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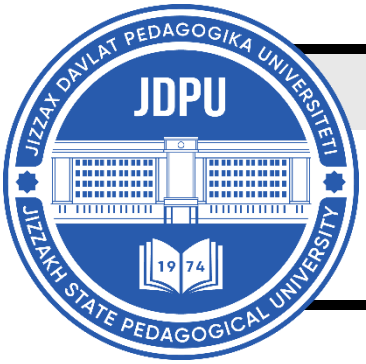

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DIFFERENCES AND SPECIFIC FEATURES OF STRENGTH DEVELOPMENT IN WRESTLING STYLES WITH "LOCKED" HANDS (BELT WRESTLING) AND STYLES WITH FREE HAND MOVEMENT

Sh.S. Mirzanov
PhD, Professor
Tashkent, Uzbekistan

ABOUT ARTICLE

Key words: qualified wrestlers, muscles of the abdomen, pelvic-hip and shoulder joints, isometric mode, static positions, static strength, endurance.

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Abstract: The article analyzes the results of a study on the rate of development of static strength endurance of the arm and leg muscles in the isometric mode, involving the muscles of the abdomen, pelvic-hip, and shoulder joints in wrestlers of different styles over the course of a one-year training cycle.

Introduction. Observations of wrestling training sessions and analysis of the use of various exercises indicate that most coaches, in their training, use exercises aimed at developing specific technical methods or their components characteristic of other wrestling styles (such as pulling or pushing the opponent, turning or rotating them, etc.), and even exercises that develop specific physical qualities. Undoubtedly, there is a certain useful logic in this approach to teaching or improving skills. This approach is aimed at applying chosen techniques with new coordination and enriching the sequence of their execution.

However, when using such an approach, it is important to know what quality or technical element the exercise is intended to develop, as well as the rules for applying it (sequence and speed), especially if it is aimed at increasing the range of motion of the legs or arms. For example, in freestyle wrestling, judo, or Greco-Roman wrestling, exercises aimed at increasing the range of motion are performed without objects or with weights. In belt wrestling, however, because matches are performed with "locked" hands, the range of motion is limited. Therefore,

exercises aimed at increasing the range of motion quickly or with high force may produce negative results in belt wrestling [Y.V. Verkhoshansky, 2021, pp. 111–139; L.P. Matveev, 2021, pp. 281–301; V.N. Platonov, 2019, pp. 268–294; I.A. Pismensky, 2022, pp. 107–189; D.G. Mendiasvili, 2018, pp. 89–167].

Static strength or static strength endurance, which is spent on elements such as "pressing" or maintaining a "bridge" position against the opponent's resistance, is performed according to the isometric holding time of the relevant muscles. Thus, the ability of wrestlers to maintain the abdominal, lumbar, pelvic, and spinal muscles in a fixed position in the isometric mode (muscle fibers maintain their length) provides the basis for overcoming resistance, tolerating its impact, applying a "counter-move," or successfully completing a technique.

Purpose of the study: To investigate the rate of improvement over one academic year in the endurance of holding legs and arms in various static positions in qualified wrestlers.

Methods: Tests included holding the legs at a 90° angle while hanging on a pull-up bar or supporting the arms on parallel bars, as well as holding the arms in a "half-bent" position.

Results and comparative analysis:

Research on wrestlers of different styles showed that the time of holding legs at 90° while hanging on a pull-up bar before the academic year (AY) was:

- Belt wrestlers: 27.32 ± 3.74 sec
- Ethno-wrestlers: 25.08 ± 3.19 sec
- Greco-Roman wrestlers: 27.03 ± 3.58 sec
- Freestyle wrestlers: 26.19 ± 3.18 sec

By the end of the AY, these values increased to:

- Belt wrestlers: 29.44 ± 3.99 sec
- Ethno-wrestlers: 26.25 ± 3.34 sec
- Greco-Roman wrestlers: 28.21 ± 3.77 sec
- Freestyle wrestlers: 27.39 ± 3.69 sec

When supporting the arms on parallel bars and holding the legs at 90°, the times before the AY were:

- Belt wrestlers: 24.12 ± 3.13 sec
- Ethno-wrestlers: 21.27 ± 3.01 sec
- Greco-Roman wrestlers: 23.12 ± 3.05 sec
- Freestyle wrestlers: 22.87 ± 2.78 sec

By the end of the AY, these values increased to:

- Belt wrestlers: 25.37 ± 3.07 sec

- Ethno-wrestlers: 22.35 ± 3.09 sec
- Greco-Roman wrestlers: 24.77 ± 3.15 sec
- Freestyle wrestlers: 24.58 ± 3.19 sec

