

# Gender differences of morphofunctional signs in persons engaged in single combats

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## Abstract

**Objective of the study** was to compare the degree of expression of sexual dimorphism of morphofunctional traits in athletes involved in taekwondo and martial arts in general. 101 athletes and 105 athletes aged 18-23 years old, specializing in martial arts (taekwondo, boxing, freestyle wrestling), performing in the qualification of the I adult category - Master of Sports were examined. All representatives of martial arts were combined into two groups of a single array (sportsmen and athletes). Taekwondo athletes made up two experimental groups (sportsmen and sportswomen).

**Methods and structure of the study.** With the help of anthropometry, all the necessary measurements were made in athletes (longitudinal, transverse, girth, thickness of skin-fat folds), body mass components and somatotype according to the Heath-Carter scheme were determined, indicators of VC, backbone strength and dynamometry of the leading arm were identified.

**Results and conclusions.** Differences in the sexual dimorphism of morphological and functional parameters in taekwondo fighters were revealed in comparison with a single array of martial artists. Gender differences in functional indicators in the examined athletes are more pronounced than in morphological parameters, regardless of the type of martial arts.

**Keywords:** *sexual dimorphism, morphofunctional indicators, taekwondo, boxing, freestyle wrestling.*

**Introduction.** It is known that in female athletes, many morphological and functional indicators approach or even exceed the corresponding parameters in male athletes. The physique features of athletes depend primarily on the biomechanical stereotype and energy characteristics of the sport. So, for example, there is a convergence of gender differences in body proportions in people involved in cyclic sports, in the ratio of muscle and fat components of body mass - in endurance trainees [4].

In our previous studies, it was shown that sexual dimorphism manifests itself to varying degrees in representatives of specializations with different biomechanics of motor activity [6]. At the same time, the question of how pronounced gender differences in morphofunctional characteristics are in athletes of closely related specializations remains unexplored.

**Objective of the study** was to reveal the sexual dimorphism of morphological and functional traits in athletes involved in taekwondo, and to compare the degree of its severity with the corresponding indicators in representatives of martial arts in general.

**Methods and structure of the study.** 101 athletes and 105 athletes aged 18-23 years old, specializing in martial arts (taekwondo, boxing, freestyle wrestling), performing in the qualification of the I adult category - Master of Sports (Table 1) were examined. All representatives of martial arts were combined into two groups of a single array (sportsmen and athletes). Taekwondo athletes made up two experimental groups (sportsmen and sportswomen). In all subjects, height, weight, longitudinal, transverse and girth dimensions of the body, as well as the thickness of skin-fat folds were measured, body mass components, somato-

**Table 1.** Characteristics of study participants

Type of martial arts	Gender of athletes		Number of persons
	Women	Men	
Taekwondo	36	40	76
Box	35	34	69
Freestyle wrestling	30	31	61
Total number	101	105	206

type, indicators of VC, backbone strength and dynamometry of the leading arm, physical development of athletes were determined [1, 5- 7].

**Results of the study and their discussion.** As a result of the study, gender differences in anthropometric and functional characteristics were noted both in taekwondo athletes and in all examined martial artists in general, however, the degree of severity of sexual dimorphism in the experimental groups and groups of the fused array was different (Table 2). As expected, athletes in all studied parameters outperform athletes of the same age and level of sportsmanship. At the same time, in representatives of taekwondo, gender

differences in morphological features were revealed to a lesser extent, compared with the group of the fused array. This is especially true for indicators of the length of the limbs, the circumference of the chest and forearm, the average thickness of the skin-fat folds, the content of muscle mass of the body. Gender differences in the component composition of the somatotype in taekwondo athletes were revealed only in mesomorphy, while in athletes of the fused array - both in mesomorphy and ectomorphy. Comparison of the sexual dimorphism of the indicators of the mesomorphic component revealed significantly smaller differences among taekwondo fighters, compared with

