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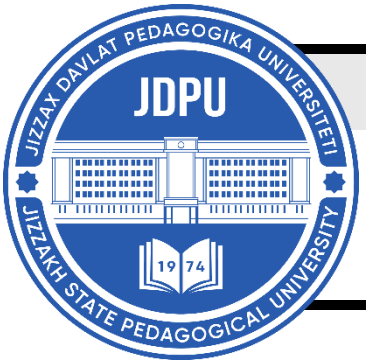

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DETERMINING THE EFFECTIVENESS OF USING INNOVATIVE TOOLS IN DEVELOPING THE STRENGTH QUALITY OF 11–13-YEAR-OLD STUDENTS (PRELIMINARY RESULTS)

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ABOUT ARTICLE

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Abstract: This article presents the data of the analysis of the results recorded at the beginning of the pedagogical experiment on the development of strength qualities using exercises performed due to the resistance of one's own weight and the developed non-standard innovative sports equipment.

Introduction. In the modern world, special attention is being paid to the further development of physical education and sports, in particular to the promotion of mass sports, the involvement of all segments of society in physical culture, and the increase of public participation in sports activities. At present, the issue of improving the physical preparedness of general secondary school students remains one of the most urgent problems in the theory and practice of school physical education.

To address this issue, it is necessary to promote the widespread use of specific exercises performed through one's own body weight resistance — exercises aimed at developing strength qualities, which are becoming increasingly popular worldwide. It is also essential to create systematic movement programs that allow students to demonstrate their abilities and to conduct scientific research on this subject.

Since the organism of children at this age (11–13 years) is in a stage of rapid growth and development, properly organized physical exercises provide wide opportunities for developing such important physical qualities as strength and endurance. According to modern approaches, it is necessary to use innovative tools effectively, alongside traditional methods, in the process of strength development. For this reason, research on developing strength qualities using innovative means has significant relevance.

One of the most important directions of physical training is the development of strength qualities. In the modern system of sports and physical education, innovative technologies and tools are widely applied to improve strength development.

Innovative tools are means developed on the basis of modern technologies, interactive equipment, and new pedagogical methods that contribute to the effective development of physical qualities. Along with traditional physical education tools, the use of modern sports equipment such as the innovative pull-up bar increases students' interest in physical exercises and helps organize training sessions more effectively.

The innovative pull-up bar is a piece of sports equipment that requires dynamic movements and serves to strengthen various muscle groups of the body through nonstandard movements, while also developing coordination and mental endurance. Its advantage lies in the fact that, compared to the traditional pull-up bar, it requires greater motor activity and develops active reflexes in students.

Exercises performed with the innovative pull-up bar are an effective means of developing strength qualities, increasing physical activity, and ensuring overall physical development. This equipment promotes not only physical but also psychological improvements among students. With proper planning and regular supervision of the training process, steady physical growth can be achieved.

- The supports of the innovative pull-up bar, the diameter of both rotating surfaces, the rotation mechanism, and the ergonomic placement of the handles are designed in accordance with the age characteristics of the trainees.
- Unlike a traditional pull-up bar, the presence of special rotating surfaces allows for a variety of exercises, which increases student engagement and motivation during training.

Purpose of the Study. The purpose of this study is to determine the effectiveness of using the innovative pull-up bar in developing the strength qualities of secondary school students by comparing the results of control and experimental groups at the beginning of the pedagogical experiment.

Objectives of the Study

- To summarize and analyze the information available in scientific and methodological literature regarding the use of exercises performed on the innovative pull-up bar.
- To record and compare the results of selected tests conducted with students from the control and experimental groups, who were trained using exercises on the innovative pull-up bar, and to observe the changes that occurred during the experiment.

Research Methods. The following methods were employed in the study: analysis of scientific and methodological literature, pedagogical observation, pedagogical experiment, pedagogical testing, and mathematical-statistical methods.

Organization of the Study. The research was conducted during extracurricular physical education sessions aimed at developing students' strength qualities through the use of innovative tools. Two groups were formed, each consisting of 30 students: a control group and an experimental group. Attention was given to ensuring that the initial preparedness levels of the 11–13-year-old students in both groups were approximately equal. The results of the selected physical tests were recorded again at the end of the experiment, and statistical analysis was carried out to evaluate the changes observed.

Object of the Study. The object of the study is the process of extracurricular physical education sessions for 11–13-year-old students in general secondary schools.

Research Results and Their Discussion. At the initial stage of the pedagogical experiment, based on the analysis of available scientific and methodological literature as well as our own practical experience, we identified the main statistical characteristics of the results recorded in the control and experimental groups according to the selected tests reflecting special physical preparedness. The data comparing the differences between the groups are presented in Table 1 below.

