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METHODOLOGY FOR DETERMINING THE LEVEL OF DEVELOPMENT OF STRENGTH AND ITS TYPES IN QUALIFIED BELT WRESTLERS

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Abstract:

The article describes the phases of application of combat techniques in skilled wrestlers and the determination of the level of development of hand strength and types of force in their execution. It is assumed that the results of such an assessment of strength and types of force can serve to increase the effectiveness of their establishment and improvement during training.

Keywords: Wrestling, competition, strength endurance, hand-wrist-paw strength, hand-body strength, different weight, physical quality.

Introduction

Аннотация. Мақолада малакали белбоғли курашчиларда беллашув усуллари кўллаш фазалари ҳамда уларни ижро этишда кўл куч ва куч турларининг ривожланганлик даражасини аниқлаш очиб берилган. Бундай куч ва уни турларини баҳолаш натижалари машғулотлар давомида ўрнатиш ва такомиллаштириш самарадорлигини оширишга хизмат қилиши мумкинлиги эҳтимол қилинган.

Калит сўзлар: кураш, беллашув, куч чидамкорлиги, кўл билак – панжа кучини, кўл – гавда кучи турли вазн жисмоний сифат.



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Аннотация

В статье рассмотрены фазы применения приемов борьбы у квалифицированных борцов, а также определение уровня развития силы рук и видов силы при их выполнении. Считается, что результаты такой оценки силы и ее видов могут служить повышению эффективности тренировок и совершенствованию в процессе тренировок.

Ключевые слова: борьба, соревнования, силовая выносливость, сила рук и запястий, сила рук и корпуса, различные физические качества.

Relevance of the Study:

In the Republic of Uzbekistan, the practice of training qualified belt wrestlers, along with scientific research conducted by local specialists and scholars in this field, is aimed at ensuring that our belt wrestlers achieve high results at World and Asian competitions. In this regard, the task of “implementing systematic measures to develop national sports and increase their mass participation, as well as to include them in the programs of the Asian and Olympic Games” has been defined as a priority.

However, an analysis of studies conducted by foreign and domestic specialists, as well as published scientific-methodological and educational sources, indicates that in belt wrestling the development of statodynamic strength endurance—based on isometric and isotonic muscle contractions, including resistance to an opponent in concentric and eccentric modes—has not been sufficiently investigated or adequately established. This circumstance confirms the relevance of the present research.

It should be particularly emphasized that, across almost all courses, the strength of the left wrist–hand has been demonstrated to be significantly weaker than that of the right wrist–hand. In other words, a clearly noticeable asymmetry exists between right and left wrist–hand strength. Such an asymmetrical difference between right and left hand strength cannot be said to have no negative impact on firmly gripping the belt and effectively performing subsequent technical actions.



The present article serves, to a certain extent, to support the implementation of the tasks set out in the Decrees of the President of the Republic of Uzbekistan: Resolution No. PD-3306 dated October 2, 2017, “On Measures to Further Develop the National Sport of Kurash”; Resolution No. PD-4881 dated November 4, 2020, “On Measures to Develop the National Sport of Kurash and Further Enhance Its International Prestige”; and Resolution No. PD-450 dated December 20, 2024, “On Measures to Elevate the Development and Popularization of the National Sport of Kurash to a New Level as well as other relevant regulatory and legal documents in this field.

Purpose of the Study:

The purpose of this study is to determine the level of development of hand strength and its types in qualified belt wrestlers during the phases of applying wrestling techniques and in the execution of these techniques.

Research Results and Their Analysis:

In bouts involving qualified belt wrestlers, almost all techniques are predominantly performed using arm strength. In particular, lifting and throwing the opponent in such situations requires, first, a high and symmetrical level of strength development in both wrists and hands. Second, the successful execution of lifting and throwing techniques is critically dependent on the well-developed strength of both the arms and the trunk.

The current studies conducted in this area have shown that, among qualified belt wrestlers who train using traditional training methods, the muscular strength of the aforementioned body segments is not sufficiently developed.

It should be especially emphasized that, in wrestling sports, the arms are constantly required to perform different functions. Therefore, athletes engaged in wrestling disciplines must develop right and left arm strength to a high and symmetrical level.

When the hands are engaged in gripping various parts of the opponent’s body and sports clothing, lifting the opponent “with ease” requires an excellently developed combination of arm and trunk strength. Thus, the strength indicators



recorded in the qualified belt wrestlers who participated in the present study indicate that they do not meet the required level.

