

Analysis of Grand Slam Tennis Tournaments by Gender

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Abstract

The aim of this study is to analyze the variables determined in tournaments on different court surfaces by gender. In this research, official websites of 2019 Grand Slam tennis tournaments were used in the category of single men and single women as data collection tool. In the research, winning matches in the American Open and Australian Open played on hard surface (250 single men, 252 single women), the French Open played on clay surface (127 single men, 122 single women) and Wimbledon played on grass surface (127 single men, 126 single women) were analyzed. In these competitions, aces, double fault, win on 1st. serve, win on 2nd. serve, break points, unforced errors, winner, total points, fastest service and match duration were evaluated. SPSS 22.0 statistical software was used to evaluate the data and to find the calculated values. Since the data showed normal distribution, t test was used in independent groups and the level of significance was accepted as 0.05. When the variables taken into consideration were compared by gender, there was no statistically significant difference between men and women only in the double fault variable in the clay court ($p > 0.05$), whereas all other variables were significantly different in all courts ($p < 0.05$). It has been determined that women's double fault, break points and unforced errors on hard and grass court, break points and unforced errors performance on clay court are better than man athletes. As a result, it can be said that the selected variables are affected by the gender factor on all court surfaces.

Keywords: Tennis, Grand Slam, Match analysis

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Introduction

Competitive tennis games require good interaction between tactical, technical, psychological and physical components (Kovacs, 2007). Increasing evidence shows that there is a strong relationship between motor skills such as strength, power, agility, speed and explosivity, as well as mental power and a highly developed neuromuscular coordination ability with tournament performance. Therefore, the development of these features is indispensable to reach the international performance level (König et al., 2001). The physical and physiological requirements of tennis players may change depending on the level of the players, the style of play, gender or the surface of the court. The critical stages of a tennis game, such as service, hits, and rapid acceleration of the ball, are largely dependent on ways of providing anaerobic energy combined with aerobic submaximal activities (rest periods between games and points) (Fernandez-Fernandez et al., 2009). However, it is known that performance indicators are not the only important factor for the success of a tennis player. Other important factors should be taken into consideration, including tactical quality, creativity, the ability to hide movements, the quality of strokes in all game situations, the player's self-confidence and emotional control (Kilit and Arslan, 2018).

Today, tennis is a world class competitive sport that attracts millions of players and fans worldwide. Competitive tennis is played under the rules of the International Tennis Federation (ITF). The competitions are organized by the ITF, the Association of Tennis Professionals (ATP) and the Women's Tennis Association (WTA) (Fernandez-Fernandez et al., 2006). The most important and prestigious tournaments in tennis are Grand Slam tournaments. Of these tournaments, Wimbledon is played on the grass court, Roland Garros on the clay court, and the US and Australian Open tournaments are played on the hard court (Del Corral, 2009). The characteristics of each court surface affect the style of play, the tennis ball rebound and the quality of performance (Martin and Prioux, 2015). The court speed is determined primarily by the coefficient of friction and restitution between the ball and the court surface. As the friction increases, the ball slows down. The higher the bounce, the slower the ball. How well a player performs during professional tournaments is related to the surface on which the matches are played (Murias et al., 2007). It is well known that some players are advantageous and perform better on particular surfaces. Serve and volleyers do relatively better on grass, while baseliners

usually prefer clay (Barnet and Clarke, 2005). It is very important to identify the most influential factors on performance, as tennis has progressed from a sport which skill was the primary prerequisite for successful performance to a sport that also requires the complex interaction of various physical components (Ulbricht et al.,2016).

Contemporary sports are filled with statistical data that define athlete or team performance, and these data are used by coaches to shape the in-game strategy and guide interventions (Reid et al., 2010). The aim of this study is to analyze the variables determined in tournaments on different grounds by gender.

Method

In this research, official websites of 2019 Grand Slam tennis tournaments were used in the category of single men and single women as data collection tool (<https://www.usopen.org/index.html>,<https://ausopen.com/>,<https://www.rolandgarros.com/en-us/>, <https://www.wimbledon.com/>). In the research, winning matches in the US Open and Australian Open played on hard surface (250 single men, 252 single women), the French Open played on clay surface (127 single men, 122 single women) and Wimbledon played on grass surface (127 single men, 126 single women) were analyzed. In these competitions, aces, double fault, win on 1st. serve, win on 2nd. serve, break points, unforced errors, winner, total points, fastest serve and match duration were evaluated.

