DIFFERENCES BETWEEN 2010 AND 2011 PERFORMANCE INDICATORS OF TENNIS PLAY AT THE GRAND SLAM TOURNAMENTS

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Abstract:

The aim was to ascertain whether any differences in the performance indicators could be discerned when the indicators of the matches played in the year 2010 were compared with the matches played in 2011 at each of the three greatest Grand Slam tournaments – Roland-Garros (R-G), Wimbledon and US Open. The sample of entities consisted of 1524 game statistics records of 127 men single matches played within the main draw of each of the three tournaments in each of the two observed years. The basic central and dispersive parameters were calculated, and independent samples *t*-test was used to establish differences between the explored years (significance level $p<.05$). The smallest number of differences were determined for the R-G tournament. Generally, at all the three tournaments speed deceleration of the 1st and 2nd serve was obvious in 2011, probably indicating the shift of players' focus on serve features other than power used for the active entrance into points. The number of unforced errors increased at R-G in 2011, whereas on the fast, grass, courts of Wimbledon and hard courts of US Open it was decreased, as well as the number of winners. The findings suggest that tennis play styles on fast courts tend to a safer play with lower risks in the starting and middle phases of a point, whereas on slow courts play styles are characterized with a more aggressive play in the middle phase of a point.

Key words: *tennis game analysis, situation-related efficiency, tennis statistics, Roland-Garros, Wimbledon, US Open*

Introduction

Tennis is a sport that requires exceptional accuracy, consequently a high stroke performance efficiency on every court surface. That is why all involved in tennis follow very carefully game statistics as well as research studies dealing with certain parameters of tennis play and performance (situation-related efficiency) of tennis players. The ability to win one's own serve games and to break the opponent's serve game(s) depends on the optimal variability of a sequence of technicaltactical decisions made during a match, as well as on accuracy and power of tennis strokes performed under diverse competition conditions and on various court surfaces.

Previous research studies on tennis have been focused mainly on point duration, rest duration, active play to total playing time ratio, playing styles and their influence on active play duration in a match, and physiological load variability in relation with court surfaces (Christmas, Richmond, & Cable, 1998; Unierzyski & Szczepanowska, 2000; Koning, Huonker, & Schmid, 2001; Bernardi, et al., 1998; Barbaros Tudor, 2008), just to single out the most important. Tennis stroke analyses in numerous studies have revealed that service/serve is the most relevant to play on fast surfaces; it has also been found that serve speed is gender- and court-type-dependent (O'Donoghue & Ballantyne, 2004). Apart from the mentioned, it has been demonstrated that by following up the 15 standard variables, even 96% of lost and 96.6% of won tennis matches can be explained (Djurovic, Lozovina, & Pavičić, 2009). Despite the demonstrated, few research studies can be found that treat time-related (across years) changes in statistical performance parameters collected from the matches played at the same tennis tourrnaments.

The aim was to ascertain differences and similarities in the structure of the game of tennis as manifested in the standard performance indicators trough the comparison of the matches played in the year 2010 with the matches played in 2011 for each of the three greatest Grand Slam tournaments

– Roland-Garros (R-G), Wimbledon (WIM) and US Open (US). The findings will complement the current kinesiological description of tennis game.

Methods

The research was conducted on the secondary data consisting of the aggregated game statiscs (for each and every player) from all the matches played within the main draws of Roland Gaross, Wimbledon and US Open in the years 2010 and 2011.

Sample of entities

The sample of entities consisted of 127 men single matches played within the main draw of each of the three explored Grand Slam tournaments in each of the two observed years (the total of 762 matches played). The entity is defined as the final game statistics (15 standard variables of situation-related efficiency) of each and every player who took part in the main part (128 ATP players at the beginning of each tournament who managed to enter the main part of the tournaments, either due to their ATP ranking or through the qualification round prior to each tournament). The total of the standard game statistic sets, on which the research was conducted, was 1524 game statistics records. Ideally, the total of players' game statistics for each of the three Grand Slam tournaments should be 254; however, this number is usually a somewhat smaller due to the unfinished or yielded matches (mostly due to health reasons). The players played their matches in three different Grand Slam tournaments on three types of court surface: Roland-Garros – clay court, Wimbledon – grass court, and US Open – hard court. The analysed matches were played in the years 2010 and 2011.