Among qualified belt wrestlers of different weight categories, the strength indicators discussed above demonstrated low rates of improvement both throughout the training year and across academic courses. Specifically, at the beginning of the training year, right wrist–hand strength in belt wrestlers was recorded as 51.4 ± 2.03 kg in the 60 kg weight category, 52.8 ± 1.79 kg in the 66 kg category, 54.7 ± 1.96 kg in the 73 kg category, and 59.7 ± 2.45 kg in the 81 kg category.

By the middle of the training year, these indicators changed with a highly uneven dynamic and were recorded, respectively, as 52.3 ± 1.88 kg, 53.9 ± 1.74 kg, 56.5 ± 1.77 kg, and 62.4 ± 2.17 kg.

Left wrist–hand strength at the beginning of the training year was recorded, respectively, as 47.7 ± 1.55 kg, 48.4 ± 1.61 kg, 54.0 ± 1.59 kg, and 58.6 ± 1.44 kg. By the middle of the training year, these values increased to 48.3 ± 1.57 kg, 49.1 ± 1.67 kg, 55.7 ± 1.63 kg, and 61.7 ± 1.47 kg.

As can be seen, right wrist–hand strength in different weight categories showed a gradual, albeit modest, increase both at the beginning and in the middle of the training year.

Table 1 Rate of Development of Right and Left Wrist–Hand and Arm–Trunk Strength in Qualified Belt Wrestlers of Different Weight Categories During the Training Year ($\pm \sigma$)

№	Tests	60	60	60	60
		kg	kg	kg	kg
	Right wrist–hand strength (kg)	n = 6	n = 6	n = 6	n = 6
	Left wrist–hand strength (kg)				
	Arm–trunk strength (kg)				
1	Right wrist–hand strength (kg)	<u>51.4 ± 2.03</u>	<u>52.8 ± 1.79</u>	<u>54.7 ± 1.56</u>	<u>59.9 ± 2.45</u>
	Left wrist–hand strength (kg)	$52,3 \pm 1,88$	$53,9 \pm 1,74$	$56,5 \pm 1,77$	$62,4 \pm 2,17$
	Arm–trunk strength (kg)				
2	Right wrist–hand strength (kg)	<u>47.7 ± 1.55</u>	<u>48.4 ± 1.61</u>	<u>54.0 ± 1.59</u>	<u>58.6 ± 1.44</u>
	Left wrist–hand strength (kg)	$48,3 \pm 1,57$	$49,1 \pm 1,67$	$55,7 \pm 1,63$	$61,7 \pm 1,47$
	Arm–trunk strength (kg)				
3	Right wrist–hand strength (kg)	<u>193.5 ± 3.35</u>	<u>195.2 ± 3.26</u>	<u>196.8 ± 3.07</u>	<u>197.5 ± 2.96</u>
	Left wrist–hand strength (kg)	$194,4 \pm 3,27$	$195,8 \pm 3,31$	$197,5 \pm 3,13$	$197,9 \pm 3,08$
	Arm–trunk strength (kg)				



Note: Right and left wrist–hand strength was measured simultaneously with the arms raised in a horizontal position; data in the numerator were recorded in September 2024, and data in the denominator were recorded in January 2025. In different weight categories, arm–trunk strength, although significantly below the required level both at the beginning and at the end of the training year, showed a steady increase from course to course. The relatively low levels of right and left wrist–hand strength, as well as arm–trunk strength, and their slow growth dynamics indicate the need to enrich all types of exercises performed in the training of qualified belt wrestlers with additional strength-oriented components.

As noted above, in qualified wrestling, during the “preparation for technique” phase at the start of a bout, the opponent is pressed down (muscles are activated in an isometric, static mode), and in the subsequent phases—lifting the opponent, turning or rotating them—the muscles are again activated isometrically, followed by isotonic activation in concentric and eccentric directions as the opponent is lifted and thrown (dynamic muscular effort). The repeated performance of these strength demands over short intervals in training sessions and competitions requires a highly developed level of both static and dynamic strength endurance in qualified belt wrestlers.

