dominant type of parental behaviour; CarPB – caring type of parental behaviour; DetPB – detached type of parental behaviour.

The mean values of the indicators on the integral scales of the questionnaire 'Typology of the behaviour of parents of children engaged in sports' are given in Figure 3. The integral positive pole reflects constructive forms of parental behaviour; the negative pole reflects destructive or unfavourable forms.

In all the parents the integral positive pole of behaviour appreciably exceeds the negative one, which indicates a predominance of constructive educational strategies – care, support and reasonable control. Mothers statistically significantly more often demonstrate a 'caring type of behaviour with understanding and support.' In fathers, on the contrary, the indicators of overprotection, of uninvolved, detached behaviour and of the integral negative pole are higher. Mothers

more often display care and attention, while fathers place the emphasis on planning and motivation.

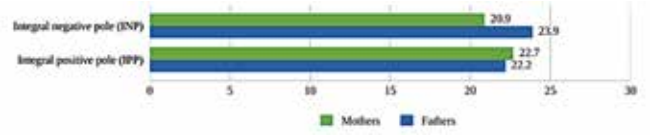


Figure 3. Mean values of the indicators on the integral scales of the questionnaire 'Typology of the behaviour of parents of children engaged in sports'

Figure 4 shows the mean values for the questionnaire 'Scale of value attitude towards children.' The parents demonstrate a mature type of value attitude towards children, expressed at an intermediate level and characterised by stability, responsibility and a positive emotional background. In fathers a tendency is noted towards a more pronounced rational, purposeful approach to upbringing, associated with an orientation towards the development of independence and achievement. A comparison of the expression of the various types of attitudes depending on the sex of the child, his or her age and the sport showed no statistically significant differences.

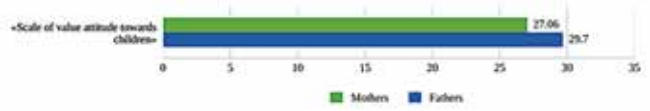


Figure 4. Mean values on the 'Scale of value attitude towards children'

Conclusions. The study confirms the hypothesis that the family acts as the primary social environment in which the child's attitude towards physical activity and sport is laid down. In both the mothers and the fathers of athletes the constructive type 'involved, supportive parent' predominates, with minimal values of detachment. Mothers statistically significantly more often use strategies of understanding and emotional support. Fathers are more often oriented towards high achievement by the child, with pronounced control over the results of the sports sessions.

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Emotional mechanisms of adaptation to subjective and objective uncertainty in sports tourism

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Abstract

Objective of the study is to systematise contemporary knowledge about uncertainty as a characteristic of sports tourism and to analyse the emotional mechanisms underlying psychological adaptation to it.

Methods and structure of the study. In the contemporary literature, uncertainty is conceptualised not only as an objective characteristic of the environment, but also as a subjective experience shaped by the athletes' experience, level of preparation and individual features. In sports tourism, uncertainty may be manifested both in a situation where the possible outcomes are known but their probabilities are unknown, and in a situation where the outcomes themselves are partially unknown or change dynamically (for example, because of changes in the weather conditions, in the state of the route or in the actions of the group).

Results and conclusions. A theoretical review of Russian and international studies devoted to uncertainty in psychology and in sport was carried out. Contemporary approaches to the understanding of objective and subjective uncertainty, of first- and second-order uncertainty, and also the main sources of uncertainty were examined. It was revealed that emotional adaptation depends on the interaction of the level of uncertainty, its subjective significance and the perceived controllability of the situation. The role of positive and negative emotions, of anxiety, fear, hope and emotional arousal in the regulation of attention, in learning, in risk-taking and in the behaviour of athletes under conditions of uncertainty is described.

Emotional mechanisms are an important component of psychological adaptation to uncertainty in sports tourism, since they shape the perception of the situation, the distribution of attention and subsequent behaviour.

The results obtained create a theoretical basis for the development of a model of psychological adaptation to uncertainty in sports tourism, and also for the creation of methods of assessment and psychological preparation of athlete-tourists.

Keywords: *sports tourism, uncertainty, emotional regulation, extreme activity.*

Introduction. Sports tourism represents a form of extreme activity carried out under conditions of objective risk and a high degree of uncertainty of the natural environment [2, 4, 7]. Under such conditions both sporting results and safety depend not only on physical preparation and technical competence, but also on the athletes' ability to adapt to uncertainty [3, 9, 10].

Despite the considerable volume of research on uncertainty, the existing data remain fragmentary as applied to sport as a whole, and attempts at a conceptual integration of the results in the context of sports tourism are practically absent [1, 5, 6, 8]. The majority of studies have concentrated on individual aspects of uncertainty — such as emotional experiences, attention, decision-making or motivation — whereas the contribution of emotions to the adaptation of athletes to uncertainty has not received systematic attention [3, 10].

Objective of the study is to systematise contemporary knowledge about uncertainty as a characteristic of sports tourism and to analyse the emotional mechanisms underlying psychological adaptation to it.

Methods and structure of the study. In the contemporary literature, uncertainty is conceptualised not only as an objective characteristic of the environment, but also as a subjective experience shaped by the ath-

letes' experience, level of preparation and individual features [8]. In sports tourism, uncertainty may be manifested both in a situation where the possible outcomes are known but their probabilities are unknown, and in a situation where the outcomes themselves are partially unknown or change dynamically (for example, because of changes in the weather conditions, in the state of the route or in the actions of the group) [2].

Objective uncertainty proceeds from the characteristics of the situation itself and concerns future events, whereas subjective uncertainty is the result of a lack of knowledge and of the inner experience of ambiguity and incomprehension. It may also be regarded as a continuum of the availability of information, reflecting the degree of an individual's awareness of what is more likely to be experienced as frustrating and may lead to behavioural inhibition. Previous studies have shown that risk and ambiguity differ not only psychologically but also in their neural mechanisms, which indicates that they constitute relatively independent constructs. Some authors distinguish three main sources of uncertainty: errors in the input data, prediction errors, and the limitations of the models used to describe the situation [7].

In contrast to clinical contexts, uncertainty in sports tourism may evoke curiosity, emotional arousal and hope, and may sustain motivation and involvement, thereby acquiring a positive emotional valence [8].

Emotional reactions to uncertainty depend on the perceived controllability of the situation and on the individual «safe dose» of uncertainty. Excessive uncertainty, on the contrary, intensifies anxiety and fear, distracts attention from the task and reduces goal-directed behaviour. Subjective uncertainty has a particularly disorganising effect; people with a low tolerance of uncertainty experience persistent psychological and physiological stress reactions under such conditions.

Hope acquires particular significance in uncertain situations. As an emotional state associated with the possibility of achieving a desired result, hope arises precisely when the outcome remains uncertain. It sustains persistent effort even when success is improbable, which is especially important in sport. Hope also reduces the subjective intensity of uncertainty, postpones the need for its immediate resolution and encourages the search for opportunities, including risk-taking.

Positive emotions likewise contribute to adaptation to uncertainty. Emotional arousal increases under conditions of uncertainty and may facilitate learning. A higher level of arousal is associated with involvement, concentrated attention and interest, thereby facilitating the acquisition and consolidation of new experience.

The sources of uncertainty are in themselves insufficient to evoke emotional reactions. An event attracts attention only if it is unexpected, personally significant and difficult to explain. For an experienced sports tourist, crossing an icefall may represent a familiar task, whereas for a novice it may become an unpredictable and emotionally significant challenge.

At the same time, uncertainty inevitably gives rise to negative emotions, which perform important adaptive functions in sports tourism. Most frequently it is associated with fear, anxiety and the feeling of insecurity connected with uncertainty. Less frequently, such emotions as sadness, anger, confusion, surprise, curiosity, arousal and enthusiasm are noted. On the whole, uncertainty tends to intensify negative emotions and to weaken positive ones.

As a diffuse emotional state, anxiety intensifies the scanning of the environment for potential threats and heightens sensitivity to threatening stimuli. Persons with heightened anxiety detect threats more quickly, which reflects an automatic orientation of attention towards danger. Subjective uncertainty possesses a greater frustrating and disorganising potential than objective uncertainty. However, such hypervigilance also disrupts the switching of attention and may reduce cognitive control.

Thus, both the valence and the intensity of emotional reactions depend on perceived controllability, on the degree of uncertainty and on its subjective significance. Consequently, emotions direct attention and effort, shaping the athlete's subsequent behaviour.

Results of the study and discussion. A theoretical review of Russian and international studies devoted to uncertainty in psychology and in sport was carried out. Contemporary approaches to the understanding of objective and subjective uncertainty, of first- and second-order uncertainty, and also the main sources of uncertainty were examined. It was revealed that emotional adaptation depends on the interaction of the level of uncertainty, its subjective significance and the perceived controllability of the situation. The role of positive and negative emotions, of anxiety, fear, hope and emotional arousal in the regulation of atten-

tion, in learning, in risk-taking and in the behaviour of athletes under conditions of uncertainty is described.

Emotional mechanisms are an important component of psychological adaptation to uncertainty in sports tourism, since they shape the perception of the situation, the distribution of attention and subsequent behaviour. The results obtained create a theoretical basis for further studies of the cognitive and value-motivational mechanisms of adaptation, and also for the development of programmes of psychological preparation of sports tourists.

The theoretical analysis may be applied in the development of programmes of sports psychological preparation aimed at assessing and raising emotional resilience under conditions of uncertainty. Given the reactive character of emotional mechanisms, the emotional well-being of the group should be taken into account in programmes for the preparation of athletes and in the training of expedition leaders, with a view to forming a tolerance of uncertainty.

Conclusions. Uncertainty is an inalienable characteristic of sports tourism, embracing both the objective features of the external environment and the athletes' subjective perception of the conditions of activity. The present analysis emphasises the importance of emotional mechanisms in adaptation to uncertainty in sports tourism. Emotions shape the subjective experience of uncertainty, mobilise psychological resources and influence cognitive processes. The results obtained create a theoretical basis for the development of a model of psychological adaptation to uncertainty in sports tourism, and also for the creation of methods of assessment and psychological preparation of athlete-tourists.

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Medical support as an inalienable part of the organisation of sports training

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Abstract

Objective of the study is to substantiate proposals for raising the level of medical support for students undergoing sports training.

Methods and structure of the study. General scientific research methods (analysis, synthesis) and special methods of jurisprudence (comparative-legal, formal-legal) were used for developing proposals on the inclusion of sports medicine physicians in the standard costs of the remuneration of persons directly involved in the implementation of sports training.

Results and conclusions. In the course of the research it was revealed that the medical support of students undergoing sports training is limited by the inconsistency of the legal regulation of the institutions of «sports training» and «supplementary education». In order to eliminate this contradiction, a set of measures is proposed, aimed at: the normative consolidation of the obligatory participation of sports medicine physicians in the implementation of the federal standards of sports training; the development of standards for their establishment numbers depending on the stage of training and the number of students; the adjustment of the methodology for calculating the salaries of medical workers; the inclusion of organisations carrying out sports training and holding a licence for medical activity in the list of institutions conferring the right to early pension provision; and also the simplification of the staffing requirements for the medical rooms of organisations located in regions with a low population density and transport remoteness from administrative centres.

Keywords: *medical support, sports training, pensions for medical workers, salaries of medical workers.*

Introduction. Physical culture and sport (hereinafter PCS) as a phenomenon of public life is one of the priorities of the development of the state. Mindful of the high risk of injury in PCS activities, the legislator included among the basic principles of the current legislation on PCS the safeguarding of the life and health of persons engaged in PCS, including sports training (hereinafter ST) (sub-clause 6 of Article 3 of Law No. 329-FZ).

Every organisation carrying out ST is obliged to have a medical room with a corresponding staff of medical workers (Appendix 13 to Order No. 1144n of the Ministry of Health of 23.10.2020). Under the conditions of the harmonisation of the legislation of 'sport' and 'education,' however, ST has acquired the external features of the system of supplementary education (hereinafter SE) [1, 2]. Practice therefore shows that institutions organise the medical support of ST according to the rules of the SE system, justifying their decision by the supplementary general education programmes they implement. Another group, on the contrary, organises the medical support of all PCS activities, irrespective of whether they belong to ST or SE, according to the rules of the ST system.

One of the main causes of such a division is the absence of unambiguous and comprehensible legal regulation of the organisation of the medical support of ST, since ST relates simultaneously both to ST organisations and to SE organisations. The problem of the study therefore lies in the contradiction between the proper (normative) level of medical support for persons undergoing ST and the current legislation of

the Russian Federation regulating the organisation of ST under the conditions of the harmonisation of legislation.

Objective of the study is to substantiate proposals for raising the level of medical support for students undergoing sports training.

Methods and structure of the study. General scientific research methods (analysis, synthesis) and special methods of jurisprudence (comparative-legal, formal-legal) were used for developing proposals on raising the level of medical support for students in organisations carrying out ST.

Results of the study and discussion. Proceeding to the attainment of the objective set for the study, we examined the question of the differences in the organisation of medical support for students receiving SE services under supplementary general developmental programmes in the field of PCS, or receiving ST services under supplementary general developmental programmes in the field of PCS and/or supplementary educational ST programmes by sport (Table 1).

A cursory analysis of the information in the table allows us to speak of the existing similarities and differences in the medical support of students in ST and in SE. And whereas in the organisation of official sports competitions the differences in medical support are lost, for students in ST the provision of scientific-methodological and medico-biological support is additionally included.

Nevertheless, the question arises as to the causes of the low level of medical support in organisations carrying out ST:

1. The federal ST standards are the basis for the development of the standard costs of carrying out ST, including the payroll fund. Neither in the repealed nor in the newly adopted federal ST standards are there any provisions on the inclusion of medical workers in the calculation of the standard costs where a medical post (room) is present. This lowers the standard costs of the remuneration of the employees of organisations carrying out ST.

2. The difference in the labour rights and social guarantees of the medical workers (who do not have the right to pension provision) of organisations carrying out ST and holding a licence for medical activity in types of services analogous to those of a sports medicine dispensary, as compared with the medical workers of specialised medical organisations [1]. Moreover, a sports medicine physician of a primary organisation carrying out ST has a negative potential for professional growth as compared with a sports medicine physician at a sports medicine dispensary.

Table 1. Comparative analysis of the norms regulating medical support in the organisation of 'Sports training' or 'Supplementary education'

No.	Name of the feature	'Sports training'	'Supplementary education'
1	By aims of activity (powers)	Law of the RF No. 329-FZ + Law of the RF No. 273-FZ + Law No. 323-FZ (sports result)	Law No. 273-FZ + Law No. 323-FZ (leisure, entertainment, where a sports result is an anomaly)
2	By section of the budget classification	Order No. 82n of the Ministry of Finance of Russia — sports training 1100 + funds of the compulsory medical insurance fund*	Order No. 82n of the Ministry of Finance of Russia — education 0700 + funds of the compulsory medical insurance fund
3	By the procedure of medical support of sessions and official competitions	Order No. 211n of the Ministry of Health of Russia + Order No. 1144n of the Ministry of Health of Russia (insurance + budget financing)	Order No. 211n of the Ministry of Health of Russia + Order No. 213n of the Ministry of Health of Russia (insurance financing) and Order No. 1144n of the Ministry of Health of Russia for servicing events outside the curriculum (budget financing)
4	By type of professional activity of the employees	Professional standard (code 06 «Healthcare»)	Professional standard (code 06 «Healthcare»)
5	List of posts of medical workers	Sports medicine physician, nurse, feldsher (Order No. 1144n)	Feldsher, paediatrician, nurse (Order No. 213n)
6	Medical document on admission to sessions	Medical certificate (Order No. 211n) + in-depth medical examination (1-2 times a year) (Order No. 1144n)	Medical certificate on health groups for physical culture sessions (Order No. 211n) + annually (Order No. 211n)

* – admission to undergo ST is obtained from a paediatrician at the expense of the funds of the compulsory medical insurance fund.

3. The methodology for calculating the 'average salary' does not motivate the primary organisations carrying out ST to attract qualified medical workers, irrespective of the conditions of their employment (at the principal place of work or by secondary employment).

