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Differences in Anthropometrics Characteristics, Somatotype and Motor Skill in Karate and Non-Athletes

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Abstract: Anthropometric characteristics aim to improve the performance in many sports. Morphological status of top athletes is relatively homogeneous, depending on the sport, and can be defined as a pattern for the achievements of athletes (Misigoj-Duraković, Matković, &Medved, 1995). Somatotype reflects the overall appearance of the human body and gives meaning to the total morphological status of the human body (Ross, Ward, Leahy, & Day 1982). Our research was conducted with the main objective to identify the differences in anthropometric characteristics somatotype and some basic motor skills in karate and non-athletes. The research was conducted on 100 male subjects 17-18 years, karate (50) and non-athletes (50). The purpose of this study is to define the differences in anthropometric characteristics, somatotypes and basic motor skills in karate and non-athletes. The pattern of the anthropometric measures is defined by ISAK (International Society for the Advancement of Kinanthropmetry), except the variables: body mass index (BMI), body fat percentage (BF %) and lean body mass (ALBM), which are calculated according to the methodology During Womerslay, while the variable (HWR) derives from the software program somatotype 1.2, the pattern of motor skill is defined by battery of Eurofit testing. For determining the differences between the two groups of respondents, a t-test for independent samples is applied, while the evaluation of the somatotypes was done according to the methodology by Heath-Carter with 10 anthropometric measurements. Based on the obtained results of measurements from both groups respondents, was proved that there are no statistically significant differences in anthropometric measures. Based on our study, while in karate we found balanced mesomorph somatotype 3.07-4.28-2.85 in non-athletes we find endomorphic mesomorph somatotype 3.47-4.96-2.67. Statistically significant differences on the components of somatotypes exist at mesomorph component. Differences in the motor skill were found in favor of karate athletes.
Key Words: somatotype, anthropometrics characteristics, motor skills, karate, non-athletes

Introduction

Anthropometric characteristics aim to improve the performance in many sports. Morphological status of top athletes is relatively homogeneous, depending on the sport, and can be defined as a pattern for the achievements of athletes (Misigoj-Duraković, Matković, & Medved, 1995). Somatotype reflects the overall appearance of the human body and gives meaning to the total morphological status of the human body (Ross, Ward, Leahy, & Day 1982). Many studies show that the somatotypes have a strong genetic basis (Harrison, Weiner, & Tanner, 1976). Somatotype measurements are applied based on external features of body structure and it is accepted as one of the indicators of physical body structure (Zorba, 2005). The researches of Amus and Onievadume (2001) in karate representatives from Botswana, as a part of the preparations for the African Games in 1999, concluded that the main somatotype in men was 2.5+1.1- 3.9+0.9-3.0+1.2 and in women 4.4+0.8-4.7+1.2-1.3+1.1 (endomorph, mesomorph and ectomorph). Katić, Blazević, Krstulović, and Mulić (2005) found that adult elite karate in Croatia is predominantly characterized by mesomorph somatotype, which was confirmed by Fritzsche and Raschka (2007) in the German elite adult karate determined by Heath-Carter methodology and found medium somatotype in elite male karate 2.0-3.7-2.7. Meanwhile in female elite karate 3.4-2.4-2.4. Gualdo and Graziani (1993) made an analysis and description of the somatotypes in 1593 young Italian athletes (717 male and 876 female subjects) from different sports. The average of somatotypes was 2.7-4.7-2.7 in male subjects and 3.6-3.7- 2.8 in female subjects. Sandeep Roy Sarkari and Samir Sil (2014) in their research "Somatotype of Non-athlete Tribal School Boys of West Tripura, District of Tripura (Aged 8+ to 16+ Years)", has concluded that the mean somatotypes fell in the mesomorph-ectomorph sectors with a rating of 1.78-4.22-3.78. The somatotype categories ectomorphic mesomorph and mesomorph-ectomorph included the greatest proportion of these tribal boys. Thus the non-athlete tribal school boys of West Tripura district were predominantly mesomorphic. Kostovski et. al (2017) in

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the research "Morphological Characteristics with Students – Karate Athletes and Non-athletes the Age of 16-18 Years old" in a battery of 5tests for assessment of the body composition was applied to the respondents, he found that differences in the components of the body composition were found in favor of karate athletes. The main objective of our research was to identify the differences in anthropometric characteristics, somatotypes and some basic motor skills in karate and non-athletes.

