

# Investigation Of The Relationship Between Arm Skin Thickness And Circumference Measurement And Hand Grip Strength Of Children Attending With Badminton Sport

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## Abstract

**Purpose:** The aim of this study is to investigate the relationship between the thickness of the arm, circumference measurement and the hand grip of the 10-12 age children badminton athletes. **Materials and Methods:** 72 badminton athletes with a mean age of  $11.8 \pm 0.1$  were included in the study voluntarily. Physical characteristics of children; height (kg), body weight (kg), body mass index ( $\text{kg}/\text{m}^2$ ), body circumference measurements (cm), (forearm, mid-arm and mid-upper arm) and skinfold (mm), (triceps, subscapula, biceps, suprailiac skin thickness) values were measured. **Results:** Data were analyzed by SPSS 23.0 package program. The Shapiro-Wilk test was used to determine whether the distribution of numerical variables was uniformly distributed. Pearson Correlation test was applied to determine whether there is a correlation between the parameters. Statistical significance level was accepted as  $p < 0.05$ . In the evaluation, a statistically significant difference was found between the right hand grip strength and subscapula skin thickness, ( $r=0.25$ ), mid-arm circumference, ( $r=0.27$ ), measurement and left hand grip strength with subscapula skin thickness, ( $r=0.3$ ), forearm circumference, ( $r=0.24$ ), mid-arm circumference, ( $r=0.35$ ) and mid-upper arm circumference, ( $r=0.34$ ), ( $p < 0.05$ ). **Conclusion:** It can be said that arm skin thickness and arm circumferential measurements are effective in the hand grip strength parameters of sports such as badminton.

**Keywords:** Badminton, skin thickness, circumference measurements, hand grip strength

## INTRODUCTION

Badminton is a sport game based on quickness, speed, strength, skill, coordination and immediate decision, played by two or two people, aiming to drop a ball made of goose feather or plastic with a lightweight hand-held racket to the opponent's court. It is a game and sport in which everyone can easily learn and play with pleasure and pleasure of all ages, play and play in any environment where there is no strong wind when it can be used for recreation and fitness purposes (2). As in every sports branch, badminton athletes want to have a

fast, strong, durable and perfect technique in return for heavy training, devoted and bored work. Therefore, the physical physiological and biomotoric properties of the athlete must be appropriate for the sport in which he will apply. If these elements are present, success can be achieved by organizing them well (9).

Muscle strength is the ability of the person to elicit the strength or torque that the muscle generates in a given unit of time. (5, 11). Strength and physical properties are closely linked. Considering that the top-level athletes in badminton

can reach up to 320 km/h in smash, it is an indication that the strength and explosive strength parameter is important for an effective hit (5). In addition to being the health criterion of physical and physiological factors such as skin thickness, body circumference measurements, which are important in achieving success, it is accepted as an important element of sporting performance (7, 8). At the same time, bad physical properties against gravity during trainings and competitions in badminton have difficulties for the athlete (9). In this context, it is known that body weight is a determining factor in terms of performance.

In this context; The aim of this study is to investigate the relationship between arm skin thickness, circumference measurement and environmental strength and grip strength of children who are engaged in badminton sport in children aged 10-12 years, since it is necessary to know which physical and / or physiological properties affect the other and to improve the performance of the athlete.

## MATERIALS AND METHODS

72 badminton athletes with a mean age of  $11.8 \pm 0.1$  participated in the study voluntarily. Volunteers were informed about the purpose and content of the study and the best and healthiest measurements were obtained and a form was obtained from the families of the participants to confirm their participation in the study. Participants do not have any health or disability problems.

## RESULTS

Parameters	Group	Mean $\pm$ SD
Age	Badminton (n:72)	11.7 $\pm$ 0.11
Body Height (cm)	Badminton (n:72)	150.4 $\pm$ 1.09
Body Weight (kg)	Badminton (n:72)	42.3 $\pm$ 1.27
Body Mass Index (kg/m <sup>2</sup> )	Badminton (n:72)	18.5 $\pm$ 0.39

When Table 1 was examined, the mean age of children playing badminton the ages of 10-12 was  $11.7 \pm 0.11$ , height was  $150.4 \pm 1.09$  cm, body weight was  $42.3 \pm 1.27$  kg and body mass index was  $18.5 \pm 0.39$  kg / m<sup>2</sup>.

