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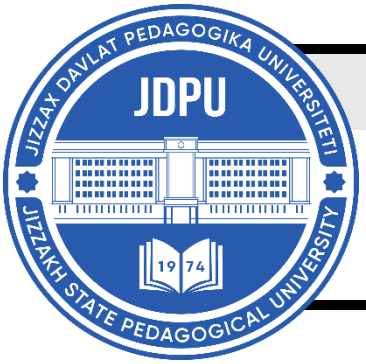

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ASSESSMENT OF RAPID DYNAMIC STRENGTH INDICATORS USED BY SKILLED WRESTLERS TO PUSH AN "OPPONENT" DOWN AND LIFT THEM UP USING AN ELECTRONIC MEASURING TRIANGLE

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ABOUT ARTICLE

Key words: belt wrestling; strength assessment; lifting techniques; throwing techniques; eccentric muscle activation; concentric muscle activation; explosive strength; speed–strength endurance; biokinematic chain; spinal extensor muscles; arm and torso muscles; destabilization of opponent.

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Abstract: This article presents findings from a three-month experiment evaluating the development rate of strength types (maximum and explosive strength) associated with lifting an "opponent" (the simulator frame) upward and pressing them downward in skilled belt wrestlers, using an electronic training device that provides real-time feedback. The study revealed that the stronger the downward pressing force applied to the opponent, the more intensive the upward lifting force can be. It was also found that these types of strength showed rapid improvement in the experimental group (EG), which regularly practiced experimentally designed exercises throughout the training period.

Introduction. In wrestling disciplines—especially belt wrestling, where the bout takes place with the opponents' hands "locked" on each other's belts—it is crucial to reliably and objectively assess the strength required to pull the opponent downward with a jerk and then sharply lift him upward.

According to most scholars, the execution of techniques involving lifting or throwing an opponent in wrestling requires timely concentric and eccentric muscle activation. At the same time, in belt wrestling, the technical elements involving lifting an opponent—elements that are of decisive importance—pose specific challenges.

[A.A. Karelin, 2002, pp. 187–193; T.S. Tumanyan, 2006, pp. 169–185; M.N. Shepetyun, 2012, pp. 97–123; F.A. Kerimov, 2018, pp. 68–89]

In particular, during a belt-wrestling bout, the fact that the arms remain constantly "locked into a biokinematic chain" attached to the opponent's belt requires destabilizing the opponent and first activating the arm, torso, and especially spinal extensor muscles in an eccentric and then in a concentric mode. This process demands the display of maximum strength demonstrated primarily through explosive power. Maintaining these strength qualities throughout the bout depends on integrated speed-strength endurance.

[A.I. Babakov, S.V. Ulyankin, 2012, pp. 17–25; M.B. Musapaev, S.V. Telenkov, 2006, pp. 14–25; Sh.S. Mirzanov, 2019, pp. 22–31]

Therefore, it is reasonable to assume that developing this type of speed-strength endurance in belt wrestling with the help of a rapid-feedback electronic training device capable of displaying each result on a screen is of significant importance.

Research Aim

The aim of the study was to examine the rate of development of explosive and maximum strength demonstrated upward and downward by skilled belt wrestlers during the pedagogical experiment.

Organization of the Research and Methods for Developing and Assessing Strength

The research was carried out at the beginning and end of a 3-month pedagogical experiment. The participants included a control group (CG), which continued traditional training, and an experimental group (EG), which, in addition to traditional training, regularly performed exercises aimed at developing explosive and maximum strength upward and downward using an electronic device providing real-time feedback. The rate of development of these strength qualities was assessed using the same measuring device.

This device was adapted to measure the explosive and maximum force exerted when lifting an opponent upward or pressing him downward by simulating the force applied to raise or press down the frame of the apparatus.

Research Results and Comparative Analysis. Before analyzing the experimental results, it is important to clarify once again the nature of the maximum and explosive strength demonstrated upward and downward in belt wrestling. Lighter and middleweight wrestlers mainly rely on explosive strength to jerk and lift an opponent. Heavyweight wrestlers, however, tend to use maximum strength for this purpose. Nevertheless, regardless of the wrestler's weight category, all athletes first press the opponent downward with considerable force—this generates a powerful "starting force" before lifting.

The results of the study demonstrated that, in the CG, the explosive force used to jerk the simulator frame upward at the beginning of the experiment (January 2019) was 1876.3 ± 353.78 N (equivalent to 187.63 kg). At the end of the experiment (late March 2019), this value increased to 1887.6 ± 339.81 N (188.76 kg). The growth rate over 3 months was 11.3 N (6.08%). It should be noted that the CG trained only with traditional methods during all 11 months, including the 3-month experiment.

