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THE EFFECTS OF ISOKINETIC KNEE STRENGTH ON THE PROMPTNESS OF SOCCER PLAYERS

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Abstract:

The purpose of this study is to examine the effects of isokinetic knee strength on promptness. 15 soccer players with an average age of 22,80±2,14 years and 15 controls with an average age of 21,60±1,40 years participated in the study. Body composition, isokinetic knee strength measurement at angular speeds of 60°, 180°, 240° and 10 m sprint test were conducted respectively in the study. General warm-up procedure was carried out on the groups before measurements. In statistical analyses, Shapiro-Wilk test was used to test the assumption of normality, while Levene test was used to test the assumption of homogeneity. Independent t test was used for the comparison of paired groups, while Pearson correlation was used to check the association between variables. When the results of our research were analyzed, no statistical significance was found between the two groups in terms of descriptive information (age, height, weight, BMI), while differences were found in the 10 meter sprint test in favor of the soccer players ($p<0,05$). When the isokinetic knee strengths were analyzed at angular speeds of 60°, 180°, 240°, while no statistical significance was found between the two groups, soccer players were found to have high results in general. As a conclusion, it was found that knee isokinetic strength of soccer players were higher when compared with the control group and they had better promptness time, and in soccer players, promptness was improved in the correlation test conducted for 10 meter sprint test as age increased.

Keywords: promptness; isokinetic knee strength; body composition; soccer player

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1. Introduction

As is known, the human body is made up of different rates and intensities of fat, muscle and bones. These components are known to influence performance in different rates based on sport branches. Today, athletes' differences depend on athletes' being more skilled and having faster anthropometric and physiological capacities as well as their technical characteristics (Ersöz et al., 1996; Melekoğlu et al., 2012, Yılmaz et al., 2017). The purpose of an effective test program is to show whether the athletes' physical structures are suitable for the related sport branches. Thus, sports scientists have included body compositions and physical profiles of athletes as well as their physiological profiles in their research areas (Kuter and Öztürk, 1992). Physical structure has a great importance in showing maximal levels of physiological strength. In fact, performance does not take place exactly if this physical structure is not suitable for the performed sport branch (Açıkada and Ergen, 1996; Aktuğ, 2016).

The game of soccer is a sport in which the characteristics of promptness and agility are shown in top levels (Cometti et al., 2000), and it is also a sport which includes motoric characteristics and which is influenced by all performance parameters (Little and Williams, 2005; Ağaoğlu et al., 2009; Hazır et al., 2010; Jovanovic et al., 2010). Soccer is known to consist of high intensity and non-continuous exercises which include a great number of different periods of negative and positive acceleration, sprints, jumps and moves which require agility (Shephard, 1999).Thus, lower extremity strength, strength, speed, acceleration and endurance are important performance components for a soccer player.

As in all sport branches, strength has a great significance in terms of the need for mobility within the game of soccer. Although the game of soccer is a sport branch which requires too much endurance, it also requires optimal muscle strength. Especially lower extremity muscle strength is important in specific moves of soccer and muscle strength can be assessed objectively with isokinetic dynamometers (Dutta and Subramanium, 2002; Mallileo et al., 2003; Taşmektepligil, 2016).

According to literature review, the association between various performance and body composition parameters in soccer players have been examined by a great number of researchers (Young et al., 2001; Young and Farrow, 2006; Vescovi and McGuigan, 2008). However, it was found that the association with isokinetic knee strength has not been researched too much. Based on this information, the purpose of this study is to examine the effects of isokinetic knee strength on promptness in soccer players.

2. Material and Method

15 male soccer players in professional and/or amateur leagues with an average age of 22,80±2,14 years and 15 male controls who did not have any involvement with soccer with an average age of 21,60±1,40 years participated in our study. The samples who participated in the study were exposed to two tests, isokinetic knee strength at angular speeds of $60^{o}sec^{-1,}$ $180^{o}sec^{-1,}$ $240^{o}sec^{-1}$ and 10 meter sprint test. The measurements of isokinetic knee strength and body composition were conducted on the same day and after a full-day long resting interval, 10 meter sprint tests were conducted. The practices samples participated in were determined according to the suitability of the samples and randomly. In order to collect the descriptive data, height was recorded in cm and weight in kg with Gaia 359 plus weight scale with a precision of 0,1 kg and the digital stadiometer on this scale when the samples kept their anatomic stand, with sports outfit and no shoes on. The square of height in meter was divided into weight in kg and the body mass index (BMI) value was obtained. Peak torque angular speeds of the samples shown in knee extension and flexion were tested with computer controlled isokinetic dynamometer (Humac Norm Testing and Rehabilitation System, CSMI, USA) adjusted at $60^{o}sec^{-1,}$ $180^{o}sec^{-1,}$ $240^{o}sec^{-1}$ protocol. Tagheuer HL-232 photocell was used o measure the 10 meter sprint test, also known as 10 meter run, and the results were recorded in seconds.

