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Study of the Impact of Palmaris Longus Muscle on Shooting Velocity in Handball Players

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ABSTRACT This study determined whether the existence of the Palmaris Longus (PL) in handball players had an impact on their shooting velocity. 42 handball players with the Palmaris Longus (PL+) muscle in the forearm of their dominant hands and 12 handball players without the Palmaris Longus (PL-) muscle participated in the study. The participating subjects were measured for their anthropometric values and shooting velocities. The shooting velocity of handball players with PL was higher than that of handball players without the muscle. This result suggests that the existence of PL in the forearm is advantageous in terms of shooting velocity in handball players.

INTRODUCTION

Handball is a team sport played by hand in a rather faster manner than the other team sports, owing to the relatively small size of the ball. From this perspective, the speed of the ball should be adjusted accurately in passing the ball to a teammate or shooting it to the goal. Shooting velocity is therefore a factor that affects the result negatively or positively in handball (Aygül 1992). Speed and strength are two motor features, which are closely interrelated. The importance of speed in individual and team sports is well appreciated by all sports scientists. One of the factors that produce speed is force (Sevim 2010), which derives from coordinated muscular action. Body parts should have the required muscular strength to practice a technique in a sports branch successfully (Aydos et al. 2004; Ayodos et al. 2009).

Hands, as one of the most sophisticated parts of human body, which are able to carry out even the finest actions, are a motor and functional unit of the body. The muscles that impart the necessary force to move the hands are located in the forearm. One of these muscles is the Palmaris Longus (PL) (Koç and Aycan 2010; Özgönül et al. 2008). However, whether and how the PL contributes in typical sports activity such as ball shooting, has not been subjected to a systematic exploration. PL is a muscle in the forearm and is one of the most varied muscles in the body (Arinç and Elhan 2001; Brian et al. 1998; Carroll et al. 2000; Cinar et al. 2007; Oommen 2002; Uz and Tagil 2002).

This study was therefore undertaken to find out how critical is the contribution of the PL in handball by comparing players with PL with those who do not have this muscle.

MATERIAL AND METHODS

Subjects

Twelve handball players having a PL in the forearm of their dominant hands who have been training at least for 7 years and play in the Turkish Premier Handball League, heretofore the PL+ group and a control group (PL-) of 42 handball players with a congenital absence of the PL participated in this study. Their physical measures are outlined. This study was approved by the Erciyes University Health Ethics Committee. To detect the Palmaris Longus muscle, the "O" position was tested by flexing the wrist and combining the thumb with the little finger (Figs. 1 and 2).

Procedure

An inflexible measuring tape and compass were used to measure length, width and circumference of the forearm (McArdle et al. 1991). Cameras, meters, chronometers and No.3 male handballs were used to measure the shooting speed. The shooting speed was measured by means of

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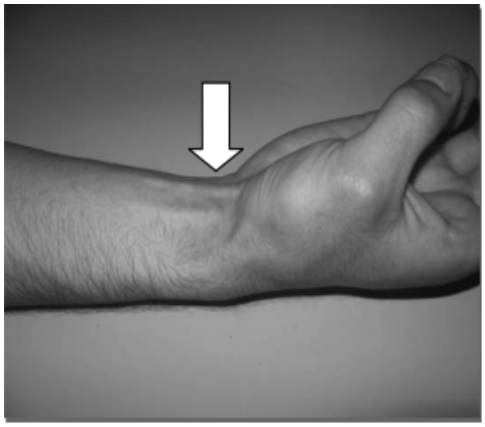