**Table 2.** Comparative analysis of gender differences in morphofunctional parameters in athletes ( $\bar{x} \pm S_x$ )

Morphofunctional indicators	Sportswomen		Sportsman	
	Taekwondo (n=24)	Fused array (n=101)	Taekwondo (n=28)	Fused array (n=105)
Body length, cm	164,5 $\pm$ 2,1	162,3 $\pm$ 5,9	175,5 $\pm$ 2,3*	174,7 $\pm$ 6,1*
Upper limb length, cm	72,0 $\pm$ 1,8	71,5 $\pm$ 1,8	75,9 $\pm$ 1,5*	77,5 $\pm$ 2,7*
Lower limb length, cm	86,2 $\pm$ 2,3	87,2 $\pm$ 1,9	88,5 $\pm$ 1,8*	91,1 $\pm$ 2,8*
Chest girth, cm	87,8 $\pm$ 1,3	88,9 $\pm$ 1,3	91,6 $\pm$ 1,3*	93,8 $\pm$ 1,3*
Thigh girth, cm	56,2 $\pm$ 2,4	55,3 $\pm$ 2,1	60,4 $\pm$ 3,1*	58,2 $\pm$ 2,7*
Shoulder girth, cm	27,0 $\pm$ 1,4	26,8 $\pm$ 1,3	31,0 $\pm$ 2,2*	30,5 $\pm$ 1,6*
Forearm girth, cm	24,0 $\pm$ 1,2	23,5 $\pm$ 1,6	25,5 $\pm$ 1,3	28,0 $\pm$ 2,3*
Shin girth, cm	36,1 $\pm$ 2,1	35,0 $\pm$ 1,9	39,1 $\pm$ 2,2*	37,9 $\pm$ 2,1*
Acromial diameter, cm	38,4 $\pm$ 2,2	38,3 $\pm$ 2,0	40,5 $\pm$ 2,1*	40,7 $\pm$ 1,7*
Pelvic crest diameter, cm	27,9 $\pm$ 1,6	27,2 $\pm$ 1,1	26,0 $\pm$ 1,3*	25,9 $\pm$ 1,9*
Average thickness of skin-fat folds, mm	13,2 $\pm$ 0,9	13,4 $\pm$ 0,6	8,2 $\pm$ 0,8*	7,1 $\pm$ 0,7*
Bone component, %	17,8 $\pm$ 1,4	17,1 $\pm$ 1,6	20,4 $\pm$ 1,1*	21,9 $\pm$ 1,4*
Muscle component, %	45,8 $\pm$ 2,2	44,7 $\pm$ 2,8	51,2 $\pm$ 2,3*	52,3 $\pm$ 2,8*
Fat component, %	23,0 $\pm$ 1,2	23,3 $\pm$ 2,1	8,1 $\pm$ 0,7*	6,8 $\pm$ 0,9*
Endomorphy, points	3,0 $\pm$ 0,3	3,4 $\pm$ 0,5	3,0 $\pm$ 0,1	3,5 $\pm$ 0,4
Mesomorphy, points	5,0 $\pm$ 0,6	4,8 $\pm$ 0,4	5,5 $\pm$ 0,2*	6,1 $\pm$ 0,7*
Ectomorphy, points	2,9 $\pm$ 0,2	2,6 $\pm$ 0,3	3,0 $\pm$ 0,4	3,2 $\pm$ 0,1*
VC, l	3550 $\pm$ 15,6	3780 $\pm$ 20,8	4440 $\pm$ 19,5*	4990 $\pm$ 25,16*
Hand dynamometer, kg	24,5 $\pm$ 1,5	25,3 $\pm$ 1,2	56,8 $\pm$ 2,4*	56,0 $\pm$ 3,5*
Deadlift, kg	64,2 $\pm$ 2,2	68,5 $\pm$ 1,9	142,3 $\pm$ 4,3*	145,5 $\pm$ 6,0*

Note: n - sample size, \* - differences between persons of different sexes are significant,  $p < 0.05$ .



the corresponding indicators among representatives of martial arts in general.

It is interesting to note that the gender differences in functional indicators in the examined athletes are more pronounced than in anthropometric parameters, regardless of the type of martial arts.

Thus, the comparison of gender differences in morphofunctional characteristics in taekwondo fighters and in athletes of the fused array showed a lesser severity of sexual dimorphism of the studied indicators in taekwondo representatives, which is explained, on the one hand, by the result of the selection of athletes with a certain set of morphofunctional characteristics necessary for their successful competitive activity in taekwondo, and on the other hand, by the influence of the training process, which forms the necessary somatotype of an athlete [2, 3].

**Conclusions.** Differences in the sexual dimorphism of morphological and functional parameters in taekwondo fighters were revealed in comparison with a single array of martial artists. Gender differences in functional indicators in the examined athletes are more pronounced than in morphological parameters, regardless of the type of martial arts.

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