

Clay Vs. Grass: A Statistical Comparison of the French Open and Wimbledon

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Abstract: Problem statement: While most professional tennis tournaments today are played on hard courts, there is a short clay court season culminating in the French Open and an even shorter grass court season culminating in Wimbledon, where specialists on those surfaces have their chance to shine. Conventional thinking has it that these two surfaces play so differently that it is difficult for a player to succeed on both and this has largely proven true over the years. **Approach:** Performance statistics were collected from the French Open and Wimbledon in 2010 and analyzed. This study seeks to quantify the significant differences that exist in performance on these surfaces. **Results:** While the differences between the two tournaments have been reduced somewhat over the years, there remain significant differences. **Conclusion/Recommendations:** These results have implications both for professional tennis players and for the management of these tournaments.

Key words: Professional tennis, statistical analysis, sports management, performance measures

INTRODUCTION

Of the four major tennis championships in the world each year, both the U.S. Open and the Australian Open are played on hard courts, as are most tournaments throughout the year. Hard courts may present different playing conditions based on such things as temperature, humidity, wind, sun and the specific composition of the court, but overall they give the most consistent bounces and are thought to be the fairest test of tennis ability. The French Open is played on clay (actually crushed brick), which gives a slower, higher bounce, making it easier to strike the ball and more difficult for one player to hit a ball out of reach of the other or to force an error. Points on clay often consist of long rallies from the baseline. Wimbledon is played on grass, which plays "faster," giving a lower, more difficult and more inconsistent bounce. Traditionally, Wimbledon has favored big hitters with a strong serve-and-volley game; points often consist of either a service winner or just a few strikes of the ball.

Because of the difference in surfaces and the short time (just a few weeks) between the French Open and Wimbledon, it has been very difficult for players to excel in both. In fact, some top players, such as Pete Sampras at the French Open, have sometimes skipped one or the other because of the feeling that they had no hope of doing well. Sampras ranks second overall in Grand Slam titles with 14, but none of them were in the French Open. Similarly, Ivan Lendl was never able to win at Wimbledon, despite his 8 Grand Slam titles. The most notable exception to this rule was Bjorn Borg in the 1970's and early 1980's. He won 6 French Open

titles and 5 Wimbledon titles, three times winning both in the same year. His strong topspin stroke was well-suited both to clay and to grass, but he didn't win a single major championship on a hard court.

In recent years the disparity between the clay at the French and the grass at Wimbledon seems to have narrowed. In fact, in each of the last three years the same player has won both, Rafael Nadal in 2008 and 2010 and Roger Federer in 2009. Between them these two players have won the last 6 French Opens and the last 8 Wimbledons. Also during those years Federer was runner-up 3 times to Nadal at the French and Nadal was runner-up twice to Federer at Wimbledon. Part of the reason is certainly that these are two extraordinary players who have a good chance of winning any tournament they enter. Federer is the all-time leader in Grand Slam titles with 16 and Nadal's heavy topspin shots, like Borg's, are an advantage on both surfaces. However, another factor may be that the surfaces are no longer playing quite as differently as they have in the past. After complaints that the strength of the players and the new racquet technology had made points at Wimbledon too short and uninteresting, in 2001 the courts were completely replaced. The new grass was more durable, allowing the soil to be compacted more and providing for a slower, higher bounce, more similar to clay (Harrell, 2008). Players have also complained that the balls at Wimbledon have been made less lively over the years. According to Eddie Seaward, the head groundskeeper at Wimbledon for the last 20 years, the ball now comes off the ground at the same speed as before but does have a higher bounce, giving players an extra one-tenth of a second to hit it (Martin, 2010). This

small amount of time, along with fewer bad bounces, can make a significant difference in the overall speed of the court.

Because of the changes in courts, balls, equipment and players over the years, this study examines a snapshot of the differences in performance in the Men's Singles events at the French Open and Wimbledon in 2010.

