



AN EXAMINATION OF GRIP STRENGTH AND ARM ANGLES OF ELITE LEVEL OF TENNIS PLAYERS WITH RELATION TO THEIR SPORTS

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ABSTRACT

Aim: The purpose of this study is; to investigate the relationship between the grip strength and some of arm angles of university tennis players with the age of the sport and to investigate the effect of sporting age on grip strength performance.

Material and Methods: 40 female and 50 male volunteer tennis players attending the Turkish Universities Tennis Championships organized in Marmaris in 2016 participated the research as subject. The grip strengths of the subjects were tested with three maximal repetitions with dominant and non-dominant hand with Takai brand hand dynamometer. In the analysis of the data, Pearson correlation statistic was used in relation to sport age and performance beside the descriptive statistics. Again, T test was used in binary comparisons and ANOVA was applied among the age groups.

Findings: In the results, average sport ages of the subjects were determined as 10.8(4) for males and 6.7(3.6) for females. Mean dominant and non-dominant hand grip strengths were statistically significant ($P < 0.05$) 38.9 (12) kg and 35.2 (11) kg for the all subjects respectively. Again, there was a significant ($P < 0.01$) positive correlations between the age of the sport and the grip strength ($r =$ dominant 0.59, $r =$ non-dominant 0.50). On the other hand, there was a low correlation ($r = 0.21$) between the angle of elbow supination and sports ages.

Conclusion: There is a significant increase in the grip strength of the athletes with the long ages of doing tennis sports and the existence of the relationship. This can be regarded as a sign that tennis is a sport, that tennis players have a positive influence on their grip strength development.

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INTRODUCTION

Nowadays, tennis has become a sports branch that millions of people watch and play throughout the world (Akşit, 2012). Many tournaments and competitions are held every year. In these competitions, athletes from all levels participate in different categories (Işık, 2009). As in every modern-day sport, it is aimed to be faster and more skillful and physiological capacity should be at the high level (Söyleyici, 2011). In recent years, it has been observed that the studies examining the motor and physiological properties, which are the factors that lead to the high-performance level, have gained focus (Sevim, 2002).

The fact that body compositions and physical profiles of athletes are also important in terms of fitness for sports in addition to physiological profiles has given rise to an increase in the number of studies that have been conducted on this subject (Kuter and Öztürk, 1998). It has been reported that athletes who cannot reach the expected physical fitness levels have difficulties in applying the training techniques and therefore have to apply inappropriate force to the different parts of the extremity and this causes serious sports injuries (Bompa, 1998; Gelen *et al.*, 2006). Hand grip strength, arm flexibility, and motion extensiveness are indicated as important indicators of tennis performance (Bompa, 1998; Gelen *et al.*, 2006). As in all branches, starting to play tennis in early age has positive contributions both in terms of the

development of motor skills and in the development of technical and coordination skills (Layton and DeBeliso, 2017). In our country, it has been seen that the multi-subject and comprehensive physical fitness profile research studies are limited. One way that Turkish tennis can be successful on the world scale is to clarify the contributions of the tests that are done with scientific methods to the training programs. In this study, it has been aimed to determine the hand grip strength of young adult tennis players and to examine the relationship between the hand grip strength and the age of starting sports and duration of sports participation.

male athletes (10.8 ± 4) in comparison to female athletes (14.3 ± 4), the duration of sports participation for male athletes (10.8 ± 3.9) is 4 years longer in average than female athletes (6.7 ± 3.6) ($p < 0.05$). The grip strength of the female athletes in the dominant hand is $28.45 (\pm 5.4)$ kg, and the grip strength in the non-dominant hand is $25.6 (\pm 4.5)$ kg. For male athletes, these values have been measured as $47.6 (\pm 7.8)$ kg in the dominant hand and $43.2 (\pm 7.2)$ kg in the non-dominant hand. When all subjects have been considered, the grip strength has been found as $38.9 (\pm 12)$ kg for the dominant hand and $35.2 (\pm 11)$ kg for the other hand.

Table 1. Comparison of Hand Grip Strengths

	Dominant hand grip strength	Other hand grip strength	p
Female	28.4 (± 5.4)	25.6 (± 4.5)	*
Male	47.6 (± 7.8)	43.2 (± 7.2)	*
Total	38.9 (± 12)	35.2 (± 11)	*

All values have been presented as average (\pm standard deviation).

*: Statistically significant difference ($p < 0.05$)

Table 2. Correlation analysis data of the measured parameters of all tennis players (n: 90)

	Age	Age of the Athlete	Age of Starting Sports	Dominant Hand Grip Strength	Other hand grip strength	Height	BW
Age (year)	1						
Age of the Athlete (year)		1					
Age of Starting Sports (year)	0.24*	-0.88**	1				
Dominant Hand Grip Strength (kg)	0.12	0.59**	-0.52**	1			
Other Hand Grip Strength (kg)	0.15	0.50**	-0.42**	0.93**	1		
Height(cm)	0.15	0.54**	-0.46**	0.78**	0.73**	1	
BW (kg)	0.13	0.44**	-0.38**	0.84**	0.76**	0.82**	1

BW: Bodyweight. * Correlation is significant at $p < 0.05$ level. ** Correlation is significant at $p < 0.01$ level.