Conclusions. With a view to raising the level of medical support of the students of organisations carrying out ST, it is proposed that the Ministry of Sport of Russia should:

1) Initiate the inclusion of medical workers in the federal ST standards by sport, supplementing them with a special appendix 'List of persons directly engaged for the implementation of sports training';

2) Initiate the calculation of standards for medical workers in relation to one student for each stage of ST;

3) Initiate the inclusion, in the methodology for calculating the indicator of the average salary of medical workers, of adjustments for calculating the indicator in relation to 1 hour of working time per salary rate;

4) Initiate the inclusion of organisations carrying out ST and holding a licence for medical activity in sports medicine (analogous to the medical services provided by sports medicine dispensaries) in the section 'Name of institutions' of the List of posts and institutions work in which is counted towards the length of service conferring the right to the early award of an old-age labour pension to persons who have carried out medical and other activity in the protection of public health in healthcare institutions, in accordance with sub-clause 20 of clause 1 of Article 27 of the Federal Law 'On Labour Pensions in the Russian Federation';

5) Draw the attention of organisations directly providing medical accompaniment of ST or SE sessions to the need to include code 86.21 in the list of supplementary types of economic activity, and also to the need for a licence to engage in medical activity obtained by the primary organisation for each address at which educational (medical) activity is carried out;

6) Consider the question of simplifying the provisions on the staffing of the medical rooms (posts) of organisations carrying out ST, including the organisation of sports competitions, with account of the existing socio-economic conditions in the constituent entities of the RF (low population density (fewer than 25 persons/km), transport remoteness from the 'capitals' of the constituent entities of the RF (150 km and more), and so on): primary organisations – a feldsher who has completed professional retraining in sports medicine (up to and including the training stage and sports competitions of regional significance); the sports medicine dispensary – a sports medicine physician (supervisor of the feldshers of the primary organisations).

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Diagnosis of motivation for learning activities and the formation of academic abilities students of universities of physical education in the context of the intensification of the educational process

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Abstract

Objective of the study is to carry out a diagnosis of the academic motivation of first-year students of the sport programme of the physical culture university and to determine the ways of effectively forming the academic abilities of the students.

Methods and structure of the study. The diagnosis of academic motivation of 102 first-year students of the RUS 'GTSOLIFK' (2025/26 academic year) was carried out using the questionnaire 'Scales of academic motivation.'

Results and conclusions. It was found that the motivation profile corresponds to data from other Russian universities: cognitive motivation, motivation for self-development and self-esteem prevail; half of the students showed frustration with the need for autonomy in learning activities. The necessity of activating the educational process from the first year is substantiated. It is shown that developmental, problem-based, personality-oriented, modular, project-based, gaming and remote technologies and appropriate interactive methods increase academic motivation and contribute to the formation of professionally significant academic abilities.

Keywords: *students, diagnostics of motivation for learning, academic abilities, activation of cognitive activity.*

Introduction. The pedagogical skills of a sports teacher are determined by the high level of development of a complex of pedagogical abilities, an important component of which is academic abilities [4,7,8].

According to research results, it has been established that students' academic abilities have a complex structure, while the proportion of cognitive components in it is dominant [8].

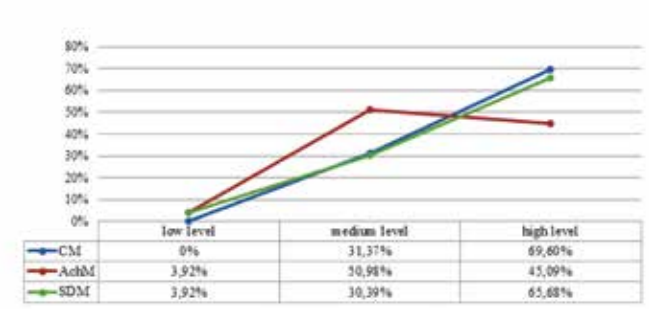
Thus, a necessary component of the professional training of students of universities of physical culture and sports is the formation of a complex of pedagogical abilities and its leading component – academic abilities. The most important mechanism for 'launching' the progressive development of academic abilities is the stable academic motivation of first-year students [1, 10].

Objective of the study is to carry out a diagnosis of the academic motivation of first-year students of the sport programme of the physical culture university and to determine the ways of effectively forming the academic abilities of the students.

Methods and structure of the study. The research involved 102 respondents (28 young men (27 %) and 74 young women (73 %)) – first-year students (academic year 2025-2026) studying on the «Sport» programme of various specialisations at RUS 'GTSOLIFK.' In the course of the research, the analysis and generalization of literary sources, comparison, analysis and synthesis, psychological testing using the questionnaire 'Scales of Academic Motivation' (SAM) by T.O. Gordeeva, O.A. Sychev and E.N. Osin [4]; and methods of mathematical statistics.

Results of the study and discussion. As the study showed, the results obtained (Table 1) for all types of internal and external motivation for learning activities of students of RUS 'GTSOLIFK' correspond to the distribution profile of indicators of types of motivation for learning of students of other Russian universities [1, 10]. In particular, two types of intrinsic motivation for learning activities prevail: cognitive and self-development motivation. Among the types of external motivation for learning activities, self-esteem motivation dominates. Thus, first-year students of the RUS 'GTSOLIFK' have sufficient personal maturity, a dominant inner interest in learning activities, strive to develop their abilities within the educational process, and want to increase their own self-esteem through academic achievements. At the same time, introjected motives (study as a duty) and external motives (associated with a sense of external coercion) are expressed to a lesser extent among students of a sports university.

For a deeper examination of the features of the manifestation of academic motivation in the students



Note: the decoding of the index designations of the scales is given in Table 1 and in Figure 1

Figure 1. Indicators of the level-by-level percentage ratio of the types of internal motivation for the learning activity of first-year students of RUS 'GTSOLIFK'

of the sports university, all the scales of the SAM instrument were divided into levels: low (4-9 points), intermediate (10-14 points) and high (15-20 points). The results of the level-by-level examination of the types of academic motivation are presented in Figures 1 and 2.

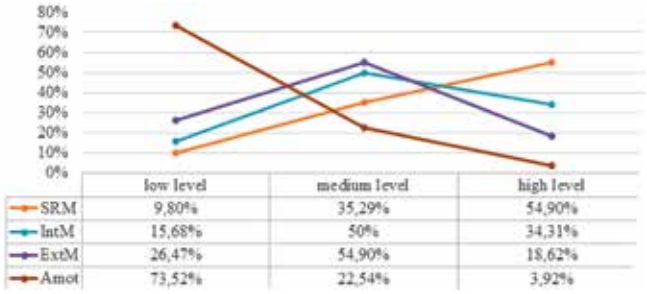
The data presented in Figure 1 testify that for the majority of the students the characteristic dominant is the striving to learn something new, to penetrate into the subject being studied and to obtain positive emotions in the cognitive process. The students wish to develop their abilities, to realise their personal potential in learning activity and to attain competence in the questions being studied. However, fewer than half of the students set themselves the goal of achieving the highest possible results in their studies; they do not consider the solution of difficult tasks to be a necessary element of the successful mastering of the profession. Herein lie the reserves for raising internal motivation for learning activity. In this connection, an important direction of pedagogical work with students is the invigoration of the cognitive activity of the students from the moment of their entry into the sports university. Various aspects of the invigoration of this activity of student athletes have been examined in many scientific publications [2, 7, 11, 12].

Figure 2 presents the percentage ratio of the levels of the three types of external motivation and of amotivation of the students according to the results of the study carried out. As was to be expected (in accordance with the approach of the authors of the SAM instrument [4]), the indicators of self-respect motivation received the highest assessments from the respondents.

Consequently, the majority of the students are characterised by a stable desire to achieve academic success in order to raise their self-esteem and to

Table. Indicators of the psychological testing of first-year students of a sports university by the questionnaire 'Scales of Academic Motivation' by T.O. Gordeeva, O.A. Sychev and E.N. Osin, n=102, points

	Scales	$\bar{x} \pm \sigma$
CM	Cognitive motivation	15.99 ±2.63
AchM	Achievement motivation	14.09 ±3.11
SDM	Self-development motivation	15.40 ±2.84
SRM	Self-respect motivation	14.55 ±3.58
IntM	Introjected motivation	13.18 ±3.01
ExtM	External motivation	11.62 ±3.48
Amot	Amotivation	7.78 ±3.34



	low level	medium level	high level
SRM	9,80%	35,29%	54,90%
IntM	15,68%	50%	34,31%
ExtM	26,47%	54,90%	18,62%
Amot	73,52%	22,54%	3,92%

Note: the decoding of the index designations of the scales is given in Table 1 and in Figure 1

Figure 2. Indicators of the level-by-level percentage ratio of the types of external motivation for the learning activity of first-year students of RUS 'GTSOLIFK'

satisfy their need for the respect of those around them.

Introjected motivation, generated by a sense of duty towards oneself and towards other significant people, was assessed by half of the respondents at the intermediate level and by more than one third at the high level, which is an alarming signal. The high-level assessments for external motivation testify to an even greater frustration of the autonomy of learning activity in almost one fifth of those surveyed. This type of motivation has a close interrelation with amotivation [4], which is characterised by an absence of meaningfulness in learning activity, and the intermediate level of the indicators of which was recorded in one fifth of the respondents.

The indicators of the external motives for the learning activity of first-year students that were obtained are connected, in our view, with the following causes: on the one hand, with the inertia of the habits of school learning, and on the other, with the presence of such a powerful dominant of external motivation as the training process in the chosen sport. The students, engaging in sport professionally, actively build a sporting career, whereas study at the university is aimed at obtaining the profession of coach.

Taking the listed features into account, scholars propose to restructure the educational process at the sports university in the direction of its invigoration. The results of the complex of scientific studies carried out by the teaching staff of the Department of Pedagogy of RUS 'GTSOLIFK' [2, 5, 6, 8, 12] make it possible to assert that the invigoration of the contemporary educational process at a sports university is directly connected with the wide use of diverse kinds of teaching: developmental, problem-based, personality-oriented, modular, project-based, interactive (including game technologies), distance, and contextual teaching, and of the teaching methods corresponding to them, which ensure the maximum involvement of every student in the educational process and his or her academic interaction with fellow students in the creative solution of practice-oriented educational tasks.

Conclusions. In the studies carried out at the Department of Pedagogy of RUS 'GTSOLIFK,' the effectiveness of the following organisational and methodological conditions for invigorating the cognitive interest of first-year students has been experimentally substantiated: the creation of a comfortable educational environment for dialogue-based interaction (the organisation of space for discussions in the classroom); the alternation of various forms of students' learning activity (individual, pair and group work); the provision of prompt feedback between the teacher and the students; an optimal combination of classroom and extracurricular learning tasks, both individual and group ones; the rational use of information and communication technologies and multimedia teaching aids; the actualisation of students' personal life experience when studying new educational material; the provision of a dialogic quality of interaction within the system 'teacher – student;' the application of interactive methods; the development and application of practice-oriented tasks based on the material of sporting and physical culture activity; and the organisation of independent academic work of an exploratory character. A substantial part of the organisational and methodological conditions developed is the application of such interactive teaching methods as 'brainstorming,' 'group reflection,' 'case study,' discussion in a small study group, debates, whole-class academic discussion, the project method, the method of group research in a small study group, didactic games and role-playing games.

Thus, the proposed conditions for invigorating the cognitive activity of students stimulate the academic motivation of first-year students of the sports university and contribute to the progressive formation of professionally valuable academic abilities within the educational process of the institution.

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Professional and personal components of the image of a physical education teacher in the representation of students in 6th-9th grades

UDC 796



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Abstract

Objective of the study is to determine the professional and personal components of the image of a physical education teacher in the representation of students in 6th-9th grades.

Methods and structure of the study. We conducted a survey among students of grades 6-9 of general education schools to determine the image of a physical education teacher. The study was organized on the basis of MBU «Lyceum No. 6» in Tolyatti. Students of the 6th grades-22 people, 7th grades – 14 people, 8th grades-19 people, 9th grades – 17 people took part in the survey.

Results and conclusions. There are several components of the image: external, internal and procedural components. In all age groups, students value: fairness – as a basic condition of trust in the teacher; clarity of explanations-from simple instructions (6th grade) to scientifically based recommendations (9th grade); benevolence-manifests itself through facial expressions, tone of voice and willingness to support; neatness and functionality of clothing – as a sign of respect attitude to the profession and students; emotional stability of the teacher – the ability to remain calm in stressful situations.

Keywords: *professional and personal components, image, physical education teacher, general education school.*

Introduction. Changes in modern schools are associated with digitalization, new socio-economic conditions and the requirements for graduates that are imposed by the XXI century. The previous model of teaching, where the teacher primarily passed on ready-made knowledge, no longer copes with its task. It is being replaced by an approach that focuses on the student's own personality. In this regard, the idea of T. V. Chernigovskaya about the education of a 'person who understands' is interesting: when information becomes too much, and artificial intelligence develops faster than we have time to comprehend its capabilities, it is important for the school to teach the child not to remember facts, but to think – to analyze, compare, search for meanings. The role of the teacher is also changing: he is not only a source of knowledge on the subject, but also a person who helps the student navigate the world [5]. Changes in society make new demands on the image of teachers, especially when working with teenagers in 6th-9th grades, as during this age period, students actively form a personality, sharpen their emotional perception, and search for landmarks. The authority of an adult for them is no longer based on the position, but on how sincere he is and knows how to find a common language with them [2]. Physical education in these conditions should occupy an important place, contributing to the harmonious development of a teenager and reducing the risk of deviant behavior [1]. But the potential of the subject often remains undisclosed: the profession of a physical education teacher has a low social status, and the subject itself is often perceived as secondary [4]. At the same time, both physical education and preventive work are largely based on students' trust in the teacher. And trust, in turn, depends on the professional image - the image that is formed among students, parents, colleagues and the school administration [3]. The analysis of theoretical sources has shown that to date, pedagogical science has accumulated a significant amount of knowledge necessary for the formation of image competence of the future teacher. The relevance of the study is related to

the fact that there is a noticeable gap between modern requirements for a physical education teacher and the real perception of his image by teenagers, which needs to be understood. Understanding exactly what qualities of a physical education teacher are a priority for students in 6th-9th grades will allow us not only to specify the structure of the teacher's image in this subject area, but also to develop effective tools for its formation that meet the needs of modern schools and the age characteristics of the adolescent audience.

Objective of the study is to determine the professional and personal components of the image of a physical education teacher in the representation of students in 6th-9th grades.

Methods and structure of the study. We conducted a survey among students of grades 6-9 of general education schools to determine the image of a physical education teacher. The study was organized on the basis of MBU «Lyceum No. 6» in Tolyatti. Students of the 6th grades-22 people, 7th grades – 14 people, 8th grades-19 people, 9th grades – 17 people took part in the survey.

Results of the study and discussion. There are several components of the image: external, internal and procedural components.

The internal component includes the following qualities: sociability, fairness, kindness, demanding attitude, sense of humor, mutual understanding, balance, love for children, and restraint.

Sixth graders (11-12 years old) value kindness most of all, they need security and support, then sociability, and then justice. In grades 7-8 (12-14 years), the main thing is justice. It is important for teenagers that the rules are clear and everyone is treated equally. Eighth graders still appreciate the teacher's poise in difficult situations.

For ninth-graders (15-16 years old), priorities are shifting: mutual understanding comes first as a desire for partnership and taking their opinions into account. This is followed by fairness (still important at all stages of learning) and balance. At the same time, the role of sociability decreases - the desire for easy communication is replaced by the need for constructive interaction and the ability to influence the learning process.

Thus, for effective interaction with students of different ages, physical education teachers need to flexibly adapt their communication style: with younger students, focus on kindness and openness, creating a psychologically safe environment; in middle classes, emphasize fairness and consistency, combining them with emotional stability; with high school students, build partnerships based on mutual understanding. In all cases, minimizing authoritarian methods and replacing demanding ones with motivating support contributes to the formation of a positive image of the teacher and increases the involvement of students in the educational process.

In the process component of the image of a physical education teacher, we have identified the following skills: it is interesting to conduct a lesson, explain the educational material clearly and easily, knowledge of the subject, and independently show exercises. After analyzing the answers, we can conclude that the priorities of students in relation to the qualities of a physical education teacher naturally change with age, since if as an alternative to gadgets, and the clarity of explanations is put in second place, then seventh-graders (12-13 years old) put the ability to explain clearly (with step-by-step instructions and the connection of theory with practice), and interest in the lesson remains an important, but secondary factor.

For eighth graders (13-14 years old), the main criterion of professionalism is a deep knowledge of the subject (theory, methodology, physiology), the second place is taken by clarity and practical use of explanations, while fascination fades to the third plan in favor of getting results from classes.

Based on responses from ninth graders (15-16 years old) it can be said that they focus as much as possible on practical benefits and individual results, expecting from the teacher the scientific validity of recommendations, preparation for standards (including the GFSK TRP), adaptation of loads to personal goals and health restrictions, and the emotional component of the lesson is the least significant for them.

