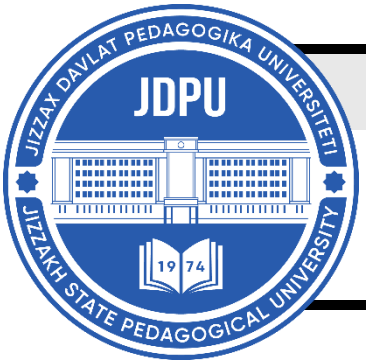
DOI: https://doi.org/10.37547/mesmj-V6-I7-34 Pages: 259-569

MENTAL ENLIGHTENMENT SCIENTIFIC – METHODOLOGICAL JOURNAL



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METHODOLOGY FOR IMPROVING THE STRENGTH ENDURANCE OF FEMALE STUDENT WRESTLERS THROUGH SPECIAL EXERCISES

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ABOUT ARTICLE

Key words: Wrestling, sport, strength, endurance, exercise, methods, methodology, physical preparation, load, tools, intensity, competition.

Received: 10.11.25
Accepted: 11.11.25
Published: 13.12.25

Abstract: This article presents a methodology developed based on the study of competitions held over the course of one year. The following tournaments were analyzed and observed: the Uzbekistan Championship, Uzbekistan Cup, the "Five Initiatives" Youth Tournament, Universiade, and the Youth Uzbekistan Championship. The research focuses on developing and applying a methodology to improve the strength endurance of female student wrestlers through special exercises. These special exercises are selected from existing training practices, and their implementation is adapted to the physical characteristics of female student wrestlers. The methodology defines exercise tools, norms, rest intervals, and load application sequences specifically tailored to this group. The results of the applied methodology demonstrated a positive impact on the athletes' strength endurance, as illustrated in the presented tables and diagrams.

Introduction. In many countries around the world, wrestling is one of the most popular and widely practiced sports. In recent years, the number of athletes, coaches, and referees engaged in our national sport — Kurash — has been steadily increasing. To promote and develop Kurash globally, the International Kurash Association has been carrying out a range of

initiatives. As this sport continues to evolve, the level of competitiveness rises, making tournaments more intense and engaging.

In addition, various countries are actively working to advance and teach Kurash by organizing seminars, training camps, educational programs, and methodological manuals. While foreign nations are striving to master the techniques and principles of Kurash, it is equally important that our athletes continue to improve and strengthen their own skills. Achieving victory in competitions requires not only technical and tactical proficiency but also the full development of all physical qualities.

Our research indicates that the duration of matches in all types of wrestling is gradually increasing, especially during semi-final and final rounds, where only the strongest athletes remain. Considering this, wrestlers must be able to endure longer matches, maintain resistance against the opponent's technical moves, and still execute their own techniques effectively. Therefore, developing strength endurance is of crucial importance. For this reason, in our sport, strength endurance is regarded as one of the most significant physical qualities.

According to the Decree of the President of the Republic of Uzbekistan No. PQ-3306 dated October 2, 2011, "On measures for the further development of Kurash sport", as well as the Decree No. PQ-336 dated July 29, 2022, "On measures for further development of Olympic wrestling types", and the Resolution of the Cabinet of Ministers No. 122 dated March 4, 2020, "On improving the system of selection for national teams in various sports," Uzbekistan is paying great attention to the restoration, promotion, and global recognition of Kurash as a symbol of tolerance, nobility, and honesty — values deeply rooted in the history of the Uzbek nation.

Our esteemed President has initiated several efforts to elevate Kurash on the international stage, including the designation of September 6 as the National Kurash Day. This aligns with the national goal to systematically develop and popularize traditional sports and include them in the programs of the Asian Games and the Olympic Games.

However, despite this growing attention, insufficient focus has been given to the development of strength endurance among female student wrestlers. The advantages and methods of enhancing strength endurance in this group have not been adequately studied. The results of our analysis demonstrate that it is necessary to develop a methodology aimed at improving the strength endurance of female student wrestlers, assess the outcomes using modern technologies, and test the effectiveness of the developed approach among various groups of female wrestlers. This highlights the relevance and practical significance of the present research.