## MEASUREMENT METHODS

**Height measurement:** Height measurements degree of precision is made to height meter of 0.01 m.

**Measurement of body weight (kg) and body mass index:** Participants' body weight (kg), body mass index (kg/m<sup>2</sup>) were determined by Inbody 270 Professional Body Analyzer.

**Hand grip strength measurement:** Hand grip strength measurement is performed by T.K.K. 5401 model dynamometer manufactured by TAKEI brand. The athletes were asked to squeeze the dynamometer in their hands with all their forces without bending the arm and touching the body while standing. The test was performed twice and the best result was recorded.

### Skinfold thickness measurement:

Subcutaneous fat measurements of the athletes participating in the study, 0.2mm precision HOLTAIN brand skinfold caliper was made on the right side of the body. For this study; biceps, triceps, sup-scapula, suprailiac skinfold were measured.

**Circumference measurements:** Measurements were taken with the athlete standing upright and the center of gravity balanced on both legs. Tape measure was used in these measurements.

Data analysis was performed using SPSS 23.0 package program. Shapiro-Wilk test was used to determine the distribution of numerical variables. Pearson correlation test was used to determine whether there was a correlation between the parameters

**Table 2.** The relationship between skin thickness and right hand grip strength of circumference measurement parameters

Parameters	Mean±SD	Right Hand Grip Strength (kg)		
		Mean±SD	r	p
Triceps skin thickness (mm)	13.9±0.49	19.7±0.39	0.16	0.19
Subscapula skin thickness (mm)	9.39±0.46		0.25	0.04*
Biceps skin thickness (mm)	8.53±0.39		0.04	0.76
Forearm circumference (cm)	19.1±0.18		0.18	0.14
Mid-arm circumference (cm)	21.5±0.23		0.27	0.02*
Mid-upper arm circumference (cm)	22±0.01		0.21	0.08

\*p&lt;0.05

Table 2 examined, subscapula skin thickness (mm), (r=0.25) and Mid-arm circumference (r=0.27) with the right hand grip strength (kg) parameter was found to have a statistically significant positive correlation between 95% confidence interval, triceps skin There was no statistically significant difference in thickness (mm), biceps skin thickness (mm), forearm circumference (cm) and mid-upper arm circumference (cm) (p>0.05).

**Table 3.** The relationship between skin thickness and left hand grip strength of circumference measurement parameters

Parameters	Mean±SD	Left Hand Grip Strength (kg)		
		Mean±SD	r	p
Triceps skin thickness (mm)	13.9±0.49	18.7±0.43	0.14	0.25
Subscapula skin thickness (mm)	9.39±0.46		0.3	0.01*
Biceps skin thickness (mm)	8.53±0.39		0.13	0.27
Forearm circumference (cm)	19.1±0.18		0.24	0.04*
Mid-arm circumference (cm)	21.5±0.23		0.35	0.00*
Mid-upper arm circumference (cm)	22±0.01		0.34	0.00*

\*p&lt;0.05

Table 3 examined, Subscapula skin thickness (cm), (r=0.3), forearm circumference (cm), (r=0.24), mid-arm circumference (cm), (r=0.35) and Mid-upper arm circumference (cm), (r=0.34) Left hand grip strength (kg) parameter was found to have a statistically significant positive relationship in 95% confidence interval (p<0.05) but triceps skin thickness (cm) and biceps skin thickness (cm) values were not statistically significant difference (p>0.05).

## DISCUSSION

In this study, the relationship between grip strength and arm skin thickness and circumference measurement of 72 badminton children aged between 10-12 years were investigated. In the evaluation, a statistically significant difference was found between right hand grip strength and subscapula skin thickness, mid-arm circumference measurement and left hand grip strength and subscapula skin thickness, forearm circumference, mid-arm circumference measurement, mid-upper arm circumference measurement (p<0.05). Right hand grip strength parameter with triceps skin thickness, biceps skin thickness, forearm circumference and mid-upper perimeter values and hand grip strength parameter with triceps skin thickness and biceps

skin thickness values were not statistically significant (p>0.05).