Thus, a clear trend can be traced: from a focus on engagement and comfort in the lower grades - to a conscious, practice-oriented approach in the older ones, where teacher professionalism, scientific validity and individual progress of students become the key.

In the external component, we identified: clothes, age, face, charm, hairstyle, pleasant voice, makeup. After analyzing the respondents' responses on the external component of the physical education teacher's image, we can identify both common features and differences in the perception of students from the sixth to the ninth grades. What is common for all age groups is the importance of a pleasant voice (clarity of speech is important at all stages), clothing (neatness and functionality are always appreciated) and facial expressions (friendliness and engagement create a comfortable atmosphere). In all classes, make-up and hairstyle remain insignifi-

Table 1 Components of the physical education teacher's image

Teacher qualities	6 grade	7 grade	8 Grade	9 grade
Moral qualities (justice, benevolence, ability to support)	2nd place	2nd place	1st place	1st place
Professional qualities (knowledge of the subject, ability to explain the exercise, competent organization of the lesson)	1st place	1st place	2nd place	2nd place
External component (clothing style, fitness, energy)	3rd place	3rd place	3rd place	3rd place

cant factors, and charm plays a role-although its weight changes with age. In addition, in all age groups, students do not value formal signs of appearance, but how appearance and behavior help the teacher to effectively conduct the lesson.

The differences are reflected in the prioritization. In grades 6 (11-12 years), emotional connection comes first – charm and a pleasant voice create a trusting atmosphere, and comfortable clothes and a friendly face reinforce a positive perception. In the 7th-grade (12-13 years old) the emphasis shifts to communication, so the voice and charm (already with a bias towards demanding) remain key, and clothing (appearance) begins to be perceived as a marker of modernity and competence. In-grades 8 (13-14 years), priority is given to the professional appearance and confident presentation of educational material, where clothing is an indicator of competence, and facial expression is an indicator of teacher engagement and confidence. In-the 9th grade (15-16 years), confidence in facial expressions, clarity and structure of speech, a restrained and functional style of clothing become the main criteria, and age begins to be perceived as a marker of pedagogical experience, while emotional attractiveness (charm of the teacher's personality) loses its significance.

Thus, with age, students' perception changes from a focus on emotional connection and comfort (in lower grades) to a focus on professionalism and business interaction style (in high school students). At the same time, the basic elements of the image (voice, neatness, friendliness) They retain their importance at all stages, but their role and content change as students get older.

Personal qualities of a physical education teacher were ranked by students in 6th-9th grades, the results are presented in the table 1.

According to the results of this study, a clear age dynamics in assessing the qualities of a physical education teacher was revealed. If in-grades 6-7 priority is given to the professional qualities of the teacher (knowledge of the subject, competent organization of the lesson), then by grades 8-9, moral qualities (justice, benevolence, ability to support) come first. At the same time, in all age groups, the external component (clothing style, fitness) remains the least significant characteristic of the teacher.

Conclusions. Thus, the image of a physical education teacher is a dynamic system that requires adaptation of the communication style and presentation of material to the age characteristics of students. A successful teacher combines consistent professional and ethical qualities with flexibility, from creating emotional security in lower grades to building partnerships and focusing on practical results for high school students. This increases student engagement and creates a positive attitude towards the subject.

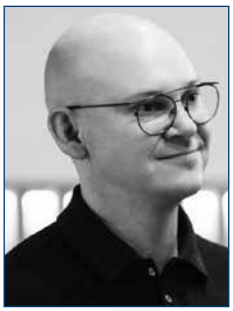
In all age groups, students value: fairness – as a basic condition of trust in the teacher; clarity of explanations-from simple instructions (6th grade) to scientifically based recommendations (9th grade); benevolence-manifests itself through facial expressions, tone of voice and willingness to support; neatness and functionality of clothing - as a sign of respect attitude to the profession and students; emotional stability of the teacher – the ability to remain calm in stressful situations.

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Applied fitness technology for forming women's readiness for safe living

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Abstract

Objective of the study is to provide a theoretical substantiation of the formation of the readiness of female university students to fulfil the GTO standards on the basis of sports-applied fitness boxing sessions, and to recommend the methodology for piloting in the practice of physical education.

Methods and structure of the study. The preliminary research was carried out at the Russian State Agrarian University – Moscow Timiryazev Agricultural Academy, Moscow, in 2025-2026. For the organisation and conduct of the study the following methods were selected: analysis of the scientific and methodological literature and of the practice of fulfilling the GTO standards by female university students; questionnaire surveys; interviewing; pedagogical observation; modelling; abstraction; testing of physical fitness; systematisation of the factual material; methods of mathematical statistics, and others. The experiment involved first- and second-year female students. The sample size amounted to 150 female students, of whom 50 young women of the experimental group practised fitness boxing twice a week (the sports-applied approach), while 100 persons of the control group attended physical education classes according to the timetable, also twice a week, working to the traditional programme.

Results and conclusions. The theoretical study carried out facilitated the collection of factual material on the basis of which the following statistical indicators were identified: since the beginning of the revival of the new GTO complex (2014), more than 23 million people (16.4 % of the total population of the country) have taken part in fulfilling the GTO standards, of whom 11 million people fulfilled the GTO standards for the badges of distinction (gold, silver and bronze badges) (21.6 % the gold badge, 39.5 % the silver and 38.9 % the bronze). In total, 47.8 % of all the participants fulfilled the standards for the GTO badges. Schoolchildren also took part in fulfilling the GTO standards – 28 % of the total number of participants – and students – 26 %, of whom 44 % did not fulfil the GTO standards for the badges of distinction. Every year more than 1,800,000 people (1.5 % of the total population of the country) take part in fulfilling the GTO standards.

Keywords: *sports-applied fitness boxing, formation of readiness, female students, GTO complex, higher educational institution, sport-specific approach.*

Introduction. At the present time one of the important directions of state policy is the systematic physical education of the country's population. At the same time, physical education in a systematic form is implemented in Russia for only 28 % of the population (at the stages of preschool, school and student education), while 72 % of the country's inhabitants engage in physical culture and sport episodically and are not covered by this process. One of the directions of motivating the population towards systematic physical culture and sports activity is the activation of society in recognising the necessity and importance of preparing for and fulfilling the GTO standards as an important criterion of the physical and applied readiness of the population for various kinds of activity. As the statistics show, more than 1,800,000 people (1.5 % of the total population of the country) take part in fulfilling the GTO standards every year; this is clearly insufficient and an increase in the number of participants is required. Within these indicators the share of student participation amounts to 26 %, of whom 44 % of the young people do not fulfil the GTO standards. Such indicators testify to the low effectiveness of preparing students to fulfil the GTO standards in educational institutions and to the insufficient activity of young people in the All-Russian GTO movement. The search for new pedagogical approaches and technologies for activating students, including young women, towards preparing for and fulfilling the GTO standards, and for increasing mass participation, constituted the aim of the present work.

Objective of the study is to provide a theoretical substantiation of the formation of the readiness of female university students to fulfil the GTO standards on the basis of sports-applied fitness boxing sessions, and to recommend the methodology for piloting in the practice of physical education.

Methods and structure of the study. The preliminary research was carried out at the Russian State Agrarian University – Moscow Timiryazev Agricultural Academy, Moscow, in 2025-2026. For the organisation and conduct of the study the following methods were selected: analysis of the scientific and methodological literature and of the practice of fulfilling the GTO standards by female university students; questionnaire surveys; interviewing; pedagogical observation; modelling; abstraction; testing of physical fitness; systematisation of the factual material; methods of mathematical statistics, and others. The experiment involved first- and second-year female students. The sample size amounted to 150 female students, of whom 50 young women of the experimental group practised fitness boxing twice a week (the sports-applied approach), while 100 persons of the control group attended physical education classes according to the timetable, also twice a week, working to the traditional programme. On the completion of the academic year the female students of the experimental and control groups took the GTO standards of Stage VII. On the basis of the experimental results obtained, scientific and theoretical conclusions were prepared and practical recommendations were developed for specialists and physical education teachers.

Results of the study and discussion. Following the work carried out, the main indicators of the current state and the dynamics of the movement of the All-Russian Physical Culture and Sports Complex GTO among the population of the country, including among student youth, were systematised in a table (Table 1).

The above statistical indicators of the participation of the population in taking the GTO standards show that this participation has not acquired a mass character and does not ensure the attainment of the proper results in accordance with the GTO standards. The indicators of participation (10.3 %) and of fulfilment (6.5 %) of the GTO standards among student youth are particularly disappointing. In order to activate young people, and especially young women, in fulfilling the GTO standards, we have developed programme and methodological support for sports-applied fitness boxing sessions for female university students, with an emphasis on motivated preparation for fulfilling the GTO standards (Table 2).

Table 2 presents the sections of the programme for forming the readiness of female university students to fulfil the GTO standards on the basis of sports-applied fitness boxing sessions.

Conclusions. Following the study carried out, the following main conclusions should be formulated:

- 23 million people (16.4 % of the total population of the country) have taken part in the movement for fulfilling the GTO standards in the country since 2014;
- 47.8 % of the total number of participants fulfilled the GTO standards;
- more than 1,800,000 people (1.5 % of the total population of the country) take part in fulfilling the GTO standards every year;
- more than 500,000 students (10.3 % of the total

Table 1. Analysis of the state and dynamics of the participation of the country's population in fulfilling the GTO standards

Indicators of the population's participation in fulfilling the GTO standards	Results
Participation of the population in taking the GTO standards from 2024 to 2024	23 million people (16.4 % of the total population of the country)
Fulfilment of the GTO standards	47.8 % of the total number of participants
Participation of schoolchildren and students	54 % of the total number of participants
Fulfilment of the GTO standards among the participating schoolchildren and students	56 %
Annual participation of the country's population in taking the GTO standards	more than 1,800,000 people (1.5 % of the total population of the country)
Participation of students in taking the GTO standards	more than 500,000 students (10.3 % of the total number of students in the country)
Fulfilment of the GTO standards among the participating students	6.5 % (33,000 persons of the total number of participating students)

Table 2. Programme content of the preparation of female university students for fulfilling the GTO standards on the basis of sports-applied fitness boxing sessions

No.	Content of the programme	Hours	Semesters			
			I	II	III	IV
I	Theoretical section:	12	3	3	3	3
	The GTO complex in human life activity	4	1	1	1	1
	The GTO complex as a means of monitoring the physical and applied readiness of the country's population	4	1	1	1	1
	Fitness boxing as an applied means of preparing female university students for fulfilling the GTO standards	4	1	1	1	1
II	Practical section:	364	81	81	101	101
	2.1. Complexes of fitness boxing exercises for forming:					
	- general endurance	100	20	20	30	30
	- speed endurance	50	10	10	15	15
	- strength indicators	32	6	6	10	10
	- mobility of the musculoskeletal system	44	10	10	12	12
	- throwing skills and running jumps	100	20	20	10	10
	- agility and coordination	44	12	12	10	10
	2.2. Control sessions for assessing the readiness of female students to fulfil the GTO standards	14	3	3	4	4
III	Control section:	10	2	2	4	4
	3.1. Competitions among first- and second-year university students in fulfilling the GTO standards	10	2	2	4	4

number of students in the country) also take part in fulfilling the GTO standards every year;

- only 6.5 % of students (of the total number of participating students) fulfil the GTO standards.

The above statistical indicators speak of the insufficient activity of the student youth of the country's higher educational institutions in the GTO movement, and also of the low indicators of their readiness to fulfil the GTO standards.

In order to raise the mass character and the quality of the fulfilment of the GTO standards by students, including by young women, it is necessary to move to new directions and approaches in the physical education of young people at higher educational institutions. As such an alternative approach, a sports-applied direction is proposed, using the example of fitness boxing sessions, which contributes to forming not only applied self-defence skills in young women but also readiness to fulfil the GTO standards. It is also proposed that, instead of awarding a pass mark in physical education to students at a higher educational institution, the obligatory fulfilment of the GTO standards should be introduced: the obtaining of the bronze, silver and gold badges. All this taken together will contribute to raising the mass character and the quality of the fulfilment of the GTO standards by the student youth of the country.

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Improving the monitoring and assessment of spinal mobility in fire and rescue academy cadets

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Abstract

Objective of the study is to substantiate the need to improve the control exercise for determining the level of spinal mobility in cadets of a fire and rescue academy and to recommend it for practical use.

Methods and structure of the study. The research was carried out in 2024-2026 at the Siberian Fire and Rescue Academy of the State Fire Service of EMERCOM, Zheleznogorsk, Krasnoyarsk Krai. The sample size comprised 300 first- and second-year cadets. Over the course of two years, the spinal mobility of the academy's cadets was tested by two control exercises: the traditional test – the forward bend from a standing position – and the authors' test, which is the forward bend from a position seated on the floor. The factual and statistical material collected made it possible to establish the accuracy and quality of the measurement of the cadets' spinal mobility by the traditional and by the authors' control test, to determine the effectiveness and promptness of the measurements and to recommend the innovative control exercise for practical use.

Results and conclusions. Following the study carried out, the dynamics of the spinal mobility of the academy's cadets were identified and levels of the cadets' spinal mobility were developed on the basis of the authors' methodology. An authors' control test was also developed and piloted, comprising the forward bend from a position seated on the floor with the use of a special measuring technical device. The innovative measuring device developed makes it possible to monitor the spinal mobility of the academy's cadets promptly and more accurately. This device can be recommended for the process of monitoring spinal mobility in students of the country's higher educational institutions.

Keywords: *improvement, control exercise, spinal mobility, cadets, fire and rescue academy, authors' methodology, special measuring device.*

Introduction. An important and informative indicator of the physical education of students at a higher educational institution, and especially of cadets of a fire and rescue academy, is physical fitness. The physical training of cadets of a fire and rescue academy is one of the basic directions in the professional formation of specialists in this field. The dynamics of the increase in the cadets' physical fitness indicators is assessed by the results of the physical education process with the use of control exercises (tests). To assess the cadets' speed indicators, the 100-metre run is used as a control exercise; general endurance is assessed in the 3000-metre run; the strength indicators of the upper shoulder girdle are monitored by pull-ups on the high bar; agility and coordination are monitored by the shuttle run; the speed-strength indicators of the legs are determined by the standing long jump; and spinal mobility is established by the forward bend from a standing position. The above control exercises for assessing the physical fitness of the academy's cadets are on the whole no longer topical and no longer representative, and require modification, refinement and so on. One of the tests requiring improvement is the control exercise of the forward bend from a standing position for determining spinal mobility. This exercise does not possess sufficient representativeness for determining the accuracy of the assessment of the cadets' spinal mobility. It is therefore proposed to use a modified test – the forward bend from a position seated on the floor with the use of a special measuring

device. The proposed test makes it possible to assess the spinal mobility of the academy's cadets promptly, systematically, individually and more correctly.

Objective of the study is to substantiate the need to improve the control exercise for determining the level of spinal mobility in cadets of a fire and rescue academy and to recommend it for practical use.

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Results of the study and discussion. The pilot study carried out facilitated the substantiation, development and piloting of an improved control exercise (test) for assessing the spinal mobility of cadets of a fire and rescue academy. The improved control exercise comprises the forward bend from a position seated on the floor with the use of a technical device in the form of two measuring rulers joined to each other by two wooden slats. The methodology for performing this control exercise is as follows: for the accurate measurement of the spinal mobility of the academy's cadets, a device has been made consisting of two parallel rulers joined to each other by slats (Figure 1).

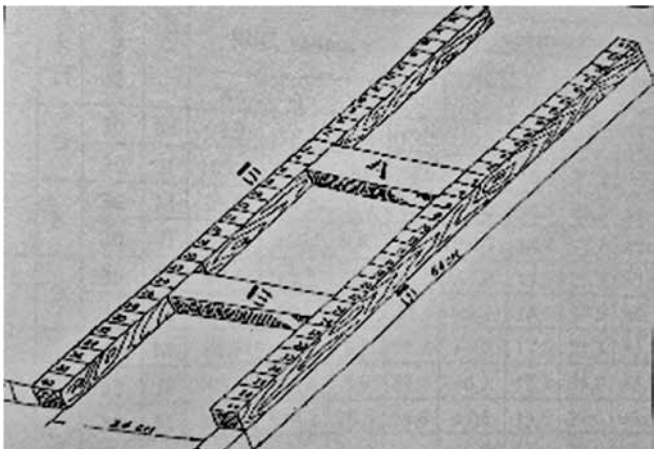


Figure 1. Device for measuring spinal mobility from a position seated on the floor (the heels of the person being measured rest against slat A)



Figure 2. Forward bend from a position seated on the floor, arms alongside the trunk

Figure 2 shows the correct position of the person being measured above the slat for determining spinal mobility.