When holding the arms bent at the elbows at 90° on the pull-up bar, the times before the AY were:

- Belt wrestlers: 19.13 ± 2.29 sec
- Ethno-wrestlers: 17.06 ± 2.01 sec
- Greco-Roman wrestlers: 18.37 ± 2.13 sec
- Freestyle wrestlers: 16.15 ± 1.79 sec

By the end of the AY, these times increased to:

- Belt wrestlers: 21.07 ± 2.67 sec
- Ethno-wrestlers: 18.12 ± 2.25 sec
- Greco-Roman wrestlers: 19.56 ± 2.34 sec
- Freestyle wrestlers: 17.28 ± 1.93 sec

Table:

Rate of improvement over one academic year in endurance of abdominal and pelvic muscles in isometric mode, maintaining legs and arms in various static positions in qualified wrestlers ($(\bar{X} \pm \delta)$)

No.	Tests	Belt Wrestlers (n=29×2=58)	Ethno-Wrestlers (n=26×2=52)	Greco-Roman Wrestlers (n=25×2=50)	Freestyle Wrestlers (n=23×2=46)
1	Hanging on pull-up bar, legs raised 90° (sec)	27.32 ± 3.74 → 29.44 ± 3.93	25.08 ± 3.19 → 26.25 ± 3.34	27.03 ± 3.58 → 28.21 ± 3.77	26.19 ± 3.18 → 27.39 ± 3.69
2	Supporting arms on parallel bars, legs raised 90° (sec)	24.12 ± 3.13 → 25.37 ± 3.07	21.27 ± 3.01 → 22.35 ± 3.09	23.12 ± 3.05 → 24.77 ± 3.15	22.87 ± 2.78 → 24.58 ± 3.19
3	Hanging on pull-up bar, arms bent 90° at elbows (sec)	19.13 ± 2.29 → 21.07 ± 2.67	17.06 ± 2.01 → 18.12 ± 2.25	18.37 ± 2.13 → 19.56 ± 2.34	16.15 ± 1.79 → 17.28 ± 1.93
4	Supporting "half-bent" arms on parallel bars (sec)	22.16 ± 2.78 → 24.28 ± 2.91	19.07 ± 2.39 → 20.23 ± 2.47	21.21 ± 2.32 → 22.33 ± 2.54	18.17 ± 2.05 → 19.48 ± 2.36

Note: AY – academic year; the first value indicates the beginning of the AY, the second – the end of the AY. Only wrestlers weighing 68–73 kg were included in the study, and the results were not analyzed by weight category.

The time for maintaining the "half-bent" arms position on the parallel bars at the beginning of the AY was:

- Belt wrestlers – 22.16 ± 2.72 sec
- Ethno-wrestlers – 19.07 ± 2.39 sec
- Greco-Roman wrestlers – 21.21 ± 2.32 sec
- Freestyle wrestlers – 18.17 ± 2.05 sec

By the end of the AY, these values increased to:

- Belt wrestlers – 24.28 ± 2.91 sec
- Ethno-wrestlers – 20.23 ± 2.47 sec
- Greco-Roman wrestlers – 22.33 ± 2.54 sec
- Freestyle wrestlers – 19.48 ± 2.36 sec

Based on the comparative analysis of the above research results, it can be concluded that, firstly, although the endurance of the abdominal and pelvic muscles in the isometric mode, as well as the ability to maintain legs and arms in various static positions (pull-up bar and parallel bars), was not sufficiently developed in all groups of wrestlers included in the study, the growth of this ability by the end of the AY was minimal (Figures 1–2).

These figures show that in all groups of wrestlers included in the study, the actual values of static strength endurance measured in tests 1, 2, 3, and 4 cannot be considered fully developed. If this quality is interpreted through the test results, it can be acknowledged that the "weak" level of static strength endurance of the abdominal, pelvic, and arm-leg muscles in the isometric mode, which has significant practical importance, undoubtedly negatively affects the effective execution of certain technical elements specific to wrestling styles.

