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Investigation of The Relationship of Some Components of Hand Morphological Structure and Wrist Flexibility with Free Throw Shooting Percentage in Young Female Basketball Players

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Abstract

Objectives: The aim of this study was to investigate the relationship of some components of hand morphological structure and wrist flexibility with free throw shooting percentage in young female basketball players. **Methods:** 10 female basketball players with a mean age of 13.5 ± 0.17 participated in the study. After obtaining approval from the Ethics Committee of Giresun University Faculty of Medicine, body mass index (BMI) was calculated by measuring the height and body weight (BW) of the athletes. Morphological structure of the hand and wrist flexibility was measured on the dominant hand. The athletes were made 200 shots in five days, 40 per day from the free throw point and the success percentage was recorded. **Results:** In the research findings, a significant positive correlation was found between the A2°, HL, HW values of the athletes and their shooting percentage. There was no significant relationship between the percentage of shooting and other parameters. **Conclusion:** According to these results, it can be considered that hand morphological structure is related to free throw success in basketball sport. However, it is recommended that similar studies should be conducted in different age and gender categories with more athletes.

Keywords: Basketball, hand morphology, shooting percentage.

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Introduction

In today's world, the importance of sports on the world and parallel to this importance, the dimensions of the competition between the athletes and countries are increasing day by day; therefore, the ability to find superior talent as early and error-free as possible is essential for success in sports (Pekel et al., 2007). Body size and proportion, physical and body composition, physical structure, in other words, physical characteristics, are important factors affecting performance. It is not possible to reach the desired performance level unless the property of the physical structure is suitable for the sports branch (Acikada and Ergen, 1990; Maud and Foster, 1995). Evaluating the function or performance of the hand is important to measure functionality in daily life activities. (Yucel and Kayihan, 2008). The hand has a key role in all upper extremity functions. The complex movements of the hand arise from the good functioning of the coordination between the balanced muscular system of the hand and the central nervous system. The anatomical structures in the hand sometimes produce fine and coarse grip movements of the hand through agonist and sometimes antagonist interactions. (Gurcan and Adiyaman, 2008). Assessment of physical capacity in activities carried out with the hand begins with evaluation of hand function. Joint range of motion, muscle strength, length, circumference, diameter and grip strength are among the evaluation parameters. The wrist joint is an ellipsoid type capable of flexion, extension, ulnar deviation and radial deviation. The range of motion of the wrist joint varies according to the activities performed. (Dere, 2010; Kabakci et al., 2018).

It is known that anthropometric properties and physical structure have important relations with sportive performance and success. “In ball games where the hand is used, the morphology and functional characteristics of the hand may be important for performance.” (Barut et al., 2008). In terms of basketball, hand is the most used structure in the upper extremity in training and competitions and is the last point where the ball is removed. However, when the related literature is investigated, no comprehensive study has been found on the relationship between hand and wrist morphology and sporting skill and success in basketball.

The aim of this study was to investigate the relationship of some components of hand morphological structure and wrist flexibility with shooting percentage in young female basketball players, considering that the anatomical structure of the hand may be important for sporting success in basketball.

Methods

10 female basketball players of Giresun Municipality Sports Club with a mean age of 13.5 ± 0.17 participated in the study. After the study was approved by the Ethics Committee of

Giresun University Faculty of Medicine with the decision number 03.10.2019 / 13, the height (H) of the athletes was measured with wall-mounted Holtain stadiometer and body weight (BW) measurements were measured with Tanita MC-580 body analyzer. Body mass index (BMI) was calculated by dividing the kg of body weight by the square of the height measurement (kg/m²). Hand anthropometric measurements and wrist flexibility measurements were performed on the dominant hand using Mitutoyo precision caliper and Saehan ganiometer. Free throw shooting percentage (SP%). The athletes were made 200 shots in five days, 40 per day from the free throw point and the success percentage was recorded.