The methodology for measuring the spinal mobility of cadets in the seated position is as follows: the device is placed on a mat (the floor); the cadet, without footwear, sits on the floor so that the legs are between the rulers and the heels rest against the connecting slat (A). The teacher supports the device with the hands by the front slat holding the ends of the rulers, so that it does not move. On the teacher's command the cadet performs two preparatory forward bends and then performs a third, control bend, with the legs straightened at the knees and the palms of the hands sliding along the right and left sides of the rulers, and holds the forward-bend position for three seconds. If the participant's fingers do not reach the supporting slat, the readings will be negative; if they extend forward beyond the slat, the results will be positive. The result is recorded by the middle fingers of the hands. This device makes it possible to measure the cadets' spinal mobility promptly, effectively, accessibly and more accurately. The spinal mobility indicators of the academy's cadets in the forward bend from a standing position are higher than the results shown by the cadets from a position seated on the floor. The forward bend from a standing position is performed more easily, and accordingly the result of its performance is higher than that of the bend from a position seated on the floor, in which the legs are fixed more precisely at the knees and the result of determining spinal mobility proves to be more accurate than in the standing position. As the results of the work carried out have shown,

the difference in the cadets' indicators between the forward bend from a standing position and the performance of the exercise in a position seated on the floor lies within the range of 7-10 cm. For monitoring the spinal mobility of the academy's cadets, the following levels were developed: for young men – 11 cm (high level); 7 cm (intermediate level); 3 cm (satisfactory level). For young women – 14 cm (high level); 9 cm (intermediate level); 5 cm (satisfactory level).

The authors' control exercise proposed, which includes a technical device for assessing the spinal mobility of cadets, is more effective and representative and may be recommended for practical use.

Conclusions. The pilot study carried out demonstrated the advantage in the accuracy of measurement, the accessibility and the promptness of the control exercise – the forward bend in a position seated on the floor with the use of a special measuring device for assessing spinal mobility – over the traditional control exercise. This innovation may be widely applied in the practice of the physical education of students at the country's higher educational institutions.

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Physical education of university students based on multi-event sports training: a theoretical aspect

UDC 796.015



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Abstract

Objective of the study is to substantiate and develop the programme and methodological content of students' sessions based on multi-event sports training within physical education at a higher educational institution, and to recommend it for practical use.

Methods and structure of the study. In order to compile the theoretical and statistical material on the subject of the study, the following research methods were determined: analysis of the scientific and methodological literature, questionnaire surveys, interviewing of specialists and students, pedagogical observation, analysis of the teaching and methodological documentation and of the results of students' physical education, testing of physical fitness, systematisation of the factual material, methods of mathematical statistics, the method of expert assessments and others. The review scientific and theoretical material compiled facilitated the substantiation and development of an experimental programme of physical education of students at a higher educational institution based on multi-event sports training.

Results and conclusions. Within the framework of the current programme content for the physical education of students at a higher educational institution, a multi-event sports direction for student youth was formed on the basis of summer and winter polyathlon sessions. Summer polyathlon includes the following competitive exercises: the 1000 m run (women) and the 2000 m run (men); pull-ups on the high bar (men); press-ups in the prone support position (women); and air-rifle shooting (men and women: 10 shots, distance 10 metres, from the standing position). In winter polyathlon, cross-country skiing is included instead of running: 3000 m (women) and 5000 m (men). Experimental programme and methodological content of students' summer and winter polyathlon sessions within physical education was also developed, which includes the theoretical, the practical and the control sections of the multi-event sports training of young people at a higher educational institution.

Keywords: *physical education at a higher educational institution, students, multi-event sports training, polyathlon, sport-specific approach.*

Introduction. At present the modern conditions and the processes of the progressive development of society make high demands not only on the improvement of the professional training of future young specialists, but also on the formation of their psychophysical readiness for new changes and challenges in the socio-economic development of the country. The academic discipline 'Physical Culture and Sport' is directed towards this process of preparing young specialists. The current programme provision for the physical education of students at a higher educational institution is aimed chiefly at maintaining the minimal motor activity of young people within the educational establishment and at forming physical fitness. A gradual reduction of the teaching hours in the discipline «Physical Culture and Sport» at the country's higher educational institutions is also noted. At present, in higher-school educational establishments, physical education chiefly operates only in the first and second years, with two practical sessions a week. At medical universities there is only one session a week over two years. Such an educational situation with regard to the physical education of students at higher educational institutions considerably reduces young people's motivation and the effectiveness of the physical culture and sports movement at the country's higher educational institutions. There therefore arises an acute need to improve the current process of students' physical

education through a transition to more modern sports-pedagogical technologies and approaches, namely to multi-event sports training, which will contribute to raising students' motivation, to developing their individual motor potential and to forming a sports culture as the qualitative aspect of the mass physical culture movement in the country. All this taken together determined the subject of the present research.

Objective of the study is to substantiate and develop the programme and methodological content of students' sessions based on multi-event sports training within physical education at a higher educational institution, and to recommend it for practical use.

Methods and structure of the study. In order to compile the theoretical and statistical material on the subject of the study, the following research methods were determined: analysis of the scientific and methodological literature, questionnaire surveys, interviewing of specialists and students, pedagogical observation, analysis of the teaching and methodological documentation and of the results of students' physical education, testing of physical fitness, systematisation of the factual material, methods of mathematical statistics, the method of expert assessments and others. The review scientific and theoretical material compiled facilitated the substantiation and development of an experimental programme of physical education of students at a higher educational institution based on multi-event sports training.

Results of the study and discussion. The paper presents the following definition of multi-event sports training in the physical education of students at a higher educational institution: it is a sports-pedagogical technology designed into the process of physical education of university students, comprising the in-depth mastering of one or several sports (a multi-event) chosen by the participant for the further systematic pursuit of the selected kind of sporting activity (Doroshenko

Table 1. Programme and methodological content of the multi-event sports training of students based on polyathlon within physical education at a higher educational institution, volume: 400 hours

No.	Content of the programme material	Hours	Semesters					
			I	II	III	IV	V	VI
1	2	3	4	5	6	7	8	9
I.	**Theoretical section**							
	1.1. Sport, human sporting activity	2	2	-	-	-	-	-
	1.2. Sports activities during the student years	2	-	2	-	-	-	-
	1.3. Sport as a universal means of a person's physical perfection	2	2	-	-	-	-	-
	1.4. Fundamentals of a person's sports training	2	2	-	-	-	-	-
	1.5. Polyathlon as a sports-applied direction in the physical education of university students	2	-	2	-	-	-	-
II.	**Practical section (students' sports sessions based on polyathlon):**							
	2.1. General physical preparation	60	10	10	10	10	10	10
	2.2. Special physical preparation	48	8	8	8	8	8	8
	2.3. Technical preparation	30	5	5	5	5	5	5
	2.4. Psychological preparation	9	1	1	1	2	2	2
	2.5. Tactical preparation	18	3	3	3	3	3	3
	2.6. Cross-country running preparation	54	9	9	9	9	9	9
	2.7. Ski preparation	54	9	9	9	9	9	9
	2.8. Shooting preparation	30	5	5	5	5	5	5
	2.9. Strength preparation	30	5	5	5	5	5	5
III.	**Control section**							
	3.1. Control starts in the sports included in polyathlon	20	-	4	4	4	4	4
	3.2. Control starts in polyathlon as a whole	9	-	3	-	3	-	3
	3.3. Championship of the educational institution in summer and winter polyathlon among students	9	-	3	-	3	-	3
	3.4. Participation in inter-university polyathlon competitions	9	-	3	-	3	-	3

S.A., Ponomarev V.V., 2011). For the organisation and conduct of physical education sessions for students on the basis of multi-event sports training in polyathlon, the programme and methodological content of this process was developed (Table 1).

The sections of the multi-event sports programme presented correctly disclose the content and the directions of students' polyathlon sessions within physical education at a higher educational institution. The participation of students in various inter-university competitions and control starts in polyathlon makes it possible to improve sporting mastery through the fulfilment of sports categories, which will subsequently contribute to the active sporting activity of young people and also to the popularisation of this mass, accessible and democratic kind of multi-event.

Conclusions. The analytical work carried out facilitated the disclosure of the contemporary organisational and pedagogical problems in the system of physical education of students at higher educational institutions, of the need to improve the programme content of this process and, in particular, of the need for a transition to a sport-specific approach directed towards young people's pursuit of a chosen kind of sporting activity. All this taken together raises students' motivation, the quality of the process of physical education at the higher educational institution, the formation of a sports culture and the invigoration of the sports movement in the country.

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Influence of physical education classes on the development of moral behaviour and the cultivation of moral and ethical qualities among first-year students

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Abstract

Objective of the study is to experimentally examine the influence of specially organised physical education classes on the development of moral behaviour and the cultivation of moral and ethical qualities among first-year students.

Methods and structure of the study. The study involved first-year university students aged 17–19 years who were enrolled in non-specialist fields of study. The total sample comprised 96 participants, who were assigned to experimental and control groups. In the experimental group, each class included the following elements: 1. Cooperative motor tasks; 2. Moral choice situations; 3. Reflective micro-discussions; 4. Role switching; 5. Pedagogical feedback.

Results and conclusions. Before and after the programme, indicators of discipline, respectful behaviour, rule compliance, cooperation, personal and social responsibility, and moral disengagement were assessed. Descriptive statistics, tests of distribution normality, t-tests, repeated-measures analysis of variance, and correlation analysis were used; statistical significance was set at $p < 0,05$. Following completion of the programme, the experimental group demonstrated pronounced positive changes in indicators of moral behaviour: for example, the overall index increased from $3,12 \pm 0,35$ to $4,17 \pm 0,31$, whereas in the control group it increased from $3,10 \pm 0,36$ to $3,20 \pm 0,34$. At the same time, the overall moral disengagement index in the experimental group decreased from $2,93 \pm 0,31$ to $1,85 \pm 0,28$, compared with a decrease from $2,90 \pm 0,30$ to $2,81 \pm 0,29$ in the control group. Between-group differences after completion of the programme were statistically significant for the indicators specified above ($p < 0,001$). The findings indicate the potential of physical education as a setting in which motor activity can be integrated with the development of responsibility, self-control, and cooperative behaviour.

Keywords: *physical education; moral behaviour; moral and ethical qualities; responsibility; moral disengagement; first-year students; educational programme.*

Introduction. The transition from school to university is not limited to a change in the educational environment. For a first-year student, it is a period during which daily routines, social relationships, and perceptions of personal responsibility are simultaneously restructured. This is why physical education classes are of interest not only as a means of maintaining physical activity. Within a study group, students constantly encounter rules, role allocation, the need to take their peers' interests into account, and the consequences of their own decisions. These circumstances make the class a potentially important setting for the development of socially approved patterns of behaviour. In these studies, physical education is viewed as an environment in which, with the right organization of interactions, responsibility, cooperation, and social and moral values can develop. Regular training also promotes fairness, integrity, and respect in others. Sport helps develop discipline and self-discipline, which are essential for success in both academic and professional life [1-3, 7].

Objective of the study is to experimentally examine the influence of specially organised physical education classes on the development of moral behaviour and the cultivation of moral and ethical qualities among first-year students.

Methods and structure of the study. The study involved 96 first-year university students aged 17-19 years who were enrolled in non-specialist fields of study. The participants were assigned to an experimental group (n = 48) and a control group (n = 48). The formative stage lasted 12 weeks.

In the experimental group, each class comprised five interrelated components. First, cooperative motor tasks were used, in which the outcome depended on coordinated actions by the participants. Second, moral choice situations were introduced into the class, requiring students to determine an acceptable course of action when interests, rules, and the group task came into conflict. Third, 5-10 minutes after the main part of the class were allocated to reflective micro-discussions concerning respect, honesty, responsibility, fairness, and self-control. Fourth, role switching was employed: students took turns performing the roles of leader, assistant, observer, and referee. Fifth, the teacher provided feedback not only on the quality of motor performance but also on discipline, respect for peers, initiative, rule compliance, and the ability to work as part of a group.

The control group followed the standard university physical education programme without the specific inclusion of educational and value-oriented components. This comparative design made it possible to consider differences between the groups in the context of the content of the pedagogical intervention rather than merely the fact of regular physical activity.

The diagnostic battery included indicators of moral behaviour, personal and social responsibility, moral disengagement, moral and ethical qualities, and perceptions of the learning climate. Responsibility was assessed using the Responsibility Scale in Physical Education (RSPE) [5]. Moral disengagement was assessed using a scale based on the corresponding concept and adapted to the physical education context [6]. Indicators of moral and ethical qualities were additionally assessed using a researcher-developed questionnaire and a semi-structured interview. Moral behaviour was recorded using a pedagogical observation record.

Initial assessment was conducted before the formative programme began. After its completion, both groups underwent repeated assessment; data from pedagogical observation and interviews were analysed in parallel. Data analysis included descriptive statistics, tests of distribution normality, t-tests for dependent and independent samples, repeated-measures analysis of variance, effect-size estimation, and correlation analysis. Where necessary to control for baseline differences between the groups, ANCOVA could be applied. The critical level of statistical significance was set at $p < 0,05$.

Results of the study and discussion. At the first stage, baseline comparability of the experimental and control groups was examined across the main indicators. No statistically significant differences were found in age or baseline values of discipline, personal responsibility, moral behaviour, moral disengagement, and task orientation (Table 2). This provides an acceptable baseline for subsequent between-group comparison of changes over time.

After the 12-week programme, changes in the experimental group were pronounced and directional. The most notable dynamics concerned indicators directly related to joint activity: discipline, respect for others, rule compliance, and cooperation. Changes in the control group were substantially less pronounced.

Table 1. Key Variables and Measurement Instruments

Variable	Operationalisation	Instrument
Moral behaviour	Discipline, respect, cooperation, rule compliance	Pedagogical observation record
Personal and social responsibility	Willingness to fulfil commitments, assist the group, accept consequences of actions	Responsibility Scale in Physical Education (RSPE) [4]
Moral disengagement	Justification of transgressions, reduced personal responsibility, neutralisation of moral norms	Moral Disengagement in Physical Education Scale [5]
Moral and ethical qualities	Self-control, empathy, fairness, inner discipline	Researcher-developed questionnaire and semi-structured interview
Learning climate	Support, respect, orientation towards cooperation	Brief lesson climate perception scale

Table 2. Baseline Indicators of the Experimental and Control Groups

Indicator	Experimental group (n=48)	Control group (n=48)	p
Age, years	18,2 ± 0,6	18,1 ± 0,5	0,48
Discipline during classes (scores)	3,12 ± 0,41	3,09 ± 0,44	0,73
Personal responsibility	3,08 ± 0,37	3,11 ± 0,35	0,69
Moral behaviour	3,05 ± 0,39	3,03 ± 0,36	0,81
Moral disengagement	2,94 ± 0,33	2,91 ± 0,31	0,77
Task orientation	3,16 ± 0,42	3,14 ± 0,40	0,84

Table 3. Changes in Indicators of Moral Behaviour

Indicator	Experimental group before	Experimental group after	Control group before	Control group after	p after
Discipline	3,18 ± 0,40	4,12 ± 0,36	3,15 ± 0,42	3,28 ± 0,40	<0,001
Respect for others	3,09 ± 0,38	4,18 ± 0,34	3,07 ± 0,39	3,16 ± 0,37	<0,001
Rule compliance	3,14 ± 0,41	4,21 ± 0,32	3,12 ± 0,40	3,22 ± 0,38	<0,001
Cooperation	3,06 ± 0,37	4,16 ± 0,35	3,04 ± 0,39	3,13 ± 0,36	<0,001
Overall moral behaviour index	3,12 ± 0,35	4,17 ± 0,31	3,10 ± 0,36	3,20 ± 0,34	<0,001

Notably, improvement was observed across all four specific characteristics simultaneously. The overall moral behaviour index in the experimental group increased by more than one point - from 3,12 ± 0,35 to 4,17 ± 0,31. In the control group, the change was considerably smaller: from 3,10 ± 0,36 to 3,20 ± 0,34. Between-group differences after completion of the programme were statistically significant ($p < 0,001$).

A separate block of results concerns moral disengagement. Across all components presented, the experimental group showed decreases, whereas changes in the control group were small. The most pronounced reductions were observed in the indicators of justification of transgressions, displacement of personal responsibility, and neutralisation of moral norms (Table 4).