Research has shown that in qualified wrestling, the muscles responsible for handling the primary load—including the arms, wrists–hands, abdomen, and shoulder–back muscles—are not sufficiently developed in belt wrestlers under study. For instance, the indicator reflecting static strength endurance—time holding on a pull-up bar with arms bent at 50%—was 30.4 ± 3.15 s at the beginning of the training year, increasing to 31.9 ± 3.19 s by the end of the training year, representing a 9-month growth of 1.5 s (see Table 3). The time holding on the pull-up bar with legs bent at 90° was 29.3 ± 3.73 s at the start and 29.7 ± 3.75 s at the end, showing a growth of 0.4 s.

The time for holding the arms bent at 90° while supporting on parallel bars increased from 32.5 ± 2.27 s to 33.7 ± 2.31 s over the course of the training year. When supporting on dip bars with legs bent at 90° , the holding time increased from 26.7 ± 3.29 s to 27.5 ± 3.13 s.



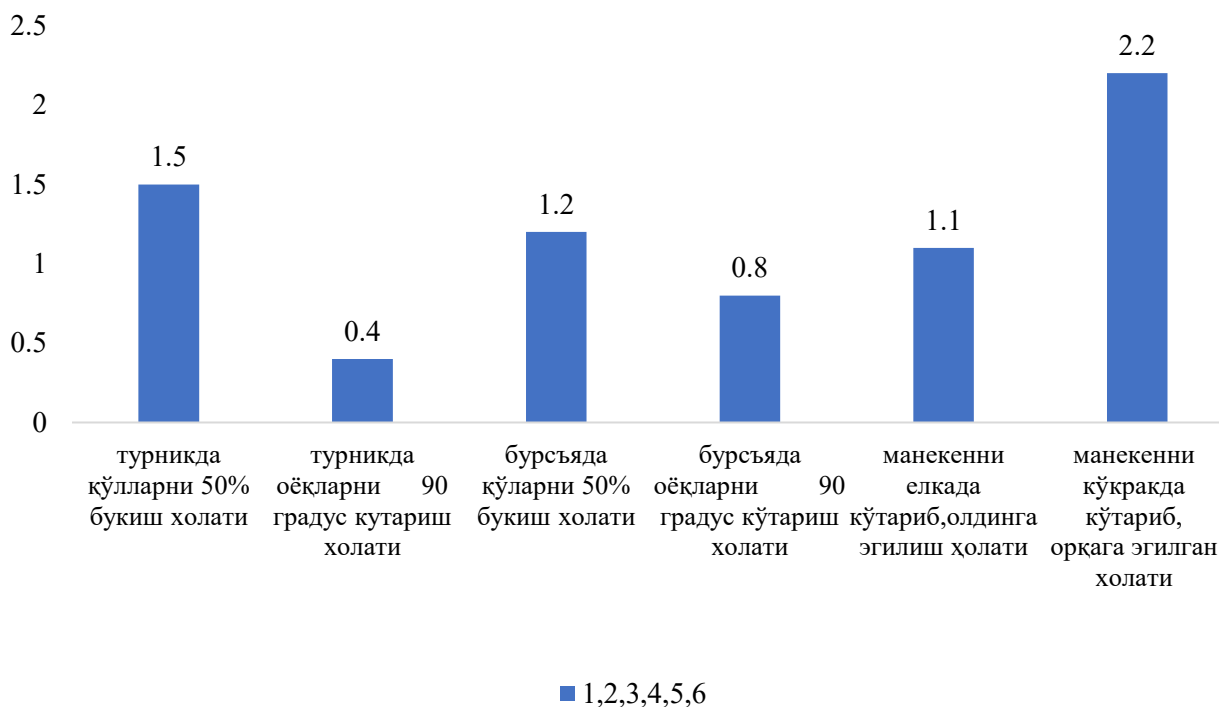
A comparative analysis of these indicators shows that, first, the static strength endurance of the arm muscles was relatively low, and the rate of improvement in this quality over the training year was very slow. Second, the static strength endurance of the hip, thigh, and abdominal muscles among the belt wrestlers who participated in the study developed at an even slower pace.

The time for holding a 30 kg mannequin on the shoulders with the trunk bent forward at 90° increased from 35.6 ± 3.04 s to 36.7 ± 2.85 s during the training year. However, holding the same load on the chest while leaning backward was extremely short, increasing only from 13.7 ± 2.12 s to 15.9 ± 2.26 s over the same period.

