COMPARISON OF GAME CHARACTERISTICS OF MALE AND FEMALE TENNIS PLAYERS AT ROLAND GARROS 2005

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The game characteristics of elite male and female tennis players at the French Open 2005 (Roland Garros) have been analyzed based on a large number of sets, a total of 894 in the category of men and 592 sets in the category of women. In addition, a comparison of game characteristics in an individual set between winners and losers has been made. It was ascertained that there are statistically characteristic differences in most variables between the winners and loser in the category of men as well as in the category of women. In the category of men, there are statistically characteristic differences in all variables except in the break point conversions. In women however, there are statistically characteristic differences in all variables except in the number of won aces.

Based on these findings it can be concluded that statistically characteristic differences in the majority of variables, which define game characteristics, indicate that there are certain measurable indicators of tennis statistics, which distinguish winners from losers.

Keywords: Tennis, tennis statistics, successfulness in tennis.

INTRODUCTION

Direct or competitive successfulness is indicated in the competitive effectiveness of tennis players. The utmost indicator of how competitively effective the players are, is their ranking on national, European or world ranking lists. The ranking depends on the number of tournaments played and on the result achieved (ranking) at individual tournaments. In addition to ranking on the ranking lists, a good indicator of competitive effectiveness is the statistical data on each individual tennis match.

Using the statistical data, we can better define the successful performance of individual strokes in the match (serve, return), excellent and poor characteristics of an individual's game, the way of playing (aggressive, defensive) and some other factors that contribute to a successful tennis game. With the statistical analysis of game characteristics, we can establish the reasons for winning or losing a game.

An effective serve, an aggressive and reliable game across the entire court, a low number of unforced errors, and the ability to complete a high number of victories are now the key to achieving good results. Contemporary tennis game development trends are to shorten the point played and the match in general. The players therefore score more points also with the first or second stroke after the serve or return. The success of a serve is therefore a very important factor in a tennis game.

The return is a stroke that lately became of equal importance as the serve. It is true that players less often score victories though, but in spite of this, successfulness and scoring points after a return represent significant statistical data, which ultimately affect successfulness in tennis.

The percentage of points won on the first and second serve is likewise one of the indicators demonstrating the effectiveness of the player's serve related to playing across the entire court.

A break opportunity in a tennis game signifies an opportunity to take the opponent's serve or an opportunity to win the game served by the opponent. Taking advantage of a break is a certain advantage for the player in winning the set, particularly on fast pace surfaces where such opportunities are less frequent.

Tennis game aggressiveness is, in addition to fast pace and accuracy of serve, characterized by a more aggressive style of playing at the baseline and in an "all court" game. Such a way of playing is indicated primarily by scoring more victories as well as by net approaches and consequently putting more pressure on the opponent. There are certain moments in the game when players choose or have to choose more or less risky tactical decisions. In this case, the ratio between the number of winners and the number of unforced errors is also important.

There are different methods that can be used to analyze a tennis game. Tennis coaches use special statistical

forms or computer programs for palmtops and personal computers.

In the selected problem area, a couple of similar research projects were carried out. Planinšek (1994) used the tennis expert system to analyse playing and time characteristics in tennis on different surfaces (clay, hard court). Two tennis matches were analyzed and several differences in time characteristics were found. We should mention the research done by Ferjan (2001), who analyzed the final matches at the US Open and at the Australian Open in 2000 and 2001. He established that the winner of the US Open was more successful in the percentage of points won after the first and the second serve; the winner had less double faults and won more victeories and total points. The loser was, however, more successful in the first serve. At the Australian Open, the winner was more successful in the percentage of points won after the first serve, had less double faults and won more total points, while the loser was more successful in the percentage of points won after the second serve and in the number of victories. Pintarič (2002) analyzed the final matches at the French Open in 2001 and 2002. He established that the winners in both finals scored a higher percentage of first serves and at the same time also a higher percentage of points won after the first and the second serve than the losers. Zlatoper (2002) analyzed the final matches of the French Open (Roland Garros), Wimbledon and the US Open in 2001. He established that the winner of the US Open was more successful in the percentage of first serves, the percentage in points won after the first and the second serve. The winner also won more victories and total points. The loser had fewer double faults and won more aces. At the Wimbledon tournament, the winner was more successful in the percentage of points won after the first and the second serve, the winner won more aces and winners, and had the same number of total points won as the loser. The loser was, however, more successful in the first serve and had fewer double faults. When analyzing the French Open, he established that the winner was more successful in the percentage of first serves and the percentage of points won after the first and the second serve, the winner also won more aces, had fewer double faults and won more total points. The loser was more successful in the number of victories.