Conclusions. 1. Specially organised physical education classes in which motor activity was combined with morally salient situations, reflection, role switching, and pedagogical feedback were accompanied by more pronounced positive changes in moral behaviour than the standard programme.

2. In the experimental group, indicators of discipline, respect for others, rule compliance, and cooperation increased. The overall moral behaviour index increased from 3,12 ± 0,35 to 4,17 ± 0,31, whereas in the control group it increased from 3,10 ± 0,36 to 3,20 ± 0,34; the between-group difference after completion of the programme was statistically significant ($p < 0,001$).

3. At the same time, the experimental group demonstrated a marked reduction in moral disengagement. The overall index decreased from 2,93 ± 0,31 to

Table 4. Changes in Indicators of Moral Disengagement

Indicator	Experimental group before	Experimental group after	Control group before	Control group after	p after
Justification of transgressions	2,96 ± 0,34	1,89 ± 0,31	2,93 ± 0,33	2,84 ± 0,32	<0,001
Displacement of personal responsibility	2,92 ± 0,35	1,82 ± 0,29	2,90 ± 0,34	2,81 ± 0,31	<0,001
Neutralisation of moral norms	2,90 ± 0,32	1,85 ± 0,30	2,88 ± 0,31	2,79 ± 0,30	<0,001
Overall moral disengagement index	2,93 ± 0,31	1,85 ± 0,28	2,90 ± 0,30	2,81 ± 0,29	<0,001

1,85 ± 0,28, whereas in the control group it decreased from 2,90 ± 0,30 to 2,81 ± 0,29; the differences after completion of the programme also reached statistical significance ($p < 0,001$).

4. The findings make it possible to regard physical education as a potentially important setting for the pedagogical socialisation of first-year students. Its educational effect appears to be determined not by physical activity itself, but by the extent to which situations involving responsibility, interaction, and meaningful choice are deliberately created within the structure of the class.

5. A promising direction for further research is to conduct studies with stricter design control, a larger sample, validated instruments, and assessment of the persistence of changes after completion of the formative programme.

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Methodology of physical fitness with an emphasis on the motivational sphere of female students engaged in badminton

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Abstract

Objective of the study is to identify the influence of the means of badminton on the improvement of physical fitness indicators and of motivation for physical activity.

Methods and structure of the study. The research was carried out on the basis of the North-West Institute of Management of the Russian Presidential Academy of National Economy and Public Administration during the first semester of the 2025-2026 academic year. The experiment involved 40 first- and second-year female students aged 18-20 years; they were divided into two groups of 20 persons: a control group (CG) and an experimental group (EG). The control group worked to the standard physical education programme (track and field, fitness, sports games of their choice: volleyball, basketball). Instead of the traditional sports games, the experimental group practised badminton twice a week (for 90 minutes) according to a specially developed programme.

Results and conclusions. The experimental badminton programme developed (twice a week for 90 minutes over 4 months) made it possible to achieve a significant improvement in all the physical fitness indicators studied in the female students of the experimental group ($p<0.01$-0.001). The most pronounced increase was recorded in static balance – 43.6 %. The indicators of explosive strength improved by 11.0 %, of coordination abilities by 9.0 %, and of general endurance by 13.2 %. In the control group, which worked to the traditional programme, no significant changes were recorded in any of the indicators ($p>0.05$). Badminton sessions had a positive influence on the motivational sphere of the female students. In the experimental group, internal motivation for physical culture activity increased to a greater degree in the indicator 'interest in the process of the sessions.'

Keywords: *physical education at a higher educational institution, female students, badminton, physical fitness, motivation for physical activity.*

Introduction. Contemporary physical education in higher education faces a number of problems: a decline in the actual motor activity of female students, the formalisation of classes, and the absence of a sustained interest in attending them [1, 4, 5]. As Deng N. notes, traditional approaches based on the normative performance of exercises often fail to take into account the individual preferences and the level of fitness of the students, which leads to a fall in motivation [7]. In this connection the search for kinds of motor activity that simultaneously solve two tasks – raising physical fitness and forming a positive attitude towards classes – acquires particular relevance. However, comprehensive studies simultaneously assessing the dynamics both of the objective indicators of fitness and of the subjective motivational sphere are insufficient. Particular attention is merited by the data of Ch. Wenkai and A.V. Gaskov, who, on a Chinese sample, demonstrated significant shifts in students' motivation after badminton sessions [2]. The question of the applicability of analogous approaches in Russian conditions remains open.

Objective of the study is to identify the influence of the means of badminton on the improvement of physical fitness indicators and of motivation for physical activity.

Methods and structure of the study. The research was carried out on the basis of the North-West Institute of Management of the Russian Presi-

dential Academy of National Economy and Public Administration during the first semester of the 2025-2026 academic year. The experiment involved 40 first- and second-year female students aged 18-20 years who had no contraindications to physical culture activity and did not engage in sport at a professional level. The female students were divided into two equal groups of 20 persons: a control group (CG) and an experimental group (EG).

The control group worked to the standard physical education programme (track and field, fitness, sports games of their choice – volleyball/basketball). Instead of the traditional sports games, the experimental group practised badminton twice a week (for 90 minutes) according to a specially developed programme which included: instruction in the technique of the grip, of movements and of strokes (smash, drop, net shot); paired and singles playing tasks of variable intensity; and exercises for developing coordination, speed of reaction and jumping ability (based on the plyometric elements from [8], adapted to the tasks of physical education).

The following were used to assess physical fitness: the 3 10 m shuttle run (coordination abilities), the standing long jump (explosive strength of the legs), a static balance test (the Romberg test), and the 6-minute run (general endurance). To assess the changes in the motivational sphere, a questionnaire was used which had been developed on the basis of the works of I.R. Stovba et al. [6] and of Ch. Wenkai and A.V. Gaskov [2]. The questionnaire included four scales, and the assessment on each scale was made on a 7-point system (from 1 – 'completely disagree' to 7 – 'completely agree'). The statistical processing was carried out using Student's t-test for related and independent samples ($p \leq 0.05$).

Results of the study and discussion. Before the beginning of the pedagogical experiment no statistically significant differences were found between the CG and the EG ($p>0.05$). After 4 months of sessions the following results were obtained (Tables 1 and 2). An analysis of the data obtained makes it possible to note that the explosive strength of the lower limbs, assessed by means of the standing long jump, revealed significant improvements in the experimental group: the increase amounted to 11.0 % ($p<0.01$). In the '3×10 m shuttle run' test the experimental group showed an improvement of 9.0 % ($p<0.01$), whereas in the control group the increase amounted to only 2.0 % and was statistically insignificant.

The most considerable changes occurred in the Romberg test, which assesses static balance: in the experimental group the time of holding the posture increased from 20.2 s to 29.0 s, which corresponds to an increase of 43.6 % ($p<0.001$). In the control group there was no dynamic (+6.3 %, $p>0.05$). In the general endurance test (the 6-minute run) the experimental group improved its result by 13.2 % (from 945 m to 1070 m, $p<0.01$), whereas in the control group the increase was minimal (+2.6 %, $p>0.05$). The results obtained accord with the data of D.D. Okalnaya, who likewise noted the positive influence of badminton sessions on the jumping abilities of female students [1, 5, 8], and also with the conclusions of S. Chandra et al., who recorded an improvement in explosive strength of 12-15 % in badminton players after 6 weeks of training.

It is important to emphasise that a significant increase in the experimental group was recorded in all four tests, whereas in the control group it was recorded in none. This testifies to the comprehensive effect of badminton on the physical fitness of female students. As O.N. Kostyukova et al. note, in team sports the training effect is systemic in character and affects various motor qualities simultaneously

Table 1. Dynamics of the physical fitness indicators of the female students over the period of the experiment (M±σ)

Indicator	Group	Before the experiment	After the experiment	Increase w (%)	Significance
3x10 m shuttle run (s)	CG	9.9±0.4	9.7±0.4	-2.0	p>0.05
	EG	10.0±0.5	**9.1±0.3**	**-9.0**	**p<0.01**
Standing long jump (cm)	CG	165±10	168±9	+1.8	p>0.05
	EG	164±11	**182±8**	**+11.0**	**p<0.01**
Romberg test (s)	CG	20.5±4.0	21.8±3.8	+6.3	p>0.05
	EG	20.2±4.2	**29.0±3.0**	**+43.6**	**p<0.001**
6-minute run, m	CG	950±70	975±65	+2.6	p>0.05
	EG	945±75	**1070±60**	**+13.2**	**p<0.01**

Table 2. Dynamics of the motivational indicators of the female students (in points)

Scale	Group	Before the experiment	After the experiment	Significance, p
Internal motivation	CG	3.3±0.7	3.5±0.8	>0.05
	EG	3.2±0.6	**5.9±0.5**	**<0.001**
Interest in the process	CG	3.1±0.8	3.3±0.9	>0.05
	EG	3.0±0.7	**6.2±0.6**	**<0.001**
External motivation (assessment)	CG	4.6±0.9	4.5±0.8	>0.05
	EG	4.5±1.0	4.0±0.9	<0.05
Avoidance of failure	CG	4.3±1.0	4.4±1.1	>0.05
	EG	4.2±1.1	**2.8±0.8**	**<0.001**

[3]. Thus, the results of the experiment confirm that the inclusion of badminton in the physical education programme makes it possible to solve the task of raising the physical fitness of female students more effectively than traditional methods.

An analysis of the motivational indicators revealed fundamental differences between the groups (Table 2). In the experimental group there was an increase in internal motivation – from 3.2 to 5.9 points ($p<0.001$) – whereas in the control group there were no changes.

An even more pronounced dynamic was recorded on the scale 'interest in the process': the increase was from 3.0 to 6.2 points ($p<0.001$). The data obtained accord with the results of Ch. Wenkai and A.V. Gaskov, who, on a Chinese sample, likewise recorded a considerable growth of internal motivation after badminton training [2]. We note the decrease in the indicator 'avoidance of failure' in the experimental group from 4.2 to 2.8 points ($p<0.001$). The indicator 'external motivation (assessment)' in the experimental group decreased by 0.5 points ($p<0.05$), which is a consequence of the growth of internal motivation: when a session becomes interesting in itself, the significance of a formal mark decreases. Thus, badminton possesses a high motivational potential, which is confirmed by the conclusions of I.R. Stovba et al., who likewise noted the ability of badminton to form a sustained interest in physical culture activity in students [6]. The combination of emotional richness, accessibility and rapid progress in mastering the technical elements makes badminton an effective means not only of the physical but also of the personal development of female students.

Conclusions. An analysis of the scientific and methodological literature showed that badminton is regarded by contemporary researchers as an effective means of the physical education of students, possessing accessibility, emotional attractiveness and a comprehensive effect on physical qualities. However, comprehensive works simultaneously assessing the dynamics of physical fitness and of the motivational sphere of female students under the influence of badminton sessions are insufficient.

The experimental badminton programme developed (twice a week for 90 minutes over 4 months) made it possible to achieve a significant improvement in all the physical fitness indicators studied in the female students of the experimental group ($p<0.01$-0.001). The most pronounced increase was recorded in static balance (the Romberg test) – +43.6 % (from 20.2 s to 29.0 s), which is explained by the specific nature of badminton movements, which require constant control of equilibrium after lunges, jumps and abrupt stops.

The indicators of explosive strength (the standing long jump) improved by 11.0 % (from 164 cm to 182 cm, $p<0.01$), of coordination abilities (the 3 10 m shuttle run) by 9.0 % (from 10.0 s to 9.1 s, $p<0.01$), and of general endurance (the 6-minute run) by 13.2 % (from 945 m to 1070 m, $p<0.01$). In the control group, which worked to the traditional programme, no significant changes were recorded in any of the indicators ($p>0.05$).

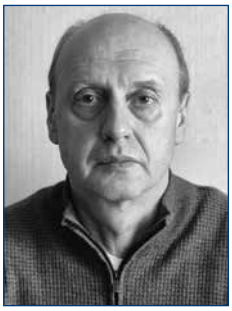
Badminton sessions had a considerable positive influence on the motivational sphere of the female students. In the experimental group, internal motivation for physical culture activity grew from 3.2 to 5.9 points ($p<0.001$), and interest in the process of the sessions from 3.0 to 6.2 points ($p<0.001$). At the same time there was a decrease in the indicator 'avoidance of failure' from 4.2 to 2.8 points ($p<0.001$) and in external motivation (assessment) from 4.5 to 4.0 points ($p<0.05$).

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A functional approach to the organization of classes in a special educational department

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Abstract

Objective of the study is to identify the possibilities of differentiating students assigned to a special medical group, using the assessment of the physical condition index (PCI) according to E.A. Pirogova (non-load approach) and the assessment of functional reserves based on the results of step ergometry (load approach).

Methods and structure of the study. The study was conducted during the fall of the 2025/2026 academic year. The subjects were students from a special education department who were assigned to a special group based on medical examination results. Two methods were used: assessing the E.A. Pirogova Physical Condition Index and assessing physical performance using a step test. A total of 134 students were examined: 63 men and 71 women.

Results and conclusions. An analysis of the results shows that dividing students into subgroups based on the results of the PCI assessment may lead to an error in determining the acceptable limits of physical activity. The use of load testing is more justified. The results showed that 60% of students have a 'low' and 'below average' level of physical performance. The 'high' and 'above average' levels include students who have a time restriction or are in remission, they study additionally – 2-3 times a week. They may be recommended to undergo repeated medical examinations to change the medical group. When conducting training sessions with students of a special educational department based on a functional approach, it is necessary to take into account the limits of permissible physical activity based on the results of step ergometry and analyze the main and additional diagnoses of students.

Keywords: *students, special education department, functional approach, nosology, physical condition index, step test, wellness training.*

Introduction. According to the literature, the tendency towards an increase in the number of students in special medical groups is fairly stable [4, 12]. Values from 16 to 50 % are encountered in the literature. When diseases are taken into account, according to the data of the teachers of university physical education departments, the predominant ones are diseases of the musculoskeletal system, diseases of the circulatory system, of the respiratory organs and diseases of the eyes [4, 9]. According to medical statistics, in 2011 the students most frequently placed on dispensary registration in the Russian Federation were those with diseases of the respiratory organs, of the genitourinary system and of the digestive organs [3]. Specialists are unanimous: health improvement is connected with increasing the physical activity of such students. There is, however, a contradiction between the recommendations for applying the means of health-improving physical culture in sports medicine and in the practice of the education system. Thus, the medical approach proposes strengthening medical supervision of the state of students' health. It is recommended that programmes be developed and introduced whose main principles are the comprehensiveness of health-improving technologies during the period of study, an individual approach in accordance with the leading diseases identified, increasing the involvement of young people in physical culture and sport, and the promotion of a healthy lifestyle [3]. Practitioners, meanwhile, note that the system of adaptive physical education is built on a residual principle and, as a rule, is either not carried out at all or is carried out at the discretion of the physical education teachers [5, p. 37]. Every year the number of students in special medical groups who have two, three or more concomitant pathologies in their history increases. Their combination sets physical education teachers the difficult task of dosing the load

and selecting exercises individually [11]. The situation is aggravated by the passive attitude towards physical culture which gradually forms in senior schoolchildren and persists in students. Thus, a survey of first-year students showed that 34.2 % of the students of a special educational department did not take part in physical education lessons in Years 10-11 [6].

An analysis of the publications on the organisation of group classes in a special educational department shows that over the last 15-20 years the predominant direction has been the health-improving and rehabilitative one. It is based on the assessment of the energy potential of the organism and subsequent health-improving training. The corrective component is included at the end of the main part or in the concluding part of the class. The level of physical condition, the adaptive potential or other indicators make it possible to establish individual limits of acceptable physical activity. We considered it of interest to study the possibilities of differentiating students assigned to a special medical group using the assessment of the physical condition index (PCI) according to E.A. Pirogova [10] (the non-load approach) and the assessment of functional reserves according to the results of step ergometry (the load approach).

Objective of the study is to identify the possibilities of differentiating students assigned to a special medical group, using the assessment of the physical condition index (PCI) according to E.A. Pirogova (non-load approach) and the assessment of functional reserves based on the results of step ergometry (load approach).

Methods and structure of the study. The research was carried out in the autumn of the 2025-2026 academic year. The object of the study was students of a special educational department who, on the results of medical examination, had been assigned to a special medical group. To assess the students' physical condition index, the methodology of E.A. Pirogova was used. The following indicators were entered in the protocol: body length and mass, blood pressure, heart rate at rest, age and sex. The assessment was carried out according to the scale presented in Table 1 [8]. A total of 134 students were examined.

