ANTHROPOMETRY, BODY COMPOSITION AND SOMATOTYPES OF BOTSWANA NATIONAL KARATE PLAYERS: A DESCRIPTIVE STUDY

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ABSTRACT

The present study was undertaken to assess the physique, body composition and somatotypes of Botswana national karate players camped in preparation for the 1999 All Africa Games held in Johannesburg, South Africa. In total, ten male and seven female karate players took part in the descriptive research. The mean somatotype rating for males were: 2.5± 1.1 – 3.9±0.9 – 3.0±1.2 and for females: 4.4±0.8 – 4.7±1.2 – 1.3±1.1 (endomorphy, mesomorphy and ectomorphy, respectively). This exploratory study has revealed that anthropometric factors of height, body mass, % body fat, BMI and somatotypes are important for high profile sport like karate.

Key words: karate, anthropometry, somatotype

INTRODUCTION

Researches are conducted in line with the specific demands for success in various sports. As is the practice in most parts of the world where sport is a big business, various sport scientists make their inputs into the training continuums of various teams with the ultimate aim of success. With the emergence of sport scientists in Africa, national teams now realize that they need the inputs of their scientists during the whole phase of training. It is therefore proper, for a start, to conduct baseline studies with the main intention of providing scientifically-backed suggestions for the improvement of training or the modification of available schedules. Also, since

karate is a relatively new competitive sport in this part of the world, there is a need to vigorously acquire a bank of information on various aspects of the elite athlete; particularly as they relate to the physico-physiological, motor performance, physique and other anthropometric variables. This would serve as a reference point for comparison and for projecting on the success-failure ratio of athletes prepared for competitions.

Karate, like other dynamic sports, requires quick and sharp movements which are facilitated through adequate body physique. Coaches, trainers and sport scientists acknowledge that preparations for karate competitions call for requisite profiles among which are body build, body composition and somatotypes. The present study was undertaken to assess the physique, body composition and somatotypes of Botswana National karate players camped in preparation for the 1999 All Africa Games held in Johannesburg, South Africa, with a view to obtaining a comprehensive information on the preparedness of the athletes for the major competition and providing the coaches with necessary suggestions for improvement. It was also the aim of this study that data collected would be beneficial for use by both African and non-African sport scientists.

METHODS

Participants: Ten male (26.4 ± 3.0 yrs.) and seven female (22.4 ± 3.7 yrs.) karate players took part in the descriptive research. They were selected into the national team based on their previous performance records in national and regional karate championships. The evaluation was done at the invitation of the Botswana National Sports Council.

Tests: The kinanthropometric assessments involved the use of restricted profiles [14] which, in addition to stature and body mass, consist of nine skinfolds (triceps, subscapular, biceps, iliac-crest, supraspinale, abdominal, front thigh, medial calf and medial axilla), five girths (arm-relaxed, arm-flexed and tensed, waist, gluteal and calf) and two breadths (humerus and femur). These profiles were assessed according to the protocol of the International Society for the Advancement of Kinanthropometry [11]. For the same-day test-retest reliability, three successive measurements, per site, were taken on each player.

Data Collection: All measurements were taken in the Human Performance Laboratory, University of Botswana on the reporting date for camping. Athletes were duly informed of the test protocols and evaluation procedures prior to the assessment. They then signed the informed consent

form and cooperated with the researchers. Their gender, ages (in yrs) and body masses (in kg) were first recorded followed by measurements of their skinfolds (in mm), skeletal diameters (in cm) and circumferences (in cm). Skinfolds were taken at the appropriate sites with a Harpenden skinfold caliper. Skeletal diameters were measured to the nearest mm at the appropriate sites using a broad blade anthropometer while circumferences were measured to the nearest cm using the 2.0-meter long retractable flexible steel tape, with an end tab before the zero marking.

Body density was computed from the anthropometric data using the equations for males [19] and for females [21]. Lean body weight was determined using equation of Withers et al. [20], while percent body fat was determined using equation of Siri [17]. Body mass index (BMI) was determined from the measures of stature and body mass using the equation [1]. The Heath-Carter method of somatotyping in which anthropometry is used to estimate criterion somatotype was employed to determine the somatotypes of the karate players [3]. The equations for decimalised anthropometric somatotype [4] were employed in computing the somatotypes of the participants. The resulting somatotype values were then displayed on a standard somato-chart.

Analyses of data: Descriptive statistics of mean, standard deviation and variation coefficients were applied to the data using the Statistical Package for Social Sciences. Since gender was acknowledged to influence physique and other anthropometric measurements, the data for males and females were analysed separately. No efforts were made to compare the results of both groups as this was not part of the assessment objectives.

RESULTS

Data on the age, body mass, physique and body composition variables of the male and female karate players are shown in Table 1.

Table 1. Age, body mass, physique and body composition of the karatekas.

