Methodology for the development of general and special physical training in young wrestlers

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Abstract
This article highlights the modern methodological features for developing the general and special physical training of 13-15-year-old wrestlers. The objective of the research is to determine and implement the optimal ratio of general and special physical loads to enhance the physical capabilities and technical-tactical skills of young athletes. The article analyzes the traditional training system and evaluates a new set of exercises developed with consideration for age-specific characteristics, along with their effectiveness. The research conducted proves that the proposed methodology facilitates the systematic development of strength, speed, endurance, and flexibility in young wrestlers, as well as enhances their functional capabilities on the mat. The results of performance analysis and the pedagogical experiment confirm the significance of the developed methodology in increasing the effectiveness of sports training.
Keywords: young wrestlers, general physical training (GPT), special physical training (SPT), methodology, pedagogical experiment, functional capabilities, physical qualities.

Introduction

During the initial assessments conducted in the control and experimental groups, a series of tests was used to determine the general and special physical preparedness, coordination level, psycho-physiological qualities, and anthropometric data of 13-15-year-old wrestlers.

A comparative analysis of the initial assessment results revealed no statistically significant differences ($P>0.05$) between the control and experimental groups, which indicates the similarity of the groups.

Based on the analysis of the differences between the main indicators of general physical preparedness in the control and experimental groups, no statistically significant differences ($P>0.05$) were recorded.

In the analysis of the special physical preparedness test results, statistically significant differences ($P<0.05$) were noted in the "Execution of 32 SPTA" test, where the results in the experimental group (97.38±12.54 s) were found to be better than those in the control group (107.13±13.74 s). This is explained by the fact that the wrestlers in the experimental group have more firmly mastered the skills of using combinations. Specifically, these technical-tactical actions constitute their main competitive exercises, and in turn, special attention is paid to the acquisition and improvement of these combinations during their training sessions.

Additionally, significant differences ($P<0.05$) were identified in the results of the "*jump with a precise landing*" test, which characterizes coordination abilities (accuracy of muscle exertion and spatial coordination). This is explained by the fact that mastering combinations and employing a combinational style of attack place high demands on coordination abilities.

The purpose of the study is to improve the general and special physical fitness indicators of 13-15-year-old wrestlers at the educational-training stage.

Results and discussion

Based on the analysis of intra-group changes, the following can be noted: specifically, during the pedagogical experiment, significant changes ($p<0.05$) were recorded in the experimental groups in the results of tests characterizing the following physical qualities and abilities: speed ("60-meter run," "standing long jump"), speed-strength abilities ("push-ups from a supine position with feet on a gymnastic bench for 15 seconds," "sit-ups for 20 seconds," "time to perform 18 throws"), flexibility ("forward bend from a standing position on a gymnastic bench," "standing bridge"), strength abilities ("pull-ups on a horizontal bar," "push-ups from a prone position," "handgrip dynamometry"), special endurance ("acrobatic combination," "Romberg's test," "running in a wrestler's bridge"); psychophysiological qualities ("simple and complex reaction time," "tapping test for 10 seconds"); and anthropometric indicators ("height," "body weight," "chest circumference and excursion,"

Table 1. Dynamics of general and special preparedness of wrestlers at the beginning of the experiment (n = 24)

No.	Tests		Statistical indicators				Significance
			Xmean	σ	V, %	m	p < 0.05
1	60-meter dash (s)	EG	10.28	0.573	5.6	0.12	
		CG	10.02	0.64	6.4	0.13	0.144
2	3×10 meter shuttle run (s)	EG	8.07	0.532	6.6	0.11	
		CG	8.05	0.43	5.4	0.09	0.880
3	1000-meter run (s)	EG	262.71	24.33	9.3	4.97	
		CG	263.36	26.37	10.0	5.38	0.865
4	Pull-ups (hanging from a horizontal bar, flexing and extending arms) (reps)	EG	11.42	7.49	65.6	1.53	
		CG	10.17	6.31	62.1	1.29	0.535
5	Push-ups (reps)	EG	38.46	17.24	44.8	3.52	
		CG	40.13	16.65	41.5	3.40	0.735
6	Push-ups in a prone position for 15 seconds (reps)	EG	15.63	3.85	24.7	0.79	
		CG	15.92	3.02	19.0	0.62	0.772
7	Standing long jump (cm)	EG	186.87	12.75	6.8	2.60	
		CG	188.04	11.66	6.2	2.38	0.742
8	Sit-ups (flexing and extending the torso from a supine position) (reps)	EG	18.08	1.93	10.7	0.39	
		CG	18.79	1.53	8.1	0.31	0.166
9	Sit-and-reach test (leaning forward while standing on a bench) (cm)	EG	9.83	2.22	22.6	0.45	
		CG	9.88	1.90	19.2	0.39	0.945
10	Handgrip dynamometry (dominant hand)	EG	14.92	4.45	29.8	0.91	
		CG	15.88	3.57	22.5	0.73	0.415

