DOI 10.26773/jaspe.230104

Journal of Anthropology of Sport and Physical Education

ORIGINAL SCIENTIFIC PAPER

Morphological Characteristics and Body Composition in Female Kata and Kumite Karatekas

Borko Katanic[1], Dusko Bjelica[2], Nedim Covic[3]

[1]University of Nis, Faculty of Sports and Physical Education, Nis, Serbia, [2]University of Montenegro, Faculty for Sports and Physical Education, Niksic, Montenegro, [3]University of Sarajevo, Faculty of Sport and Physical Education, Sarajevo, BiH

Abstract

Elite female karatekas should have specific morphological characteristics suitable for their specializations. This study aimed to determine the differences in morphological characteristics and body composition of female karatekas according to different specializations. This study consisted of a total of 15 female karatekas divided according to specialization in kumite (fighting) and kata (form or movement pattern) disciplines. The subject sample included healthy, female senior karatekas, with no prior injuries divided into kumite (n-8, 22.75±4.65 years) and kata (n-7, 22.00±4.58 years) athletes. Morphological characteristics and body composition were evaluated by a battery of 11 variables: body height (BH), body mass (BM), triceps skinfold (TS), biceps skinfold (BiS), back skinfold (BS), abdominal skinfold (AS), upper leg skinfold (UlS), lower leg skinfold (LlS), body mass index (BMI), fat percentage (FP), and muscle mass percentages (MP). Based on the t-test for small independent samples, findings showed that female kata and kumite karatekas do not have different morphological characteristics. Although there was no difference in morphological characteristics, for more complete conclusions an analysis should be performed on a larger sample of elite female karate athletes.

Keywords: *karate, anthropometrics characteristics, body composition, female karatekas, Montenegro*

Introduction

Karate is considered one of the most popular martial arts, which includes two competitive disciplines: forms (kata) and sports fighting (kumite) (Koropanovski et al., 2011; Tabben et al., 2013). Kata technique involves rhythm, expressiveness, and kime (short isometric contraction). Kata karatekas perform one Tokui (free-style Kata) and one Shitei (fixed Kata styles), and have 60–80 s to complete the Kata (World Karate Federation, 2021). While Kumite represents combat between two karatekas under certain rules where judges count kicks and punches - Ippon (3 points), Waza-ari (2 points), and Yuko (1 point). The duration of the Kumite match is 3 min (World Karate Federation, 2021).

The morphological status of athletes is very important and it is known that morphological characteristics play an important role in achievements in most sports (López-Plaza, Alacid, Muyor, & López-Miñarro, 2017; Slimani & Nikolaidis, 2019, Banjevic et al., 2022). When selecting athletes, it is necessary that they possess an optimal level of morphological characteristics according to the requirements of a particular sport (Popović, Akpinar, Jakšić, Matić, & Bjelica, 2013; Slankamenac et al., 2021; Banjević et al., 2022).

The same situation is in karate, where elite karatekas in addition to other characteristics, must have suitable anthropometric characteristics (Lehmann & Jedliczka, 1998; Amusa & Onyewadume, 2001; Jukic, Katic, & Blazevic, 2012). It was determined that female karatekas have significantly higher subcutaneous and body fat percentages compared to males. While, male karatekas have higher skeletal muscle mass compared to female athletes (Nawarathna, Bandara, Weerasinghe, & Adikari, 2021). Also, female karatekas showed a healthy anthropometric profile, although mean BMI values were slightly above normal values. As in adults and in younger people, total fat percentages are higher in girls compared to boys (de Quel, Alegre, Castillo García, & Ayán, 2021).

Only one study (de Quel, Izquierdo, & Ayán, 2020) was found that examined differences in morphology between female kata and kumite karatekas. It was observed that there are some differences in morphology status between the groups, although this is certain-

Correspondence:

Borko Katanic
University of Nis, Faculty of Sports and Physical Education, Carnojevica 10/a, 18000, Nis, Serbia
E-mail: borkokatanic@gmail.com

ly not enough to draw any general conclusions.

Although morphological characteristics are important in karate, there is a lack of research that examined the morphology of female karate athletes, and especially the differences between kumite and kata competitors in morphological characteristics (Koropanovski et al., 2011). Consequently, the study aimed to identify differences in morphological characteristics and body composition between female kata and kumite karatekas.