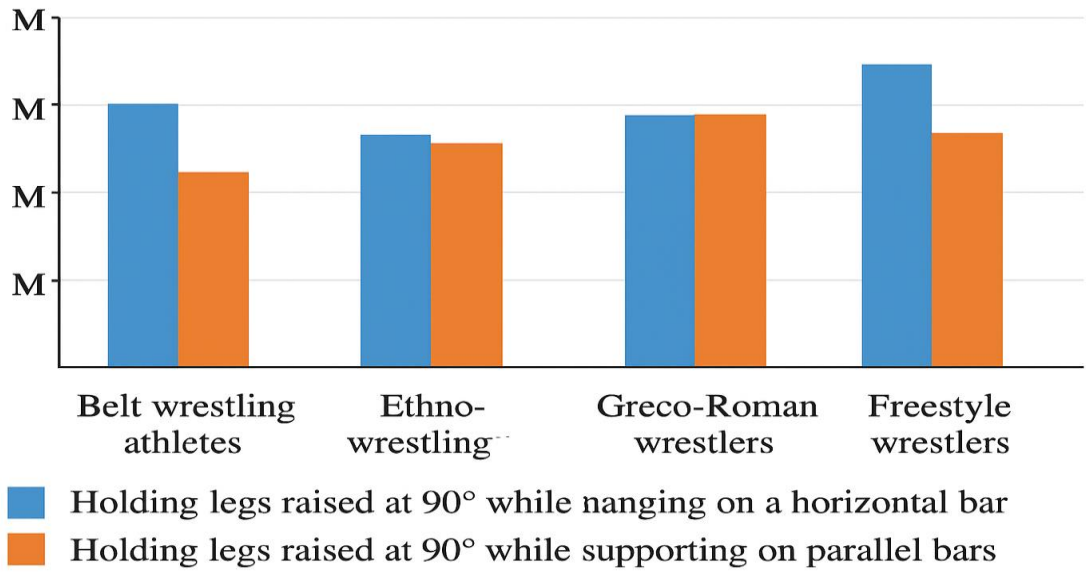

Figure 1. Diagrams showing the changes in static strength endurance for tests 1 and 2 in qualified wrestlers of different wrestling styles, expressed as the increase (sec) by the end of the academic year.

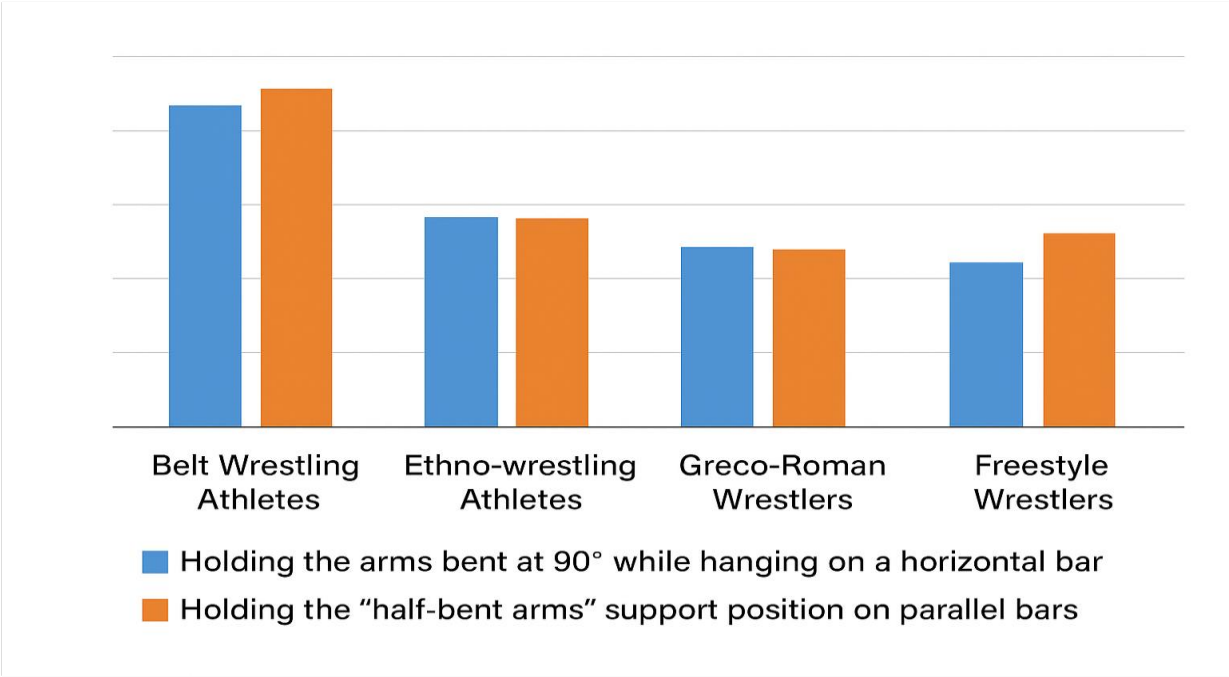

Figure 2. Diagrams showing the changes in static strength endurance for tests 3 and 4 in qualified wrestlers of different wrestling styles, expressed as the increase (sec) by the end of the academic year.