Table 2 Rate of Development of Strength and Endurance in Qualified Belt Wrestlers of Different Weight Categories During the Training Year (± σ, n = 24)

No	Tests	September 2024	January 2025	Difference in Indicators
1	Hanging on a pull-up bar, holding arms bent at 50° (s)	30,4 ± 3,15	31,9 ± 3,19	1,5
2	Hanging on a pull-up bar, holding legs bent at 90° (s)	29,3 ± 3,73	29,7 ± 3,75	0,4
3	Supporting on dip bars, holding arms bent at 90° (s)	32,5 ± 2,27	33,7 ± 2,31	1,2
4	Supporting on dip bars, holding legs bent at 90° (s)	26,7 ± 3,29	27,5 ± 3,13	0,8
5	Holding a 30 kg mannequin on the shoulders, trunk bent forward at 90° (s)	35,6 ± 3,04	36,7 ± 2,85	1,1
6	Holding a 30 kg mannequin on the chest, trunk leaned backward (s)	13,7 ± 2,12	15,9 ± 2,26	2,2

It is evident that, despite the fact that the muscles of the pelvis, thighs, and especially the trunk (abdominal and muscles around the waist and spine)—which are primarily responsible for executing techniques that lift and throw the opponent using static and dynamic strength—are very weakly developed, their growth remained slow over a long period (see Diagram 1).



Note: 1 – Holding arms bent at 50° while hanging on a pull-up bar. 2 – Raising legs to 90° while hanging on a pull-up bar. 3 – Holding arms bent at 90° on parallel bars. 4 – Raising legs to 90° on parallel bars. 5 – Lifting a mannequin onto the shoulders, trunk bent forward. 6 – Lifting a mannequin onto the chest, trunk leaned backward

Diagram 1. Growth of static strength endurance in the arms, legs, and trunk–abdominal muscles of qualified belt wrestlers by the end of the training year (s).

These strength indicators were observed to have increased only slowly across courses during the training year (see Table 3). According to the recorded results, the time for maintaining arms bent at 90° while hanging on a pull-up bar at the beginning of the training year was:

- 1st course – 27.5 ± 2.73 s
- 2nd course – 28.9 ± 2.86 s
- 3rd course – 30.3 ± 2.75 s
- 4th course – 30.8 ± 2.87 s



By the end of the training year, these values were recorded as:

- 1st course – 28.7 ± 2.67 s
- 2nd course – 29.3 ± 2.82 s
- 3rd course – 29.6 ± 2.59 s
- 4th course – 28.5 ± 2.45 s

It was noted that the static strength endurance (time maintaining the 90° bent-arm position) decreased by 2.3 s only in the 4th-course students by the end of the training year.

The time for maintaining legs bent at 90° while hanging on the pull-up bar was shorter for all courses compared to the 90° bent-arm position. Throughout the training year, and across courses, the duration of maintaining the static muscular contraction of the abdominal muscles while raising the legs to 90° increased at a very slow pace.

Table 3 Rate of Development of Strength and Endurance in Qualified Belt Wrestlers of Different Weight Categories During the Training Year ($\pm \sigma$)

No	Tests	60 kg n = 6	66 kg n = 6	73 kg n = 6	81 kg n = 6
1	Hanging on a pull-up bar, holding arms bent at 50% (s)	$27,5 \pm 2,73$ $28,7 \pm 2,67$	$28,9 \pm 2,86$ $29,3 \pm 2,82$	$30,3 \pm 2,75$ $29,6 \pm 2,55$	$30,8 \pm 2,87$ $28,5 \pm 2,45$
2	Hanging on a pull-up bar, holding legs bent at 90° (s)	$25,3 \pm 2,26$ $25,8 \pm 2,32$	$25,7 \pm 2,25$ $26,9 \pm 2,34$	$26,8 \pm 2,31$ $27,7 \pm 2,66$	$25,5 \pm 2,19$ $24,3 \pm 2,07$
3	Supporting on parallel bars, holding arms bent at 90° (s)	$32,4 \pm 3,11$ $33,7 \pm 3,28$	$32,7 \pm 3,19$ $33,3 \pm 3,21$	$31,5 \pm 2,78$ $32,3 \pm 2,86$	$30,4 \pm 2,57$ $29,7 \pm 2,66$
4	Supporting on parallel bars, holding legs bent at 90° (s)	$25,7 \pm 2,44$ $27,3 \pm 2,67$	$27,5 \pm 2,48$ $28,6 \pm 2,55$	$28,9 \pm 2,37$ $29,6 \pm 2,26$	$28,1 \pm 2,22$ $29,3 \pm 2,35$
5	Holding a 30 kg mannequin on the shoulders, trunk bent forward at 90° (s)	$35,8 \pm 3,12$ $36,7 \pm 3,19$	$36,6 \pm 3,22$ $37,7 \pm 3,37$	$37,8 \pm 3,43$ $38,6 \pm 3,49$	$36,6 \pm 3,35$ $37,5 \pm 3,41$
6	Holding a 30 kg mannequin on the chest, trunk leaned backward (s)	$13,3 \pm 1,49$ $13,9 \pm 1,54$	$14,5 \pm 1,57$ $15,7 \pm 1,58$	$15,8 \pm 1,66$ $16,3 \pm 1,77$	$14,5 \pm 1,54$ $14,9 \pm 1,56$