Statistical Analysis

SPSS 22.0 statistical package program was used to evaluate the data and find the calculated values. The data are summarized by giving mean and standard deviations. Whether the data showed a normal distribution was checked by the range of kurtosis-skewness coefficients (Tabachnick and Fidell, 2013). Since the data showed normal distribution, t test was used in independent groups and the level of significance was accepted as 0,05.

Results

Table 1. T-test results of variables of competitions played on hard court by gender

	Gender	N	Mean	Ss	Sd	t	p
Aces	Men	250	12,196	7,460	500	15,462	0,000*
	Women	252	4,273	3,169			
Double Fault	Men	250	4,432	3,512	500	5,778	0,000*
	Women	252	2,853	2,535			
Win on 1st. Serve (%)	Men	250	77,880	6,666	500	7,930	0,000*
	Women	252	72,555	8,294			
Win on 2nd. Serve (%)	Men	250	55,652	9,142	500	3,600	0,000*
	Women	252	52,333	11,397			
Break Points	Men	250	45,880	17,414	500	3,964	0,000*
	Women	252	52,067	17,559			
Unforced Errors	Men	250	35,652	16,094	500	8,761	0,000*
	Women	252	24,785	11,295			
Winner	Men	250	42,712	15,066	500	15,062	0,000*
	Women	252	25,734	9,615			
Total Points	Men	250	125,376	31,474	500	21,122	0,000*
	Women	252	77,353	17,593			
Fastests Serve (kmh)	Men	250	205,705	8,325	500	40,450	0,000*
	Women	252	178,187	6,851			
Match Duration (dk)	Men	250	159,956	49,169	500	17,762	0,000*
	Women	252	95,313	30,211			

P<0,05

When the variables taken into consideration were compared by gender, a significant difference was found between men and women in all variables (F (502); $p < 0.05$). It has been determined that women's double fault, break points and unforced errors performances are better than male athletes on hard court (Table 1).

Table 2. T-test results of variables of competitions played on clay court by gender

	Gender	N	Mean	Ss	Sd	t	p
Aces	Men	127	7,283	5,974	247	7,691	0,000*
	Women	122	2,762	2,805			
Double Fault	Men	127	3,370	2,905	247	1,917	0,058
	Women	122	2,754	2,117			
Win on 1st. Serve (%)	Men	127	74,661	7,033	247	6,529	0,000*
	Women	122	67,819	9,379			
Win on 2nd. Serve (%)	Men	127	56,480	9,016	247	4,492	0,000*
	Women	122	50,409	12,136			
Break Points	Men	127	49,259	15,680	247	2,808	0,005*
	Women	122	55,147	17,392			
Unforced Errors	Men	127	33,417	15,569	247	5,373	0,000*
	Women	122	24,221	10,939			
Winner	Men	127	39,850	14,546	247	9,277	0,000*
	Women	122	25,426	9,573			
Total Points	Men	127	120,724	32,083	247	12,281	0,000*
	Women	122	78,688	20,989			
Fastests Serve (kmh)	Men	127	201,618	7,513	247	32,908	0,000*
	Women	122	173,682	5,723			
Match Duration (dk)	Men	127	154,488	50,654	247	11,168	0,000*
	Women	122	94,311	32,823			

P<0,05

When the variables taken into consideration were compared by gender, there was no statistically significant difference between males and females only in the double fault variable ($p>0.05$), but a significant difference was found in all other variables ($F(249)$; $p<0.05$). It was determined that the break points and unforced errors performances of women were better than male athletes on clay court (Table 2).