AIMS OF THE STUDY

Aims of the study were to ascertain the following:

1. Is there a difference between winners and losers in the percentage of first serves in the category of men and women?
2. Is there a difference in the reliability of playing between winners and losers in the category of men and women?
3. Is there a difference between winners and losers in the percentage of points won after the first and the second serve in the category of men and women?
4. Is there a difference in the aggressiveness of play between winners and losers in the category of men and women?
5. Is there a difference in the percentage of receiving points won afterwards and in the percentage of break point conversions between winners and losers in the category of men and women?
6. Is there a difference in the total points won between winners and losers in the category of men and women?

METHODS

The sample of participants

We have analyzed the game characteristics of male and female tennis players who played in the main draw of the 2005 Roland Garros. Data for 128 male and 128 female tennis players has been collected from the tournament's official web sites. We have analyzed the total of 894 sets in the category of men and 592 sets in the category of women.

The sample of variables

The sample of variables used for the game characteristics analysis was as follows: percentage of first serves (S1P); number of aces (ACES); number of double faults (DF); number of unforced errors (UE); winning percentage on first serve (W1S); winning percentage on second serve (W2S); number of winners (WIN); percentage of receiving points won (RPW); percentage of break point conversions (BPC); percentage of points won in net approaches (NA) and total points won (TPW).

Data processing methods

We have calculated the parameters of descriptive statistics for the collected data. For all variables, a normal distribution was tested using the Kolmogorov-Smirnov test. A non parametric method (chi-square test) was applied to ascertain statistically characteristic differences between winners and losers in both the male and female category.

RESULTS AND DISCUSSION

The results and discussion are presented separately for male and female players (winners and losers).

Male tennis players

Descriptive statistics (min., max., mean, standard deviation, normal distribution test – Kolmogorov-Smirnov) were calculated separately for winners and losers

for male players (TABLE 1). The table shows that some players achieved a 100% success rate in certain variables (W1S, W2S) and that some male players (winners) absolutely no unforced errors (UE) were made.

We have established that in the majority of variables, the distribution was non normal, therefore a non parametric method (chi-square test) was used to ascertain statistically characteristic differences between winners and losers in the male category. We have established that in all variables except for BPC (Break Point Conversions), there is a statistically characteristic difference between the two groups.

Number of aces (ACES)

The analysis of the number of aces shows a statistically characteristic difference between winners and losers. Namely, winners of the matches won a higher number of aces as compared to losers. From the descriptive statistical results presented in TABLE 1, it is evident that players on average won less than two aces per set. According to this we can conclude that because of the tactics and a slower pace surface, the effect of the first serve is not such as the effect of the faster pace surfaces. Recently, Zlatoper (2002) established that the winners of the 2001 French Open and Wimbledon won a higher number of aces than the losers. The winner of the 2001 US Open, which is played on a fast pace surface, however hit less aces than the loser. The latter fact is interesting, but winners as a rule win a higher number of aces. It should be mentioned here that aces are an effective and attractive way of winning points, but are very rare on clay courts. So it all depends on the court surface and on the players in a match.