METHODS

The research was conducted on 100 male subjects 17-18 years $\pm$ 6 month, 50 karate junior competitors in kata and kumite of different categories and 50 non-athlete students in high school. In this research we applied 26 variable, 17 anthropometric and 9 motor variables, of which 13 variables were measured by-ISAK (International Society for the Advancement of Kinanthropometry), body height (AVT), bodymass (AMT), triceps skinfold (AKNT), biceps skinfold (AKNB), abdomen skinfold (AKNA), supraspinale skinfold (AKNS), subscapular skinfold (AKNG), femur skinfold (AKNN), calf skinfold (AKNP), upper arm girth (AON), calf girth (AOP), breadth of the humerus (ADL), breadth of the femur (ADK), except the variables: body massindex (BMI), body fat percentage (BF%) and lean body mass (ALBM), which were calculated according to the methodology of DuringWomerslay, while the variable Height-Weight ratio calculation (HWR) derives from the software program somatotype 1.2., while the evaluation of the somatotypes was done according to the methodology by Heath-Carter with 10 anthropometric measurements. Variables for evaluation motor skill are defined by battery of *EuroFIT* testing: Flamingo balance test (MFT), Plate tapping (MTR), Sit and reach (MDPS), Standing broad jump (MSDM), Hand grip (MDSH), Sit-ups (MPTL), Bent arm hang (MVZN), Shuttle run: 10 x 5 m (MSHR10x5) and Endurance shuttle run test (MFBT20m). For the data processing we used the software program SPSS20 for Windows. To determine the significant differences between arithmetic averages of each group, we used a student *t*-test, while the determination of somatotypes and their difference was made by the software program somatotype1.2. This procedure determines somatotypes for each subject individually, according to the methodology of Heath-Carter.

RESULTS AND DISCUSSION

Table no. 1 presents the differences of the anthropometric characteristics of the two groups taken in the study, karate and non-athletes. Based on the values of the table, we can conclude that significant differences do not appear in any of the variables, although based on the arithmetic average values, we can see that all variables with which the fat tissue is determined, karate exhibit smaller values than in the group of non- athletes, which means that karatists have less fat tissue than non- athletes.

Table 1. T-test in anthropometric characteristics between karate and non-athletes

Variable	Karate (N=50)		Non-athlets(N=50)		F	t	Sig.
	Mean	SD	Mean	SD			
AVT	173.86	5.13	173.77	6.94	6.28	0.07	0.94
AMT	67.25	8.34	68.50	10.92	3.86	-0.64	0.52
BMI	22.21	2.60	22.54	2.96	1.78	-0.58	0.56
BF%	14.63	6.40	16.19	6.02	0.00	-1.26	0.21
ALBM	57.04	5.06	56.75	6.91	3.66	0.24	0.81
AKNT	11.08	6.72	12.90	6.37	0.02	-1.39	0.17
AKNB	5.86	3.88	5.78	2.89	0.73	0.12	0.91
AKNA	12.68	9.29	15.72	7.90	0.01	-1.76	0.08
AKNG	10.22	4.55	11.36	4.84	0.17	-1.21	0.23
AKNS	10.90	7.03	11.78	6.57	0.02	-0.65	0.52
AKNN	13.22	6.25	15.30	6.79	1.29	-1.59	0.11
AKNP	11.14	5.50	11.80	5.85	0.06	-0.58	0.56
AON	26.00	3.60	27.10	3.08	0.26	-1.64	0.10
AOP	35.08	2.83	36.09	2.90	1.21	-1.76	0.08
ADL	7.52	0.52	7.73	0.85	7.35	-1.48	0.14
ADK	9.90	0.74	10.18	0.78	0.75	-1.83	0.07
HWR	42.88	1.77	42.65	1.82	0.17	0.63	0.53

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If we compare the values of BF% 14.63 with the study of Kostovski et. al (2017) 11.09, we can conclude that the percentages of the fat tissue in our study show higher values in karate, whereas the same situation appears to non-athletes. If we analyze BMI 22.21 variables in karatists and 22.54 in non-athletes with the same study Kostovski et. al (2017), karatists 22.62 and non-athletes in rural areas 20.64, we can conclude that the values of our BMI study are lower in karatists while non-athletes are of higher values.