Hand and wrist anthropometric parameters

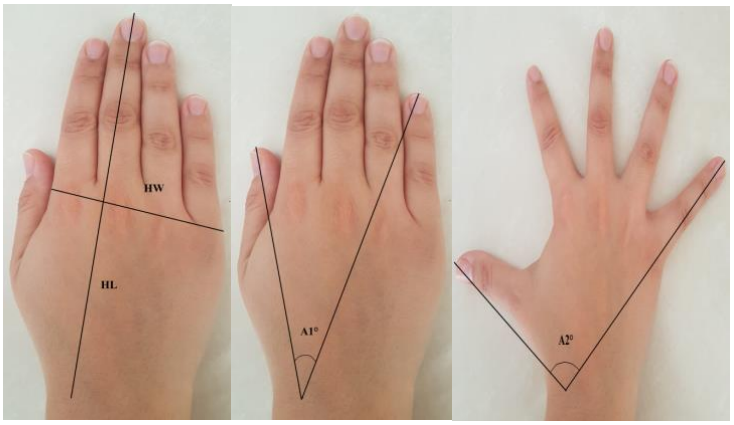

Fig 1. Hand Length (HL) Fig 2. First Angle (A1°) Fig 3. Second Angle (A2°) and Hand Width (HW)

Hand Length (HL): The distance between the distal of the processus styloideus radii protrusion of the radius and the tip of the third finger when the fingers are in the adduction and extension position (Otman and Kose, 2014). ***Hand Width (HW):*** Distance between second and fifth metacarpophalangeal joints (Otman and Kose, 2014). ***First Angle (A1°):*** Angle between the line from the distal of the processus styloideus radii protrusion of the radius to the anterior end of the thumb and the line to the anterior end of the pinky finger when the fingers are in the adduction and extension position. ***Second Angle (A2°):*** Angle between the line from the distal of the processus styloideus radii protrusion of the radius to the anterior end of the thumb and the line to the anterior end of the pinky finger when the fingers are in the maximum abduction and extension position. ***Hand Flexion (HF):*** After the ganiometer was placed on the styloid protrusion of the ulna, the hand was brought to maximum flexion (Otman and Kose, 2014). ***Hand Extension (EE):*** After the ganiometer was placed on the styloid protrusion of the ulna, the hand was brought to maximum extension (Otman and Kose, 2014). ***Radial Deviation (RD):*** The ganiometer was placed proximally to the metacarpal, midpoint of the carpometacarpal

joint, and maximum radial deviation was performed (Otman and Kose, 2014). ***Ulnar Deviation (RD):*** The ganiometer was placed proximally to the metacarpal, midpoint of the carpometacarpal joint, and maximum ulnar deviation was performed (Otman and Kose, 2014).

Result

When we examine the descriptive statistics of the data in Table 1, first angle (A1°) is x̄:97,70 ± 1,61, second angle (A2°) is x̄:35,50 ± 0,88, hand lenght (HL) is x̄:17,67 ± 0,35, hand width (HW) is 9,20 ± 0,24, hand extension (HE) is x̄:115,60 ± 1,26, hand flexion (HF) is x̄:90,60 ± 1,55 radial deviation (RD) is x̄:24,50 ± 0,78, ulnar deviation (UD) is x̄:39,20±1,12, body height (H) is 165,7 ± 1,75, body weight (BW) is 61,1 ± 3,31, body mass index (BMI) is 21,3 ± 0,73 and shooting percentage (SP%) is x̄:56,00 ± 2,09.

Table 1. Descriptive statistics of data.

Parameters	Mean (x̄)	SE (±)
A1°	97,70	1,61
A2°	35,30	0,88
HL	17,67	0,35
HW	9,20	0,24
HE	115,60	1,26
HF	90,60	1,55
RD	24,50	0,78
UD	39,20	1,12

Table 2. The relationship between athletes' height, body weight and body mass index values and shooting percentages.

Parameters	Mean (x̄)	SE (±)	r	p
H	165,7	1,75	0,237	0,510
BW	58,5	2,2	0,598	0,068
BMI	21,3	0,73	0,418	0,229
SP(%)	56,00	2,09	----	----

P<0,05

When we examined Table 2, no statistically significant relationship was found between athletes' height (H), body weight (BW) and body mass index (BMI) values and shooting percentages.

Table 3. The relationship between athletes' shooting percentage and selected hand and wrist parameters

Parameters		A1°	A2°	HL	HW	HE	FF	RD	UD
SP (%)	r	0,254	**0,698***	**0,697***	**0,713***	-0,293	0,107	0,260	-0,075
	p	0,479	**0,025**	**0,025**	**0,021**	0,411	0,768	0,468	0,837

P<0,05

When the relationship between shooting percentage and selected wrist and wrist parameters in Table 3 was examined, a significant positive correlation was found between athletes' A2°, HL and HW values and shooting percentage values. No relationship was found between the percentage of shooting and other parameters.