MATERIALS AND METHODS

Statistics are provided by IBM for both the French Open (Roland-Garros, 2010) and Wimbledon (Wimbledon Championships, 2010). While some of the percentage calculations on these websites were not accurate, it is assumed that the raw frequencies were correct. These statistics include overall performance measures for the entire tournament, including every point played, as well as performance measures for each match within the tournament.

The overall measures for each tournament may be thought of as exact parameters for that tournament, with no sampling error, since the population would be defined as the points played in that tournament. In that sense any differences between the two tournaments do describe the actual differences for those players on those days. However, in order to generalize, a more conservative and useful definition of the populations would be the set of all possible points generated by the players in each tournament. Thus, the actual points observed would form a (very large) random sample of points observed from that population and the common statistical tests of significance would apply. Similarly, the performance measures of the individual matches may be defined as statistics derived from sample points taken from a larger population of possible points from those players.

Of the 128 players in each tournament, 102 played in both the French and Wimbledon. Thus, the overall statistics of each event largely reflect the same players under different court conditions. To make direct comparisons, though, we have also compared the

performance of the top ten players who played at both events.

RESULTS AND DISCUSSION

Table 1 shows overall performance measures for the French Open, broken down by round. Table 2 shows similar measures for Wimbledon. While there are ordinarily 127 matches in a field of 128 players, Wimbledon had only 126 matches because of a forfeiture by one player before the match started. There were also several matches at each tournament where a player had to retire before the end of a match because of injury. It is interesting to note that Wimbledon had more total points (30,251-27,293), more total games (4,974-4,328) and more total sets (479-457) than did the French. On the average, players played about 5 more games per match at Wimbledon. This could indicate that the matches were more evenly contested, possibly because of a greater server's advantage at Wimbledon. Because of these discrepancies, though, the most relevant statistics to compare the two tournaments would be in the form of percentages.

Table 3 shows the results of 9 hypothesis tests of the difference between relevant proportions at the two tournaments. The results are consistent with expectations and for the most part, are extremely significant statistically. As expected, the server won a significantly higher percentage of first-serve points at Wimbledon than at the French, a difference of more than 5 percentage points. The same was true of second-serve points, but with less significance. The overall percentage of points won by the server showed the same high level of significance, with a difference of over 4 percentage points.

Table 1: 2010 French open statistics -- Men's singles

Round	1st	2nd	3rd	4th	Q-F	S-F	F	Total	Percent
Matches played	64.0000	32.0000	16.0000	8.0000	4.0000	2.0000	1.0000	127	
Sets played	232.0000	115.0000	59.0000	25.0000	15.0000	8.0000	3.0000	457	
Tie breaks played	30.0000	15.0000	7.0000	2.0000	3.0000	1.0000	0.0000	58	0.1269
Total games	2198.0000	1084.0000	558.0000	234.0000	148.0000	78.0000	28.0000	4328	
Winners	5972.0000	2873.0000	1466.0000	560.0000	382.0000	223.0000	75.0000	11551	0.4232
Return games won	472.0000	261.0000	137.0000	58.0000	23.0000	17.0000	4.0000	972	0.2246
Server points won	8691.0000	4277.0000	2174.0000	856.0000	614.0000	298.0000	119.0000	17029	0.6239
Total points	13825.0000	6957.0000	3518.0000	1372.0000	961.0000	479.0000	181.0000	27293	
First serves in	8278.0000	4253.0000	2217.0000	837.0000	598.0000	303.0000	120.0000	16606	
% 1st serves in	0.5988	0.6113	0.6302	0.6101	0.6223	0.6326	0.6630		0.6084
Total aces	968.0000	411.0000	221.0000	83.0000	57.0000	46.0000	14.0000	1800	0.0660
Total double faults	482.0000	193.0000	105.0000	24.0000	29.0000	19.0000	5.0000	857	0.0314
1st serve pts won	5895.0000	2928.0000	1503.0000	575.0000	424.0000	215.0000	84.0000	11624	
% 1st serve pts won	0.7121	0.6885	0.6779	0.6870	0.7090	0.7096	0.7000		0.7000
% 2nd serve pts won	0.5041	0.4989	0.5158	0.5252	0.5234	0.4716	0.5738		0.505