Percentage of break point conversions (BPC)

The analysis of the percentage of break point conversions *did not* show statistically characteristic differences between winners and losers. It is worth mentioning that

TABLE 1
Descriptive statistics and chi-square for male tennis players (winners and losers)

Variable	Group	n	Min.	Max.	Mean	Std. deviation	Kolmogorov–Smirnov	Sig.	χ-square value	Sig.
ACES	1	446	0	7	1.43	1.388	0.816	0.518	–3.862	0
	2	448	0	7	1.33	1.513	0.834	0.49		
BPC	1	446	0	100	52.65	29.951	4.728	0	–1.935	0.053
	2	448	0	100	33.78	36.897	5.077	0		
DF	1	446	0	5	0.93	1.033	5.247	0	–4.332	0
	2	448	0	7	1.29	1.252	4.789	0		
NA	1	446	0	100	65.44	22.142	1.839	0.002	–9.156	0
	2	448	0	100	56.12	23.722	1.526	0.019		
RPW	1	446	5	86	43.51	12.258	1.332	0.058	–10.529	0
	2	448	0	79	30.12	12.629	1.175	0.127		
S1P	1	446	25	94	60.29	11.154	1.583	0.013	–11.239	0
	2	448	26	86	57.46	10.367	0.912	0.377		
TPW	1	446	7	59	32.95	7.704	2.145	0	–4.16	0
	2	448	5	59	27.28	10.196	1.92	0.001		
UE	1	446	0	35	11.59	6.033	1.053	0.217	–15.1	0
	2	448	2	43	15.14	5.971	1.099	0.178		
W1S	1	446	11	100	71.58	13.586	2.734	0	–8.785	0
	2	448	8	100	61.75	14.342	5.498	0		
W2S	1	446	0	100	53.34	17.683	1.636	0.009	–6.146	0
	2	448	0	86	39.28	16.528	1.53	0.019		
WIN	1	446	1	27	10.6	4.518	2.099	0	–9.529	0
	2	448	0	26	9.38	4.591	1.439	0		

Legend:
1– winners,
2– losers,
ACES – number of Aces,
BPC – Break Point Conversions,
DF – Double Faults,
NA – Net Approachs,
RPW – Receiving Points Won,
S1P – 1st Serve %,
TPW – Total Points Won,
UE – Unforced Errors,
W1S – Winning % on 1st Serve,
W2S – Winning % on 2nd Serve,
WIN – Winners (Including Serve).

the results approached statistically characteristic differences ($p = 0.053$) because winners took the advantage of more break point conversion opportunities as compared to losers. Inevitably there are more factors that influence such outcomes: the return quality and the quality of the game in all playing situations at the baseline, at the net, and in defending situations. It is additionally possible that winners have higher capability of controlling their psychological pressures in stressful situations.

Number of double faults (DF)

The analysis of the number of double faults showed a statistically characteristic difference between winners and losers. Winners of matches made fewer double faults than losers. It is observed in TABLE 1 that players on average made fewer double faults per set, which indicates a high accuracy of serving. Ferjan (2001) established that the winners of the US Open 2000 and Australian Open 2001 made fewer double faults than the losers. Similar findings were established by Zlatoper (2002) in analyzing the final match at French Open 2001. In the analysis of the US Open and Wimbledon 2001, he established that the losers made fewer double faults in the matches. Zlatoper (2002) concluded that a higher number of double faults could possibly be the result of taking more risk in serving.

Percentage of points won in net approaches (NA)

The analysis of the percentage of points won in net approaches showed statistically characteristic differences between winners and losers. Winners won more points in net approaches. We can again establish that on clay courts, it is the aggressive game that leads to success in a tennis game. Despite the fact that, these days, the so called aggressive baseliners prevail among tennis players, playing at the net is, on the other hand, obviously significant, too. It is evident that winners are capable of improving the aggressive baseline game by adding a net approach transition and a score at the net in situations that allow them to do so.

Percentage of receiving points won (RPW)

The analysis of the percentage of receiving points won showed statistically characteristic differences between winners and losers. Winners had a higher percentage of receiving points won. The quality of a serve makes it hard for the receiver to win a point. This is also evident from the results in TABLE 1. The receivers on average won less than 40% of the points. This is an additional characteristic that distinguishes winners from losers. Winners are capable of playing more reliably, in a more controlled way and more aggressively, and this enables them to continue the game more easily.

Percentage of first serves (S1P)

The analysis of the percentage of first serves showed a statistically characteristic difference between winners and losers. There was a higher percentage of first serves in winners than in the losers of matches. The results, however, do not precisely show whether the winners serve faster and more accurately than the losers. The fact is that the percentage of first serves impact the final match outcome. On clay courts, players more often serve the first serve with more rotation in order to prevent opponents from taking the initiative after the second serve. In their analyses, Ferjan (2001) and Zlatoper (2002) established that the losers of the US Open 2000 and Wimbledon 2001 were more successful in the percentage of the first serves. Based on the fact that these two tournaments were held on surfaces that are faster than clay, these conclusions are rather surprising. However, the results should not be generalized.