Variables	Mean		SD		SE	
	Males (n=10)	Females (n=7)	Males	Females	Males	Females
Age (yrs)	26.4	22.4	3.0	3.7	1.0	1.4
Stature (cm)	176.0	158.2	7.0	3.5	2.2	1.3
Weight (kg)	68.2	59.6	8.9	4.5	2.8	1.7
Body fat (%)	12.2	18.6	4.6	3.2	1.5	1.2
BMI (kg/m^2)	22.0	23.8	2.5	2.5	0.8	1.0
Endomorphy	2.5	4.4	1.1	0.8	0.3	0.3
Mesomorphy	3.9	4.7	0.9	1.2	0.3	0.4
Ectomorphy	3.0	1.3	1.2	1.1	0.4	0.4

DISCUSSION

The focus of this descriptive study on the anthropometry, body composition and somatotypes of Botswana national karate players was to provide baseline data on karate players from one of the developing nations in Africa. It is worthy of note that data on karate players at the African level are very few. The karate players in the present study were therefore described in terms of how they compared with those in available studies at the African level. Where possible, reference was made to how the present athletes compared with their counterparts elsewhere in the world.

The mean age of 26.4 ± 3.0 yrs for males falls between the age-range of 23.8 yrs for Italian elite karate players [8] and the 28.5 ± 4.2 yrs obtained in a study on karate practitioners [22]. Also, the mean of 22.4 ± 3.7 yrs compares favorably with the 23.0 ± 2.3 yrs obtained on African female elite karate players [6]. These mean ages are therefore in line with the optimum age for successful performance in karate; as performance in karate requires a balance between the youthful vigor employed in karate training and competition and the gains of experience [18]. With additional years of exposure, the young karate player becomes more mature and experienced.

The importance of stature in the determination of ultimate success in elite sports has been over-emphasized [2, 5, 13]. The relevance of height for success varies from sport to sport. For instance, it was found that elite athletes in track and field athletics, rugby, handball, volleyball and basketball players and rowers are significantly taller than the normal population while gymnasts, bowlers, judokas, skiers, boxers and wrestlers were found to be significantly shorter than the normal population [12]. It

would thus appear that excessive height is not very beneficial to success in combat sports, including karate. It was therefore concluded that players' heights and body masses are critical variables used in the recruitment and selection of athletes [13] because they have been found to have significant effects on performance. Hence, these variables were considered very important in a descriptive study of this nature. The female karate players in this study had a mean stature of 158.2 ± 3.5 cm. This value was slightly lower than the 163.5 ± 8.6 from female African elite karatekas [6]. Shortness in stature has been found to be particularly advantageous in acceleration when changing direction (agility) [7] as demanded by most combat sports including karate. A tall stature has the disadvantage of slower speed of movement and reaction time though with an advantage of a longer reach [13].

Body weight values of 68.2 ± 8.9 kg and 59.6 ± 4.5 kg were obtained for males and females, respectively. The male value was lower than the 72.3 kg for male Italian karate players [8] while the female value compared favorably with the 60.4 ± 6.4 kg for female African elite karate players [6]. Also, mean % body fat of 12.2 ± 4.6 for males and 18.6 ± 3.2 for females were obtained in this study. These values were higher than the 8.2% and 15.4% obtained on Czech male and female taekwondo black-belters, respectively [10]. In many sports requiring agility, excessive body weights and % body fats are not beneficial [13] as they constitute excess burden and impede fast bodily movements [16]. Therefore, the present athletes are within weight limits that allow for optimum mobility of elite athletes. However, their slightly higher % body fat may retard their mobility.

BMI has been referred to as the traditional measure of obesity and as an index of weight relative to stature [15]. However, other researchers view it, at best, as a measure of heaviness and not fatness [1]. BMI is influenced nearly to an equal degree by the body's lean and fat components [9]; suggesting that it is as much a measure of lean tissue as it is of fat. Whatever their views, excessive BMI could have serious health and performance implications. In the present study, the male and female athletes had a BMI of 22.0 ± 2.5 $kg \cdot m^{-2}$ and 23.8 ± 2.5 $kg \cdot m^{-2}$, respectively. These values are slightly higher than the 21.9 $kg \cdot m^{-2}$ and 22.0 $kg \cdot m^{-2}$ for male and female Czech taekwondo black-belters [10]. This slight difference may be a result of the difference in proficiency and fitness levels by both groups of karate players. The values are however suggestive of the absence of serious cardiovascular risk factors.

In appraising the physique of athletes in various sports, the technique of somatotyping has been widely applied [3]. According to this technique, the magnitude of each of the three components of physique is always expressed in a three-number rating: representing endomorphy, mesomorphy and ectomorphy in that order. Ratings on each component of 2–2½, 3–5, 5½-7, and 7½ and above are considered low, moderate, high and very high, respectively [4]. With the mean somatotype rating of 2.5 ± 1.1 – 3.9 ± 0.9 – 3.0 ± 1.2 for males and 4.4 ± 0.8 – 4.7 ± 1.2 – 1.3 ± 1.1 for females, the present male karate players could be said to be low on endomorphy, moderate on mesomorphy and ectomorphy, while the females could be said to be moderate on endomorphy and mesomorphy and very low on ectomorphy. However, the values for the females are similar to the 3.8 ± 1.9 – 4.3 ± 1.1 – 2.1 ±1.0 obtained on female Africa elite karate players. In summary, the male karate players could be described as ectomorphic-mesomorphs, while the females were endomorphic-mesomorphs.

