ToxEHS

Differences in Body Components and the Significance of Rehabilitation for Taekwondo Athletes Compared to Nonathletes

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Abstract

It is well known that the difference in individual characteristics showed between somatotypes and body components. However, few studies have investigated differences in body components and gender in taekwondo athletes compared to nonathletes. The present study is to analyze the body components and skin-fold thickness of taekwondo athletes compared to nonathletes, and to contribute to current research on rehabilitation and its application and significance. The fat body mass and impedance were significantly decreased in the taekwondo athlete compared with the nonathletic groups. The same values of the men group showed significantly greater decreases than those of the women in both the nonathlete and taekwondo groups. But, the lean body mass, basal metabolic rate (BMR), and total body water were significantly increased in the taekwondo athlete compared with the nonathletic groups. In terms of gender, the values of the men in both the nonathlete and taekwondo groups showed significantly greater increases than those of the women of both groups. However, there were no significant differences between the men and women skin-fold thickness data for all participants. Therefore, these results, in part, found that there was a difference in body components between taekwondo athletes and nonathletes. Also, when applying physical stimuli such as electrotherapy, ultrasound, and heat, the body components of each patient for healthy life need to be carefully considered.

Keywords: Body components, Taekwondo athletes, Rehabilitation

Introduction

It is commonly known that the uniform application of examination protocols and physical therapy to all patients is exceedingly difficult due to differences in individual characteristics[1,2]. Differences in individual characteristics showed between somatotypes and body components[3,4]. The human somatotype in particular was characterized into several types according to the size and development of the musculoskeletal system and the thickness of subcutaneous fat[3,4]. The concept of somatotypes was classified into two types by Hippocrates (400 BC)[5]. The first, phthisic habitus, means "long and thin"; men with this physique tend to be predisposed to contracting tuberculosis. The second type, apoplectic habitus, means "short and thick"; men with this physique tend to be predisposed to contracting circulatory diseases. This makes Hippocrates the first to study people for the classification of somatotypes[5]. However, it was impossible to define uniform somatotype characteristics, as there were differences according to race, gender, age, nutrition, and environment[6]. This difference was prominent in athletes, as different muscles are used and exercise speeds differ by sports[7,8]. It is also to remember that it is normal for an athlete to receive a good "grade" when applying or changing a somatotype because the subject participates in sports[7,9]. Moreover, differences in changed somatotypes and body components give clear reason for the inability to apply uniform protocols to physical therapy for athletes. Comprehension of the sport's characteristics in particular may have an effect on whether a treatment has positive effects for specific athletes[2,8,10]. Because the body components of taekwondo athletes, among athletes of those sports classified by weight, are different than those of nonathletes, research is necessary to investigate the characteristics of taekwondo athletes'

body components. Despite this importance, however, few studies have investigated differences in body components and gender in taekwondo athletes compared to nonathletes. Most of all, there had been few studies focused on physical therapy and whether it should be applied differently based on these differences. The purpose of this study was to analyze the body components and skin-fold thickness of taekwondo athletes compared to nonathletes, and to contribute to current research on sports physical therapy and its clinical application in terms of its application and significance.

Results

Changes in Body Components and Skin-fold Thickness for Nonathletes and Taekwondo Athletes

There was no BMI difference between the taekwondo athletes and the nonathletes. According to sex, men and women showed statistically significant differences (Table 1). However, the fat body mass and impedance values in taekwondo athletes (fat body mass 11.3±0.6 kg, impedance 333.9±14.3 Ω) were significantly lower than those of the nonathletes (fat body mass 13.5±0.6 kg, impedance 399.4±17.4 Ω) (Figure 1A-a, 1A-b). Men (fat body mass non-athletes 11.8±0.9 kg; taekwondo athletes 9.7±0.6 kg; impedance nonathletes 332.7±16.4 Ω; taekwondo athletes 295.0±11.3 Ω) showed more significant decreases in fat body mass and impedance than women (fat body mass nonathletes 15.4±0.6 kg; taekwondo athletes 14.6±0.6 kg; impedance nonathletes 470.9±16.8 Ω; taekwondo athletes 415.8±20.6 Ω) (Figure 1B-a, 1B-b). On the other hand, the athlete (lean body mass, 56.2±1.7 kg; BMR, 1713.9 ±51.1 cal/day; total body water, 38.5±1.2 L) showed more significant increases in lean body mass, BMR, and total body water than the nonathletes (lean body mass, 48.5±1.5 kg; BMR, 1473.9±45.5 cal/day; total body water, 33.3±1.1 L) (Figure 1A-c, 1A-d, 1A-e). Men (lean body mass nonathletes 55.3±1.2 kg; taekwondo athletes 61.8±1.0 kg; BMR nonathletes 1669.7 ±36.2 cal/day; taekwondo athletes 1881.3±32.8 cal/day; total body water nonathletes 38.0±0.9 L; taekwondo athletes 42.7±0.8 L) showed a more significant increase in lean body mass, BMR, and total body water than women (lean body mass non-athletes 41.3±1.0 kg; taekwondo athletes 44.2±1.4 kg; BMR nonathletes 1278.1±42.2 cal/day; taekwondo athletes 1362.4± 41.1 cal/day; total body water nonathletes 28.3±0.5 L; taekwondo athletes 30.3±0.8 L) (Figure 1B-c, 1B-d, 1B-e). However, there were no significant differences between the nonathletes and taekwondo athletes or between men and women in terms of skin-fold thickness (Figure 1A-f, 1A-g, 1A-h, 1B-f. 1B-g, 1B-h).

Discussion

Sheldon proposed the definitions and names of somatotypes, such as endomorphy, mesomorphy, and ectomorphy, through photographic analysis techniques and classification according to a divided-growth organ level from the body-generation stage[5]. However, it needs to be said that his system uniformly applied treatment for athletes according to visual classification only. Because body components forming the somatotypes of athletes may show different tendencies than nonathletes[11,12], in this study, we found that taekwondo athletes showed more significant increases in lean body mass, BMR, and total body water than did nonathletes. Bioresistance as a real resistance concept and reactance as determining the phase and amplitude differences of taekwondo athletes showed significantly greater decreases than nonathletes. The main characteristics of taekwondo athletes were great speed and power. Therefore, it is reasonable to suggest that the negative values of the taekwondo athletes were lower than those

Table 1. Characteristics of nonathletes and taekwondo athletes.

	Nonathlete		Taekwondo Athlete	
	Men	Women	Men	Women
Height	173.7±1.5 cm	160.8±1.0 cm*	178.1±1.2 cm	166.0±1.6 cm*
Weight	69.8±1.8 kg	51.7±1.3 kg*	70.9±1.5 kg	61.8±1.8 kg*
BMI	22.5±0.3 kg/m^2	21.2±0.3 kg/m^2*	22.3±0.2 kg/m^2	20.9±0.4 kg/m^2*
Work Experience	None	None	6-15 years	7-14 years
Training Frequency	None	None	3/day 18/wk	3/day 18/wk
Training Time	None	None	4h/day 24h/wk	4h/day 24h/wk
Somatotype				
ectomorphy	9	17	10	0
mesomorphy	19	13	27	17
endomorphy	5	7	2	0

All data were presented as the mean±SE. BMI, body mass index. *: $p<0.05$