Methodology Developed for Improving the Strength Endurance of Female Student Wrestlers through General Exercises

To develop strength in athletes, special exercises are used that help improve the overall or specific muscle groups' strength capabilities. In wrestling, the following methods are applied to enhance the wrestler's strength potential: repeated effort, short-term maximal effort, progressive overload, shock (plyometric) method, combined impact, variation method, and isometric tension.

The repeated effort method involves performing exercises with a weight equal to 70–80% of the athlete's maximum load, continuing repetitions "until the last breath." This method assumes performing the exercise in several series. Each series is done to failure, typically 3–4 series, with 3–4 minutes of rest between them. A variation of this is the dynamic effort method, which involves performing exercises with 20–30% of maximum weight at the highest possible speed. In this case, significant muscle fatigue is achieved not by heavy weights but by the high intensity of movement.

The short-term maximal effort method is considered one of the most effective for increasing absolute muscle strength. It involves working with near-maximum or maximum weights using exercises such as the bench press, clean and jerk, or squats, often performed on training machines. Typically, 3–4 sets are executed with 3–5 minutes of rest between sets.

The progressive overload method implies gradually increasing resistance both within a single training session and over subsequent ones. For example, in the first set, the athlete lifts a weight equal to 50% of the 10-repetition maximum (10RM), in the second set — 75% of 10RM, and in the third set — 100% of 10RM. Each set is performed at maximum speed until full fatigue, with 2–4 minutes of rest between sets.

The shock (plyometric) method is based on stimulating muscle groups through the kinematic energy of falling weights or the athlete's body weight. This transition from eccentric to concentric muscle action promotes rapid force development and improves explosive power. For example, to develop explosive leg strength, athletes perform depth jumps from a height of 70–80 cm, landing with slightly bent knees and then immediately jumping upward with maximum force. These exercises are performed in 2–3 series of 8–10 jumps, with 3–5 minutes of rest between series, and no more than two sessions per week.

The combined impact method aims to improve both strength abilities and technical-tactical performance simultaneously. This occurs when wrestlers perform specialized exercises involving heavier opponents or added resistance while executing technical moves. For example, practicing throwing techniques with a heavier opponent helps strengthen muscles while

refining technique. It is crucial, however, to determine the optimal load, as excessive resistance can disrupt movement coordination and negatively affect technique.

The variation method involves performing specialized exercises with varying weights or partners of different body masses. One series may include 10–12 throws with a heavier partner, 15–16 throws with an equal-weight partner, and 10–12 throws with a lighter partner — for a total of three series, with 3–4 minutes of rest between them. This method is particularly effective for developing speed-strength qualities.

According to Sh. S. Mirzanov, strength training for belt wrestlers should primarily aim to increase the maximal contraction ability of relevant muscle groups while maintaining movement coordination and technical-tactical execution.

Endurance is defined as the ability to resist fatigue and adapt to external changes without reducing movement efficiency over time. General endurance refers to the body's ability to perform prolonged physical activities involving multiple organ systems effectively. Specific endurance, on the other hand, refers to the ability of certain body parts or systems to sustain activity during a particular task.

Resistance to fatigue depends on several factors — including the central nervous system, cardiovascular and respiratory systems, bioenergetic capacities, volitional qualities, and professional preparedness. To develop endurance, cyclic exercises such as walking, running, jumping, and swimming are highly effective. However, monotonous training loads may lead to fatigue and decreased interest, especially among younger athletes, which is why variety and progression in training programs are essential for maintaining motivation and performance.

Table 1

Special exercises aimed at developing strength endurance among female student wrestlers

№	Name of the exercise	Average duration of exercise	Number of repetitions	Rest interval	Intensity zone	Heart rate (beats/min)
1	Pull-ups on the bar	7–15 times	2 sets × 2 repetitions	40 sec between repetitions; 1.5–2 min between sets	1–2	145–160
2	Pull-ups with inward grip	8–17 times	2 sets × 2 repetitions	40 sec between repetitions; 1.5–2 min between sets	1–2	145–160
3	Hanging on the bar with a wrestler (4–6 kg lighter than own body weight) hanging from the belt	1) 30 sec 2) 40 sec 3) 1 min	3 sets × 1 repetition	1) 15 sec 2) 30 sec 3) 45 sec between repetitions; 1.5–2 min between sets	2–3	125–145

