



# Comparative characteristics of special strength fitness rates in armwrestlers of different weight categories and skill levels

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## Abstract

**Objective of the study** was to identify differences between special strength fitness levels of armwrestlers of the middle (80-85 kg) and heavy (up to 110 kg and over 110 kg) weight categories.

**Methods and structure of the study.** Sampled for the study were 24 armwrestlers aged 18-42 years who were divided into 2 weight categories and 2 groups depending on their skill levels. Group I (n=12) included the athletes with the sports titles "World Class Master of Sport" and "Master of Sport of Russia". Group II (n=12) was made of the athletes with the sports qualifications of Class I athletes and Candidate Masters of Sport. Group A (middle weight category) included the athletes (n=12) with the body mass of 78 to 85 kg, Group B (heavy weight category) - 105 kg and over (n=12). The subjects' special strength abilities were assessed using the tensodynamometry method.

**Results and conclusions.** The skilled armwrestlers and athletes of the heavy weight category (up to 110 kg and over 110 kg) were found to have significantly higher special strength fitness rates as compared to those of the middle weight category (80-85 kg.). The greatest differences between the mean strength values were found in the muscles involved in the forearm pronation, shoulder pronation, and wrist abduction ( $p < 0.01$ ). The smallest differences were found in the strength of the finger flexor muscles, forearm flexor muscles in the supine position, and wrist flexor muscles ( $p < 0.05$ ). The armwrestlers of the heavy weight category left those of the middle weight category behind in all the control tests.

**Keywords:** armwrestling, strength fitness, weight categories, strength topography.

**Background.** Armwrestling is a sport that demands higher standards of strength qualities. Research suggests that highly-skilled athletes have an advantage in both the anthropometric (forearm length, hand length and width, shoulder and forearm circumferences [3, 4]) and strength parameters (hand and fingers flexion [2, 5, 6], shoulder pronation: forearm supination and pronation, hand abduction, forearm flexion [1, 2]). This is evidenced by the results of competitions in the absolute (open-weight) weight category. They are common for Russian and international tournaments, in particular, commercial tournaments. At times, the difference in the athletes' body mass is up to 30-50

kg or even more. It is not uncommon for an athlete of a lighter weight class to beat a heavier athlete.

**Objective of the study** was to identify differences between special strength fitness levels of armwrestlers of the middle (80-85 kg) and heavy (up to 110 kg and over 110 kg) weight categories.

**Methods and structure of the study.** Sampled for the study were 24 armwrestlers aged 18-42 years who were divided into 2 weight categories and 2 groups depending on their skill levels. Group I (n=12) included the athletes with the sports titles "World Class Master of Sport" and "Master of Sport of Russia". Group II (n=12) was made of the athletes with the

**Table 1.** Comparative characteristics of special strength fitness rates in highly-skilled armwrestlers (MS and WCMS)

Control tests	Group A 80-85 kg, M±m	Group B 105+ kg, M±m	Difference, kg	Difference, %	T	P
Side	36.22±2.37	50.16±3.58	13.94	38.49	3.25	<0.01
Hand	63.31±4.65	79.80±3.09	16.49	26.05	2.95	<0.05
Abduction	23.17±1.80	36.12±2.49	12.95	55.89	4.21	<0.01
Supination	38.98±6.17	55.5±4.81	16.52	42.38	2.20	<0.05
Radius	39.26±1.18	52.89±3.96	13.63	34.72	3.30	<0.01
Back	74.44±5.92	108.11±2.72	33.67	45.23	5.17	<0.01
Biceps	40.35±2.24	50.79±2.13	10.44	25.87	2.38	<0.05
Pronation	37.03±4.09	63.23±5.62	26.20	70.75	3.77	<0.01
Fingers	80.10±6.08	98.37±5.67	18.27	22.81	2.20	<0.05

sports qualifications of Class I athletes and Candidate Masters of Sport. Group A (middle weight category) included the athletes (n=12) with the body mass of 78 to 85 kg, Group B (heavy weight category) - 105 kg and over (n=12).