Table 2. T-test in somatotype between karate and non-athletes

Variable	Karate (N=50)		Non-athlets (N=50)				
	Mean	SD	Mean	SD	F	t	Sig.
ENDO	3.07	1.57	3.47	1.50	0.04	-1.30	0.20
MESO	4.28	1.38	4.96	1.58	0.81	-2.29	0.02
ECTO	2.85	1.22	2.67	1.25	0.23	0.70	0.48

To better reflect the differences, we are presenting the distribution of somatotype components through the somatochart below:

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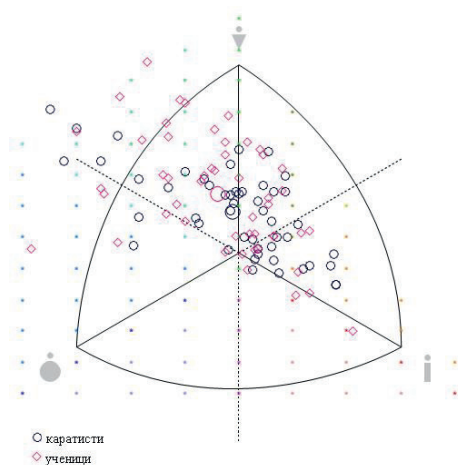
Based on the data in table no. 2 where the values of the somatotype components are presented, we can conclude that the values of the somatotype components in karatists are 3.07-4.28-2.85 and they belong to the balanced mesomorphic component whereas non-athletes present the values of 3.47-4.96-2.67 which belong to the endomorphic mesomorph component. Significant statistical differences appear in the mesomorphe component $P = 0.02$ in which we can say that the highest values in this component are presented in the group of non-athletes who are not involved in the training process.

Figure 1. Distribution of the somatotype categories in karate and non-athletes

Taking into account the characteristics of the mesomorphic component and by analyzing and observing the situation on the ground, we can conclude that although students are not involved in the training process, they come from rural areas where many physical activities are present, therefore we can conclude that the mesomorphic component represents the most emphasized values and to remind that many studies show that the somatotypes have a strong genetic basis (Harrison, Weiner, & Tanner, 1976). If we compare our study with the studies of Sandeep Roy Sarkari and Samir Sil (2014) in their research "Somatotype of Non-athlete Tribal School Boys of West Tripura, District of Tripura (Aged 8+ to 16+ Years)", where the mean somatotypes fell in the mesomorph-ectomorph sectors with a rating of 1.78-4.22-3.78, Amus and Onievadume (2001) in karate representatives from Botswana, as a part of the preparations for the African Games in 1999, where the main somatotype in men was 2.5- 3.9-3.0, Gualdo and Graziani (1993) in their analysis and description of the somatotypes in 1593 young Italian athletes from different sports, where the average of somatotypes was 2.7-4.7-2.7 in male subjects, we can conclude as the common conclusion of all studies that the values of the mesomorph component are higher compared to the endomorph and ectomorph component.

Based on the values of variables we presented in table no. 3, we can conclude that out of 9 variables, significant statistical differences are presented in 5 variables which are: Flamingo balance test (MFTp = 0.01), Standing broad jump (MSDMp=0.02), Sit-ups (MPTL p = 0.00), Bent arm hang (MVZN p = 0.01) and Shuttle run: 10 x 5 m (MSHR10x5)p = 0.00. In all the variables of the motor space in which there are significant statistical differences, we can see that the best values appear in favor of the karate group.

