

Morphometric Characteristics of Body Build and Component Composition of Body Mass in Greco-Roman Wrestlers Taking into Account Their Functional Capabilities

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Received: 18 April 2026; **Accepted:** 03 May 2026; **Published:** 29 May 2026

Abstract: When analyzing the physical development established by anthropometric research methods, it was established that high variability is characteristic of Greco-Roman wrestlers' physique characteristics such as arm length - σ - 4.91 ± 1.12 , shoulder length - σ - 4.74 ± 0.51 , hip length - 4.91 ± 0.50 , for which signal deviation values are higher than average values. When assessing and diagnosing somatotypes in 12 wrestlers by type, classical wrestling, conducted by comparison with judokas and sambo wrestlers, allowed for the identification of distinguishing features of the component composition of body weight characteristic of Greco-Roman wrestling.

Keywords: Anthropometry, morphometry, somatotype, wrestlers, bodycomposition, functionalcapacity, grecoromanwrestling, physique, bioimpedance, athleticperformance.

Introduction: Relevance: When preparing athletes in strength sports at both the initial and advanced stages of sports training, it is necessary to take into account individual physical fitness qualities, determined on the basis of complex criteria, including an assessment of the morphological and functional state of the body, which are a reflection of overall physical performance.

Level of study: The importance and necessity of taking into account anthropometric indicators in the training of wrestlers of various specializations, identifying the connection between constitutional features in athletes of various specializations and qualifications with their speed-strength and strength capabilities, the influence of hereditary and environmental factors on the formation of morphofunctional characteristics have been widely studied in the literature. As an analysis of the presented studies revealed, the scientific and

methodological literature lacks data on the specifics of morphological indicators, particularly on assessing physical development based on anthropometric indicators in Greco-Roman wrestlers. The specifics of body mass component composition are not covered, nor is there data on the relationship between morphological indicators and functional fitness indicators, which served as the rationale for conducting this study.

The aim of the study: a comparative assessment of the morphometric characteristics of body build and indicators of the component composition of body mass in Greco-Roman wrestlers, taking into account the functional capabilities

METHODS

Morphological methods: anthropometry – assessment

of physical development based on total and partial body measurements, somatoscopy – determination of the component composition of body mass based on the Heath-Carter 1989 method with subsequent diagnosis of the somatotype type in 12 highly qualified Greco-Roman wrestling wrestlers, 20 judo wrestlers, 25 wrestlers specializing in sambo.

Functional methods: assessing the activity of the informative cardiovascular and respiratory systems—determining physical performance using the PWC-170 test and the VO₂ max (maximal oxygen consumption) of highly skilled wrestlers. Blood pressure (BP) was measured at rest, under load, and at rest in athletes specializing in Greco-Roman wrestling.

Methods of Mathematical Statistics: The reliability of the obtained results is ensured by the methodological basis of the study, the adequacy of the methods used and the objectives of the work, and the correctness of the statistical processing of the obtained data.

RESULTS AND DISCUSSION

Table 1 presents the anthropometric parameters of the Greco-Roman wrestlers' physical development. Analysis of total body measurements revealed variability in both length and body mass. The standard deviation coefficient (SD) for body mass was $\sigma -5.45 \pm 0.57$, while for body mass, the sigma σ was -6.73 ± 0.70 (Table 1).

Table 1. Assessment of the physical development of Greco-Roman wrestlers based on anthropometric characteristics

	Options	Greco-Roman-40	Signs	Options	Greco-Roman-40
Body length ±	M±m	175,07±0,80	Thigh length	M±m	47,50± 0,40
	σ ±m	5,45±0,57		σ ±m	4,91±0,50
	V±m	3,10± 0,34		V±m	1,14±0,47
Body weight	M±m	70,16±1,03	Calf length	M±m	44,60±0,42
	σ ±m	6,73±0,70		σ ±m	2,96±0,41
	V±m	8,85±0,94		V±m	0,95±0,12
Chest circumference	M±m	95,10±5,98	Arm length	M±m	77,25± 0,68
	σ ±m	3,93±0,41		σ ±m	4,92±1,12
	V±m	4,11±0,42		V±m	3,49±0,37
Case length	M±m	82,10±0,43	Shoulder length	M±m	34,59±0,39
	σ ±m	3,85± 0,30		σ ±m	2,82±0,37
	V±m	3,48±0,38		V±m	4,74±0,51
Body length	M±m	54,28± 0,39	Forearm length	M±m	28,57±0,31
	σ ±m	2,58±0,28		σ ±m	2,26±0,52
	V±m	4,72±0,50		V±m	3,49±0,50
Leg length	M±m	93, 79±0,56	Brush length	M±m	20,06±0,51
	σ ±m	3,80±0,40		σ ±m	1,54±0,21
	V±m	3,74±0,45		V±m	4,68±0,56

This indicates that growth processes are not yet complete, and these characteristics may change. However, according to the chest circumference and, judging by the sigma index, 3.93 ± 0.41 , the variability is moderate, but the growth processes in the chest indicators are not yet complete, and further development of the chest is expected. High variability is characteristic of such body traits as arm length - $\sigma - 4.91 \pm 1.12$, shoulder length - $\sigma - 4.74 \pm 0.51$, femur length - 4.91 ± 0.50 , for which the sigma deviations are higher

than the average values. In the dimensional characteristics of the hand, the stability of the value of the standard deviation was revealed, which amounted to 1.54 ± 0.21 . Comparison of the total sizes between wrestlers of different specializations revealed that the greatest body length is noted in Greco-Roman wrestling and kurash wrestlers 175.30 ± 2 , 175.44 ± 1.08 , and smaller length sizes are characteristic of sambo wrestlers and judokas - 172.53 ± 2.31 , 172.95 ± 1.92 [11]. The most stable were the partial length sizes:

shoulder length, forearm shin, torso length. Fluctuations in sigma deviation range from σ - 2.26 to σ - 2.96.