In the EG, which regularly performed the recommended strength-developing exercises and movement-based games throughout the 11-month training process and during the experimental phase, the explosive strength indicator at the beginning of the experiment was 1875.8 ± 350.96 N, and by the end of the 3-month experiment it increased to 1983.5 ± 344.53 N (198.35 kg). The 3-month growth rate of explosive strength in this group amounted to 107.7 N (57.4%).

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If you want the table translated into English in full, I can do that.

Here is the translated version of the table separately, in clear academic English:

Dynamics of Changes in Isokinetic and Isometric Muscle Strength Indicators Among Highly Skilled Belt Wrestlers During the Pedagogical Experiment (n = 12)

Types of Strength	Group	Before the Test (Jan 2019)	After the Test (Mar 2019)	Difference	t	p
Maximum strength during upward lifting (N)	CG	2093.5 ± 30.6	2122.6 ± 31.6	29.1	2.29	<0.05
	EG	2099.8 ± 33.6	2161.6 ± 33.9	61.8	4.49	<0.001
Explosive maximum strength during upward swinging lift (N)	CG	1876.3 ± 25.9	1894.9 ± 25.8	18.6	1.76	>0.05
	EG	1876.9 ± 27.2	1926.6 ± 27.6	49.7	4.44	<0.001
Maximum strength during downward pressing (N)	CG	641.3 ± 10.8	651.3 ± 10.9	10.0	2.26	<0.05
	EG	641.9 ± 12.6	661.2 ± 12.5	19.3	3.77	<0.01

Types of Strength	Group	Before the Test (Jan 2019)	After the Test (Mar 2019)	Difference	t	p
Explosive maximum strength during downward swinging press (N)	CG	683.7 ± 13.6	693.5 ± 12.6	9.8	1.83	>0.05
	EG	681.5 ± 13.9	706.4 ± 13.8	24.9	4.40	<0.001

The maximum force applied to lift the device's frame upward as much as possible in the control group (CG) amounted to 2093.5 ± 339.72 N before the experiment. By the end of the testing period, this indicator increased only slightly—to 2102.3 ± 334.28 N. Thus, the increase in maximum force was 8.8 N.

At the same time, in the experimental group (EG), which regularly performed the strength-developing exercises and special motor games recommended by us during the experimental and testing period, the maximum force used to lift the frame upward was 2099.8 ± 338.91 N before the experiment. By the end of the study, this indicator increased to 2273.6 ± 336.33 N (Fig. 4.7). The three-month growth rate of this strength parameter reached 173.84 N, or 82.5%.

The explosive force applied to forcefully press the frame downward in the CG was 683.7 ± 117.18 N before the experiment, and by the end of the experiment reached 691.4 ± 118.22 N (Fig. 4.8). The three-month increase in this parameter was only 7.7 N (1.12%).

In the EG, this indicator was 681.5 ± 115.23 N before the experiment, and after the experiment it increased to 798.9 ± 49.07 N. The difference in explosive force over the three-month period reached 117.4 N. The growth rate was 117.4 N, or 17.3%.

The maximum force applied to press the device's frame downward as intensely as possible in the CG was 641.3 ± 112.35 N at the beginning of the experiment, and by the end increased to 661.3 ± 113.42 N. Thus, the three-month increase was 19.8 N (3.09%).

However, in the EG, which regularly performed the strength-developing exercises and special motor games recommended by us during the experiment, the maximum force used to press the frame downward was 640.9 ± 111.37 N before the experiment, and reached 766.7 ± 115.24 N by the end. The growth rate of maximum force in this direction increased by 125.8 N, or 19.3%.

Comparative analysis of these indicators shows that during the 11-month pedagogical experiment and the three-month testing period, the strength qualities in the EG—whose

training included a systematic program of strength-developing exercises and special motor games—improved rapidly by the end of the experiment. Meanwhile, the CG, which continued traditional training, did not show such noticeable progressive changes.

Conclusion. During the three-month period (January–March 2019), the results of developing and evaluating explosive and strength qualities in highly skilled belt wrestlers of the 73 kg weight category using the "PDSKB-SHER" device (which functions both as a training machine and as a measuring instrument) through isokinetic exercises show that these strength qualities can develop rapidly even in relatively short periods. For example, in the EG that performed isokinetic exercises on this device, the explosive force measured by the upward swing-lift test increased from 1875.8 ± 332.29 N (or 187.58 kg) before the experiment to 1983.5 ± 344.53 N (or 198.35 kg) after three months. The three-month growth rate of explosive force in this group reached 107.7 N (or 10.77 kg). No such progressive indicators were recorded in the CG, which continued traditional training during the two-month experimental and three-month testing period.

The indicators recorded for maximum force during upward lifting, and for explosive and maximum force during downward pressing, also showed significantly greater progressive improvements in the EG. The rapid development of explosive and maximum strength in the EG can be attributed, first, to the effectiveness of the isokinetic exercises performed on the training device during the three-month period, and second, to the enhanced motivation generated by the use of a training machine that provides immediate feedback on results.

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