The time for holding arms bent at 50% while supporting on dip bars at the beginning of the training year showed a mixed trend across weight categories. For belt wrestlers in the 60 kg and 66 kg categories, there was a slight tendency



for increase— 32.4 ± 3.11 s and 32.7 ± 3.19 s, respectively—whereas in the 73 kg and 81 kg categories, these values decreased— 31.5 ± 2.78 s and 30.4 ± 2.57 s, respectively. By the middle of the training year, the same pattern of change was observed.

The time for holding legs bent at 90° while supporting on dip bars increased slightly for 73 kg belt wrestlers both at the beginning and end of the training year: at the start – 25.7 ± 2.44 , 27.5 ± 2.48 , 28.9 ± 2.37 s; at the end – 27.3 ± 2.67 , 28.6 ± 2.55 , 29.6 ± 2.26 s. However, in the 81 kg category, this indicator increased only from 28.1 ± 2.22 s at the beginning to 29.3 ± 2.35 s at the end of the training year.

A comparative analysis of these indicators shows that, in the qualified belt wrestlers participating in the study, the **isometric static strength endurance of the pelvis, thighs, and particularly the abdominal muscles** (as reflected in the time holding legs bent at 90°) is relatively underdeveloped. Nevertheless, in qualified wrestling, these muscles play a leading role in generating the energy (strength) required to lift the opponent, rotate or turn them, and throw them onto the mat.

The time for holding a 30 kg mannequin on the shoulders with the trunk bent forward at 90° was higher compared to the previously mentioned indicators. Specifically, at the beginning of the training year, the values were:

- 60 kg belt wrestlers – 35.8 ± 3.12 s
- 66 kg belt wrestlers – 36.6 ± 3.22 s
- 73 kg belt wrestlers – 37.8 ± 3.43 s
- 81 kg belt wrestlers – 36.6 ± 3.35 s

By the middle of the training year, these values had increased to: 36.7 ± 3.19 ; 37.7 ± 3.37 ; 38.6 ± 3.49 ; 37.5 ± 3.41 s, respectively.

It is noticeable that this static strength endurance decreased only in the 81 kg category, meaning that the time for holding the 30 kg mannequin on the shoulders with the trunk bent forward at 90° was significantly shorter compared to students in other courses. This may be due to interruptions in training, lack of efficiency in training sessions, or insufficient application of appropriate exercises. Additionally, the development rate of this and other types of strength



may not have been consistently monitored, which could explain these observations.

For example, the time for holding a 30 kg mannequin on the chest with the trunk leaned backward at the beginning of the training year was:

- 60 kg belt wrestlers – 13.3 ± 1.49 s
- 66 kg belt wrestlers – 14.5 ± 1.57 s
- 73 kg belt wrestlers – 15.8 ± 1.66 s
- 81 kg belt wrestlers – 14.5 ± 1.54 s

By the end of the training year, these values had changed to: 13.9 ± 1.54 ; 15.7 ± 1.58 ; 16.3 ± 1.77 ; 14.9 ± 1.56 s, respectively.

Conclusion: The recorded final indicators suggest that in qualified belt wrestlers, the muscles responsible for accelerating the bending of the pelvis, thighs, and trunk–spinal segments—critical for executing almost all wrestling techniques, especially lifting the opponent from the chest—are very weakly developed. It is likely that this underdevelopment also relates to the dynamic activation of these muscle groups.

The relatively low level of dynamic strength endurance across different weight categories, particularly the lack of significant improvement by the end of the training year, indicates that in the traditional training regimen, insufficient attention is given to the targeted development of the dynamic strength endurance of the muscles responsible for bending and stabilizing the arms and trunk.

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