The subjects' special strength abilities were assessed using the tensodynamometry method [2]. After the warm-up, the subjects were given two attempts for every test, where only the best attempt was recorded.

The athletes' maximum effort was registered in the following 9 main anatomical points of strength topography: shoulder pronator, hand flexors, hand abductor muscles, forearm supinators, neutral-point forearm flexors, shoulder extensors, supine forearm flexors, forearm pronators, and finger flexors, with every test applied to the relevant strength focusing point.

The statistical analysis of the data obtained was carried out using the license application program package "Excel". The method of descriptive statis-

tics was applied to analyze the following indicators: arithmetic mean, standard deviation, and error of the mean. The statistical significance of differences in the groups was determined by the parametric Student's t-test.

The study was carried out on the basis of the armwrestling section of the Bauman Moscow State Technical University.

**Results and discussion.** Given in Table 1 are the indicators of special strength fitness of the armwrestlers with the sports titles.

*Legend.* Side – shoulder pronation, hand – hand flexion, abduction – hand abduction, supination – forearm supination, radius – neutral-point forearm flexion, back – shoulder extension, biceps – supine forearm flexion, pronation – forearm pronation, fingers – finger flexion.

The statistical analysis revealed significant differences between the middle and heavy weigh cat-

**Table 2.** Comparative characteristics of special strength fitness rates in armwrestlers of senior categories (CMS)

Control tests	Group A 78-85 kg, M±m	Group B 105+ kg, M±m	Difference, kg	Difference, %	t	p
Side	32.02±2.07	45.14±2.61	13.12	40.97	3.94	<0.01
Hand	53.75±0.47	70.79±4.56	17.04	31.70	3.72	<0.01
Abduction	19.83±1.53	30.64±1.14	10.81	54.51	5.67	<0.01
Supination	34.67±2.59	45.87±4.33	11.2	32.30	2.22	<0.05
Radius	37.03±0.89	49.64±2.55	12.61	34.05	4.67	<0.01
Back	74.42±5.13	104.39±7.36	29.97	40.27	3.34	<0.01
Biceps	36.29±2.90	50.23±3.76	13.94	38.41	2.94	<0.05
Pronation	32.92±1.67	56.11±2.49	23.19	70.44	7.73	<0.01
Fingers	65.39±1.67	85.38±3.91	19.99	30.57	4.70	<0.01

egory groups in terms of all test rates. The greatest difference between the mean strength values, above 50%, was found in the forearm pronators and hand abductors ( $p < 0.01$ ); the smallest, below 30% - in the finger flexors, supine forearm flexors, and hand flexors ( $p < 0.05$ ). At the same time, the mean body mass value in Group A was 83.3 kg, while in Group B - 122.6 kg - 32% difference.

Similar results were obtained in the comparative analysis of the armwrestlers with the 1st senior category and title of Candidate Master of Sports (Table 2). The armwrestlers of the senior categories from Group B left the highly-skilled armwrestlers of Group A behind in all the control tests.

As may be supposed, occasional wins of the armwrestlers of the middle weight category over those of the heavy weight one were due to the better developed speed qualities and special endurance of the former, which indicated a higher integral training level.

**Conclusions.** The skilled armwrestlers and athletes of the heavy weight category (up to 110 kg and over 110 kg) were found to have significantly higher special strength fitness rates as compared to those of the middle weight category (80-85 kg.). The largest differences between the mean strength values were found in the muscles involved in the forearm pronation, shoulder pronation, and wrist abduction ( $p < 0.01$ ). The smallest differences were found in the strength of the finger flexor muscles, forearm flexor muscles in the supine position, and wrist flexor muscles ( $p < 0.05$ ). The armwrestlers of the heavy weight category left those of the middle weight category behind in all the control tests.

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