It is known that the assessment scale was developed on young healthy men and was subsequently refined for women. In our experience, the rapid assessment of the physical condition level according to G.L. Apanasenko and L.A. Popova [1] is more reliable. At present, however, such an approach has limitations in mass examinations owing to the prevalence of various respiratory infections, since vital capacity is measured with a dry spirometer.

Load testing was carried out using a two-stage step test [7]. For women the step height at the first load was 0.12 m and at the second 0.22 m. For men the step height was 0.2 and 0.3 m. The rate of ascent was 24 cycles per minute (96 metronome signals), and the duration of each load was 5 minutes. Heart rate was measured using pulse oximeters in a seated position for 15-20 seconds immediately after the completion of the load. No rest pause between the stages was provided for.

Results of the study and discussion. The results obtained from the assessment of the PCI by the methodology of E.A. Pirogova (the non-load method) are presented in Figure 1.

The methodology of assessing the PCI according to E.A. Pirogova showed that in 65 % of the male students of the special educational department the level of functional capabilities is 'low' or 'below average': the 'low' level – 17 % of the students; 'below average' – 48 %; 'average' – 32 %; 'above average' – 3 %; 'high' – 0 %.

An analysis of the PCI and of the nosological forms of the students showed that the 'above average' level predominated among students with diseases of a temporary character (injuries of the musculoskeletal system, appendicitis). Among students with levels from 'low' to 'average,' a wide spectrum of diseases was noted which were in the stage of remission. It may therefore be said that the use of this methodology for dividing the male group into subgroups by functional level and for determining the limits of acceptable physical load is justified.

An analysis of the results of the PCI assessment in the female students showed: the 'low' level is held by

Table 1. Scale for assessing the PCI

Physical condition index (PCI)	Values	
	Women	Men
High	0.576 and above	0.826 and above
Above average	0.476-0.575	0.676-0.825
Average	0.366-0.475	0.526-0.675
Below average	0.261-0.365	0.375-0.525
Low	0.157-0.260	0.374 and below

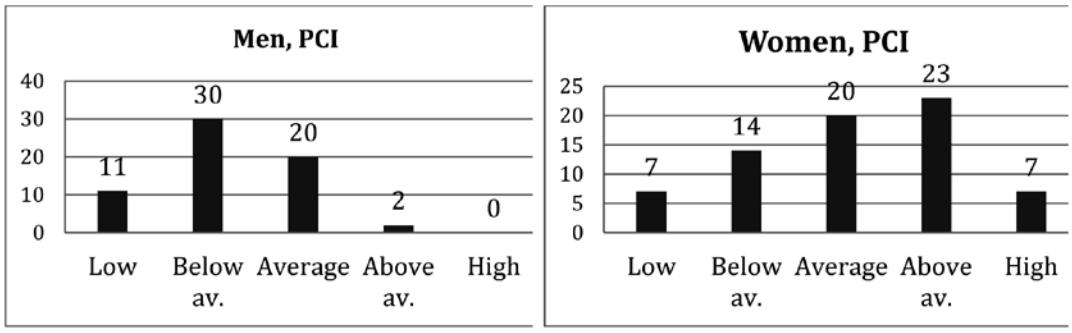


Figure 1. Results of the PCI assessment in the students (men and women)

10 %; 'below average' – 20 %; 'average' – 28 %; 'above average' – 32 %; and 'high' – 10 %. That is, 30 % of the female students were assigned to the 'low' and 'below average' subgroups. It should be noted that 32 % entered the 'above average' subgroup. A comparison with the disease groups showed that the subgroups with the 'high' and 'above average' levels include female students who have restrictions on a large physical load (130-150 beats/min according to V.S. Farfel).

Let us single out two aspects. The first is connected with the fact that some young women aspire to a model-like appearance and therefore artificially restrict themselves in food, have insufficient muscle mass and an asthenic body type. Their blood pressure is at the lower limit of the norm or below it (hypotension). Such female students are classified into the subgroups with a 'high' or 'above average' PCI erroneously. Without the inclusion of additional investigations, the limits of acceptable physical load will be determined incorrectly.

The second aspect is connected with the presence in 40-60 % of the students of a second or third diagnosis [1]. It is necessary to analyse the combinations of diseases and only then to assess the students' functional reserves. For example, the principal diagnosis may be diseases of the eyes, of the musculoskeletal system, of the respiratory system or of the digestive organs, and then the presence of additional diseases comes to light. In such female students the state of health may deteriorate sharply in the course of classes. The teacher will be required to observe the female students' reaction to a small load and then to increase the load gradually.

Let us consider the results of step ergometry (load testing) (Figure 2).

The 'low' and 'below average' levels included 54.3 % of the students. The 'average' level amounted to 23.9 %, 'above average' to 8.7 % and, finally, the 'high' level to 13 % of the students. A survey of the students who found themselves in the subgroups with the 'high' and 'above average' levels showed that these students are in the stage of remission or of temporary restriction, and all of them train independently or at fitness clubs 2-3 times a week. Such students may be recommended to undergo an additional medical examination with a view to transferring to the preparatory or the main educational department.

Let us analyse the results of step ergometry in the female students. The 'low' level includes 41.1 % and 'below average' 17.9 %. In total, 59 % of the female students have substantially reduced functional capabilities.

The 'high' level – 19.6 % of the women, 'above average' – 3.6 %, 'average' – 17.9 %. Among the women with the 'high' and 'above average' levels the situation is similar to the answers of the men. The majority of these female students train at fitness clubs. Some of them do so with coaches. The recommendations are similar.

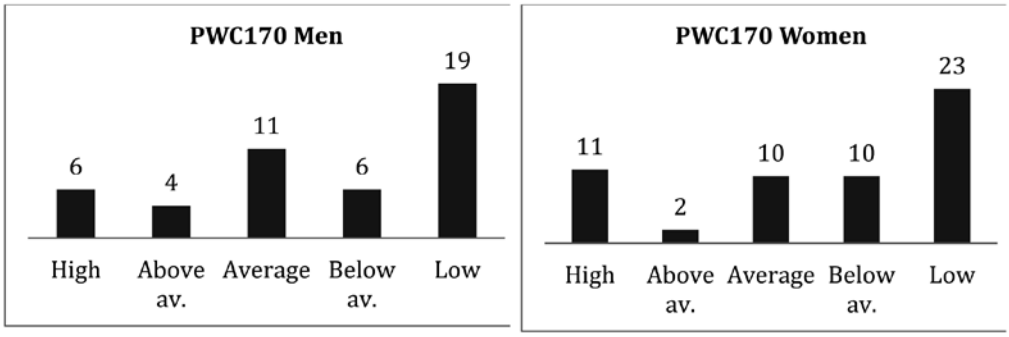


Figure 2. Results of step ergometry in the students (men and women)

At the same time, in both the men and the women, attention may be drawn to the considerably greater number of students assigned to the subgroups with the 'low' and 'below average' levels according to the results of step ergometry.

A comparison of the diagrams of non-load and load testing shows substantial differences. Thus, the overall results of load testing – about 60 % of the students of the special educational department have a 'low' or 'below average' level of functional reserves – presuppose, in a group form of classes, a moderate functional load in the main part of the class, from 110 to 130 beats/min. This accords well with the recommendations of other specialists [2]. Students cannot be recommended particular regimes of health-improving training solely on the basis of the PCI assessment.

Conclusions. The allocation of students to functional classes on the basis of the PCI assessment according to E.A. Pirogova showed that the 'low' level is held by 17 % of the men and 10 % of the women, the 'below average' level by 48 and 20 %, the 'average' level by 32 and 28 %, the 'above average' level by 3 and 32 %, and the 'high' level by 10 % of the women. A comparison of the results with the nosological groups of the students showed that errors are possible in assessing the limit of acceptable physical load.

An analysis of the structure of the functional classes of the students on the basis of the assessment of the results of physical working capacity using step ergometry showed that the 'low' level is held by 41.3 % of the men and 41.1 % of the women, the 'below average' level by 13 % of the men and 17.9 % of the women, the 'average' level by 23.9 % of the men and 17.9 % of the women, the 'above average' level by 8.7 % of the men and 3.6 % of the women, and the 'high' level by 13 % of the men and 19.6 % of the women. A comparison with the nosological groups showed that the probability of error in assessing the limit of acceptable physical load in the students is reduced.

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Features of body balance when maintaining an upright standing position in children with cerebral palsy

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Abstract

Objective of the study is to study the features of body balance when maintaining an upright standing position in children with cerebral palsy.

Methods and structure of the study. With the help of the software and hardware complex 'Habilect' with biofeedback, the characteristics of changes in the spatial position of the body in the frontal and sagittal planes, stato-locomotor stability in terms of percentage values of deviations of the center of gravity (CG) of the body in statics while maintaining an upright posture were determined.

Results and conclusions. Features of postural balance in boys and girls with cerebral palsy were revealed depending on the level of motor disorders according to the GMFCS classification. Large values of standard deviation (X ±σ) in all groups indicate individual heterogeneity of biomechanical and functional abnormalities within each GMFCS level.

Keywords: *children with cerebral palsy, body balance, upright position, frontal and sagittal planes.*

Introduction. Any movements, such as maintaining a posture in space, walking, running and jumping, which ensure the necessary functioning of the physiological systems of the organism, are connected with the preservation of the upright position. The pathology of motor impairments which occurs in children with disabilities, in its most varied manifestations, has a negative effect on the formation of stability when assuming the upright position. The mechanisms of the formation of motor functions are connected with overcoming the forces of gravity and are directed towards adapting the body to the upright position and to the performance of voluntary movements. Motor functions and anti-gravity mechanisms are improved provided that the child receives appropriate physical loads. These facts determine the importance and relevance of the task of studying the features of the maintenance of equilibrium (body balance) in children with cerebral palsy. The study becomes especially relevant during the period of the child's early development, when the transition from the horizontal lying position to the upright one takes place, which is accompanied by a radical restructuring within the organism.

At the age of about one year the child's organism attains a level that allows it to get to its feet and to take its first steps. This period is characterised by the onset of the action of the forces of gravity, which activate the work of the musculoskeletal system and of the nervous system and stimulate the active development of the skeletal system, which constitutes an unaccustomed load for the functioning of the systems of the organism of children of this period [1, 3, 5].

The preservation of the upright position is connected with the control of the kinetic system formed by the links of the lower and upper limbs and of the spine, whose total mobility is measured by a large number of degrees of freedom, and in which the musculoskeletal system and the central and peripheral nervous systems also participate. Among the sense organs, the proprioceptive and visual systems and the vestibular apparatus should be singled out, as they carry the principal physiological load.

When the upright position is disturbed, an asymmetrical mutual arrangement of the component elements of the muscular-articular system is observed, with a deviation of the trajectory of the general centre of gravity (CG) (forward, backward, to the sides) relative to the vertical, as well as a disturbance of muscle tone and of the range of movement, which does not allow the child to coordinate its movements and to maintain equilibrium.

Thus, the study of the process of body balance in the basic stance provides extensive information about the functional state of the greater part of the musculoskeletal and sensory systems, which may be modified depending on various factors: the placement of the feet, the holding of the trunk and upper limbs, and the deviation from the position of the projection of the general centre of gravity onto the horizontal plane. This serves as a basis for studying the features of the regulation of posture in children with cerebral palsy and is a foundation for understanding the processes that take place in the formation of motor skills, which influence the subsequent periods of the growth and development of their organism [1, 2, 3].

Objective of the study is to study the features of body balance when maintaining an upright standing position in children with cerebral palsy.

Methods and structure of the study. The research involved children with cerebral palsy aged 3-14 years with different levels of development of gross motor functions according to the international GMFCS scale. A total of 684 observations were carried out, of which 331 were in boys and 353 in girls. By means of the 'Habilect' hardware-and-software complex with biofeedback and the H.VrS virtual stabiloplatform module, the characteristics of the change in the spatial position of the body in the frontal and sagittal planes, and the stato-locomotor stability according to the percentage values of the deviations of the centre of gravity (CG) of the body in statics while maintaining an upright posture, were determined. The examinations were carried out at the beginning of the rehabilitation session.

Results of the study and discussion. The mean values of the deviation of the CG (in %) in the sagittal and frontal planes in boys and girls diagnosed with cerebral palsy of different GMFCS levels are shown in Table 1.

In the group of boys, in the case of deviation in the sagittal plane (forward – backward), a backward deviation was revealed in the children with GMFCS levels I-IV, as is indicated by the large values of the percentage of deviations relative to the number of 'forward' deviations.

Considering the number of percentage deviations backward at each of the levels of motor development on the GMFCS scale, it can be seen that in the sagittal plane – backward – the maximum value was noted in the boys of GMFCS level II, amounting to 36.5±16.8 %, and the minimum 27.1±23.5 % in the boys of level IV. The differing percentages of deviation obtained at the GMFCS levels did not reveal any clear dependence on them.

In the analysis of the sagittal forward displacements at GMFCS levels I, III and IV, a minimum number of deviations was revealed, with values of 2.0±7.4 %, 2.6±8.1 % and 2.7±8.0 %. At GMFCS levels II and V the maximum number of deviations amounted to 12.5 % and 43.5±9.2 %, of which the figure of 43.5±9.2 % exceeded the value of 36.5±16.8 % for the backward deviation. The occurrence of abrupt fluctuation values indicates a great instability of body balance, which leads to a considerable spread of the individual data, especially in comparison with the children of level V, who are unable to move independently.

In the case of leftward deviation in the frontal plane, the maximum magnitude of deviation amounted to 26.1±17.2 % and 39±12.9 %, the value of 39±12.9 % being noted in the boys of level V. The minimum values of deviation were revealed in the boys of levels IV, III and I, in the range from 3.7±10.2 % and 4.0±10.2 % to 5.0±10.9 %.

Table 1. Mean value of the deviations of the CG (in %) in the sagittal and frontal planes in boys and girls diagnosed with cerebral palsy of different GMFCS levels

GMFCS levels	Boys				Girls			
	CG deviation in the sagittal plane, %		CG deviation in the frontal plane, %		CG deviation in the sagittal plane, %		CG deviation in the frontal plane, %	
	backward	forward	leftward	rightward	backward	forward	leftward	rightward
I	30.1±21.0	2.0±7.4	5.0±10.9	11.8±14.5	41.2±13.8	23.6±15.9	17.5±15.5	25.0±15.3
II	36.5±16.8	12.5±8.9	26.1±17.2	20.2±14.9	37.6±16.9	17.4±17.2	22.6±17.2	16.9±14.7
III	28.1±23.0	2.6±8.1	4.0±10.2	12.4±14.4	35.4±18.3	28.8±16.1	31.4±1.0	29±19.3
IV	27.1±23.5	2.7±8.0	3.7±10.2	12.4±14.1	33.9±18.7	31.4±14.2	31.8±17.1	36.5±17.9
V	36.1±17.2	43.5±9.2	39±12.9	28.2±23.9	34.1±19.7	14.3±23.9	45.0±8.7	30.9±17.9

Table 2. Number of variants of the distribution of directions in the deviations in the sagittal and frontal planes in boys and girls

GMFCS levels	Sagittal plane	Frontal plane	Sagittal plane	Frontal plane
	Boys		Girls	
I	Backward	Rightward	Backward	Rightward
II	Backward	Leftward	Backward	Leftward
III	Backward	Rightward	Backward	Leftward
IV	Backward	Rightward	Backward	Rightward
V	Forward	Leftward	Backward	Leftward

In the case of rightward deviation in the frontal plane, the greatest values amounted to 20.2±14.9 % and 28.2±23.9 % in the children of levels II and V, and the smallest to 11.8±14.5 %, 12.4±14.0 % and 12.4±14.1 % in the boys of GMFCS levels I, III and IV.

Thus, for the group of boys the characteristic position when assuming the upright stance was the greatest ratio of backward-rightward deviations and the smallest of backward-leftward ones (Table 2).

Attention is drawn to the fact of the close percentage values in the boys of GMFCS levels III and IV in the case of backward deviation (28.1 and 27.1 %) and of forward deviation (2.6 and 2.7 %), and also in the indicators of frontal displacement at the same levels, which may be explained by the random composition of groups with similar levels of development of motor capabilities.

In the girls the greatest mean values in the sagittal deviations were, as in the boys, directed backward at all the GMFCS levels, and their values were higher than in the boys. The greatest magnitude of the percentage of deviation amounted to 41.2±13.8 % at GMFCS level I. As motor capabilities deteriorate from level I to level IV, the percentages for backward deviation decrease, while for forward deviation they rise to 31.4±14.2 % at level IV.