CONCLUSION

This exploratory study has revealed that anthropometric factors of height, body mass, % body fat, BMI and somatotypes are important for high profile sport like karate. Since karate is a relatively new sport in Botswana, the information gathered on the participants would be quite valuable to both the players and coaches in their preparation for international championships.

REFERENCES

1. Abernethy P., Olds T., Eden B., Neill M., Baines L. (1996) Anthropometry, health and body composition. In K. Norton & T. Olds (Eds.). Anthropometrica: A textbook of body measurement for sports and health courses. Marrickville, NSW (Australia): UNSW Press. 366–391.
2. Ackland T., Schreiner A., Kerr D. (1994) Anthropometric profiles of world championship female basketball players. International Conference of Science and Medicine in Sport. Sports Medicine Australia (Abstract).
3. Carter J. E. L. (1996) The Heath-Carter anthropometric somatotype method. In K. Norton & T. Olds (Eds.). Anthropometrica: A textbook of body measurement for sports and health courses. Marrickville, NSW (Australia): UNSW Press. 148–170.

4. Carter J. E. L., Heath B. H. (1990) Somatotyping — Development and Applications. Cambridge: Cambridge University Press.
5. Cox M. H., Miles D. S., Verde T. J., Rhodes E. C. (1995) Applied physiology of ice hockey. Sports Med. 19: 184–201.
6. De Ridder J. H., Monyeki K. D., Amusa L. O., Toriola A. L., Wekesa M., Carter J. E. L. (2000). Kinanthropometry in African sports: somatotypes of female african athletes. African J. Phys. Health Educ. Rec. Dance (AJPHERD), 6: 1–15.
7. Ford I. E. (1984) Some consequences of body size. Am. J. Physiol. 247: H495–H507.
8. Francescato M., Talon T., di Prampero P. (1995). Energy cost and energy sources in karate. Eur. J. Appl. Physiol. Occup. Physiol. 71: 355–361.
9. Hawe M. R. (1996) Human body composition. In R. Eston & T. Reilly (Eds.), Kinanthropometry and exercise physiology laboratory manual: Test, procedures and data. Australia: Chapman & Hall. 5–34.
10. Heller J., Peric T., Dlouha R., Kohlikova E., Melichna J., Novakova H. (1998) Physiological profiles of male and female taekwon-do (ITF) black belts. J. Sports Sci. 16: 243–249.
11. International Society for the Advancement of Kinanthropometry (1999). Body Composition: A Practical Demonstration. Kinanthreport, XII: 14–15.
12. Medved R. (1996) Body height and predisposition for certain sports. J. Sports Med. Phys. Fit. 6: 89–91.
13. Norton K., Olds T., Olive S., Craig N. (1996) Anthropometry and sports performance. In K. Norton and T. Olds (Eds.). Anthropometrica: A Textbook of body measurement for sports and health courses. Marrickville, NSW (Australia): UNSW Press. 287–364.
14. Norton K., Whittingham N., Carter J. E. L, Kerr D., Gore C., Marfell-Jones M. J. (1996) Measurement techniques in anthropometry. In K. Norton and T. Olds (Eds.). Anthropometrica: A Textbook of body measurement for sports and health courses. Marrickville, NSW (Australia): UNSW Press. 25–75.
15. Pounder D., Carson D., Davison M., Orihara Y. (1998) Evaluation of indices of obesity in men: Descriptive study. Br. Med. J. 316: 1428–1429.
16. Sharkey B. J. (1997) Fitness and health. Australia: Human Kinetics.
17. Siri W. E. (1961) Body Volume Measurement by Gas Dilution. In J. Brozek and A. Henschel (Eds.) Techniques for Measuring Body Composition. Washington, D. C.: National Academy of Sciences, National Research Council. 108–117.
18. Wilkinson L. K. (1996) The martial arts: A mental health intervention? J. Am. Psych. Nur. Assoc. 2: 202–207.
19. Withers R. T., Craig N. P., Bourdon P. C., Norton K. I. (1987) Relative body fat and anthropometric prediction of body density of male athletes. Eur. J. Appl. Physiol. 56: 191–200.
20. Withers R., Laforgia J., Heymsfield S., Wang Z., Pillans R. (1996) Two, three and four-component chemical models of body composition analyses. In K. Norton and T. Olds (Eds.). Anthropometrica: A Textbook of body mea-

surement for sports and health courses. Marrickville, NSW (Australia): UNSW Press. 199–231.
21. Withers R. T., Norton K. I., Craig N. P., Hartland M. C., Venables W. (1987) The relative fat and anthropometric predictions of body density of South Australia females aged 17–35 years. Eur. J. Appl. Physiol. 56: 181–190.
22. Zehr E., Sale D. (1993) Oxygen uptake, heart rate and blood lactate responses to the Chito-Ryu seisan kata in skilled karate practitioners. Int. J. Sports Med. 14: 269–274.

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