Fig. 1. Palmaris longus muscle is present

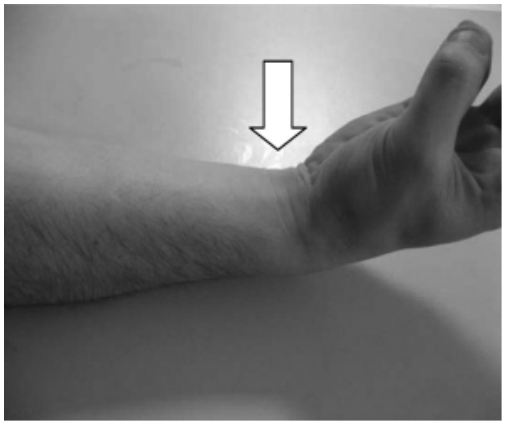

Fig. 2. Palmaris longus muscle is missing

cameras that record from various angles. Camera 1 recorded the instant when the ball left the hand, Camera 2 recorded the travelling time of the ball, and Camera 3 recorded the instant when the ball passed the line at 28 meters. Athletes made a pivot-step basic shot, and the time that elapsed from shooting of the ball towards the 28-meter line and the touchdown of the ball was recorded in terms of seconds. The values acquired were processed using the formula: "Velocity (v) = distance (s) / time (t)" to find the average shooting speed of handball players.

Statistical Analyses

Measurement results were presented in mean (M) and standard deviation (SD). Student t-test for independent samples was used for comparison of groups. The Shapiro-Wilk test was used to determine if the dependent variables were normally distributed. The direction and power of relationship between shooting velocity and forearm, and forearm in contracted position was determined by the Pearson correlation coefficient. In evaluation of the data, the SPSS (Statistical Package for the Social Sciences) software was used and the $p<0.05$ value was considered to be significant.

FINDINGS

Table 1 shows that when compared the two groups ((PL+ and PL-), no significant differences were found between PL+ and PL- players for the anthropometric measurements.

When the two groups (PL+ and PL-) were compared for of upper-arm length and forearm circumference (in flexed position) than significant inter-group differences were observed as shown in Table 2

From Table 3, it has been found that that PL+ players had a significantly higher shooting velocity compared to their PL- counterparts.

When Table 4 is examined, it outlines a number of correlation coefficients. The relationship between shooting velocity and forearm in contracted position was analyzed by "Pearson correlation coefficient". This analysis indicated that

Table 1: Physical measurement of handball players

Variables	*Group*	*n*	*Mean±SD*	*t*	*p*
Age (year)	PL+	42	21.28±2.99	1.146	0.269
	PL-	12	22.24±1.61		
Height (cm)	PL+	42	181.24±3.78	-0.499	0.623
	PL-	12	181.78±3.46		
Body weight (kg)	PL+	42	81.24±8.42	0.698	0.491
	PL-	12	79.64±7.19		
BMI (kg/m^2)	PL+	42	23.89±2.30	-0.002	0.998
	PL-	12	23.90±2.40		

Table 2: Height, circumference and width measurements of handball players

Variables	*Group*	*n*	*Mean±SD*	*t*	*p*
Upper arm length (cm)	PL+	42	33.78±2.13	3.812	**0.000****
	PL-	12	30.85±3.50		
Front arm length (cm)	PL+	42	30.57±3.43	-1.909	0.061
	PL-	12	28.69±3.14		
Front arm (cm)	PL+	42	27.88±1.54	1.512	0.148
	PL-	12	27.00±2.00		
Front arm (Position muscle) (cm)	PL+	42	30.75±1.24	2.535	**0.019***
	PL-	12	29.78±1.25		

* The correlation is significant at the level of p<0.05. ** The correlation is significant at the level of p<0.01.

Table 3: Shooting velocities of handball players

Variables	*Group*	*n*	*Mean±SD*	*t*	*p*
28 m Distance Time (sn)	PL+	42	1.38±0.15	4.448	**0.000****
	PL-	12	1.79±0.33		
Shooting Velocity (m/sn)	PL+	42	20.21±2.25	-4.796	**0.000****
	PL-	12	15.58±3.09		