Total points won (TPW)

The analysis of the total points won showed statistically characteristic differences between winners and losers. Winners won more total points in a match than losers. The results are of no surprise as they indicate that winners are capable of high performance playing for the entire match and are capable of successfully solving various playing situations. Previously, Ferjan (2001) and Zlatoper (2002) established that winners of the matches won more total points.

Number of unforced errors (UE)

The analysis of unforced errors showed statistically characteristic differences between winners and losers. Winners made fewer unforced errors than losers. The number of unforced errors is one of the significant indicators of being successful in a tennis game. The game of tennis has lately become extremely fast, dynamic and aggressive; nonetheless, players are capable of playing with a remarkably low number of unforced errors. On clay courts a number of variations are taking place: the speed of the ball, rotation, height and depth, and the angles at which the players perform their strokes. A higher number of ball exchanges over the net, moreover, requires excellent physical condition.

Winning percentage on first serve (W1S)

The analysis of the winning percentage on the first serve showed statistically characteristic differences between winners and losers. There was a higher percentage of points won after the first serve in winners. It can be established that on clay courts and other surfaces alike, a higher percentage of winning on the first serve positively affects the success in a match. We can con-

clude that when the winners serve, they are more frequently capable of taking the initiative and controlling the course of the game. In their research projects of individual final matches, Ferjan (2001), Pintarič (2002) and Zlatoper (2002) established that the winners of the US Open 2000, Australian Open 2001, French Open 2001 and 2002, Wimbledon and US Open 2001 achieved a higher percentage of points won on the first serve, which additionally confirms the previously mentioned results.

Winning percentage on second serve (W2S)

The analysis of the winning percentage on the second serve showed statistically characteristic differences between winners and losers. There were a higher percentage of points won after the second serve in winners. On clay courts players more often use a spin serve, which increases the reliability of the serve and at the same time, increases the height and the bounce of the ball. In this way they prevent the opponents from taking the initiative in a game. Additionally, the quality of a return should be observed, as it can enable the other player to annul the advantage of the player serving. Pintarič (2002) and Zlatoper (2002) came to the same conclusions. The winners of the final matches at the French Open and US Open won a higher percentage of points on the second serve. Ferjan (2001) analyzed the Australian Open, yet established just the opposite. In the final match of the 2001 Australian Open, the loser won a higher percentage of points on the second serve than the winner.

Number of winners (WIN)

The analysis of the number of winners showed statistically characteristic differences between winners and losers. Namely, winners in the male category achieved more victories than losses. TABLE 1 presents the fact that players, on average, achieved 10.6 wins per set. It can be concluded that an aggressive game and taking the initiative in a game are current factors that influence successfulness in tennis. Ferjan (2001) and Zlatoper (2002) established that the winners of the Australian and French Open in 2001 achieved fewer victories than losers. Here we should consider though, that we are looking a few years back and that the analysis covered just one single tennis match.

Female players

Descriptive statistics (min, max, mean, standard deviation, normal distribution test – Kolmogorov-Smirnov) were calculated for female players (TABLE 2).

We have established that, in the majority of variables, the distribution was non normal, therefore a non parametric method (chi-square test) was used to ascertain statistically characteristic differences between winners and losers in the female category. We have established that, in all variables except for ACES (number of aces) there is a statistically characteristic difference between the two groups of female tennis players. The table shows that some female players achieved a 100% success rate in certain variables (W1S, W2S) and that some male players (winners) made absolutely no unforced errors (UE).

Number of aces (ACES)

The analysis of the number of aces *did not* show a statistically characteristic difference between winners and losers. Winners of the matches won a higher number of aces but the difference was not statistically characteristic. From the descriptive statistical results presented in TABLE 2, it is evident that female winners on average won less than one ace per set, which is less as compared to male players (TABLE 1). According to this we can conclude that because of the tactics and a slower paced surface, the effect of the first serve is not such as found in male players. It should be mentioned at this point that aces are an effective and attractive way of winning points also in the female category, but are very rare on clay courts. Based on these results we can establish that the number of aces does not impact success in the match in the female category.