Sample of variables

The sample of variables analysed in the current research consisted of 15 statistical parameters the International Tennis Federation officially collects from the Grand Slam competitions: percentage of the 1st serves made (FRSTSER%); number of aces (ACE); number of double faults (DBFOL); number of unforced errors (UNFORERR); percentage of the winning point after 1st serves (WINFSSER); percentage of the winning point after 2nd serves (WINSECSE); number of winners (serves included) (WINNER); percentage of the receiving points won (RECPOWON); percentage of break points conversions (BREPOCON); percentage of net approaches (NETAPPR); number of points won (TOTPWON); speed of the fastest serve in km/h (FRSEKM_H); average 1st serve speed in km/h (AVG_FRSE); average 2nd serve speed in km/h (AVG_SECS); and match duration in minutes (DURATION).

However, due to the absence of measuring instruments from particular courts, it was not possible to collect all performance parameters from all the matches played at the explored tournaments.

Data processing methods

Means and standard deviations were calculated. Independent samples *t*-test was used to determine differences between the 2010 and 2011 statistical performance parameters at R-G, WIM and US. The statistical significance level was set at $p<.05$.

Results

Aggregated results of the statistical analyses are presented in Table 1.

The statistically significant differences were obtained in four variables between the matches played in 2010 and those played in 2011 at Roland-Garros. Players achieved, on average, higher values of the fastest 1st serve speed in 2010 (208.99/205.86), then the higher average speed of all the 1st (185.68/183.59) serves and 2nd performed (150.35/146.97), whereas the number of unforced errors was lower (29.40 vs. 35.96) in 2010 than in 2011. The differences in unforced errors may indicate that the players in the 2011 R-G tournament performed more offensive strokes in the less threatening situations and thus, probably, performed more unforced errors (Gillet, et al., 2009).

Eight variables were found statistically significantly different between the matches played in 2010 and 2011 at Wimbledon. The WIM participants on average demonstrated a higher speed of the 1st (188.80/185.78) and 2nd serve (156.46/153.76), and achieved a larger number of aces (12.85/10.07) in 2010 than in 2011. However, they made more double faults (4.36 vs. 3.43). In 2010, as compared with 2011, a smaller percentage of the 1st serve was registered (62.56 vs. 64.49) and a larger number of unforced errors (25.59 vs. 22.79), which may indicate a more aggressive entrance into a point. A higher percentage of points won after the 1st serve (75.50 vs. 73.70) and more winners (42.67 vs. 38.19) speaks in favour of the predominance in the starting phase of points at the 2010 Wimbledon.

In 2010 players at the US Open, compared to the year 2011, demonstrated a higher average value of the fastest serve speed (209.17 vs. 205.23), higher speed of the 1st (184.22 vs. 180.56) and 2nd serve (149.11 vs. 145.12), a larger number of aces (9.43 vs. 7.77), a higher percentage of points won after the 2nd serve (52.20 vs. 50.29) and a bigger number of winners (34.73 vs. 23.86). The results indicate a somewhat higher percentage of points won after receives (RECPOWON 36.07 vs. 3.89) at the 2011 US Open. Although the difference does not seem considerable, it was statistically significant.

Table 1. Aggregated descriptive statistics by the tournaments: Roland-Garros, Wimbledon and US Open in 2010 and 2011

	Valid N	Roland-Garros		Wimbledon		US Open	
		2010	2011	2010	2011	2010	2011
		Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD
FRSTSER%	254	60.9 ±8.11	61.59 ±7.04	**62.56 ±6.11**	**64.49** ±6.44**	58.48 ±6.66	58.41 ±8.62
ACE	254	7.09 ±5.43	6.23 ±4.85	**12.85 ±8.40**	**10.07** ±7.48**	**9.43 ±7.77**	**7.77** ±6.88**
DBFOL	254	3.37 ±2.39	3.26 ±2.54	**3.97 ±2.73**	**3.43** ±2.74**	4.71 ±3.14	4.48 ±2.85
UNFORERR	254	**29.40 ±13.73**	**35.96** ±16.08**	**25.59 ±12.31**	**22.79** ±11.14**	**36.13 ±16.04**	**24.81** ±19.06**
WINFSSER	254	70.03 ±10.05	69.66 ±9.41	**75.50 ±8.87**	**73.70* ±8.71**	72.18 ±9.47	70.81 ±9.92
WINSECSE	254	50.72 ±11.22	51.44 ±10.91	51.99 ±9.44	52.00 ±11.35	**52.20 ±10.12**	**50.29* ±10.70**
WINNER	254	37.12 ±16.20	34.95 ±14.29	**42.67 ±16.47**	**38.19** ±14.20**	**34.73 ±14.87**	**23.86** ±16.34**
RECPOWON	254	37.64 ±9.24	37.52 ±8.60	33.40 ±7.81	34.17 ±7.85	**36.07 ±8.16**	**37.89* ±9.06**
BREPOCON	254	39.55 ±21.46	40.87 ±22.80	39.51 ±25.18	35.98 ±22.37	39.97 ±22.42	40.24 ±22.62
NETAPPR	254	62.22 ±13.35	63.44 ±12.69	65.59 ±11.85	65.27 ±10.65	64.53 ±10.94	65.39 ±15.12
TOTPWON	254	107.45 ±35.83	109.16 ±32.0	116.48 ±35.25	--	108.33 ±34.42	104.75 ±36.24
FRSEKM_H	188	**208.99 ±9.66**	**205.86** ±9.03**	208.47 ±9.85	206.64 ±9.21	209.17 ±9.49	205.23** ±10.15
AVG_FRSE	188	**185.68 ±9.89**	**183.59* ±9.84**	**188.80 ±8.31**	**185.78** ±9.00**	**184.22 ±9.04**	**181.49** ±9.94**
AVG_SECS	188	**150.35 ±9.33**	**146.97** ±8.52**	**156.46 ±8.86**	**153.76* ±10.16**	**149.11 ±9.02**	**145.12** ±9.55**
DURATION	254	148.33 ±48.79	152.03 ±44.91	146.62 ±44.56	140.91 ±43.31	149.11 ±49.47	148.61 ±52.58