** The correlation is significant at the level of p<0.01.

Table 4: Pearson correlation

Variables		*Upper arm length (cm)*	*Front arm length (cm)*	*Front arm (cm)*	*Front arm (Position muscle) (cm)*	*28 m Distance Time (sn)*	*Shooting Velocity (m/sn)*
Upper Arm Length (cm)	r	1	0.446**	-0.122	-0.359**	0.555**	-0.529**
	p	.	0.000	0.356	0.005	0.000	0.000
	n	54	59	59	59	59	55
Front Arm Length (cm)	r	0.446**	1	-0.375**	-0.558**	0.388**	-0.389**
	p	0.000	.	0.003	0.000	0.002	0.003
	n	54	54	59	59	59	55
Front Arm (cm)	r	-0.122	-0.375**	1	0.784**	-0.242	0.270*
	p	0.356	0.003	.	0.000	0.064	0.046
	n	54	54	54	59	59	55
Front Arm (Position Muscle)(cm)	r	-0.359**	-0.558**	0.784**	1	-0.498**	0.492**
	p	0.005	0.000	0.000	.	0.000	0.000
	n	54	54	54	54	59	55
28 m Distance Time (sn)	r	0.555**	0.388**	-0.242	-0.498**	1	-0.986**
	p	0.000	0.002	0.064	0.000	.	0.000
	n	54	54	54	54	54	55
Shooting Velocity (m/sn)	r	-0.529**	-0.389**	0.270*	0.492**	-0.986**	1
	p	0.000	0.003	0.046	0.000	0.000	.
	n	54	54	54	54	54	54

* The correlation is significant at the level of p<0.05. ** The correlation is significant at the level of p<0.01.

there was a strong correlation (0.75–1.00) between the "shooting velocity" and "forearm in contracted position" (p<0.01).

DISCUSSION

As a conclusion of this study, which was carried out in order to determine how frequently the Palmaris Longus muscle exists in handball players and whether this muscle has an impact on the shooting speed of handball players having this muscle, the findings support that there are differences between the two groups and it is an advantage in shooting power for handball players who have the Palmaris Longus muscle. The fact that there is no previous study on this

topic turns up the importance of the study. Nevertheless it also limits the study. Various authors have stated that this muscle has different abnormalities (Açikel et al. 2007; Aycan and Balkar 1991; Baldi et al. 2005; Bencteux et al. 2001; Perçin and Çimen 1994; Van Gils 2000).

Tillaar et al. (2004) observed in a study on 20 male and female handball players at the average age of 20 that the maximum shooting speed was 23,2 m/sec for males and 19,1m/sec for females. Gorostiaga et al. (2005) figured out in the outcome of a study on 30 elite and amateur handball players that the basic side-step shooting speed was 23.8±1.9m/sec for elite players and 21.8±1.6 m/sec for amateur players while the jump-shot speed was 25.3±2.2m/sec for elite players and 22.9 ± 1.4 m/sec for amateur players, and stated that there might be a correlation between the muscular power and shooting speed in elite handball players, however this correlation might be different in amateur handball players. There are differences in functions of the fibrils in the muscular structures of individuals. It is known that the fast-twitch and slow-twitch fiber types are at the same amount during babyhood (Fox et al. 1999). However, these fiber types cannot be converted to one another, and can only be developed in line with the requirements of the sports branch the individual pursues (Bilge and Tunçel 2004). The fast-twitch fiber type is dominant in motions that require explosive force (Sevim 2010). This is because this type of fiber contracts faster by its nature and its contracting force is higher (Sönmez 2002).

In another study conducted, the researchers examined the flexion power and clutch power of athletes with and without the Palmaris Longus in different sports branches and found out that the group with a Palmaris Longus muscle had a greater flexion power and clutch power than the group without Palmaris Longus did (Koç and Aycan 2010; Özgönül et al. 2008; Sanal 2006), Koç et al. (2006) indicate that the shooting speed of handball players goes up due to the increase in the muscular volume as a result of regular passing and shooting exercises.

CONCLUSION

In conclusion, this study has revealed that the shooting speed is different in handball players with and without the Palmaris Longus muscle in the forearm. The very existence of the Palmaris Longus muscle is an advantage for handball players, in addition to the exercises to improve the muscular power for an improved shooting speed. From this point of view, having the Palmaris Longus muscle in the forearm plays a significant role in handball when passing the ball and making the goal kick. Therefore, in handball player selections where the candidates are primarily asked to shoot by using their forearms, existence or non-existence of the Palmaris Longus muscle can serve as a good selection criterion. The researchers are of the opinion that existence or non-existence of the Palmaris Longus muscle can be set as a pre-condition in handball player selections.

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