№	Name of the exercise	Average duration of exercise	Number of repetitions	Rest interval	Intensity zone	Heart rate (beats/min)
4	Hanging on the bar with a wrestler (equal body weight) hanging from the belt	30 sec, 45 sec, 1 min	3 sets × 1 repetition	20 sec, 40 sec, 1 min between repetitions; 1.5–2 min between sets	1–2	120–135
5	Walking 30 meters back and forth with 15 kg barbell, knees half-bent	45 sec – 1 min	2 sets × 2 repetitions	30 sec between repetitions; 1 min between sets	1–2	135–150
6	Walking 30 meters back and forth with 15 kg barbell, knees half-bent	45 sec – 1 min	2 sets × 2 repetitions	30 sec between repetitions; 1 min between sets	1–2	135–150
7	Stretching resistance band to chest level, feet shoulder-width apart (tension depends on band tightness)	30 sec – 1 min	2 sets × 1 repetition	20–30 sec between repetitions; 1 min between sets	1–2	135–150
8	Throwing resistance band over the hip (belt-level throw technique)	2–5 min	4 sets × 3 repetitions	1–2 min between repetitions; 2 min between sets	2–3	155–188
9	Throwing resistance band over the shoulder	2–5 min	4 sets × 3 repetitions	1–2 min between repetitions; 2 min between sets	2–3	145–180
10	Performing side-hip throw with resistance band	2–5 min	4 sets × 3 repetitions	1–2 min between repetitions; 2 min between sets	2–3	150–185
11	Holding a 7 kg dumbbell at arm's length using only fingers	30 sec – 1 min	2 sets × 2 repetitions	15–30 sec between repetitions; 30 sec between sets	1–2	125–140
12	Holding a 10 kg stone while bent forward, alternating grip between fingers	1–2 min	2 sets × 2 repetitions	30 sec – 1 min between repetitions; 1 min between sets	1–2	125–135
13	Holding a 10 kg stone at chest level and pushing it forward using arms	30 sec – 2 min	3 sets × 1 repetition	15–60 sec between repetitions; 1 min between sets	1–2	130–145
14	Lifting and lowering a 10 kg dumbbell, alternating hands	10–20 times or until fatigue	3 sets × 2 repetitions	15–60 sec between repetitions; 1 min between sets	1–2	

Note:

In the above table, various exercises were selected to improve the strength endurance of female student wrestlers. The first column shows the exercise number, the second — the name of the exercise, the third — the average duration of performance, the fourth — the number of repetitions, the fifth — the rest interval, the sixth — the intensity zone of the workload, and the seventh — the number of heartbeats per minute.

Methodology Based on Wrestling Techniques to Improve the Strength Endurance of Female Student Wrestlers

Table 2

№	Name of Technique	Equipment and Type of External Resistance Used	Average Duration of Exercise	Number of Repetitions	Rest Interval	Load Intensity	Heart Rate (beats/min)
1	Grasping the opponent's arm from a convenient position and holding the other hand by the collar	During the technique, a rubber band is tied around the first wrestler's waist, while the second wrestler performs the technique repeatedly	1.2 min × 28–40 reps; 2–3 min × 40–57 reps	3 sets, 1 repetition	1.1–2.2 min between sets	2–3	152–185
2	Grasping the opponent's arm from a convenient position, placing the other hand over the top, holding the belt from behind, and blocking with the leg from the side	The first wrestler has a resistance band tied around the waist; the second performs the technique repeatedly	1.2 min × 28–40 reps; 2–3 min × 40–57 reps	3 sets, 1 repetition	1.1–2.2 min between sets	2–3	145–172
3	Holding the opponent's arm and shoulder from behind, blocking the opponent's leg from the front, and pulling into the throw	The first wrestler has a resistance band tied around the waist; the second performs the technique repeatedly	1.2 min × 28–40 reps; 2–3 min × 40–57 reps	3 sets, 1 repetition	1.1–2.2 min between sets	2–3	165–178
4	Holding the opponent by the arm and belt,	The first wrestler has a resistance band tied around	1.2 min × 28–40 reps; 2–3	3 sets, 1 repetition	1.1–2.2 min	2–3	152–185