Table 3. T-test results of variables of competitions played on grass court by gender

	Gender	N	Mean	Ss	Sd	t	p																																																																																																								
Aces	Men	127	10,464	6,705	251	10,346	0,000*																																																																																																								
	Women	126	3,595	3,306				Double Fault	Men	127	3,724	2,605	251	3,449	0,001*	Women	126	2,658	2,298	Win on 1st. Serve (%)	Men	127	78,653	6,540	251	8,025	0,000*	Women	126	70,611	9,188	Win on 2nd. Serve (%)	Men	127	57,984	8,556	251	4,200	0,000*	Women	126	53,023	10,167	Break Points	Men	127	43,629	15,900	251	4,297	0,005*	Women	126	53,182	19,305	Unforced Errors	Men	127	27,196	12,996	251	4,123	0,000*	Women	126	21,119	10,307	Winner	Men	127	41,834	12,899	251	11,780	0,000*	Women	126	24,325	10,643	Total Points	Men	127	122,078	26,297	251	15,541	0,000*	Women	126	77,349	18,910	Fastests Serve (kmh)	Men	127	205,165	7,630	251	30,869	0,000*	Women	126	176,246	7,268	Match Duration (dk)	Men	127	145,401	43,192	251	11,229	0,000*
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$P<0,05$

When the variables taken into consideration were compared by gender, a significant difference was found between men and women in all variables ($F(253)$; $p<0.05$). It was determined that women's double fault, break points and unforced errors performances were better than male athletes on grass court (Table 3).

Discussion and Conclusion

In this study in which some variables were analyzed by gender in tournaments played on different court surfaces, a significant difference was found between men and women in the aces, double fault, win on 1st. serve, win on 2nd. serve, break points, unforced errors, winner, total points, fastest serve and match duration variables in all courts (hard, clay, grass), excluding only the double fault on the clay court.

Since the serve is the most important stroke in tennis, it is important to determine the physical qualities that define its performance (i.e., speed) and help to prevent a future overuse injury in the shoulder (Fernandez-Fernandez et al., 2019). Even on clay, the slowest court surface, serves and serve-returns are the most effective strokes in modern tennis games (Gillet et al., 2009). It has been stated that the body height of both male and female tennis players is an important factor affecting the serve speed, and the tall players probably have a significant biomechanical advantage (Vaverka and Cernosek, 2013). The ability to produce increased serve speed is multifactorial. The combination of skill, body height, hip motion, and upper and lower extremity power can determine serve speed (Palmer et al., 2018). During serve, it has been determined that skilled tennis players show more suitable muscle activity with shorter activation times and have a higher coordination level than less skilled players (Groppel and Roetert, 1992). In addition, it was stated that serve is not only enough to earn points, success in serve-return, strategy in the game, technical level and condition of the athlete is very important (Ölçücü et al., 2012). Filipcic et al (2011) found that there is no direct relationship between serve and match result, and that a successful serve helps players to win games in their own serve. In our current study, it was found that aces, win on 1st. serve, win on 2nd. serve, break points, the fastest serve performances of men were higher than the women in the competitions won on all three court surfaces. Similarly, Norton and Clarke (2002) stated that in the Australian Open competitions in 2000, the average of aces, win on 1st. serve and serve winner of men were higher than women. Serve, serve return, groundstroke and movement data were compared between sexes in Grand Slam Australian Open (2012-2014). As a result of the study, first serve points won, first serve points won, peak serve speed, percent of groundstrokes contacted inside the baseline, covered in a match, average movement speed of the player during point play for the match values of men were higher than women. These findings highlight the need for gender-specific training and practice designs that cater to the different stroke dynamics, particularly in relation to the first serve and serve-return, as well as movement speeds (Reid et al., 2016). In our current study, a significant difference was found between males and females in hard and grass courts in double fault averages, but no difference was observed in clay courts. Contrary to our study, females committed significantly more double faults per service game than males in Grand Slam Australian Open tournaments (Reid et al., 2016). However, as a