Percentage of break point conversions (BPC)

The analysis of the percentage of break point conversions showed statistically characteristic differences between female winners and losers. Winners had a higher percentage of won break points than losers. In our opinion, there are inevitably more factors that influence such outcomes – the return quality and the quality of the game in all playing situations at the baseline, at the net, and in defending situations. It is additionally possible that winners are better capable of controlling their psychological pressures in stressful situations.

Number of double faults (DF)

The analysis of the number of double faults showed a statistically characteristic difference between female winners and losers. Winners of matches made fewer double faults than losers, which indicates a high reliability of the second serve. From the descriptive statistics results presented in TABLE 1 and 2, it is evident that female players made more double faults as compared to male players.

Percentage of points won in net approaches (NA)

The analysis of the percentage of points won in net approaches showed statistically characteristic differences between female winners and losers. Winners had

TABLE 2
Descriptive statistics and chi-square for female tennis players (winners and losers)

Variable	Group	n	Min.	Max.	Mean	Std. deviation	Kolmogorov-Smirnov	Sig.	χ-square value	Sig.
ACES	1	296	0	6	0.97	1.189	0.744	0.637	–0.57	0.569
	2	296	0	4	0.45	0.78	0.906	0.384		
BPC	1	296	0	100	58.6	25.57	4.338	0	–6.027	0
	2	296	0	100	38.18	33.322	6.969	0		
DF	1	296	0	10	1.78	1.567	3.223	0	–2.947	0.003
	2	296	0	8	2.11	1.523	2.928	0		
NA	1	296	0	100	63.84	27.776	1.064	0.208	–2.924	0.003
	2	296	0	100	55.97	31	1.355	0.051		
RPW	1	296	8	92	47.3	12.365	0.813	0.524	–11.682	0
	2	296	0	68	32.29	12.881	1.088	0.188		
S1P	1	296	30	92	58.9	11.231	1.168	0.131	–8.764	0
	2	296	30	93	59.36	11.435	1.247	0.089		
TPW	1	296	14	56	33.64	7.369	1.308	0.065	–9.159	0
	2	296	2	53	26.89	9.978	2.07	0		
UE	1	296	0	37	14.45	6.994	1.124	0.16	–13.009	0
	2	296	2	41	15.96	6.23	1.006	0.264		
W1S	1	296	25	100	67.84	13.201	2.115	0	–8.069	0
	2	296	0	95	52.81	15.39	3.065	0		
W2S	1	296	0	100	44.63	16.002	2.064	0	–3.483	0
	2	296	0	100	33.44	14.887	1.685	0.007		
WIN	1	296	0	24	10.54	4.395	1.698	0	–8.73	0
	2	296	0	20	7.26	4.028	1.026	0.243		

Legend:
1 – winners,
2 – losers,
ACES – number of aces,
BPC – Break Point Conversions,
DF – Double Faults,
NA – Net Approaches,
RPW – Receiving Points Won,
S1P – 1st Serve %,
TPW – Total Points Won,
UE – Unforced Errors,
W1S – Winning % on 1st Serve,
W2S – Winning % on 2nd Serve,
WIN – Winners (Including Serve).

a higher percentage of points won at the net. We can conclude that winners are capable of improving their aggressive baseline game by adding a net approach transition and a score at the net in situations that allow them to do so. This undoubtedly indicates that winners have the capability to play more diversely than losers and that they can score points in more ways also in the female category. From the descriptive statistics results presented in TABLE 1 and 2, it is seen that female players have a similar percentage of points won in net approaches.

Percentage of receiving points won (RPW)

The analysis of the percentage of receiving points won showed statistically characteristic differences between female winners and losers. Winners had a higher percentage of receiving points won. We can assume that the reasons for these differences are indicated by the quality of the return and the game following the return as was also found in the male category. In addition, from the descriptive statistics results presented in TABLE 1 and 2, it is seen that female players have a lower percentage of receiving points won as compared to male players.