*Statistical difference from the same tournament in 2010 (p<.05)
** Statistical difference from the same tournament 2010 (p<.01)

Discussion and conclusion

The smallest number of changes in the structure of tennis game, as expressed in the standard performance indicators, between the years 2010 and 2011 among the three explored Grand Slam tournaments were obtained in game statistics of players who appeared in the Roland-Garros tournament. At the 2011 Roland-Garros tournament the reduced speed of both the 1st and 2nd serve was registered, whereas the number of unforced errors was higher than in 2010. Since it is difficult to win a point on a slower surface with less strokes (O'Donoghue & Ingram, 2001), we can suggest the possible cause of unforced errors: when playing on clay courts, players try to create favourable situations in the game by playing more aggressive strokes, in which way they take the initiative, create space-time advantage, and produce pressure on the opponent. All the mentioned either forces the opponent into errors, or create a favourable situation for a player to win a point. Aggressive stroke performance in the described game situations is a probable cause of the increased number of unforced errors (Pollard, et al., 2006).

As opposed to the results from R-G, at Wimbledon most of game statisc indicators for the year 2011 differed from the 2010 ones. In 2011, the players at Wimbeldon, like the players at R-G, achieved a lower average speed in both the 1st and 2nd serves than in 2010. It was also established that they had a higher percentage of the 1st serve in 2011 than in 2010, whereas the number of double faults and aces was smaller. Fewer aces, partially explainable by a lower speed of both the 1st and 2nd serves, indicate a somewhat less aggressive beginning of points and, consequently, a lower percentage of the points won after a good 1st serve. The reduced starting aggressiveness in the begining of a point caused also a smaller number of winners and unforced errors, so it was feasible to infer that the

players at the 2011 WIM preferred the safer play style than in 2010. Takamashi et al. (2009) demonstrated that in the last observed period in the years 2004 and 2005 at Wimbledon the number of rallies in the point increased, while the match time was shorter in 2005, meaning stroke performance speed was higher, whereas pauses between points were shorter. Therefore Takamashi et al. (2009) inferred that tennis game was becoming faster and physically more demanding. Deceleration in certain segments of tennis game, registered between the years 2010 and 2011, indicates that tennis game might have reached its upper limit in terms of physical requirements and other players' potentials needed for certain aspects of the game.

Interestlingy enough the players at the 2011 US Open also performed the less powerful 1st and 2nd serves, but additionally achieved a lower average speed of the fastest serves than in 2010. They also performed a lower number of aces, unforced errors and winners in 2011 than in 2010. Since the similar differences were obtained at the 2011 Wimbledon, it seems the professional tennis players gradually change approach to playing on fast surfaces in a way to avoid risks by seeking safer paths to point winning. Whether the reason lies in a better performance of the players receiving serves, i.e. the players who are in a passive position – better passing shots, maybe, or something else, yet is to be ascertain through analyses of tennis experts. Due to a somewhat slower court surface (hard court) at the US Open tournament than at Wimbledon, the significant differences indicating a lower percentage on winning 2nd serve are quite understandable. A slightly higher percentage of the receiving-serve points wins was also established, probably caused by a lower 2nd serve speed. If serve speeds performed at all the three Grand Slam tournaments are compared, it becomes obvious that the players at Wimbeldon performed the fastest (most powerful) both the 1st and 2nd serves in both analysed years. The finding corroborates previous insigths (O'Donoghue & Ballantyne, 2004) into the influence of court surface on serve speed (power), meaning the obtained data suggest the players performed a somewhat faster services at Wimbledon in order to gain advantage over their oppopnents in the very beginning of a point.