result of the analysis of the 2014 Grand Slam tournament (US Open, Australian Open, French Open), there was no significant difference between the tournaments in the double fault variable in both men and women (Sánchez-Pay et al., 2015). The fastest service was highest in France Open (land) in both men and women in 2008, service speed was lowest (hard) in 2016 French Open for men and 2012 Australian Open for women. In all three years, the average speed of the first serve was found to be highest in Wimbledon (grass) for both men and women. The researchers reported that it would be possible to conclude from these results that players in Wimbledon are trying to achieve a higher first serve speed during the match than playing on other courts with different court surfaces (Vaverka et al., 2018). In a different study, significant differences were observed between the tournaments in both sexes in the aces, while aces reached the highest values in Australia Open in both men and women (Sánchez-Pay et al., 2015). In the study, where the serve and serve return performances of professional (18 and over), under 12 and under 16 age male and female tennis players were examined, a significant interaction was found between gender and player groups for serving aces. A significant gender by player group interaction was found for serving aces. Male professionals served significantly more aces than the Under-16 and Under-12 male players and female professional players. Female professional players served more aces than the Under-12 female players (Hizan et al., 2011). In the study, in which the analysis of single men Grand Slam tournaments covering the period of 1991-2009 was made, it was stated that the nature of the tennis game continues to change. It was observed that the biggest change was the increase in serve speed at the French Open and the serve speed continued to increase in all tournaments, such as aces (Cross and Pollard, 2009). However, the highest and lowest service speed values may vary depending on weather conditions such as sun, wind and temperature, or the use of different systems to measure or calibrate the service speed (Vaverka et al., 2018). In addition, O'Donoghue (2002) revealed that the speed of service is a number of factors that affect the proportion of points won on first and second service. In single women, the success of points emanating from first serve depends on aces, ability at the net and the number of winners played per unforced error. Effectiveness in points emanating from second service, however, depends largely on the number of winners played per unforced error. In single men, the success of points emanating from first serve

depends on aces, number of net points, ability at the net and the number of winners played per unforced error.

Tennis performance varies according to gender and player levels as well as game-specific variables such as different court surface and balls (Kilit and Arslan, 2017). In our current research, a significant difference was found between the men and women in all three court surfaces in the variables of unforced errors, winner, total points and match duration. Of these variables, only unforced errors were lower in women. Tudor et al (2014) reported that the number of unforced errors increased at Roland-Garros (clay court) in 2011, whereas it was decreased as well as the number of winners at Wimbledon (grass court) and America Open (hard court). Researchers stated that while playing on fast courts, the players tend to play a lower risk at the beginning and middle stages, and on slow courts, they tend to play more aggressively at the middle stages of the points. Cui et al (2018) found that players had more service winners, double faults, return winners and return unforced errors in the Australian Open and US Open. The researchers stated that this means fast serve strategy, and higher dominance rate and better serve performance at Wimbledon. While receiving players had better chances to break opponents' service game in Roland Garros. In a different study, for the same training session on hard and clay courts, there were no differences in total distance or stroke volume. However, clay courts resulted in fewer errors compared with the increased unforced error rate noted on hard courts (Reid et al., 2013). Smith and Holmes (2013) indicated that men have continued to have a greater length of rally than women on clay and hard courts, however women saw a longer rally duration when playing on the grass courts of Wimbledon, but fewer shots were played. In a study evaluating the correlation among particular tennis game elements and match outcomes specifically at Wimbledon and Roland Garros tournaments 2009, it was found that Wimbledon winners are characterized by the variables related to service which the players rely on, while Roland Garros winners are characterized by baseline play predominated by basic strokes (Katic et al., 2011).

These data reflect different demands and strategies used by players on different court surfaces. For example, a more aggressive game is associated with a faster surface, such as grass. In addition, the data suggest that various factors such as gender and surface have an important effect on match activity. These observations mean that training components must be court-specific and gender-

specific, so players get more aerobic training as they prepare for competitions on slower surfaces (Fernandez-Fernandez et al., 2006). Martin et al (2011) stated that the court surface affects the properties of tennis match. On the clay court, effective playing time and average rally time increase, while effective rest time decreases. On the hard court, effective play time and average rally time decrease while effective rest time increases. Researchers reported that these changes were probably responsible for higher average heart rate and blood lactate concentration values measured on the clay surface, and there was an overall higher physiological demand on this surface.

As a result, it can be said that the selected variables are affected by the gender factor on all court surfaces. Current findings show that both gender and court surface are effective on the strategy adopted by players in different tournaments. For this reason, elite tennis players should develop a match strategy that is not only based on their strengths and weaknesses, but also on their gender and court surface.

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