Table 1

Comparison of the Main Statistical Characteristics of the Results Recorded in the Control (n = 30) and Experimental (n = 30) Groups at the Beginning of the Pedagogical Experiment

Test	Experimental Group			Control Group		
	$\bar{X}$	σ	V, %	$\bar{X}$	σ	V,
1	25.45	4.57	17.96	24.76	4.35	17
2	24.85	4.22	16.98	24.43	4.05	16
3	5.93	0.95	15.97	6.07	0.95	15
4	15.70	2.82	17.98	15.20	2.67	17

Test	Experimental Group			Control Group		
Average	—	—	—	—	—	—

- Note: AF – Absolute difference; NF – Relative difference (in percentages).

For convenience and consistency, the tests characterizing special physical preparedness are designated in the following order in the table and diagram:

1 – Right-hand grip strength (kg);

2 – Left-hand grip strength (kg);

3 – Number of pull-ups on the bar (times);

4 – Number of push-ups performed with hands supported on the floor (times).

- The generalization and analysis of the data presented in this table show that, at the beginning of the pedagogical experiment, there were no significant or statistically meaningful differences between the results of the control and experimental groups in the selected tests characterizing special physical preparedness.
- In particular, at the beginning of the experiment, the average arithmetic and standard deviation values of the right-hand grip strength (Test 1) among the 11–13-year-old students of the experimental group were 25.45 ± 4.57 kg (with a variation coefficient of V = 17.96%), while in the control group, these indicators were 24.76 ± 4.35 kg (with V = 17.57%).

The absolute difference between the arithmetic means of the results recorded in the experimental and control groups at the beginning of the experiment was 0.69 kg, and the relative difference was 2.71% (illustrated in Figure 1).

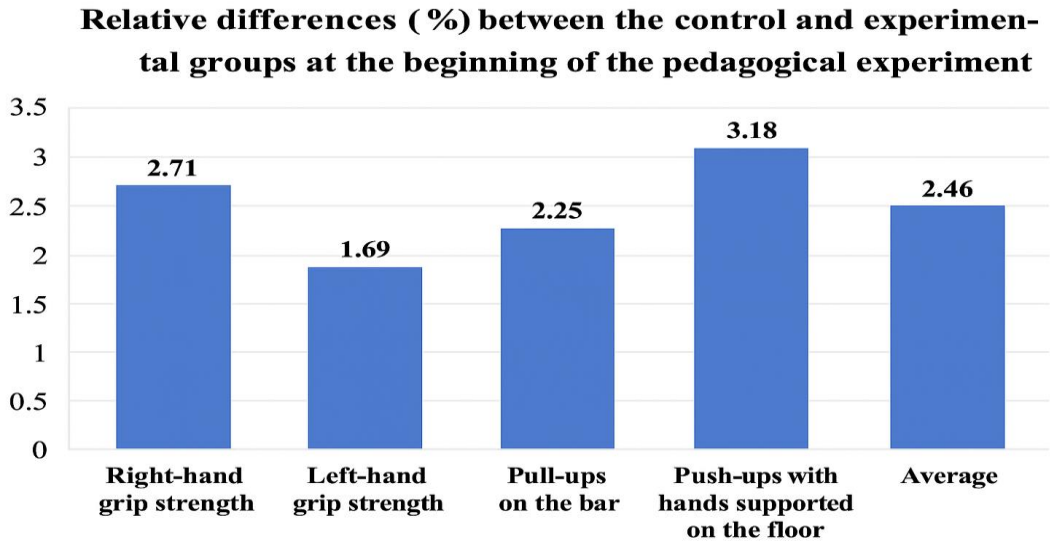

Figure 1. Diagram of the relative differences (in percentages) of the arithmetic mean values recorded in the control and experimental groups at the beginning of the pedagogical experiment

Among the tests studied, the smallest relative difference was observed in Test 2 — left-hand grip strength — amounting to 1.69%, while the largest relative difference was found in Test 4 — the number of push-ups performed with hands resting on the floor — which reached 3.18%. The average relative difference across all tests was 2.46%.

At the same time, the statistical significance of the absolute differences in the arithmetic mean values recorded in the control and experimental groups at the beginning of the pedagogical experiment was found to be statistically insignificant, as the t-values ranged from 0.39 to 0.70, with p-values between 0.6 and 0.4.

Conclusion. The fact that the average relative difference between the arithmetic mean values of the control and experimental groups at the beginning of the pedagogical experiment amounted to 2.46%, and that the statistical significance of the absolute differences between the mean values was insignificant ($p > 0.4–0.6$), demonstrates that the pedagogical experiment was methodologically well-organized. These results confirm the appropriateness of continuing the experiment.

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