№	Name of Technique	Equipment and Type of External Resistance Used	Average Duration of Exercise	Number of Repetitions	Rest Interval	Load Intensity	Heart Rate (beats/min)
	lifting and throwing over the hip	the waist; the second performs the technique repeatedly	min × 40–57 reps		between sets		
5	Grasping the opponent's arm from a convenient position, passing the other hand over the top, holding by the belt, and lifting over the hip with the leg inside	The first wrestler has a resistance band tied around the waist; the second performs the technique repeatedly	1.2 min × 28–40 reps; 2–3 min × 40–57 reps	3 sets, 1 repetition	1.1–2.2 min between sets	2–3	152–185
6	Holding the opponent's arm above the elbow with one hand and the shoulder from behind with the other, pulling toward oneself, and kicking forward	The first wrestler has a resistance band tied around the waist; the second performs the technique repeatedly	1.2 min × 28–40 reps; 2–3 min × 40–57 reps	3 sets, 1 repetition	1.1–2.2 min between sets	2–3	152–185

Note:

In the above table, various wrestling techniques were selected to enhance the strength endurance of female student wrestlers. The first column presents the serial number, the second — the name of the technique, the third — the type of external resistance or equipment used, the fourth — the average execution time, the fifth — the number of repetitions, the sixth — the rest interval, the seventh — the intensity zone of the load, and the eighth — the heart rate (beats per minute).

Abbreviation: HR — Heart Rate (beats/minute)

General Physical Preparedness Indicators of Female Student Wrestlers Before and After the Experiment (n = 8)

Table 3

№	Pull-ups on the wrestling jacket collar (30 sec, reps)	Push-ups in half-bent arm position (max, sec)	Raising legs to 90° while hanging on the bar (30 sec, reps)	Standing knee-raise vertical jumps (30 sec, reps)
	B/E	**A/E**	**B/E**	**A/E**
1	4	10	5	9
2	3	11	6	10
3	5	11	4	10
4	4	10	5	9
5	3	9	6	10
6	4	10	8	13
7	4	10	4	12
8	5	11	5	13
$\bar{X}$	**4.00**	**10.25**	**5.50**	**10.75**
σ	**0.70**	**0.70**	**1.22**	**1.58**
V, %	**17.0**	**6.7**	**22.2**	**14.7**

Note:

This table presents the physical preparedness indicators of female student wrestlers measured before and after the experiment.

- B/E – Beginning of the Experiment
- A/E – After the Experiment
- $\bar{X}$ – Mean value
- σ – Standard deviation
- V, % – Coefficient of variation

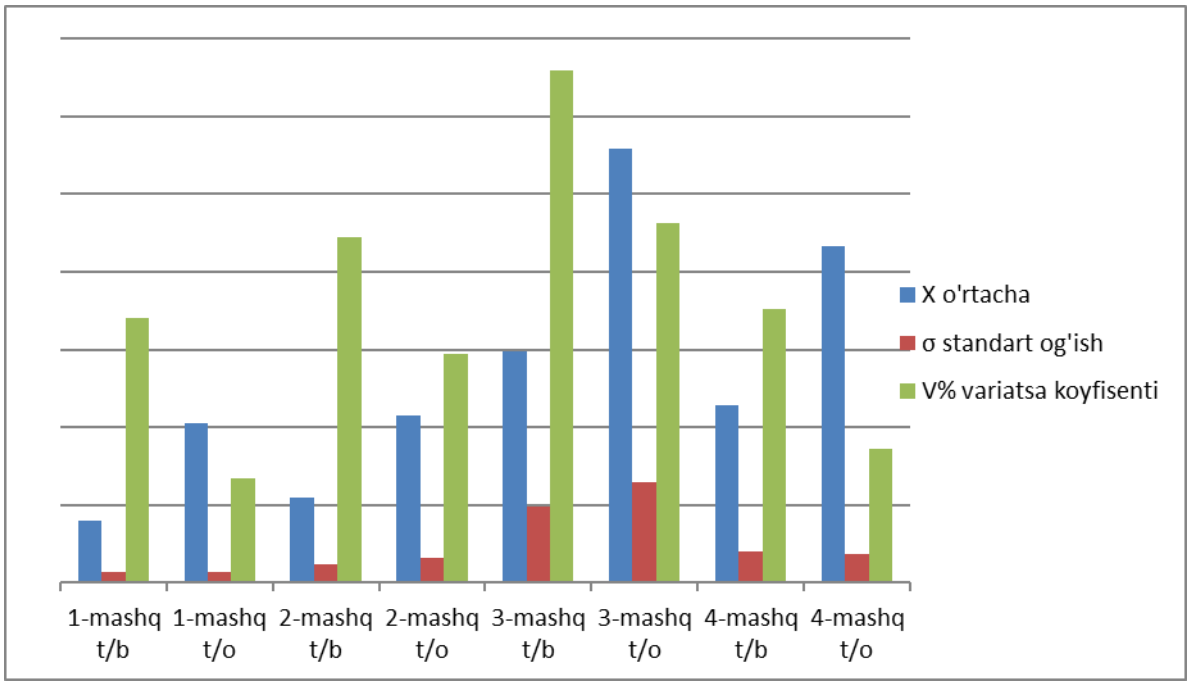
The results indicate a positive improvement in all parameters after the experiment, demonstrating the effectiveness of the applied training methodology for developing strength endurance among female student wrestlers.