Generally, on the basis of the analysed changes that had occurred in the structure of men's single tennis game at the three observed Grand Slam tournaments between the years 2010 and 2011, it may be inferred that speed of both the 1st and 2nd serves was lower in 2011 than in 2010. Here should be emphasized that a lower speed does not necesseraly imply a lower quality of serves. Further, tennis players pay ever more attention in their preparation to returns, therefore their responses to the served balls are ever faster, thus deminishing the importance of speed in serve performance and point winning. Alltogether, accuracy, variability and unpredictibilty in serve performance have become more pronounced decisive factors in good servers. It may be said: less power more accuracy. As regards court types, it is obvious the players playing on a slower surface, i.e. clay surface, made more unforced errors in 2011 than the players playing on faster, i.e. both the hard and grass surfaces. The latter also made a lower number of winners. Therefore, the inferrence is viable that the best ATP players, when playing on faster court types, tended to exhibit a more safe style of play in 2011, even on the account of a smaller number of winners. The differences between 2010 and 2011 in the variables registering unforced errors and winners are more pronounced in matches played on the hard than on the grass court surface.

The smallest differences in the structure of game between the years 2010 and 2011 were obtained for Roland-Garros. In all the three observed Grand Slam tournaments speed of both serves was reduced in 2011, indicating the philosophy of game, consequently the style of play as well, has been changed in favour of other features of serve – ball rotation, accuracy… by means of which players wished to actively open point play. The finding has been confirmed by a significantly smaller number of aces even on the fast court surfaces (hard and grass courts). At Roland-Garros the number of unforced errors increased in 2011, whereas on the fast surfaces of Wimbledona (grass court) and US Open (hard court) the number of unforced errors, as well as winners, decreased. The findings of the current study suggest that the differences between the years 2010 and 2011, obtained from the three Grand Slam tournaments, indicate the players tend to manifest a safer playing style when playing on the fast courts with a lower risks in the starting and middle stages of points, whereas when playing on slow courts, they tend to play more aggressively in the middle stages of points.

If we wish to reliably determine certain trends in the changes of structure of play, or in just one performance variable, we must analyse at least a sequence of ten tournament seasons in sequence. However, even the here presented partial results may be beneficial to coaching and playing practice of tennis.

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UTVRĐIVANJE RAZLIKA U SITUACIJSKIM PARAMETRIMA EFIKASNOSTI TENISKE IGRE NA GRAND SLAM TURNIRIMA

Cilj ovog istraživanja bio je utvrditi razlike u situacijskim parametrima natjecateljske učinkovitosti teniske igre između istih Grand Slam turnira odigranih u 2010. i 2011. godini. Istraživanje je obuhvatilo tri Grand Slam natjecanja: Roland Garros, Wimbledon i US Open. Uzorak entiteta činila je statistika igre 1524 gema iz 127 pojedinačnih susreta muškaraca odigranih u glavnom ždrijebu navedena tri turnira tijekom dvije promatrane godine. Izračunati su osnovni centralni i disperzivni parametri varijabli, a razlike u statističkim parametrima za procjenu efikasnosti teniske igre utvrđene su *t*-testom za nezavisne uzorke (na razini značajnosti od $p<0,05$). Najmanje razlike pojavile su se na Roland Garrosu. Općenito, na sva tri Grand Slam natjecanja uočeno je smanjenje brzine prvoga i drugoga servisa u 2011. godini, što najvjerojatnije upućuje na to da se u filozofiji pristupa igri igrači više „okreću“ drugim obilježjima servisa osim same snage izvođenja kako bi aktivno ušli u poen. Na Roland Garrosu se u 2011. godini povećao broj neprisiljenih pogrešaka, dok je na brzoj travnatoj podlozi Wimbledona i betonskoj podlozi US Opena uočeno statistički značajno smanjenje broja neprisiljenih pogrešaka i *winnera*. Dobiveni rezultati na svojevrstan način daju do znanja kako tenis na brzim podlogama ide u smjeru nešto sigurnije igre s manjim rizikom u početnom i središnjem dijelu poena, a tenis na sporim podlogama kreće se u smjeru agresivnije igre u središnjem dijelu poena.

Ključne riječi: *analiza teniske igre, situacijska efikasnost u tenisu, teniska statistika*