Methods

Sample of respondents

This cross-sectional study consisted of a total of 15 female karatekas divided according to specialization in kata (form or movement pattern) and kumite (fighting) disciplines. The subject sample included healthy, senior female athletes, with no prior injuries divided into kumite (n-8, 22.75±4.65 years) and kata (n-7, 22.00±4.58 years) athletes. Athletes voluntarily participated in the research process, also this research was carried out following the Helsinki Declaration.

Measurements

The standard international biological procedure was used to determine morphological characteristics (Eston & Reilly, 2013). Morphological characteristics and body composition were evaluated by a battery of 11 variables: body height (BH), body mass (BM), triceps skinfold (TS), biceps skinfold (BiS), back skinfold (BS), abdominal skinfold (AS), upper leg skinfold (UlS), lower leg skinfold (LlS), body mass index (BMI), fat percentage (FP), and muscle mass percentages (MP). Anthropometer, caliper, and measuring tape were used for morphological measurements. To evaluate the body composition, Tanita body fat scale - model BC-418MA, was used.

Statistics

Basic parameters of descriptive statistics were calculated: arithmetic mean, standard deviation, minimum, maximum, and range. To determine differences in morphological characteristics, and body composition among groups of karatekas, a t-test for small independent samples was used. For all statistical analyses, significance was accepted at $p<0.05$. Data processing was performed using the statistical program SPSS 26 (Statistical Package for Social Sciences, v26.0, SPSS Inc., Chicago, IL, USA).

Results

Table 1 indicates descriptive values of morphological parameters. Female kumite karatekas have an average height of 171.06±7.93 cm and a body weight of 64.23±8.89 kg, respectively, which are slightly lower than kata karatekas (164.79±3.78 cm, and 65.01±11.41 kg). Body mass index values are similar for female kumite (21.90±2.20) and kata (23.94±4.41) athletes, as well as fat percentage values (18.83±5.37% for kumite and 20.69±8.12% for kata karatekas). It is noticeable that kumite has lower values for muscle mass (29.33±2.40%) compared to kata female karatekas (31.70±9.30%). While the skinfold values are approximately similar.

Based on the T-test (Table 2), it was determined that there was no significant difference between female kumite and kata karatekas in any of the morphological variables.

Table 1. Descriptive data of morphological parameters between the groups

Groups		Mean	St. Dev.	Minimum	Maximum	Range
Kumite	Age	22.75	4.65	18.0	31.0	13.0
	Body height	171.06	7.93	160.0	185.0	25.0
	Body mass	64.23	8.89	55.3	78.9	23.6
	Triceps skinfold	12.71	3.73	7.6	20.0	12.4
	Biceps skinfold	8.05	3.37	5.0	15.0	10.0
	Back skinfold	9.33	1.98	7.0	12.2	5.2
	Abdominal skinfold	8.00	2.79	5.6	14.6	9.0
	Upper leg skinfold	10.43	2.63	7.2	15.8	8.6
	Lower leg skinfold	14.54	4.08	9.8	23.2	13.4
	Body mass index	21.90	2.20	18.9	26.2	7.3
	Fat percentage	18.83	5.37	9.6	25.0	15.4
	Muscle mass	29.33	2.40	27.1	33.5	6.4
Kata	Age	22.00	4.58	18.0	31.0	13.0
	Body height	164.79	3.78	159.0	170.0	11.0
	Body mass	65.01	11.41	54.9	88.9	34.0
	Triceps skinfold	13.60	5.22	7.0	21.0	14.0
	Biceps skinfold	7.56	3.17	5.6	14.0	8.4
	Back skinfold	11.91	5.66	7.4	24.0	16.6
	Abdominal skinfold	10.26	6.29	5.8	23.0	17.2
	Upper leg skinfold	12.89	3.21	10.0	19.0	9.0
	Lower leg skinfold	14.94	7.41	9.0	28.0	19.0
	Body mass index	23.94	4.41	20.8	33.5	12.7
	Fat percentage	20.69	8.12	8.0	34.6	26.6
	Muscle mass	31.70	9.30	24.6	52.0	27.4

Table 2. Descriptive data and t-test of 15 female karate athletes enrolled in the study