SPSS program (SPSS for Windows, version 22.0, 2008, SPSS Inc., Chicago, Illinois, USA) was used for the statistical analysis of the data. The data were presented in arithmetic mean and standard deviation. Shapiro-Wilk test was used to test normality assumption, while Levene's test was used to test homogeneity assumption. Skewness and kurtosis values were checked for data sets which were not normally distributed and data sets within ±2 value were considered to have normal distribution. Independent t-test was used for the comparison of paired tests. Pearson correlation was used for the control of the association between the variables. Statistical results were assessed at 95% confidence interval and $p<0,05$ significance level.

3. Results

Table 1: Comparison of the descriptive information of the soccer and control group

Variable	Group	N	Average	Std. Dev.	t	p
Age (years)	Soccer	15	22,80	2,14	1,813	0,082
	Control	15	21,60	1,40		
Height (cm)	Soccer	15	177,00	4,90	0,645	0,524
	Control	15	175,73	5,81		
Weight (kg)	Soccer	15	75,95	6,91	1,601	0,123
	Control	15	72,63	4,07		
BMI (kg/m²)	Soccer	15	24,22	1,61	1,016	0,319
	Control	15	23,57	1,84		

No significant difference was found between soccer and control groups in terms of descriptive information (p>0,05).

Table 2: Comparison of the promptness and agility parameters of the soccer and control group

Variable	Group	N	Average	Std. Dev.	t	p
10 m Sprint test (sec)	Soccer	15	1,34	0,13	**-3,911**	**0,001***
	Control	15	1,50	0,09		

A significant difference in favor of soccer players was found when the promptness time was examined between soccer and control groups (p<0,05).

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Table 3: Comparison of the isokinetic knee strength parameters of the soccer and control group

Variable	Group	N	Average	Std. Dev.	t	p
60º Right Knee Ext. Strength (nm)	Soccer	15	165,00	24,83	0,779	0,445
	Control	15	154,40	46,51		
60º Right Knee Flex. Strength (nm)	Soccer	15	105,60	17,70	1,272	0,214
	Control	15	94,93	27,22		
60º Left Knee Ext. Strength (nm)	Soccer	15	169,73	29,57	1,485	0,151
	Control	15	148,60	46,50		
60º Left Knee Flex. Strength (nm)	Soccer	15	94,73	10,65	0,838	0,414
	Control	15	87,20	33,16		
180º Right Knee Ext. Strength (nm)	Soccer	15	106,60	25,12	1,070	0,295
	Control	15	98,20	17,11		
180º Right Knee Flex. Strength (nm)	Soccer	15	68,73	20,80	0,597	0,555

	Control	15	64,27	20,17		
180º Left Knee Ext. Strength (nm)	Soccer	15	101,93	21,34	1,097	0,282
	Control	15	93,27	21,93		
180º Left Knee Flex. Strength (nm)	Soccer	15	61,67	16,41	0,192	0,849
	Control	15	60,60	13,84		
240º Right Knee Ext. Strength (nm)	Soccer	15	88,07	17,84	1,262	0,218
	Control	15	81,07	11,98		
240º Right Knee Flex. Strength (nm)	Soccer	15	56,40	13,83	0,635	0,531
	Control	15	53,00	15,46		
240º Left Knee Ext. Strength (nm)	Soccer	15	83,33	14,31	0,540	0,594
	Control	15	80,27	16,71		
240º Left Knee Flex. Strength (nm)	Soccer	15	49,47	10,15	0,018	0,985
	Control	15	49,40	9,72		

No statistically significant difference was found between soccer and control groups in terms of isokinetic knee strength (p>0,05).