Percentage of first serves (S1P)

The analysis of the percentage of first serves shows a statistically characteristic difference between female winners and losers. Surprisingly, there was a higher percentage of first serves in losers than in winners, which was not found in the male category TABLE 1. We can establish that in female tennis players, the percentage of first serves does not impact success in the match.

Total points won (TPW)

The analysis of the total number of points won showed statistically characteristic differences between female winners and losers. Winners won more total points in a match than losers. Just as for men, it can likewise be concluded that winners among women are

capable of high performance playing for the entire match and are capable of successfully solving various playing situations.

Number of unforced errors (UE)

The analysis of unforced errors showed statistically characteristic differences between female winners and losers. Winners made less unforced errors than losers. Also in women, the number of unforced errors is one of the significant indicators of being successful in a tennis game. The winners were capable of playing more aggressively (number of won victories) and had a lower number of unforced errors. Based on the clay court game characteristics, we can establish that, particularly in women, such results were to be expected.

Winning percentage on first serve (W1S)

The analysis of the winning percentage on the first serve showed statistically characteristic differences between female winners and losers. There was a higher percentage of points won after the first serve in winners. Just as for men, it can likewise be established for women, that on a clay court, a higher percentage of winning on the first serve influences the outcome of a match.

Winning percentage on second serve (W2S)

The analysis of the winning percentage on the second serve showed statistically characteristic differences between female winners and losers. There was a higher percentage of points won after the second serve in winners. It can be established that winners are more frequently capable of winning a point on or after the second serve. From the descriptive statistical results presented in TABLE 1 and 2, it is seen that female winners won a lower percentage on the second serve as compared to male winning players.

Number of winners (WIN)

The analysis of the number of winners showed statistically characteristic differences between female winners and losers. Winners achieved more wins than losers. Also in women's matches, an aggressive game and taking the initiative in a game are factors that influence successfulness in tennis.

CONCLUSION

Based on the results the following was ascertained:

1. There is a difference in the reliability of playing between winners and losers in the category of men and women. Namely, winners in both categories made fewer double faults and unforced errors and reached a higher percentage of first serves.
2. Winners are more aggressive in both categories. Winners reached more aces, and approaches to the net.
3. There is a difference between winners and losers in the percentage of points won after the first and the second serve in the category of men and women. Namely winners in both categories reached a higher percentage of points.
4. There is a difference in the percentage of receiving points won after the serve and break point conversions between winners and losers in the category of men and women.
5. Winners are capable of high performance playing for the entire match and are capable of successfully solving various playing situations.

Based on findings presented in these research results, it can be concluded that there are statistically characteristic differences in the majority of variables, which define game characteristics. Therefore, it can be concluded, there are certain measurable indicators of tennis statistics, which distinguish winners from losers in both the male and female category.

It is worth mentioning that these results show the situation on a clay surface, therefore a similar analysis should be explored on both a grass and on a hard court surface.

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SROVNÁNÍ HERNÍCH CHARAKTERISTIK TENISTŮ A TENISTEK NA ROLAND GARROS 2005
(Souhrn anglického textu)

Herní charakteristiky elitních tenistů a tenistek na French Open 2005 (Roland Garros) byly analyzovány na rozsáhlém základě 894 setů v kategorii mužů a 592 setů v kategorii žen. Navíc se srovnávaly herní charakteristiky jednotlivého setu mezi vítězi a poraženými. Bylo potvrzeno, že u většiny proměnných existují statisticky významné rozdíly mezi vítězi a poraženými, a to jak v kategorii mužů, tak i žen. V kategorii mužů jsou statisticky významné rozdíly u všech proměnných, s výjimkou využití brejkbolu. U žen byly shledány statisticky významné rozdíly u všech proměnných s výjimkou počtu vyhraných es.

Na základě těchto zjištění lze učinit závěr, že statisticky významné rozdíly u většiny proměnných určujících herní charakteristiky naznačují existenci určitých měřitelných ukazatelů ve statistice tenisu, kterými se odlišují vítězové od poražených.

Klíčová slova: tenis, statistika tenisu, úspěšnost v tenisu.

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Education and previous work experience

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First-line publications

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