Table 2. Dynamics of special physical preparedness of wrestlers at the beginning of the experiment (n = 24)

No.	Tests		Statistical indicators				Reliability	No.	Test Name		Statistical Indicators				Difference
			Xmean	σ	V, %	m	P < 0.05				Xmean	σ	V, %	m	p < 0.05
1	Throwing an opponent over the shoulder 5 times (s)	EG	11.21	2.39	21.3	0.49		10	10-second tapping test (reps)	EG	56.79	5.36	9.4	1.10	
		CG	11.22	2.28	20.3	0.47	0.979			CG	56.88	5.34	9.4	1.10	0.957
2	Throwing an opponent 20 times (s)	EG	39.28	12.81	32.6	2.61		11	40-second tapping test (reps)	EG	206.83	19.33	9.3	3.95	
		CG	38.64	11.85	30.7	2.42	0.857			CG	207.46	19.85	9.6	4.05	0.912
3	Transition from standing to bridge position	EG	4.17	0.87	20.9	0.18		12	Body weight (kg)	EG	39.24	9.63	24.5	1.96	
		CG	4.21	0.78	18.5	0.16	0.862			CG	39.52	9.48	24.0	1.94	0.919
4	Wrestler's bridge (assessment)	EG	3.75	0.79	21.1	0.16		13	Height (cm)	EG	148.75	7.21	4.8	1.47	
		CG	3.58	0.72	20.1	0.15	0.449			CG	148.71	6.99	4.7	1.43	0.984
5	Acrobatic combinations (assessment)	EG	4.38	0.77	17.6	0.16		14	Chest circumference (cm)	EG	70.08	5.80	8.3	1.18	
		CG	4.29	0.69	16.1	0.14	0.695			CG	69.50	5.00	7.2	1.02	0.711
6	360-degree walking straight after 10 turns (assessment)	EG	3.46	1.22	35.3	0.25		15	Spirometry (ml)	EG	2058.33	321.57	15.5	65.64	
		CG	3.54	1.06	29.9	0.22	0.801			CG	2075.00	257.50	12.4	52.56	0.844
7	Jump for landing accuracy (cm)	EG	1.39	0.72	51.8	0.15									
		CG	1.46	0.49	33.6	0.10	0.698								
8	Romberg test (s)	EG	9.31	5.94	63.8	1.21									
		CG	9.58	5.38	56.2	1.10	0.867								
9	Simple motor reaction time (s)	EG	0.162	0.012	7.6	0.003									
		CG	0.164	0.014	8.5	0.003	0.608								

Note: EG – Experimental Group; CG – Control Group; Xmean – Mean; σ – Standard deviation; V – Coefficient of variation; m – Standard error of the mean.
P < 0.05 – The difference is statistically significant at the 0.05 level.

Table 3. Dynamics of wrestlers' psychophysiological qualities, anthropometric indicators, and general and special preparedness at the end of the experiment (n=24)