MATERIALS AND METHODS

A total of 90 athletes, 41 female, and 49 male, who competed in the 2016 Turkish Universities Tennis Championships, have participated in the study voluntarily. The isometric hand grip strengths of the subjects have been measured through three maximal repetitions while the arms were in the position to stay on the sides and not touch the body by using a Takei (Takei Scientific Instruments Co., Ltd., Niigata City, Japan) hand dynamometer. The best value has been used in the analyses.

Statistical Analysis

SPSS 20 package program has been used to analyze the obtained data. One sample "Kolmogorov-Smirnov" test has been applied to determine whether the data have a normal distribution and as a result, it has been determined that the data have a normal distribution. Pearson correlation analysis has been used to determine the level of correlation between the duration of sports participation and the measured parameters. T-test has been used for independent samples to determine the difference occurs according to genders. For statistical significance, the value of $p < 0.05$ has been accepted. The data have been presented as mean (\pm standard deviation).

RESULTS

The values for the forty-one female athletes participating in the study are $20.95 (\pm 2)$ years old, $165.7 (\pm 6)$ cm height, $55.37 (\pm 5)$ kg body weight; and for forty-nine male athletes these values are $21.5 (\pm 2)$ years, $180.7 (\pm 7)$ cm and $75 (\pm 10)$ kg respectively. While the age for starting sports is younger for

A statistically significant difference has been found between dominant extremity and other extremity strength in both genders ($p < 0.05$). A moderate positive correlation between the age for starting sports and dominant hand grip strength ($r = 0.59$) and other hand grip strength ($r = 0.50$) ($p < 0.01$).

DISCUSSION

The values of the subjects' age, height, and bodyweight that have been found in this study that has been conducted on athletes who are university students and play tennis as competitors are similar to other studies conducted on Turkish tennis players (Gelen *et al*, 2008; Gelen *et al*, 2006). As a result of the study, it has been found that there is a statistically significant difference between dominant and non-dominant hands in both genders, and dominant hand strength values are higher. This situation is consistent with the literature (Gelen *et al*, 2008, Layton and DeBeliso, 2017, Gullikson, 2003). It also has been determined that there is a significant relationship between the age of starting sports of the athletes and dominant and non-dominant hand grip strengths. It has been understood that through this relationship the strength has been increasing in parallel with the experience of playing sports (Elliott *et al*, 1990). Success in sports emerge when various factors such as power, flexibility, agility, etc., are evaluated as a whole. Gripping strength and flexibility are being subjects for the research studies frequently, especially for the ones conducted on sports that are played with a racket and dominated by hands (Söyleyici, 2011). Muscle strength sufficiency is very important in terms of tennis as it is for all sports branches. The increase in muscle strength provides the continuity of

repetitive and powerful strokes as well as the development of the stroke technique in tennis (Kramer and Knudson, 1992). In the light of this information, it is expected that the top players to have stronger hand grips. For example, in a study conducted on tennis athletes playing in the first league, the dominant hand grip strength values of the tennis players have been determined as 46.2 (\pm 3.4) kg, while the non-dominant hand grip strengths were 39.6 (\pm 3.4) kg. The dominant hand grip strength values of the tennis athletes playing in the second league have been found as 46.0 (\pm 4.9) kg and the non-dominant hand grip strength as 37.7 (\pm 4.9) kg (Gelen *et al*, 2006). Kramer and Knudson found that the average grip strength of young tennis players is 46.7 kg for males and 30 kg for females (Kramer and Knudson, 1992). It has been seen that the grip strengths of the elite tennis players are greater than the strengths of those who do not play tennis (Layton, 2017, Kovacs, 2006). In this presented study, it has been seen that there is a significant relationship between the duration of playing tennis and the hand grip strength.

When the hand grip strengths of athletes who play badminton, which is another branch of sports played with a racket, have been compared, it has found that the dominant hand grip strengths for the badminton players are 48.41 (\pm 5.70) kg and the non-dominant hand strengths are 44.34 (\pm 8.79) kg; and for tennis players it has been determined that dominant hand strengths are 55.57(\pm 3.36), and non-dominant hand strengths are 47.49 (\pm 3.19) kg. A statistically significant difference has been observed between these two branches (Knudson and Blackwell, 1997). As a result, starting early to play tennis and exercising this sport for a long time period is associated with increased hand grip strength. Early acquisition of technical skills and physical competence in tennis will increase success in sports.

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