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Table 3. T-test in motor skills between karate and non-athletes

Variable	Karate (N=50)		Non-athlets(N=50)				
	Mean	SD	Mean	SD	F	t	Sig.
MFT	11.96	7.26	16.02	6.92	0.03	-2.86	0.01
MTR	11.74	1.14	11.85	2.03	15.08	-0.32	0.75
MDPS	30.28	6.85	28.05	8.06	1.97	1.49	0.14
MSDM	197.30	20.96	185.64	26.64	5.10	2.43	0.02
MDSH	33.64	4.71	32.68	7.23	10.57	0.79	0.43
MPTL	26.70	3.36	20.94	3.41	0.89	8.51	0.00
MVZN	33.17	17.77	23.83	19.54	0.01	2.50	0.01
MSHR10x5	20.21	1.27	21.95	2.22	20.32	-4.82	0.00
MFBT20m	37.28	4.99	35.49	5.74	1.98	1.66	0.10

Generally we can conclude that although in the anthropometric characteristics there were no significant differences between the two study groups, in the motor space where there are significant differences in the 5 variables which are in favor of the group of karateists, we can say that the training process that the karateists follow significantly affects the rise of motor performance in them.

Conclusion

Based on the obtained results of measurements from both groups respondents, it was proven that there are no statistically significant differences in anthropometric measures. Based on our study, while in karate we found balanced mesomorph somatotype 3.07-4.28-2.85, in non-athletes we found endomorphic mesomorph somatotype 3.47-4.96-2.67. Statistically significant differences on the components of somatotypes exist at the mesomorph component, where the highest values appear in the non-athletic group compared to karateists. The result is mainly explained by the genetic aspect and the physical activity of non-athletes coming from rural areas. Based on the differences in the motor space where there are significant differences in the 5 variables which are in favor of the group of karateists, we can say that the training process that follow karateists follow significantly affects the rise of motor performance in them.

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Razlike u antropometrijskim karakteristikama, somatotipu i motoričkim sposobnostima karatista i nesportista

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Razlike u antropometrijskim karakteristikama, somatotipu i motoričkim sposobnostima karatista i nesportista

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Sažetak: Antropometrijske karakteristike imaju za cilj da poboljšaju perfomanse u mnogim sportovima. Morfološki status vrhunskih sportista relativno je homogen, zavisno od sporta, i može se definisati kao obrazac za dostignuća sportista (Misigoj-Duraković, Matković i Medved, 1995). Somatotip odražava ukupni izgled ljudskog tijela i učestvuje u ukupnom morfološkom statusu tijela čovjeka (Ross, Ward, Leahy i Day 1982). Istraživanje je sprovedeno sa glavnim ciljem da se identifikuju razlike u antropometrijskim karakteristikama, somatotipu i nekim osnovnim motoričkim sposobnostima karatista i nesportista. Istraživanje je sprovedeno na 100 muških ispitanika uzrasta od 17 do 18 godina, karatista (50) i nesportista (50). Svrha ovog istraživanja je da se definišu razlike u antropometrijskim karakteristikama, somatotipu i bazičnim motoričkim sposobnostima karatista i nesportista. Obrazac za antropometrijska mjerenja definiše ISAK (Međunarodno društvo za unapređenje kinantropmetrije), osim varijabli: indeks tjelesne mase (BMI), procenat tjelesne masti (BF%) i mršavost tijela (ALBM), koji se izračunavaju prema metodologiji During Womerslay-a, dok varijabla (HWR) potiče iz softverskog programa somatotip 1.2, a mjerenje motoričkih sposobnosti je urađeno prema Eurofit bateriji testova. Za utvrđivanje razlika između dvije grupe ispitanika primijenjen je t-test za nezavisne uzorke, dok je procjena somatotipa obavljena prema metodologiji Heath-Carter-a sa 10 antropometrijskih mjera. Na osnovu rezultata dobijenih mjerenjem dviju grupa ispitanika, dokazano je da nema statistički značajnih razlika u antropometrijskim mjerama. Na osnovu naše studije, dok je u karateu prisutan uravnoteženi mezomorfni somatotip 3,07-4,28-2,85 kod nesportista preovladava endomorfni mezomorf somatotip 3,47-4,96-2,67. Statistički značajne razlike u komponentama somatotipa postoje u mezomorfnoj komponenti. Razlike u motoričkim sposobnostima idu u korist karatista.

Ključne riječi: somatotip, antropometrijske karakteristike, motoričke sposobnosti, karatisti, nesportisti