No.	Test Name		Statistical Indicators				Reliability of Differences	No.	Test Name		Statistical Indicators				Reliability of Differences
			X mean	σ	V, %	m	P < 0.05				X mean	σ	V, %	m	P < 0.05
1	60-meter run (s)	EG	10.01	0.70	7.0	0.14		20	Simple motor reaction time (sec.)	EG	0.158	0.012	7.5	0.002	
		CG	9.94	0.60	6.0	0.12	0.735			CG	0.161	0.014	8.4	0.003	0.417
2	3x10-meter shuttle run (s)	EG	8.11	0.62	7.6	0.13		21	Tapping test in 10 seconds (count)	EG	58.75	6.05	10.3	1.23	
		CG	8.02	0.40	5.0	0.08	0.552			CG	60.54	5.92	9.8	1.21	0.305
3	1000-meter run (s)	EG	266.58	25.11	9.4	5.13		22	Tapping test in 40 seconds (count)	EG	211.13	20.61	9.8	4.21	
		CG	264.17	24.41	9.2	4.98	0.737			CG	218.79	21.29	9.7	4.35	0.211
4	Pull-ups (reps)	EG	14.04	8.83	62.9	1.80		23	Body weight (kg)	EG	42.83	11.82	27.6	2.41	
		CG	13.71	7.23	52.8	1.48	0.887			CG	43.14	11.25	26.0	2.30	0.928
5	Sit-ups (reps)	EG	47.04	19.33	41.1	3.95		24	Height (cm)	EG	151.69	7.89	5.2	1.61	
		CG	50.42	19.59	38.9	4.00	0.551			CG	151.67	7.78	5.1	1.59	0.993
6	Push-ups in 15 seconds (number of reps)	EG	16.75	3.60	21.5	0.74		25	Chest circumference (cm)	EG	71.88	7.74	10.8	1.58	
		CG	17.38	2.90	16.7	0.59	0.511			CG	70.83	6.66	9.4	1.36	0.619
7	Standing long jump (cm)	EG	193.04	13.91	7.2	2.84		26	Spirometry (ml)	EG	2227.08	308.21	13.8	62.91	
		CG	194.12	12.45	6.5	2.54	0.777			CG	2204.17	355.67	16.1	72.60	0.812
8	Sit-ups with hands behind head in 20 seconds (number of reps)	EG	19.38	2.67	13.8	0.54		27	S, %	EG	20.20	10.05	49.8	2.05	
		CG	19.88	1.75	8.8	0.36	0.447			CG	9.59	9.80	102.2	2.00	**0.001***
9	Forward bend from a standing position on a bench (cm)	EG	10.50	2.09	19.9	0.43		28	KTTH, %	EG	30.64	15.38	50.2	3.14	
		CG	10.50	1.82	17.3	0.37	1.000			CG	26.85	14.43	53.7	2.95	0.384
10	Sit-to-stand in 30 seconds (number of repetitions)	EG	33.38	3.53	10.7	0.73		29	KAOP, %	EG	20.87	10.94	52.4	2.23	
		CG	34.83	2.82	8.1	0.58	0.125			CG	24.61	13.21	53.7	2.70	0.292
11	Hand-grip dynamometry (in conventional units)	EG	16.58	3.03	18.3	0.62		30	KMTTT, %	EG	68.80	31.29	45.5	6.52	
		CG	17.83	2.99	16.8	0.61	0.157			CG	50.71	34.70	68.4	9.27	0.123
12	5 throws (sec.)	EG	10.80	2.29	21.2	0.47		31	KTTH, %	EG	6.07	7.50	123.6	1.53	
		CG	10.43	2.03	19.5	0.41	0.552			CG	7.32	8.53	116.5	1.74	0.593
13	18 throws (sec.)	EG	35.24	10.75	30.5	2.19		32	KAOP, %	EG	6.42	7.93	123.5	1.62	
		CG	33.85	9.95	29.4	2.03	0.644			CG	7.50	8.71	116.1	1.78	0.655
14	32 special technical-tactical actions (STTA) (sec.)	EG	97.38	12.54	12.9	2.56		33	KMTTT, %	EG	5.69	13.79	242.4	2.87	
		CG	107.13	13.74	12.8	2.80	**0.014***			CG	4.76	12.10	254.2	3.23	0.831
15	Standing posture assessment (score)	EG	4.50	0.66	14.7	0.13		34	RTTH, conventional unit	EG	5.55	1.62	29.2	0.33	
		CG	4.63	0.58	12.5	0.12	0.488			CG	5.72	2.40	42.0	0.49	0.783
16	Splits (score)	EG	3.38	1.05	31.1	0.21		35	*AOP, conventional unit	EG	5.53	1.53	27.7	0.31	
		CG	3.50	0.95	27.1	0.19	0.667			CG	5.47	2.36	43.1	0.48	0.914
17	Bridge pose (score)	EG	4.25	0.53	12.5	0.11		36	R MTTT, conventional unit	EG	5.87	2.03	34.6	0.43	
		CG	3.88	0.80	20.6	0.16	0.062			CG	6.99	3.12	44.6	0.90	0.278
18	Jump with landing accuracy (cm)	EG	1.11	0.54	48.6	0.11		37	KHIMOYA, %	EG	73.15	13.49	18.4	2.75	
		CG	1.44	0.54	37.5	0.11	**0.036***			CG	79.82	11.11	13.9	2.27	0.068
19	Romberg's test (sec.)	EG	11.20	6.00	53.6	1.23		38	Attack interval (s.)	EG	19.69	5.63	28.6	1.15	
		CG	11.71	5.44	46.5	1.11	0.758			CG	21.28	9.45	44.4	1.93	0.483