	Grupe	Mean	St. Dev.	t	p
Age	Kumite	22.75	4.65	0.314	0.759
	Kata	22.00	4.58		
Body height	Kumite	171.08	7.93	1.910	0.078
	Kata	164.79	3.77		
Body mass	Kumite	64.23	8.89	-0.151	0.883
	Kata	65.01	11.41		
Triceps skinfold	Kumite	12.71	3.73	-0.383	0.708
	Kata	13.60	5.21		
Biceps skinfold	Kumite	8.05	3.37	0.290	0.776
	Kata	7.56	3.17		
Back skinfold	Kumite	9.33	1.98	-1.218	0.245
	Kata	11.91	5.66		
Abdominal skinfold	Kumite	8.00	2.79	-0.920	0.374
	Kata	10.26	6.29		
Upper leg skinfold	Kumite	10.43	2.63	-1.632	0.127
	Kata	12.89	3.21		
Lower leg skinfold	Kumite	14.54	4.07	-0.134	0.896
	Kata	14.94	7.41		
Body mass index	Kumite	21.90	2.20	-1.160	0.267
	Kata	23.94	4.41		
Fat percentage	Kumite	18.83	5.37	-0.530	0.605
	Kata	20.69	8.12		
Muscle mass	Kumite	29.33	2.40	-0.700	0.496
	Kata	31.70	9.30		

* statistical significance.

Discussion

This study aimed to identify differences in morphological characteristics and body composition between female kata and kumite karatekas. Based on the t-test for small independent samples, it was indicated that there are no differences in morphological parameters between groups of female kata and kumite karatekas.

There are no significant differences in the average height of female kumite and kata karatekas and these values are in line with the values of female karate athletes in other studies (Gloc, Plewa, & Nowak, 2012; Burdukiewicz, Pietraszewska, Andrzejewska, & Stachoń, 2016; Przybylski, Janiak, Szewczyk, Wieliński, & Domaszewska, 2021), and slightly higher values compared to the one study (de Quel et al., 2020). It should also be added to the study of Slankamenac et al. (2021), where the height of all female kumite karatekas matches our results, except for the +68kg category whose average height parameters (181.0 cm) are higher than our athletes.

Also, both groups achieved approximately similar average body weight, and these data correspond to some studies (Gloc et al., 2012; Burdukiewicz et al., 2016), and higher than in others (de Quel, et al., 2020; Przybylski et al., 2021). Body mass index is also similar between our groups and corresponds to karatekas in other studies (Gloc et al., 2012; Burdukiewicz et al., 2016; de Quel et al., 2020).

Abdominal and back skinfold values are approximately similar between groups of female kata and kumite athletes and correspond to the study of Przybylski et al. (2021). It should be noted that there was no difference in skinfolds between kata and kumite karatekas, which corresponds to the fact that there was no difference in the percentage of fat mass. Since it is known that skinfolds are the main indicators of body fat percentage, because over 60% of body fat is located precisely in the subcutaneous region (Wang, Thornton, Kolesnik and Pierson, 2000). In this regard, body mass percentage is also the same between our groups and corresponds to the study of de Quel et al. (2020). There was also no difference in the percentage of muscle mass between the groups. Since there was no difference in the percentage of muscle and fat mass between the groups, it can be considered that body composition was similar between kata and kumite female karatekas.

In our study, no significant difference was found between the female kata and kumite karatekas in any morphological variable. Since only one study (de Quel, et al. 2020) dealt with the difference in morphology between female kata and kumite karatekas, in that study a significant difference was found between the groups in body height and body mass on the side of Kumite fighters, which corresponds to studies (Koropanovski et al., 2011; Katanić et al., 2022) which it is considered that Kumite karateka are somewhat more robust than Kata athletes. It should be added that in the study (de Quel et al. 2020) there was no difference between the groups in BMI and percentage of fat mass, which corresponds to our data.

The main limitation of the study is the small sample size, which decreases the effect size of the results. In this regard, the proposal for further research on the body composition of female karatekas should be carried out on a larger sample and with the

assistance of more cutting-edge equipment that would determine the morphological status of the whole body, as well as individual body segments. This will allow more comprehensive data to be collected and determine whether female kumite and kata karateka have different body types. Despite this, this study made a significant contribution to determining the morphological status of female karate athletes and especially the difference between kata and kumite athletes.

Acknowledgments
There are no acknowledgments.

Conflict of Interest
The author declares that there is no conflict of interest.

Received: 1 December 2022 | **Accepted**: 20 December 2022 | **Published**: 15 January 2023

Reference

Amusa, L.O., & Onyewadume, I.U. (2001). Anthropometry, body composition and somatotypes of Botswana national karate players: a descriptive study. *Acta Kinesiologiae Universitatis Tartuensis, 6*, 7-14.

Banjevic, B., Zarkovic, B., Katanic, B., Jabucanin, B., Popovic, S., & Masanovic, B. (2022). Morphological Characteristics and Situational Precision of U15 and U16 Elite Male Players from Al-Ahli Handball Club (Bahrein). *Sports, 10*(7), 108.