The study assessed a more informative body composition indicator based on body mass component composition, followed by somatotype diagnosis. According to somatotype, the athletes studied showed a distinct tendency toward ecto-mesomorphism. In total, two somatotypes were identified in the examined sample of Greco-Roman wrestlers: ecto-mesomorphic and balanced-mesomorphic. According to Safarova, 2003, the ecto-mesomorphic type is significant for judokas and sambo wrestlers (33.4–41.7%). Wrestlers specializing in Greco-Roman or Greco-Roman wrestling exhibited an equal distribution of the two somatotypes: ecto-mesomorphic occurred in 50% of cases, while balanced mesomorphic accounted for 41.7%. Higher values of the ectomorphic component are characteristic of Greco-Roman wrestlers, whose average somatotype

scores are 2.8:4.6:2.7. The lowest endomorphy is characteristic of Greco-Roman wrestlers. However, a lag in the degree of endomorphy and mesomorphy in Greco-Roman wrestlers has been found, offset by the highest values of the ectomorphy index. As Table 2 shows, the degree of ectomorphy is diametrically opposed to the quantitative content of the endomorphic and mesomorphic components. The higher the degree of endomorphy and mesomorphy, the lower the ectomorphy value, which is particularly noticeable in athletes of the classical or Greco-Roman wrestling disciplines. Thus, when assessing and diagnosing the somatotype of 12 wrestlers in the Greco-Roman wrestling category, conducted by comparing them with judokas ($n=20$) and sambo wrestlers ($n=25$), it was possible to identify distinctive features of the component composition of body mass that are characteristic of Greco-Roman wrestling compared to other types of wrestling specializations.

Severity of somatotype components in strength athletes

Table 2.

Specialization	n= number of subjects	Endomorphy	Mesomorphy	Ectomorphy
Judo	20	3,0	5,1	2,2
Sambo	25	2,9	5,4	2,3
Greco-Roman wrestling	12	2,8	4,6	2,7

In strength sports, functional fitness is paramount in the training process, as it underlies the development of specialized motor skills. However, the development of wrestlers' specialized motor skills is inextricably linked to endurance. It should be noted that motor actions are based on stereotypes, which determine the components of the movement system's structure. It is the stereotyped composition of motor actions that allows for the selection of the most effective specialized exercises that meet the needs of the chosen

specialization. We assessed the physical performance of Greco-Roman wrestlers. An analysis of total body measurements shows that our group of wrestlers varies across weight categories, with body weight fluctuations ranging from 77 kg to 130 kg. They are united only by their athletic qualifications, as the entire group is comprised of highly skilled wrestlers with Master of Sport qualifications. A proposed set of indicators characterizing the potential of the aerobic system and physical performance can be used to determine the wrestlers' level of functional fitness.

Evaluation of the functional fitness of Greco-Roman wrestlers

Table 3.

No	Full name			BP (blood pressure)	PWC ₁₇₀	IPC
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		Weight (kg)	Height (cm)	At rest	Under load	51 restoration		
1	Пе-ов В.	93	197	130/80	180/50	120/80	1950	5.36
2	Та-ов Б.	110	188	130/80	200/80	180/50	1799	5.02
3	Ак-ов Э.	78	171	100/60	180/60	110/70	1600	4.59
5	Юл-ев Л.	83	180	120/70	160/70	110/70	1699	4.80
6	На-ев Х.	86	179	120/80	150/80	120/80	1833	5.10
7	За-ов С.	77	170	120/70	160/40	120/70	1950	4.9
8	Жу-ев М.	75	177	130/80	140/70	130/70	1950	5.3
9	Ту-ев О.	130	194	120/80	160/70	120/80	2160	5.8
10	Му-ов И.	78	179	120/80	170/60	120/80	1699	4.8
11	Ку-ов У.	103	181	130/80	150/80	130/70	1699	4.8
12	Дад-ов С.	77	178	120/80	180/60	130/70	1811	5,05

In targeted training, information on parameters that change during training, under the influence of standard or specific types of loads, is of increasing interest. The objectives of our study included examining and analyzing blood pressure (BP) readings. It was found that at rest, all BP readings were normal, i.e., 120/80. Only four wrestlers had slightly elevated blood pressure readings, reaching 130/80. Under the influence of standard physical exercise, the athletes' bodies responded differently, with blood pressure fluctuating between 150/80 and 200/80. These indicators also indicate the athletes' level of training. After 5 minutes of recovery, blood pressure returned to baseline values for almost all wrestlers, further demonstrating that the entire sample of wrestlers represents a highly skilled, promising group and can be recommended for participation in prestigious international competitions. Achieving high athletic performance requires certain physiological prerequisites. The most informative physiological indicator is maximum oxygen consumption (VO₂max). This is an integral indicator of the performance of all systems that supply the body with oxygen. In recent years, it has been proven that VO₂max is strictly genetically determined and can be considered a genetic marker [10]. It is known that human muscles contain so-called "fast," "slow," and "intermediate" fibers. Depending on the predominance of these muscle fibers, an athlete can excel in either "fast" or "slow" sports. Training does not significantly alter muscle composition. The VO₂ max reflects the high aerobic capacity of Greco-Roman wrestling athletes, allowing for an objective assessment of the

functional state of the cardiorespiratory system and their level of physical performance.

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