According to most specialists and researchers, the effectiveness of applying wrestling techniques in combat depends on almost all types of strength, including static strength

endurance. Although static strength endurance in the isometric mode is not closely related to other dynamic strength types, maintaining certain technical elements in a fixed position for a specific period during a wrestling bout provides a foundation for the effective execution of other technical components performed in a dynamic mode [A.B. Taymazov et al., 2022, pp. 39-45; I.A. Pismensky, 2019, pp. 98-114; D.G. Mindiashvili, 2018, pp. 179-188; Yu.D. Shakhmuradov, 2011, pp. 179-187; G.S. Tumanyan, 2006, pp. 357-377].

These authors note that static strength endurance has sport-specific importance depending on which joints need to be held and in what positions. Exercises aimed at developing this physical quality require relatively low energy expenditure. For example, the body's (muscles') oxygen requirement may increase by only 2–3 liters per minute. However, the ability to maintain muscle contraction in an isometric mode over a long period remains limited. Regular specialized training can effectively develop this ability.

In wrestling styles where the hands are "locked" (belt wrestling) versus styles where the hands move freely, almost all types of strength involved in performing technical methods and their components exhibit specific differences and characteristics. For instance, using a dynamometer to measure trunk-vertebrae-pelvic muscles, the strength of qualified belt wrestlers increased from 143.3±7.29 kg to 145.8±7.63 kg over the course of the training year. In ethnically named wrestlers, this strength increased from 140.7±6.89 kg to 142.4±6.78 kg. Greco-Roman wrestlers showed slightly higher values, but still lower than belt wrestlers. Freestyle wrestlers demonstrated the lowest values, which did not increase rapidly by the end of the year.

The strength of the muscles that bend the wrist-elbow joints of the right and left arms was insufficiently developed, showed no rapid increase by the end of the year, and an asymmetry of 2.2–2.6 kg between the right and left arms was observed in all wrestling groups. Such asymmetry could negatively affect the effectiveness of gripping and shifting the opponent or belt, as the "strong" hand is active and efficient, while the "weaker" hand performs sluggishly.

Almost all wrestling techniques and their components are executed in vertical and horizontal directions in concentric-eccentric modes. Therefore, well-developed strength in these modes ensures effectiveness in combat. However, research shows that the rapid dynamic strength endurance used for maximum pull-ups on the bar within 10 seconds did not exceed 4.87–6.67 reps at the start of the year and showed minimal increase by the end. The number of maximum pull-ups also remained low: 13.88–15.72 reps, with growth by only 0.24–1.04 reps by year-end.

The number of times a 60-kg mannequin could be lifted from the ground to the chest in 10 seconds was also insufficient and did not increase significantly. Thus, rapid and maximum dynamic strength endurance in concentric-eccentric modes for pull-ups and lifting a 60-kg mannequin cannot be considered highly developed in any wrestling group.

Similarly, rapid and maximum dynamic strength endurance used to lift the mannequin on the shoulder and chest, in vertical-to-horizontal or horizontal-to-vertical directions, was poorly developed across all groups. For example, bending forward and returning while holding the mannequin on the shoulder within 10 seconds did not exceed 5.3–6.5 times at the start of the year and did not increase significantly by the end. Lifting the mannequin on the chest backward within 10 seconds was even lower: 4.2–5.1 times. Maximum sit-ups with the mannequin on the shoulder in 10 seconds ranged from 7.4–8.3 reps, and 17.8–19.8 reps in other conditions.

It should be emphasized that the underdevelopment of these types of strength in qualified wrestlers can negatively affect the execution of throwing techniques, such as lifting the opponent vertically and then over the chest.

In wrestling, elements that involve pushing the opponent down or lifting and holding them for a period rely on the isometric contraction of muscles and high-level static strength endurance. Such endurance can be objectively assessed using tests such as hanging on a bar with legs raised to 90°, holding legs at 90° on parallel bars, keeping arms bent at 90° on the bar, or maintaining a half-bent arm position on parallel bars. Research results indicate that in all wrestling groups studied, the endurance of muscles in isometric mode for holding legs and arms in various static positions developed very slowly. For example, holding legs raised to 90° while hanging on a bar did not exceed 25.08–27.32 seconds at the start, and on parallel bars 21.27–24.12 seconds, with minimal increase by the end. Holding arms in a half-bent position followed a similar trend.

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