When the physical properties of the children between the ages of 10-12 were examined, the height values were found to be 150.4 ± 1.09 cm. Body weight values were found to be 42.3 ± 1.27 kg. BKI values were 18.5 ± 0.39 kg /m<sup>2</sup>. According to the researches, 323 children 13 years old in Sweden have a mean BMI of 19.9 ± 3.6 kg / m<sup>2</sup> (14). Selçuk (20), found BMI values as 19.68 ± 2.98 kg / m<sup>2</sup> in the 11-13 age group male swimming group. Kutlay et al. (10), found the BMI value of 13 elite female athletes with an average age of 11 as 15.85 ± 2.11 kg / m<sup>2</sup>. Karaca (8) found that the mean height of the children who are engaged in badminton sports between the ages of 12-14 was 156.7 ± 37.5 cm and the mean body weight was 42.3 ± 12.9 kg. Saeed Abdulrahman (18), the average age of children who do sports 10-12 years 11 ± 0.82 years, average height, 144.6 ± 7.94 cm, body weight average, 43.1 ± 7.90 kg, the average BMI, 20.4 ± 3.45 determined that. When our study and other studies were compared, it was found that they showed similar values due to their development in the same age group and dealing with badminton athletes. While Revan et al. (17), did

not find a statistically significant difference between Turkish male badminton players (10,9%) and foreign country badminton players (11,2%) in terms of body fat percentages, the body fat percentages of both groups were between normal values. Comparing the body type of men and women who do not do sports with athletes, it is stated that athletes have larger mesomorphic and endomorphic components, while their endomorphic components are lower (6)

When the physiological characteristics of the children aged 10-12 years were examined, the subscapula skin thickness was found to be  $9.39 \pm 0.46$  mm, triceps skin thickness was  $13.9 \pm 0.49$  mm, and biceps skin thickness was  $8.53 \pm 0.39$  mm. circumference measurements; the forearm was  $19.1 \pm 0.18$  cm, the mid-arm circumference was  $21.5 \pm 0.23$  cm, and the mid-upper arm circumference was  $22 \pm 0.01$  cm.

Karaca (8); skin fold thickness, biceps  $5.8 \pm 2.9$  mm, triceps  $7.45 \pm 3.72$  mm, subscapula  $7.55 \pm 2.78$  mm, suprailiac  $7.18 \pm 3.67$  mm, hand grip strength was found to be  $24.5 \pm 4.13$  kg. These findings are thought to be in line with our study because our study group is a badminton athletes. According to Lieshout, body fat percentages of badminton players said that they should be in the range of 10–15% in men and 15-20% in women. At the same time, Senel et al. (21), determined 6.9%, Lieshout and Lombard (12,13), 9.6% in body elite badminton players. In line with these studies, although body size is not the main determinant of success in badminton, individuals' skinfold thickness can affect strength and therefore performance.

When the motoric features of the children between the ages of 10 and 12 were examined, the right and left hand grip strength parameters were found to be  $19.7 \pm 0.39$  kg and  $18.7 \pm 0.43$  kg, respectively.

Pekel, 11–13 years of children's right / left hand grip strength is  $20.8 \pm 6.5 / 19.9 \pm 5.8$  kg, stated that (15). Saygın and Öztürk also found that the right and left grip strength were  $19.09 \pm 4.96$  kg and  $17.07 \pm 4.91$  kg, respectively (19). Çetin et al. found the right and left hand grip strength parameters of children between 10 and 12 years of age as  $25 \pm 0.6$  kg and  $23.9 \pm 0.62$  kg, respectively (4). Sobush and Fehring evaluated the arm grip strength of 111 participants as right and left, and looked at the relationship between body fat percentages. They showed that the relationship between body fat percentage and grip strength was significant (22).

As a result, there is a significant relationship between body fat mass and strength (7). Because of this relationship, it can be said that arm skin thickness and arm circumference measurements are effective on grip strength parameter in sports requiring arm strength such as badminton. For the reliability of the study, it is possible to reproduce the study samples in which the relationship between skinfold thickness, body circumference and strength is examined in another age group or in various sports branches.

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