When we examine the descriptive statistics of the data in Table 1, first angle (A1°) is X:97,70 ±1,61, second angle (A2°) is X:35,50±0,88, hand length (HL) is X:17,67±0,35, hand width (HW) is X:9,20 ± 0,24, hand extension (HE) is X:115,60±1,26, hand flexion (HF) is X:90,60 ± 1,55 radial deviation (RD) is X:24,50±0,78, ulnar deviation (UD) is X:39,20±1,12, body height (H) is X:165,7±1,75, body weight (BW) is X:61,1±3,31, body mass index (BMI) is X:21,3±0,73 and shooting percentage (SP%) is X:56,00±2,09.

When we examined Table 2, no statistically significant relationship was found between athletes' height (H), body weight (BW) and body mass index (BMI) values and shooting percentages. When the relationship between shooting percentage and selected wrist and wrist parameters in Table 3 was examined, a significant positive correlation was found between athletes' A2°, HL and HW values and shooting percentage values. No relationship was found between the percentage of shooting and other parameters.

Discussion

According to the results of this study, in which the relationship of some components of hand morphological structure and wrist flexibility with shooting percentage in young female basketball players were investigated, BMI values of the athletes were found to be 21.3 ± 0.70. Grabara (2012) conducted a study on female basketball players in the 13-14 age group and found their BMI to be 20.1 ± 3.1. Erol et al. (2014) found that BMI values were 20.6 ± 2.6 in a study conducted with female basketball players with a mean age of 13.5. The values found are similar. In the results of the study, no statistically significant relationship was found between the athletes' height, body weight and body mass index values and free throw shooting percentages. “Height is an important factor in basketball. Teams from tall players have great advantages over other teams, especially in the under-pot challenge” (Savucu et al., 2006).

However, in this study, it was thought that the lack of a significant correlation in height factor was due to the limitation of the research with free throwing ability. This should not be interpreted as the body length is insignificant in basketball.

Apostolidis and Emmanouıl (2015) found no significant relationship between body weight and body length and shooting ability in young basketball players. In a study conducted by Clemente et al. (2018) on young female basketball players in the 14-16 age range, no significant relationship was found between body weight and body length and ability to play ball. Chahal et al. (2012) reported that there was no significant relationship between body weight and body length and performance values in a study conducted on female basketball players with a mean age of 16.66 ± 1.24. In this respect, the research is supported by the relevant literature.

When the relationship between hand morphological parameters and shooting percentage of athletes was examined, a significant positive correlation was found between A2°, HL and HW values and shooting percentage values. It was observed that as A2°, HL and HW values increased, accurate shooting ratios increased. No relationship was found between shooting percentage and other parameters.

In a study by Unda et al. (2013), hand lengths of elite basketball players were found to be significantly higher than non-elite basketball players. Fallahi and Jadidian (2011) stated in one of their studies that hand length values of athletes were greater than non-athletes. In a study conducted by Myrtaj (2012) on basketball players, a significant relationship was found between hand length, hand width and free throw success. Kryeziu and Asllani (2016) stated that morphological features are important for accurate and precise shots. Pojskic et al. (2014) reported that physical fitness in basketball is important for shooting skill. Stankovic et al. (2019) stated that there was a relationship between morphological features and functional abilities in one of their studies. The results of the research are in parallel with similar studies.

In the study, no statistically significant relationship was found between the wrist flexibility of the athletes and the shooting percentage. In a study by Malone et al. (2002) on the free throw biomechanics of basketball players in a wheelchair, while the flexibility of shoulder and elbow joints affected the successful shot, no significant relationship was found between wrist joint and free throw success. In another study by Nagar et al. (2012), it was stated that there was no significant relationship between flexibility and performance in basketball players.

Conclusion

The morphological structure suitable for that sport branch gains importance in terms of sportive efficiency and the reflection of this efficiency to the score. According to these results,

it can be considered that hand morphological structure is related to free throw success in basketball sport. However, it is recommended that similar studies should be conducted in different age and gender categories with more athletes.

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