Note: EG (TG) – Experimental Group; CG (NG) – Control Group; X mean – Mean; σ – Standard deviation; V – Coefficient of variation; m – Standard error of the mean.
P < 0.05 – The difference is statistically significant at the 0.05 level.
* – Statistically significant difference (p < 0.05).

"vital capacity of the lungs").

In the control group, statistically significant changes ($p<0.05$) were recorded in the results of tests characterizing the following physical qualities and abilities: specifically, speed ("60-meter dash," "standing long jump"), speed-strength abilities ("push-ups from a gymnastic bench with feet supported, for 15 seconds," "sit-ups in a supine position for 20 seconds," "squats for 30 seconds," "time to perform 5 throws," "time to perform 18 throws"), flexibility ("forward bend from a standing position on a gymnastic bench"), strength abilities ("pull-ups on a horizontal bar," "push-ups from a prone position," "hand dynamometry"); special endurance ("time to perform 32 MTTHs"), coordination abilities ("Romberg's test"), psycho-physiological qualities ("simple and complex reaction time," "10-second tapping test"), and anthropometric

indicators ("body weight," "height," "chest circumference and excursion," "vital lung capacity").

Correlation analyses performed on the indicators were confirmed during the experiments. Thus, a correlation was identified between the effectiveness of special technical-tactical actions and the "jump with precise landing" test (r = –0,498). Additionally, a correlation was noted between the effectiveness of the opponent's counter-attacking actions against special technical-tactical actions and the "evaluation of acrobatic combinations" (r = –0,424).

According to experts, the key components of coordination ability in wrestling consist of spatial coordination, muscular sensitivity, and dynamic balance.

Conclusion

Thus, based on a comparison of test results that recorded the changes in both groups during the pedagogical experiment, it can be noted that the changes in many indicators characterizing various aspects of the wrestlers' preparedness were similar in both groups. This is determined by the main characteristics of the sensitive period for the development of physical qualities.

However, it should be noted that in comparing statistically significant changes on a number of tests within the control group, no reliable differences were observed in the wrestlers of the experimental group, despite recorded improvements in their general and special physical fitness indicators. Specifically, this was observed in the results of the tests characterizing speed-strength abilities: "sit-stands in 30 seconds" and "time to perform 5 throws." It was determined that reliable changes in the level of physical fitness are correlated with competitive activity.

A statistically significant improvement was identified in the "time to perform 5 throws" test results for the wrestlers in the control group, which is reflected in the results of their competitive activity. Thus, for example, for the Ka indicator, a statistically insignificant ($p>0.05$) increase in the effectiveness of individual techniques was recorded for the wrestlers in the control group (Xmean=24.61±13.21), compared to the wrestlers in the experimental group (Xmean=20.87±10.94).

The correlation analysis performed revealed a sufficiently strong relationship between the "time to perform 5 throws" test and the effectiveness of an individual technique (r = –0.624).

In the experimental group, statistically significant ($p<0.05$) improvements were observed within the group based on the results of tests characterizing coordination abilities, namely the "wrestler's bridge run" and "acrobatic sequences" tests. Furthermore, in a comparison between the groups, wrestlers in the experimental group demonstrated statistically significant ($p<0.05$) superior results on the "jump with a precise landing" test. It is plausible that the use of methods aimed at improving coordination abilities, which provided an advantage to the wrestlers in the experimental group for this type of training, along with the overall application of the developed methodology, contributed to the enhancement of their technical and tactical skills in a standing position.

This assumption was confirmed by a correlation analysis conducted during the initial and main experiments. This analysis revealed a strong correlation between parameters characterizing the competitive performance of judokas (combinational ability, effectiveness of the opponent's counterattack against special technical-tactical actions, effectiveness of individual techniques and special technical-tactical actions, number of matches won, and final ranking in the competition) and tests characterizing coordination abilities ("running in the wrestler's bridge position," "acrobatic sequence," "walking straight after 10 turns").

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