Burdukiewicz, A., Pietraszewska, J., Andrzejewska, J., & Stachoń, A. (2016). Morphological optimization of female combat sports athletes as seen by the anthropologists. *Anthropological Review, 79*(2), 201-210.

de Quel, O.M., Ara, I., Izquierdo, M., & Ayán, C. (2020). Does physical fitness predict future karate success? A study in young female karatekas. *International Journal of Sports Physiology and Performance, 15*(6), 868-873.

de Quel, O.M, Alegre, L.M., Castillo García, A., & Ayán, C. (2021). Anthropometric and fitness normative values for young karatekas. *Biology of Sport, 38*(3), 351–357.

Eston, R., & Reilly, T. (2013). *Kinanthropometry and exercise physiology laboratory manual: tests, procedures and data: volume two: physiology.* London: Routledge

Gloc, D., Plewa, M., & Nowak, Z. (2012). The effects of kyokushin karate training on the anthropometry and body composition of advanced female and male practitioners. *Journal of Combat Sports and Martial Arts, 3*(2), 63-71.

Jukic, J., Katic, R., & Blazevic, S. (2012). Impact of morphological and motor dimensions on success of young male and female karateka. *Collegium Antropologicum, 36*(4), 1247-1255.

Katanic, B., Bjelica, D., Rezic, M., Selimi, M., & Osmani, A. (2022). Differences in the Morphological Characteristics and Body Composition between Elite Montenegrin Kata and Kumite Karatekas. *Sport Mont, 20*(3), 87-91.

Koropanovski, N., Berjan, B., Bozić, P., Pazin, N., Sanader, A., & Jaric, S. (2011). Anthropometric and Physical Performance Profiles of Elite Karate Kumite and Kata Competitors. *Journal of Human Kinetics, 30,* 107-114.

Lehmann, G., & Jedliczka, G. (1998). Investigations on the determination and development of a sport-event-specific profile of the physical requirements in high-performance training for Karate-Kumite. *Leistungssport, 28*(3): 56–61.

López-Plaza, D., Alacid, F., Muyor, J.M., & López-Miñarro, P.Á. (2017). Sprint kayaking and canoeing performance prediction based on the relationship between maturity status, anthropometry and physical fitness in young elite paddlers. *Journal of Sports Sciences, 35*(11), 1083–1090.

Nawarathna, H.M.D.S.K., Bandara, J.A.S.D., Weerasinghe, S., & Adikari, A.M.G.C.P. (2021). Investigation of physical fitness and body composition profiles of elite karate Kumite athletes in Sri Lanka. In *Proceedings of 8th Ruhuna International Science & Technology Conference, University of Ruhuna.* Matara, Sri Lanka: University of Ruhuna.

Popovic, S., Akpinar, S., Jaksic, D., Matic, R., & Bjelica, D. (2013). Comparative Study of Anthropometric Measurement and Body Composition between Elite Soccer and Basketball Players. *International Journal of Morphology, 31*(2), 461-467.

Przybylski, P., Janiak, A., Szewczyk, P., Wieliński, D., & Domaszewska, K. (2021). Morphological and motor fitness determinants of shotokan karate performance. *International Journal of Environmental Research and Public Health, 18*(9), 4423.

Slankamenac, J., Bjelica, D., Jaksic, D., Trivic, T., Drapsin, M., Vujkov, S., ... & Drid, P. (2021). Somatotype Profiles of Montenegrin Karatekas: An Observational Study. International Journal of Environmental Research and Public Health, 18(24), 12914.

Slimani, M., Nikolaidis, P.T. (2019). Anthropometric and physiological characteristics of male soccer players according to their competitive level, playing position and age group: A systematic review. *The Journal of Sports Medicine and Physical Fitness, 59*(1), 141–163.

Tabben, M., Sioud, R., Haddad, M., Franchini, E., Chaouachi, A., Coquart, J., ... & Tourny-Chollet, C. (2013). Physiological and Perceived Exertion Responses during International Karate Kumite Competition. *Asian Journal of Sports Medicine, 4*(4), 263.

Wang, J., Thornton, J.C., Kolesnik, S., & Pierson, Jr.N. (2000). Anthropometry in body composition. An overview. *Annals of the New York Academy of Sciences, 904*, 317-26.

World Karate Federation (2021). Kata and Kumite Competition Rules [Version Effective from 1.1.2020; Online]. Available online: https://www.wkf.net/pdf/WKF_Competition%20Rules_2020_EN.pdf (accessed on 1 October 2021).