Comparative characteristics of anthropometric and bioimpedancemetric indicators of highly qualified wrestlers and boxers of Yakutia

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Abstract

Objective of the study was to identify the features of anthropometric and bioimpedancemetric indicators of highly qualified wrestlers and boxers from Yakutia.

Methods and structure of the study. 49 male athletes participating in the Republican Center for Sports Training of National Teams of the Republic of Sakha (Yakutia) took part in the scientific work. Of these, 36 athletes were engaged in freestyle wrestling, 13 – boxing. Body length and weight, chest circumference, waist and hips were measured. The bioimpedance study included the determination of active and reactance resistance and body components: fat mass, active cell mass, skeletal muscle mass, lean mass of athletes.

Results and conclusions. Athletes involved in freestyle wrestling showed significantly higher indicators of body weight, body mass index, hip circumference and chest circumference, and the absolute amount of skeletal muscle and lean mass. Frequency analysis of BMI determined the presence of overweight and obese individuals among the wrestlers. Among the boxers, there were no overweight or obese individuals based on BMI. According to the bioimpedance study, significantly higher rates of active and reactive resistance were found in boxers due to reduced body hydration. The resulting anthropometric and bioimpedance metrics provide valuable scientific data that can be used to improve the effectiveness and individualization of training, weight management and improve the overall performance of athletes involved in freestyle wrestling and boxing.

Keywords: *anthropometry, bioimpedancemetry, wrestlers, boxing, Yakutia, body components.*

Introduction. Anthropometric and bioimpedance studies play an important role in sports science, especially in contact sports such as wrestling and boxing [6]. It is known that athletes involved in different sports have certain morphofunctional characteristics that help them in sports activities [1, 2]. Understanding an athlete's physical characteristics helps coaches and physical training specialists individualize training programs, monitor progress, and prevent injury in athletes. All of this can allow the athlete to optimize fitness and performance to achieve their maximum potential.

Anthropometric and BIA characteristics of athletes can vary depending on many factors, including ethnicity, gender, age and level of physical activity [4, 5]. In this regard, the study of athletes from Yakutia is relevant.

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Methods and structure of the study. 49 male athletes participating in the Republican Center for Sports Training of National Teams of the Republic of Sakha (Yakutia) took part in the scientific work. Of these, 36 athletes were engaged in freestyle wrestling, 13 – boxing. The average age of wrestlers was 21,4±0,51 years, boxers – 23,4±0,89 years. The qualification level of the examined athletes varied from master of sports to international master of sports. The purpose, methods, and exclusion criteria for the study were explained to all participants. The scientific work was carried out after they signed a voluntary consent. An anthropometric study was carried out with measurements of body length and weight, chest circumfer-

ence, waist and hips. Bioimpedansometry (BIA) was carried out using the ABC-01 Medass apparatus in order to determine bioelectrical parameters (active resistance - R5, R50; reactance - Xc5, Xc50) and body components (fat mass (FM), active cell mass (ACM), skeletal muscle mass (SMM), lean mass (LM) of athletes. The BIA protocols also include an assessment of the athletes body hydration (total, extracellular and intracellular water). The obtained material was statistically processed using the SPSS 22.0 application package to describe the results. The results used were the mean value (M), the error of the mean deviation of the value (m), the standard deviation ( ), the minimum and maximum. The significance of intergroup differences was carried out using the Mann–Whitney U test. Differences were considered statistically significant at $p<0,05$.

Results of the study and discussion. The results of an anthropometric study of athletes involved in freestyle wrestling and boxing are presented in Table 1.

Analysis of the obtained indicators revealed that with reliably indistinguishable body length parameters, freestyle athletes had significantly higher body weight ($p=0,049$), BMI ($p<0,001$), hip circumference ($p=0,018$) and chest circumference ($p=0,0110$). The identified anthropometric characteristics of wrestlers are related to the fact that wrestling requires wider dimensions of the shoulders, chest, hips and buttocks for grips, throws and for stability and maneuverability during the fight. Frequency analysis of BMI determined the predominance of persons with normal body weight in 63.9% of wrestlers (n=23) and 92,3% of boxers (n=12). Among the wrestlers there were athletes with overweight (30,6%, n=11) and obesity (5,5%, n=2). Among boxers, there were no overweight or obese individuals based on BMI. The OT/BP index in 94,4% of wrestlers and 100,0% of boxers was within normal values; an increased OT/BP index was determined only in two wrestlers (5,6%). The bioelectrical parameters of the body of the examined wrestlers and boxers are presented in table 2.