Table 4: The association of body composition and isokinetic knee strength with promptness and agility of soccer players

Variable		**Age**	**Height**	**Weight**	**BMI**	**60º Right Knee Ext. Strength**	**60º Right Knee Flex. Strength**	**60º Left Knee Ext. Strength**	**60º Left Knee Flex. Strength**	**180º Right Knee Ext. Strength**	**180º Right Knee Flex. Strength**	**180º Left Knee Ext. Strength**	**180º Left Knee Flex. Strength**	**240º Right Knee Ext. Strength**	**240º Right Knee Flex. Strength**	**240º Left Knee Ext. Strength**	**240º Left Knee Flex. Strength**
	r	**-,849**	,349	,225	,024	,110	-,304	-,027	-,085	,279	-,255	,054	-,122	,218	-,215	-,138	,042
10 m Sprint	p	**,000***	,203	,421	,933	,696	,270	,923	,763	,315	,359	,849	,665	,436	,442	,625	,881
	N	**15**	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15

*p<0,05

When the association between soccer players' body composition and isokinetic knee strength and their promptness times were examined, it was found that as age increased, the time of 10 m sprint test decreased and promptness increased (r=-,849).

4. Discussion and Conclusion

When the 10 meter sprint tests of our samples were examined, they were found as 1,34±0,13 sec in the soccer player group, while they were found as 1,50±0,09 sec in the control group. When the groups were assessed, no significant difference was found between the promptness levels of the soccer players and the control group ($p<0,05$).

When 10 meter sprint tests conducted on national and international soccer players were examined, it was found that Köklü et al. (2009) found the average 10 meter sprint times of 12 midfielders as 1,61±0,1 sec, while Kollaht et al. (2003) found the average 10 meter sprint times of soccer players as 1,79±0,8 sec. In addition, Cerrah et al. (2011) found the average promptness times of 41 midfielders as 1,72±0,08 sec, while they found the averages of 25 defenders as 1,69±0,07 sec, and the averages of 14 forwards as 1,67±0,09 sec. In their study, Cometti et al. (2001) found the average promptness time as 1,80±0,2 sec. Arslanoğlu et al. (2011) found the average promptness times of 50 soccer players as 1,79±0,18 sec, while Helderud et al. (2006) found the average promptness times of 9 soccer players as 1,88±0,06 sec. When other studies conducted were examined, it was found that 10 meter sprint test values differed between 1,60 sec and 1,88 sec (Little and Williams, 2006; Magalhaes et al., 2004; Jovanovic et al., 2011; Mendez et al., 2011). When similar studies on soccer were compared with our study, it was found that our 10 meter sprint test gave better results than other studies examined in literature. On the other hand, our results were close to the results of some other studies.

When the isokinetic knee strength values of our study were examined, no statistically significant difference was found between the soccer player group and the control group ($p>0,05$). When the isokinetic strength values of the soccer player group were examined at angular speeds of 60^{o}sec$^{-1,}$ 180^{o}sec$^{-1,}$ 240^{o}sec^{-1}, the following results were found: between 150 and 165 Nm at 60^{o}sn^{-1} extension, between 95 and 105 Nm at 60^{o}sec^{-1} flexion, between 93 and 106 Nm. and 60 and 68 Nm at 180^{o}sec^{-1} extension and flexion, respectively and between 80 and 88 Nm and 49 and56 Nm at 240^{o}sec^{-1} extension and flexion, respectively.

When the study conducted by Ergün et al. (2004) on soccer players was examined, dominant and non-dominant extension values of both soccer players and the control group were between 200 and 250 Nm at 60º. While the knee flexion value at the dominant foot at 60º was between 150 and 200 Nm in the soccer player group, this value was between 100 and 150 Nm in the control group. In addition, when studies conducted on soccer players at the angular speeds of 60º, 180º, 240º were examined, it was found that 60º Extension strength was between 150 Nm and 210 Nm, 60º Flexion strength was between 80 Nm and 140 Nm, 180^{o} Extension strength was between 90 Nm and 126 Nm, 240° Extension strength was between 75 Nm and 115 Nm, and 240° Flexion strength was between 65 Nm and 85 Nm (Poulmedis 1985; Östenberg et al., 1998; Kellis et al., 2001; Akın et al., 2004; Aktuğ 2013; Kerith et al., 2014).

When the studies in literature conducted on soccer players' isokinetic strength values at angular speeds of 60º, 180º, 240º were compared with the results of our study, it was found that our results were lower when compared with some studies. It can be said that the differences in these results can be resulting from the differences in the training ages of the sample groups, the differences in the leagues of players and the differences in trainings based on strength. Although the results of our study were in parallel with the results of some studies reviewed, they were found to be higher when compared with other studies. It is thought that the values in our study are within normal ranges in terms of literature.

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