Explanation:

In the first row of the table, the numbers represent the number of female wrestlers, that is, the students who participated in our research. The second column shows the results obtained before and after the experiment for the first exercise. The third column corresponds to the second exercise, showing its pre- and post-experimental results. The fourth column presents the third exercise, also indicating the results before and after the experiment. The fifth column refers to the fourth control exercise, with the corresponding pre- and post-test results.

Additionally, the table specifies the following: the type of external resistance applied during each exercise, the duration of performance, the number of repetitions, the rest intervals, the intensity zone of the workload, and the number of heart contractions (heart rate) recorded.

Diagram of the results of female student wrestlers before and after the experiment



Note:

t/b – beginning of the experiment

t/o – end of the experiment

Analysis of the Results of Female Student-Wrestlers Before and After the Experiment

First exercise at the beginning of the study, the average result for this exercise was 4 repetitions. During this period, the coefficient of variation was 17%, indicating instability and inconsistency among the participants' results. By the end of the experiment, the average result had sharply increased to 10.25 repetitions, reflecting an 86% improvement. This indicates significant positive development. Although the standard deviation (σ) remained unchanged, the coefficient of variation decreased from 17% to 6.7%, showing that performance variability significantly decreased and stability within the group improved.

Second exercise. At the start of the study, the average performance result was 5.50 repetitions, with a coefficient of variation of 22.2%, suggesting noticeable inconsistency among the athletes. By the end of the experiment, the average result almost doubled to 10.75 repetitions, marking a 65% increase. The standard deviation slightly increased (σ = 1.22 → 1.58), but the coefficient of variation decreased from 22.2% to 14.7%. This indicates that the group became more stable and consistent. The exercise proved effective — the participants nearly doubled their results, reduced performance dispersion, and showed greater overall stability.

Third exercise. At the beginning of the study: X (mean) = 14.88, σ (standard deviation) = 4.89, V (coefficient of variation) = 32.9%, which shows high variability among the athletes — results differed significantly, and stability was low. At the end of the experiment, the results were: X = 27.88, σ = 6.51, V = 23.1%.

The mean value almost doubled (14.88 → 27.88), demonstrating that the training sessions were highly effective. Although the standard deviation slightly increased, the coefficient of variation decreased (32.9% → 23.1%). This indicates that the athletes showed overall improvement, results became more uniform, and group stability increased. The significant increase in the mean result confirms the effectiveness of the training sessions.

Fourth exercise. At the beginning of the experiment: X (mean) = 11.38, σ = 2, V = 17.6%. During this stage, the average result was relatively low, with moderate dispersion among the participants. By the end of the experiment: X = 21.63, σ = 1.85, V = 8.6%. The mean result increased considerably (11.38 → 21.63), while the coefficient of variation almost halved (17.6% → 8.6%).

This demonstrates that performance became much more consistent and overall group stability improved significantly.

Conclusion. Throughout the experiment, the athletes' average results improved substantially, the standard deviation slightly decreased, and the coefficient of variation dropped markedly. These findings indicate the effectiveness of the training program, the stabilization of performance levels, and the homogenization of overall physical preparedness among the participants.

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