The results of the CG deviation in the frontal plane (leftward-rightward) showed that the girls had higher values of the frontal displacement indicators in all the motor function groups. At levels I-IV a rightward deviation predominated in them, with a maximum of 36.5±17.9 % at GMFCS level IV. At level V the vector of deviation changed to the left, reaching a maximum value of 45.0±8.7 % with a relatively low rightward displacement (30.9 %). Thus, in the girls, in contrast to the boys, the greatest deviations are observed backward-leftward (Table 2).

Summarising the data obtained, the following may be concluded:

- no gender differences in the direction of the CG deviations were observed in the boys and girls. In maintaining upright stability, children of both sexes in the majority of cases deviated backward, the boys deviating backward and more to the right, and the girls backward and more to the left. In addition, the girls on average had higher values of the percentage of CG deviation both in the sagittal and in the frontal plane at GMFCS levels I-IV, which may indicate a greater severity of postural impairments in comparison with the boys of the same levels. The tendency to deviate backward is conditioned by the compensatory deviation of the trunk to prevent a forward fall, which is often connected with the formation of 'triple flexion' (flexed hips and knees) in equinus or equinovarus deformity of the feet; this is typical of spastic diplegia, when the child reflexively transfers the weight onto the heels (or the hind part of the foot) in order to maintain the upright position with hypertonus of the flexor muscles of the shank and thigh [1, 2, 4];

- in children of both sexes with severe motor impairments (GMFCS level V) the locomotor profile may change abruptly. In the boys an abrupt increase in the forward sagittal deviation was noted, and in the girls a leftward frontal deviation, which testifies to the complete decompensation of the mechanisms of maintaining equilibrium. The sharp forward shift of the CG at GMFCS level V in the boys and the growth of the leftward indicators in the girls show that in severe forms (for example, spastic tetraparesis or a pronounced dystonic form) the maintenance of balance by means of reflex compensations becomes impossible. A strong forward displacement of the CG may be connected with the predominance of the flexor synergy of the trunk and neck, with severe contractures of the hip and knee joints, and also with weakness of the gluteus maximus and of the extensor muscles of the back.

The predominance of rightward displacement at GMFCS levels I, III and IV indicates the asymmetrical character of the lesion (for example, a hemiparetic form with a better preserved right side, or asymmetrical diplegia). Patients instinctively unload the more affected limb, transferring the body weight onto the conditionally 'healthy' or stronger right side. This forms a vicious circle: the right side is overloaded, while on the left muscular hypotrophies and contractures progress [1, 2, 4];

- the large values of the standard deviation (±) in all the groups indicate the extreme individual heterogeneity of the biomechanical and functional impairments within each GMFCS level.

Proceeding from the quantitative data obtained, it may be concluded that the rehabilitation process of children with cerebral palsy should be individual and strictly differentiated depending on the level of their motor capabilities [1, 2, 4]. Accordingly:

- for children of GMFCS levels I-II, the correction of deviations in the sagittal plane should be directed towards reducing hypertonus (chiefly of the calf muscles and of the hip flexors), stretching the muscular-ligamentous apparatus, and training the strength of the extensors (the gluteus maximus and the quadriceps) in order to level out the sagittal CG deviation. The elimination of frontal asymmetry consists in the need to include the less active side of the body in the support in order to centre the CG. In pedagogical terms, it is recommended to expand the volume and number of movements close to the norms of healthy children, with the use of exercises directed at correcting statokinetic stability, the volume of which should amount to not less than 50 % of the total volume of load in the session;

- for children of GMFCS level III the main aim consists in stabilising the upright position and in the use of technical rehabilitation aids. Given the high backward CG deviation in the boys and the pronounced leftward deviation in the girls, an individual selection of technical aids is recommended. The main tasks are the development and consolidation of the skill of maintaining upright stability and weight-bearing capacity, and the training of dynamic balance; the performance of exercises of various orientations with an extended range of movement with the help of the «Gross Trainer» and other training devices; the performance of exercises on maintaining equilibrium in the sitting position and standing at a support, with an emphasis on the controlled transfer of body weight onto the left side (to compensate for the rightward shift). The volume of load directed at developing and consolidating the ability to maintain the upright position should amount to not less than 50 % of the total volume of load in the session;

- for children of GMFCS level IV the main aim consists in the prevention of deformities and in ensuring correct positioning. Children of this level cannot maintain balance independently. They require the observance of an orthopaedic regime: rigid fixation in wheelchairs. In pedagogical terms, it is recommended to stimulate motor activity, to teach the ability to assume and maintain an upright posture sitting and kneeling, to move on all fours, and to learn walking skills under facilitated conditions with the use of the 'Gross Trainer.' The volume of load of this orientation should amount to not less than 60-70 % in the session;

- for children of GMFCS level V the main aim is analogous to the programme for children of level IV, consisting in the prevention of deformities and in ensuring correct positioning. The stimulation of motor activity from any possible position, and the development of the ability to perform exercises with turns to the right and to the left, lying on the back or sitting. The active use of training devices and of the «Gross Trainer», and the inclusion of game elements with a ball or other objects.

Conclusions. 1. The results of the study show pronounced features of postural balance in boys and girls with cerebral palsy depending on the level of motor impairment according to the GMFCS classification.

2. In children with cerebral palsy no gender differences were revealed in the direction of the sagittal CG deviations. In both gender groups a backward displacement of the CG predominated, in the boys backward-rightward and in the girls backward-leftward.

3. The girls on average had higher values of the percentage of CG deviation both in the sagittal and in the frontal plane at GMFCS levels I-IV, which may indicate a greater severity of postural impairments in comparison with the boys of the same levels.

4. The large values of the standard deviation ($\bar{X}\pm\sigma$) in all the groups indicate the extreme individual heterogeneity of the biomechanical and functional impairments within each GMFCS level.

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Developing readiness for safe living among students with disabilities through adaptive physical education: a theoretical perspective

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Abstract

Objective of the study is to substantiate, develop and recommend for practical use the programme and methodological content of the formation of readiness for safe living among students with disabilities by means of adaptive physical culture at a higher educational institution.

Methods and structure of the study. The theoretical research was carried out from 2024 to 2026 at the Voino-Yasenetsky Krasnoyarsk State Medical University of the Ministry of Health of Russia, Krasnoyarsk (KrasSMU). The study involved 200 first- and second-year students of the Faculty of General Medicine. In order to compile the factual material, the following research methods were selected: analysis of the scientific and methodological literature on the subject of the work; systematisation of the types of diseases and of the number of students with disabilities at the institution; the formation of study groups of students by disease for the organisation of systematic adaptive physical culture sessions; assessment of the physical development and physical fitness of students with disabilities; pedagogical observation; interviewing; conversations; abstraction; modelling; the method of expert assessments; methods of mathematical statistics, and others.

Results and conclusions. On the completion of the pilot theoretical study, the dynamics and types of diseases of students of the country's higher educational institutions were identified and systematised on the basis of the factual material compiled; the programme and methodological content of the formation of the readiness of students with disabilities for safe living by means of adaptive physical culture was developed; and criteria for monitoring the readiness of students with disabilities for safe living were developed.

Keywords: *formation of readiness, safe living, students with disabilities, means of adaptive physical culture, programme and methodological content.*

Introduction. As an analysis of the scientific and methodological literature, of the practice of physical education and of the reporting documentation of the educational process shows, the number of students with disabilities studying at the country's higher educational institutions is growing every year. In the period from 2019 to 2026 an increase of 56 % in the number of students with disabilities studying at the country's higher educational institutions has been noted. At the same time it is noted that only 50 % of students with disabilities complete the full cycle of study at higher educational institutions (in regional higher educational establishments the figure is three times lower still). The main causes of this situation are: the inadequacy of the material, technical and infrastructural provision of the process of teaching students with disabilities – 38 %; the absence of modern teaching methodologies – 27 %; the shortage of specialists to work with students with disabilities – 25 %; the deterioration of the state of health of students with disabilities during their studies at the institution – 10 %, and others. The declared inclusive education of students with disabilities at Russian higher educational institutions has on the whole not justified itself, and new pedagogical practices are required in this direction.

As the statistical data show, the most widespread diseases among students are: myopia (in 2011 this indicator amounted to 17-18 %, and already in 2025 the number of students suffering from myopia had grown to 45-47 %); hypertension (observed in 16.7 % of stu-

dents); such everyday diseases as gastritis, bronchitis, iron-deficiency anaemia, tachycardia, atrial fibrillation and others are also widespread among students. In connection with the above analysis of the problem, a scientific aim was defined, namely the need to develop the programme and methodological content of the formation of readiness for safe living among students with disabilities during their studies at a higher educational institution.

Objective of the study is to substantiate, develop and recommend for practical use the programme and methodological content of the formation of readiness for safe living among students with disabilities by means of adaptive physical culture at a higher educational institution.

Methods and structure of the study. The theoretical research was carried out from 2024 to 2026 at the Voino-Yasenetsky Krasnoyarsk State Medical University of the Ministry of Health of Russia, Krasnoyarsk (KrasSMU). The study involved 200 first- and second-year students of the Faculty of General Medicine. In order to compile the factual material, the following research methods were selected: analysis of the scientific and methodological literature on the subject of the work; systematisation of the types of diseases and of the number of students with disabilities at the institution; the formation of study groups of students by disease for the organisation of systematic adaptive physical culture sessions; assessment of the physical development and physical fitness of students with disabilities; pedagogical observation; interviewing; conversations; abstraction; modelling; the method of expert assessments; methods of mathematical statistics, and others.

Table 1. Programme and methodological content of the formation of readiness for safe living among students with disabilities by means of APC in physical education sessions at a higher educational institution

No.	Programme and methodological content	Hours	Semesters					
			I	II	III	IV	V	VI
1	2	3	4	5	6	7	8	9
I.	**Theoretical section**							
	Aim and objectives of APC for students with disabilities	2	2	-	-	-	-	-
	Programme content of APC	2	2	-	-	-	-	-
	APC in the life activity of students with disabilities	2	2	-	-	-	-	-
	APC as a means of forming safe living in students with disabilities	2	-	2	-	-	-	-
	Maintenance of motor activity and of a healthy lifestyle in students with disabilities by means of APC	2	-	2	-	-	-	-
II.	**Practical section**							
	2.1. Adaptive track and field	85	12	13	15	15	15	15
	2.2. Adaptive sports and outdoor games	42	7	7	7	7	7	7
	2.3. Adaptive swimming	60	10	10	10	10	10	10
	2.4. Adaptive self-defence	30	5	5	5	5	5	5
	2.5. Adaptive gymnastics	60	10	10	10	10	10	10
	2.6. Adaptive tourism	60	10	10	10	10	10	10
	2.7. Formation of first-aid skills	18	3	3	3	3	3	3
III.	**Control section**							
	3.1. Monitoring of the practical abilities and skills formed	18	3	3	3	3	3	3
	3.2. Monitoring of first-aid provision	5	-	1	1	1	1	1
	3.3. Formation of theoretical knowledge and practical skills of self-monitoring of safe living	12	2	2	2	2	2	2

Results of the study and discussion. On the completion of the pilot theoretical study, the programme and methodological content of the formation of readiness for safe living among students with disabilities by means of adaptive physical culture (APC) was developed (Table 1).

The innovative programme presented sets out the content and the algorithm of the formation of readiness for safe living among students with disabilities at a higher educational institution. The programme is based on the following successive pedagogical stages of the formation of the applied skills and abilities of safe living in students with disabilities: the formation of basic motor locomotions – running, jumping, throwing and walking – in adaptive track-and-field sessions; the formation of agility and coordination in adaptive sports and outdoor games sessions; the formation of applied swimming skills and of readiness for self-defence; the training of students with disabilities for life activity on tourist expeditions and readiness for self-preservation in the natural environment; the formation of applied first-aid skills, and others. There also arises the need to include in the educational process of students with disabilities a separate applied academic discipline: 'Fundamentals of safe living for students with disabilities.' The following thematic sections on safe living should be included in this discipline: 'Psychological resilience and security,' 'Financial management,' 'Social training,' 'Adaptation in society,' 'Presentation of one's abilities' and others. For the formation of readiness for safe living among students with disabilities at the country's higher educational institutions, it is necessary to open a new specialism at pedagogical and medical universities: 'Teacher (specialist) of safe living for persons with disabilities.'

Conclusions. The pilot study carried out demonstrated the important necessity of forming readiness for safe living among students with disabilities at a higher educational institution. As statistics and practice show, more than half of the country's student youth with disabilities are unable to realise themselves in society because of their unreadiness for safe living and self-preservation in various life situations. In order to resolve this important state problem, it is necessary to prepare young people with disabilities for safe living in society and to create all the conditions required for this (for reference: more than 40 % of the country's population have health limitations, and this negative process is continuing). For the further resolution of the above social problem, the programme and methodological content and the organisational and methodological conditions for implementing this socio-pedagogical message were developed.

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Digital tools in the adaptive physical education of children with intellectual developmental disorders and asd who play football

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Abstract

Objective of the study is to provide a theoretical substantiation of the application of digital tools for developing the motor and cognitive skills of children with intellectual developmental disorders and autism spectrum disorders (ASD) in the course of football sessions.

Methods and structure of the study. Internet sources (frameworks, the websites of rehabilitation centres, scientific databases) were analysed, their total number amounting to 58 units.

Results and conclusions. On the basis of the analysis carried out, the following kinds of digital tools were identified which may be applied in work with children with intellectual developmental disorders and ASD who play football:
- motion capture systems based on infrared depth cameras (for example, Microsoft Kinect), which make it possible to track the position of the joints and of the centre of gravity in three-dimensional space;
- VR platforms with immersive football scenarios;
- AR projection systems for marking out the pitch and interactive floor complexes, which create a virtual football pitch with a goal and a ball;
- fitness trackers and 'smart' watches for monitoring heart rate and motor activity;
- phygital platforms combining physical action with digital feedback, including in the format of phygital gymnastics for children with mental impairments.

Keywords: *adaptive physical education; functional-digital approach; phygital; football; children with intellectual developmental disorders; children with autism spectrum disorders; digital technologies; VR/AR/MR; motivation; individualisation; sensory integration; cognitive skills; inclusiveness.*

Introduction. Children with intellectual developmental disorders and autism spectrum disorders experience a pronounced sensorimotor deficit. The traditional methods of adaptive physical culture in work with such children do not always ensure stable motivation; this is characterised by the fact that the children tire quickly and lose interest, have difficulty in perceiving multi-step verbal instructions, and transfer the skills they have acquired only weakly to playing and everyday situations. For children of this category who play football, the sensorimotor deficit is reflected in their ability to master this sport, which requires the skills of rapid switching of attention, spatial orientation and interaction with partners.

At the same time, contemporary children, including those with developmental features, constitute a «digital generation» and respond actively to visual and interactive stimuli. This creates the preconditions for introducing digital tools into adaptive physical education: fitness trackers, 'smart' watches, biofeedback devices, and also virtual (VR), augmented (AR) and mixed (MR) reality technologies and motion capture systems [1].

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sources (frameworks, the websites of rehabilitation centres, scientific databases) were analysed, their total number amounting to 58 units.

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- fitness trackers and «smart» watches for monitoring heart rate and motor activity;
- phygital platforms combining physical action with digital feedback, including in the format of phygital gymnastics for children with mental impairments.

As the results of the analysis showed, in team sports digital tools ensure the integration of visual support into playing exercises: they highlight the zones of the pitch, the directions of dribbling and the trajectories of the shot, which simplifies the perception of instructions and reduces anxiety and sensory load.

Thanks to immediate feedback and a clear visual result, children more frequently repeat and consolidate the motor actions characteristic of football – dribbling, stopping and passing the ball, shooting at goal, and movements in defence. According to pilot observations, the use of VR scenarios increased the number of repetitions of an exercise by 25-30 % as compared with the traditional form of the session, while the attention-holding time increased from 4-5 to 8-10 minutes. These observations accord with the data of meta-analyses showing that VR technologies improve motor skills in children with ASD, and that exergames based on Kinect and similar platforms raise the indicators of balance, coordination and engagement in children with developmental disorders [3].

With the help of digital tools, the individualisation of the load and of the teaching plan is implemented automatically – that is, the system independently distributes the level of difficulty depending on the dynamics of the successful performance of the exercises, which corresponds to the principle of the zone of proximal development.

