

DEFORMATION OF FOOT IN TAEKWONDO ATHLETES

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INTRODUCTION

Taekwondo, a Korean traditional martial arts and sport, has become increasingly popular in the world especially with it being chosen as an official sport for 2000 Sydney Olympics. In Taekwondo, the major attack skill is a kicking movement which results in various injuries. Although wearing shoes is prohibited in official Taekwondo competition, most Taekwondo athletes wear shoes to protect their feet. Therefore it is hypothesized that the foot shape in Taekwondo athletes is deformed by numerous impacts on human body or objects over a long period of time.

METHODS

A total of 114 male high school and college elite Taekwondo athletes participated in this study. Their mean age, career, height and mass are 17.4 ± 1.6 years, 7.3 ± 3.2 years, 174.3 ± 4.0 cm and 64.7 ± 9.7 kg, respectively. Twelve anthropometric measurements of both feet were obtained from each participant. Paired samples t-tests were used to assess significant differences between left and right foot dimension. In addition, the U.S. Army foot anthropometric data set (Parham et al., 1992) was used after normalization of the measurements by foot length to compare Taekwondo athletes' feet with the normal population.

RESULTS

Eight foot shape variables out of the 12 showed significant differences between the right and left foot (Table 1). Taekwondo players have a slightly longer left foot than right foot. Although the mean of those differences was less than 1 mm, 21 of 114 athletes (18.4%) had a difference greater than 5 mm, which could be of considerable importance for shoe last design. While the left foot has longer ball of foot length and higher medial malleolus height, the right foot has longer lateral length and greater height. The ball of foot height and circumference and instep circumference were greater for the right foot than left foot, which may indicate bone hypertrophy or deformation from overuse injury resulting from the kicking motion in training sessions and competition. Also the Taekwondo athletes' feet has a higher and wider ball of foot, a longer length of the outside ball of foot, and a greater instep and ball of foot circumference than general population from U.S. Army data (Figure 2).

DISCUSSION

The primary purpose of this study was to provide elite Taekwondo player foot anthropometric data to develop a Taekwondo training shoe. Therefore, these findings can be utilized to make the Taekwondo shoe last as a standardized foot shape in these athletes. This study also demonstrates that Taekwondo athletes' feet differ in a number of shape characteristics. The last for Taekwondo shoe must reflect these differences. Furthermore, since the right foot is used more than left foot for kicking, it shows hypertrophy in foot height and circumference. This deformation may be caused by numerous impacts on the instep during the round kicking motion which is the most frequently used attack skill in Taekwondo. A Taekwondo shoe should therefore be developed to protect athlete's instep.

Table 1. Differences between right and left foot measurements

Variables		Right foot	Left foot	Right-Left	P value
Length	Foot	255.03±12.38	255.69±12.20	-0.67±3.33	0.034
	Ball of foot	186.91±10.29	188.15±9.04	-1.24±5.52	0.018
	Outside ball of	164.14±8.67	161.74±8.76	2.40±4.71	0.000
Breadth	Ball of foot	103.29±5.71	103.18±5.62	0.11±3.05	0.690
	Heel	63.61±4.34	63.30±4.29	0.31±1.71	0.058
Height	Ankle	88.38±8.82	85.07±8.07	-1.33±3.63	0.000
	Medial malleolus	84.32±6.79	84.90±7.10	-0.58±3.77	0.104
	Lateral malleolus	69.10±6.27	66.61±5.97	2.49±4.16	0.000
	Ball of foot	56.04±4.99	55.24±4.92	0.80±1.97	0.000
	First toe	20.11±2.78	20.56±2.93	-0.45±2.61	0.070
Circumference	Instep	245.49±13.87	244.39±13.67	1.10±3.89	0.003
	Ball of foot	255.17±13.07	253.75±12.66	1.42±3.96	0.000

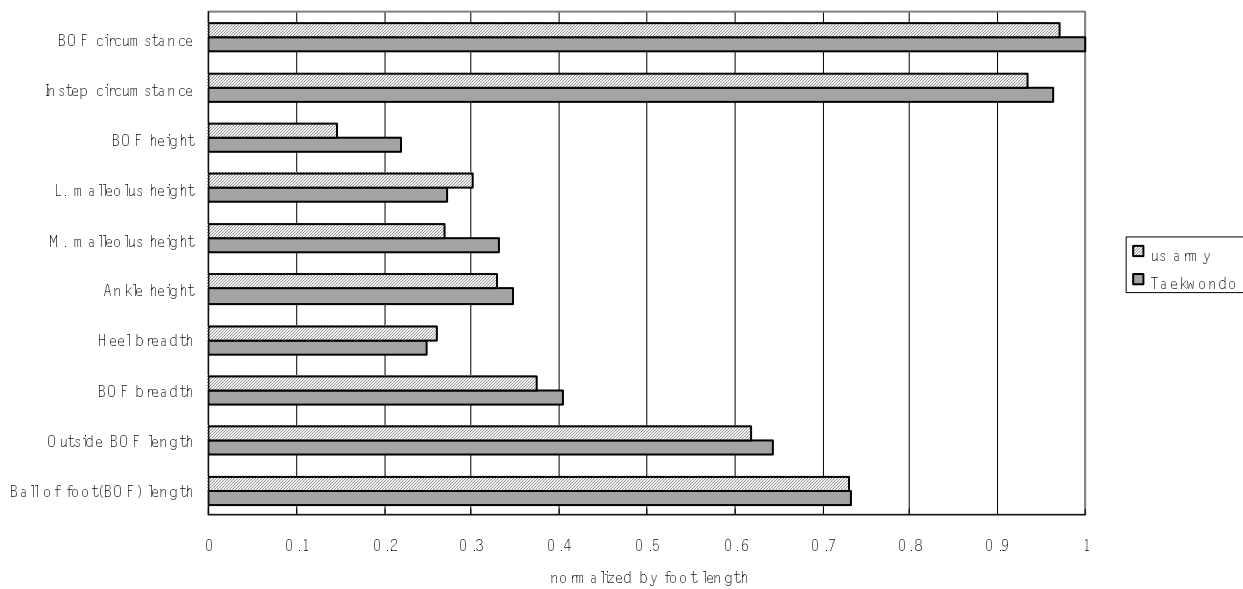


Figure 1. Differences between Taekwondo athlete and US army data.

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