Analysis of bioelectrical indicators of active (R5, R50) and reactive (Xc5, Xc50) resistances measured at frequencies of 5 and 50 kHz revealed significantly higher indicators in boxers ($p <0,001$), which is explained by the lower hydration of their body, since the conduction of electrical current is influenced by the amount of fluid in the body, which has an ionic conduction mechanism [3]. The total body fluid of the wrestlers was 44,37±1,05 kg, of the boxers – 40,0±0,71 kg, which had significant differences ($p=0,030$). The difference is due to the higher content of intracellular water in wrestlers compared to boxers (26,29±0,67 kg and 23,72±0,53 kg, respectively). The average value of extracellular water was 18,09±0,48 kg in wrestlers and 16,27±0,54 kg in boxers. The absolute and relative values of the body components of the examined groups of athletes involved in freestyle wrestling and boxing are presented in Table 3.

Analysis of the average values of body components revealed significant differences in only two components: the absolute amount of SMM and LM, which were higher in athletes involved in freestyle wrestling ($p = 0,006$ and $p = 0,026$).

Table 1. Anthropometric parameters of athletes involved in freestyle wrestling and boxing

Parameters	Freestyle wrestling (n=36)			Boxing (n=13)		
	Min – Max	M±m	δ	Min – Max	M±m	δ
Body length, cm	159,0-197,0	171,19±1,30	7,85	161,0-184,0	174,30±1,58	5,71
Body weight, kg	57,0-125,0	73,0±2,60	15,65	53,0-72,0	63,76±1,72	6,21
BMI, kg/m^2	21,4-40,8	24,74±0,64	3,86	17,6-22,9	20,94±0,34	1,22
Waist circumference, cm	65,0-106,0	74,83±1,56	9,36	58,0-78,0	71,53±1,34	4,85
Hip circumference, cm	83,0-120,0	94,0±1,37	8,25	84,0-94,0	88,23±0,85	3,06
OT/OB	0,72-1,39	0,81±0,01	0,11	0,69-0,85	0,80±0,01	0,04
Chest circumference, cm	83,5-121,0	94,82±1,49	8,98	77,0-94,0	88,31±1,29	4,67

Table 2. Bioelectrical parameters of the body of athletes involved in freestyle wrestling and boxing

Parameters	Freestyle wrestling (n=36)			Boxing (n=13)		
	Min – Max	M±m	δ	Min – Max	M±m	δ
R50, Om	316,0-552,0	456,69±8,22	49,35	495,0-579,0	535,41±7,51	27,08
R5, Om	372,0-657,0	514,47±12,63	75,78	419,0-685,0	593,61±23,31	84,06
Xc50, Om	41,0-77,0	58,59±1,23	7,39	62,9-78,20	70,03±1,20	4,34
Xc5, Om	20,1-373,0	74,52±17,68	106,09	31,7-371,0	131,58±48,13	152,20

Table 3. Body composition of athletes involved in freestyle wrestling and boxing

Parameters	Freestyle wrestling (n=36)			Boxing (n=13)		
	Min – Max	M±m	δ	Min – Max	M±m	δ
FM, kg	5,40-36,70	12,36±1,31	7,90	3,00-13,20	9,13±0,89	3,22
FM, %	8,85-30,00	15,89±1,02	6,14	5,56-18,33	14,01±1,14	4,12
ACM, kg	29,30-53,00	36,17±0,91	5,46	28,10-37,60	32,93±0,77	2,78
ACM, %	41,02-54,56	50,11±0,61	3,68	47,34-57,68	51,77±0,79	2,87
SMM, kg	26,70-46,20	33,55±0,71	4,29	26,50-32,70	30,11±0,49	1,79
SMM, %	36,45-56,56	46,75±0,83	5,01	44,31-53,15	47,44±0,80	2,89
LM, kg	51,00-88,30	60,63±1,44	8,66	48,00-59,20	54,63±0,97	3,51
LM, %	70,00-91,15	84,10±1,02	6,14	81,67-94,44	85,98±1,14	4,12

Conclusions. A scientific study showed that with reliably indistinguishable body length parameters, freestyle athletes had significantly higher body weight, BMI, hip circumference and chest circumference. Frequency analysis of BMI determined the presence of overweight and obese individuals among the wrestlers. Among boxers, there were no overweight or obese individuals based on BMI. According to the bioimpedance study, significantly higher rates of active and reactive resistance were established in boxers. The difference is due to the higher content of total and intracellular water in wrestlers compared to boxers. Athletes involved in freestyle wrestling showed large values of the absolute amount of skeletal muscle and lean mass. The resulting anthropometric and bioimpedance metrics provide valuable scientific data that can be used to improve the effectiveness and individualization of training, weight management and improve the overall performance of athletes involved in freestyle wrestling and boxing.

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