It is noted that the digital environment in the training of children with intellectual disorders and ASD who play football helps them to cope with sensory difficulties thanks to the predictability and structuredness of the tasks. The integration of the physical and the digital components of the training session contributes to the development of motor, cognitive (planning, switching of attention, spatial thinking) and social (interaction, taking turns, team play) skills. Monitoring and the assessment of the dynamics are carried out objectively and automatically, which makes it possible to obtain data on the physical condition of the participants practically in real time [2].

Conclusions. The application of VR/AR/MR technologies, of motion capture systems and of the phygital environment makes it possible to develop purposefully the motor, cognitive and social skills of children with intellectual disorders and ASD who play football. The effectiveness of digital tools is achieved subject to the following conditions: the dosing of the sensory load, prior familiarisation with the interface, the accompaniment of an adult, and the adaptation of the visual material to the individual features of the child.

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Formation of competences for overcoming transitions in the structure of the social support of young athletes

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Abstract

Objective of the study is the formation of competences for overcoming transitions in the structure of the social support of young athletes.

Methods and structure of the study. A model for overcoming critical transitions was developed on the basis of a study of the trajectory of the sporting career from the point of view of the important transitions that lead to a change in the inner attitude towards the surrounding reality, both in the sporting and in the other spheres of young athletes' life activity.

Results and conclusions. Social support in the form of the formation of competences for overcoming transitions creates a social environment and helps the young athlete to integrate into different contextual conditions. The model developed for overcoming critical transitions in sporting and educational activity makes it possible to form the skills of overcoming difficulties and of self-improvement in young athletes.

Keywords: *sporting activity, young athletes, methods of socialisation, transition competences, education, counselling.*

Introduction. A topical question of contemporary sport is the combination of the sporting and the educational activity of qualified athletes, which requires a high level of motivation, purposefulness and responsibility on the part of the participants. The expediency of developing a normative basis for the interaction of the systems of sport, education and the vocational guidance of young athletes is emphasised [2].

The absence of a normative basis and of a methodology of interaction at ministry level makes topical the development of corresponding dual-career programmes for young athletes, enabling them to combine sporting activity with obtaining general and vocational education [3].

The search for a balance between sport, education and the acquisition of competences in the profession being mastered determines the creation of conditions for the beginning, the development and the systematic transition of sporting activity into professional activity, in combination with the solution of social and material tasks and with creative and spiritual self-realisation. Above all, this implies flexible and qualified support for all-round development in the various spheres of public and professional activity as competent and full-fledged members of society [1]. Flexibility implies taking account of the athlete's individual priorities in the selection of the means of providing pedagogical support. Qualification is manifested in the selection of real didactic means for developing a curriculum, for developing communicative or project skills, for neutralising stress and for building professional contacts.

Objective of the study is the formation of competences for overcoming transitions in the structure of the social support of young athletes.

Methods and structure of the study. The study involved 47 athletes aged 14.3±1.4 years, with a sports experience of 5.4±0.9 years, training in the martial arts sector of the 'Sambo-70' Sport and Education Centre. The trajectory of the sporting career was studied from the point of view of the important transitions that lead to a change in the inner attitude towards the sur-

rounding reality, both in the sporting and in the other spheres of life activity.

The study examined the bifurcation points of the sporting career corresponding to the age periods of the athlete's development and to event-related factors, on the basis of which a model was developed for overcoming the critical transitions connected with a change of sports specialisation, with the emergence of stress, with difficulties of communication with peers, with the transfer to another coach, and so on. The model described the following sequence of events:

- the emergence of the demands of transition, prompting the athlete to change the trajectory of sports training or of other spheres of activity;

- the assessment of the possibility of achieving a dynamic balance between the barriers standing in the way of resolving the situation and the transition resources (psychological, social, material, competence-related);

- the conscious constructive resolution of, or adaptation to, the situation by means of applying problem-oriented coping strategies for adapting to the demands of transition;

- the attainment of a result depending on the quality of the constructiveness — maladaptivity of the effect of the mechanisms of coping with stress, life situations and internal conflicts.

Among the methods of socialisation the following were used:

- preventive measures revealing the problems connected with the transition stages and the need to develop resources for the effective overcoming of critical situations;

- consultations with vocational guidance specialists, including on the dual career of athletes.

The methods of counselling were applied in the context of the dual career of young athletes with the aim of orientation and social support in choosing a way of life that makes it possible to combine sporting activity with education and social communication, and also to pass through the transition periods of life activity painlessly.

The effectiveness of the model for overcoming critical transitions was assessed on the basis of the evaluation indicators given by experts – sports educators and vocational guidance specialists – according to the results of the athletes' mastery of the competences for overcoming expected and unpredictable transitions.

Descriptive statistics were used for the generalisation and presentation of the results, including frequency analysis, the calculation of mean values and percentages, and the calculation of the chi-squared criterion (χ^2). The data analysis was carried out using Microsoft Excel and Statistica software.

Results of the study and discussion. The study of the sporting career from the point of view of the important transitions that lead to a change in the inner attitude towards the surrounding reality showed that these changes are, as a rule, associated with stress and uncertainty. This leads to the activation of the mechanisms of overcoming difficulties, which objectively include a number of new additional demands connected with the training process, with competitions, with communication with peers and with the way of life. The difficulties that arise are manifested in the form of objective conditions, adaptation to which will help the athlete to achieve sporting results and to adjust to the new conditions in the transition to life outside sport.

The transitions observed in an athlete's career may be classified into two categories – expected and unpredictable. Planned (expected) transitions from the initial to a high level of sports training allow the athlete to apply strategies for overcoming the demands of transition. Adaptation to new conditions may be complicated by unexpected (unpredictable) events – the absence of prior preparation for the end of the career; the athlete's passive position; and the differences between the athlete's status in sport and after the end of the career.

Table 1. Assessment of the athletes' competences for overcoming transitions

Name of the competences	Mean score		p
	before	after	
Ability to rethink self-identification beyond the limits of sporting activity	3.8±0.1	4.2±0.6	<0.05
Emotional stability and the skills of regulating emotions	3.4±0.1	4.0±0.5	<0.05
Ability to use effective strategies for coping with stress	3.8±0.2	4.6±0.3	<0.05
Ability to form new interests and goals	3.7±0.4	4.0±0.3	<0.05

The studies showed that the difficulties of transition, not only in the sporting but also in the other spheres of life, are perceived by athletes as stressful psychological and social factors that negatively affect academic, professional and social success.

The models of transition to a social status determine the importance of having resources for the successful overcoming of such transitions – internal and external sources that promote the implementation of transition strategies: previous experience, motivation, and the social and material support of the athlete. Among the factors listed, social support is defined by athletes as the most important instrument of socialisation throughout the entire sporting career. An insufficient level of social competences, interpersonal conflicts and the difficulties of combining sport and education constitute barriers impeding adaptation to the newly arising conditions of transition.

The dynamic balance between the transition resources and the barriers, conditioned by the close interrelations between the various spheres of life activity, is achieved in a non-linear way, connected both with the construction of long-term sports training and with the development of the athlete's personal, social and educational spheres. The key idea is that the balance is formed at the junction of the various spheres of life activity, which do not exist in isolation from one another. Progress in one area, for example in sport, is determined by the other spheres – personal motivation, social ties, the educational process and social experience. At the same time, problems in one sphere – stress, burnout, a lack of resources – may be compensated for by development in other directions.

The attainment of a balance between the transition resources and the barriers includes various scenario stages. Among the non-linear periods one may single out phases of intensive work alternating with phases of active recovery or of learning, in which new skills and educational competences are mastered.

Taking the interrelations into account presupposes a differentiated approach to the choice of the means of improvement in the various spheres of activity, since what is applicable to one sphere does not always work automatically in the others (for example, the development of time management helps both in training and in study, but does not work in social adaptation).

Adaptation of the plan: under the influence of the conditions of the environment, the chosen balance plan is subject to constant review and adjustment, and this is what determines the non-linearity of the process.

Conclusions. The development of strategies for the effective overcoming of the transition (predictable and unpredictable) periods of sporting and educational activity makes it possible to form the skills of overcoming difficulties and of self-improvement, to assess the possibility of combining the various aspects of life activity, and to develop the independence and responsibility of young athletes. Social support in the form of the formation of competences for overcoming transitions creates a social environment and helps the young athlete to integrate into different contextual conditions, to master new social roles and to pass through the stages of socialisation more effectively.

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A regional approach to the physical education of university students

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Abstract

Objective of the study is to substantiate, develop and pilot in practice a multi-level approach in the physical education of university students.

Methods and structure of the study. The research was carried out on the educational base of the Siberian Federal University, Krasnoyarsk, from 2024 to 2026. More than 500 first- and second-year students took part in the preliminary stage of the work. Over the course of two years the state and dynamics of the physical fitness of first- and second-year students were assessed. For the collection of the factual material the following research methods were selected and formed: analysis of the scientific and methodological literature on the subject of the study, questionnaire surveys, sociological interviewing, pedagogical observation, testing of physical fitness, the method of expert assessments, methods of mathematical statistics and others. In all, more than 50 observations of the educational process of the physical education of university students were carried out, 10,000 measurements of the students' physical fitness indicators were taken, and more than 70 different scientific and methodological sources were analysed. The theoretical and statistical material compiled from the results of the study carried out facilitated the substantiation of the need to design a multi-level approach in the physical education of students, to develop a pedagogical technology for the functioning of the experimental approach and to introduce multi-level monitoring of the physical fitness of university students.

Results and conclusions. On the completion of the scientific and theoretical work carried out, the structure and content of a pedagogical technology for implementing a multi-level approach in the physical education of university students were developed. Levels of the students' physical fitness were also developed: low, intermediate and high. In order to raise the physical fitness indicators of university students with different levels of readiness, corrective methodologies were developed for students with low, intermediate and high levels of fitness. These multi-level methodologies are correctly and selectively directed at the progressive and dynamic formation of physical fitness indicators, at harmonious physical development and at raising the level of physical readiness of contemporary university students.

Keywords: *differentiated approach, physical education, students, higher education institution, pedagogical technology, differentiated methods.*

Introduction. Contemporary statistical analysis of the physical fitness of student youth shows an unfavourable background of students' physical readiness at the country's higher educational institutions. If the physical fitness indicators of contemporary students are compared with the standards of the All-Russian Physical Culture and Sports Complex «Ready for Labour and Defence» (GTO) – a universal system of assessing and monitoring the physical and applied readiness of the country's population — the following negative statistics on the basic physical fitness indicators of students emerge ($\bar{X} \pm \sigma$): in the 3000 m run ($\bar{X}$= 15.20 ± 2.05); in pull-ups on the high bar ($\bar{X}$ = 7.13 ± 2.2); and in the 100 m run ($\bar{X}$ = 15.2 ± 1.2). Of the three basic physical fitness indicators, the young men attain the bronze GTO badge only in the 100 m run. In the young women the physical fitness indicators are as follows: in the 100 m run ($\bar{X}$ = 18.1 ± 1.03); in raising the trunk from a lying position in one minute ($\bar{X}$ = 37.0 ± 5.3); and in the 2000 m run ($\bar{X}$ = 14.75 ± 1.15). The GTO badges attained by the young women are in the 100 m run (bronze badge) and in raising the trunk (silver badge). The statistical material presented attests to the multi-level fitness of university students and to the high percentage of low

physical fitness indicators. There therefore arises an acute need to design a multi-level approach to correcting the basic physical fitness indicators of students in physical education at a higher educational institution.

Objective of the study is to substantiate, develop and pilot in practice a multi-level approach in the physical education of university students.

Methods and structure of the study. The research was carried out on the educational base of the Siberian Federal University, Krasnoyarsk, from 2024 to 2026. More than 500 first- and second-year students took part in the preliminary stage of the work. Over the course of two years the state and dynamics of the physical fitness of first- and second-year students were assessed. For the collection of the factual material the following research methods were selected and formed: analysis of the scientific and methodological literature on the subject of the study, questionnaire surveys, sociological interviewing, pedagogical observation, testing of physical fitness, the method of expert assessments, methods of mathematical statistics and others. In all, more than 50 observations of the educational process of the physical education of university students were carried out, 10,000 measurements of the students' physical fitness indicators were taken, and more than 70 different scientific and methodological sources were analysed. The theoretical and statistical material compiled from the results of the study carried out facilitated the substantiation of the need to design a multi-level approach in the physical education of students, to develop a pedagogical technology for the functioning of the experimental approach and to introduce multi-level monitoring of the physical fitness of university students.

Results of the study and discussion. In our work we give the following definition of the key term: a «multi-level approach» is a pedagogical process in the physical education of university students directed at taking account of the initial physical fitness indicators of the participants (high, intermediate and low levels), in accordance with which the process of physical education is carried out – namely, for each level of student fitness, multi-level methodologies are formed, directed at the correct and progressive development of the students' physical fitness indicators.

Table 1 presents the levels of physical fitness of university students in points, calculated on the basis of the mean indicators and the sigma values.

As the statistical analysis of the physical fitness of university students shows, 60-70 % of the young men have low indicators in the 3000 m run (general endurance); 40-50 % in the 100 m run (speed qualities); and 30-40 % in pull-ups on the high bar (strength indicators of the shoulder girdle). In the young women, low indicators are found in the 2000 m run in 80-90 % (endurance); in the 100 m run in 60-70 % (speed qualities); and in raising the trunk from a lying position in one minute (strength indicators of the abdominals) in 30-40 %.

These statistics show that contemporary young people do not devote due attention, desire or readiness to developing general endurance – an important indicator of the physical and functional readiness of the human organism – or speed-strength qualities, which contribute to the formation of the muscular system that protects a person's internal organs from external influences, and so on. Contemporary student youth are oriented towards obtaining a quick result in all areas of activity, including in the formation of physical health, and are not

Table 1. Levels of physical fitness of university students

No.	Control exercises of physical fitness	Gender	Levels of physical fitness, in points		
			low	intermediate	high
1	1. 100 m run; 2. 3000 m run; 3. Pull-ups on the high bar.	M	6	10	13
2	1. 100 m run; 2. 2000 m run; 3. Raising the trunk from a lying position in one minute.	F	7	11	13

M – young men; F – young women.

Table 2. Multi-level methodology for forming the physical fitness of university students with different levels of readiness

Year	Level of PF	Tasks	Means	Differentiation of the means, heart-rate load	Semesters of the academic year
First year	Low level	Raising the level of the physical qualities with low indicators	Track and field, athletic gymnastics, sports games, fitness training	1. Running at HR 120-140 beats/min — 15 % 2. Running at HR 140-160 beats/min — 25 % 3. Running at HR 160-180 beats/min — 10 % 4. Strength exercises — 30 % 5. Sports games — 20 %	Semesters 1-2
	Intermediate level	Raising the general level of PF	Track and field, sports games, strength gymnastics on machines, fitness training	1. Running at HR 120-140 beats/min — 10 % 2. Running at HR 140-160 beats/min — 25 % 3. Running at HR 160-180 beats/min — 15 % 4. Strength exercises — 20 % 5. Combined relays — 10 % 6. Outdoor and sports games — 20 %	Semesters 1-2
	High level	Improvement of physical qualities, fulfilment of sports categories	Track and field, athletic gymnastics, sports games, fitness training	1. The sessions take the form of sports training in the individual kinds of control exercises (3000 m run, 100 m run, strength multi-event) 2. Track-and-field exercises at an intensity from 160 to 200 beats/min 3. Strength exercises are performed at up to 70 % of the maximum weight	Semesters 1-2

PF – physical fitness; HR – heart rate.

prepared, either in motivation or psychologically, for systematic prolonged physical training, which is what leads to the unfavourable statistics indicated above.

In order to improve the basic physical fitness indicators of students, it is necessary to incorporate into the process of the physical education of young people a multi-level approach, which, on the basis of taking account of the low results in physical readiness, makes it possible to develop multi-level methodologies directed at the selective correction of the students' physical qualities.

Table 2 presents the multi-level methodologies for raising physical fitness indicators, in which, for university students with a low level, the main attention is paid to raising general endurance; with an intermediate level, to raising speed-strength qualities; and for students with a high level of fitness, attention is paid to fulfilling the GTO standards for the gold and silver badges.

Conclusions. The scientific and theoretical research carried out facilitated the development of a multi-level approach in the physical education of university students, based on taking account of the initial level of physical fitness with the subsequent correction of the students' physical indicators through the application of multi-level methodologies. Such an innovative multi-level approach will contribute to the correct physical education of students, to an effective increase in the physical fitness of student youth and to bringing the system of the physical education of students at a higher educational institution to a higher educational level.

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