Table 2: 2010 Wimbledon statistics -- Men's singles

Round	1st	2nd	3rd	4th	Q-F	S-F	F	Total	%
Matches played	64.0000	31.0000	16.0000	8.0000	4.0000	2.0000	1.0000	126	
Sets played	238.0000	124.0000	62.0000	31.0000	15.0000	6.0000	3.0000	479	
Tie breaks played	47.0000	27.0000	14.0000	4.0000	3.0000	2.0000	0.0000	97	0.2025
Total games	2492.0000	1301.0000	630.0000	315.0000	141.0000	64.0000	31.0000	4974	
Winners	7586.0000	3969.0000	1983.0000	950.0000	424.0000	170.0000	75.0000	15157	0.5010
Return games won	426.0000	197.0000	85.0000	49.0000	24.0000	8.0000	4.0000	793	0.1594
Server points won	10000.0000	5329.0000	2602.0000	1271.0000	585.0000	266.0000	120.0000	20173	0.6669
Total points	15181.0000	7899.0000	3823.0000	1906.0000	892.0000	379.0000	171.0000	30251	
First serves in	9626.0000	4972.0000	2382.0000	1169.0000	556.0000	245.0000	110.0000	19060	
% 1st serves in	0.6341	0.6294	0.6231	0.6133	0.6233	0.6464	0.6433		0.6301
Total aces	1621.0000	948.0000	473.0000	216.0000	91.0000	39.0000	18.0000	3406	0.1126
Total double faults	515.0000	265.0000	115.0000	82.0000	31.0000	14.0000	3.0000	1025	0.0339
1st serve pts won	7162.0000	3760.0000	1863.0000	890.0000	413.0000	190.0000	83.0000	14361	
% 1st serve pts won	0.7440	0.7562	0.7821	0.7613	0.7428	0.7755	0.7545		0.7535
% 2nd serve pts won	0.5109	0.5360	0.5128	0.5170	0.5119	0.5672	0.6066		0.5193

Table 3: Tests of differences in proportions

	French	Wimbledon	Pooled proportion	z	1-tailed p
Tie breaks played	0.126915	0.202505	0.165598	-3.109850	<0.001
Winners	0.423222	0.501041	0.464132	-18.691000	<0.001
Return games won	0.224584	0.159429	0.189744	7.993948	<0.001
Server points won	0.623933	0.666854	0.646497	-10.754400	<0.001
% 1st serves in	0.608434	0.630062	0.619804	-5.336660	<0.001
Total aces	0.065951	0.112591	0.090470	-19.475900	<0.001
Total double faults	0.198013	0.206072	0.032705	-1.672300	<0.050
% 1st serve pts won	0.699988	0.753463	0.728565	-11.327900	<0.001
% 2nd serve pts won	0.505755	0.519346	0.512707	-2.010430	<0.025

The percentage of aces zoomed from 6.6% of all points at the French to 11.3% at Wimbledon, a huge difference. The percentage of points won by hitting outright winners, including aces, was also significantly higher at Wimbledon, by almost 8 percentage points. Therefore, both on the serve and during rallies we can see the effects of the greater speed of the grass court. Overall, then, it was much more difficult to break serve at Wimbledon, just 15.9% of the time as opposed to 22.5% of the time at the French.

There are several other, less obvious, differences at the two tournaments. The percentage of sets that go to tiebreakers was much higher at Wimbledon, 20.3-12.7%. Because of the difficulty in breaking serve at Wimbledon, this seems reasonable. However, we also see significant effects on service accuracy that are unexpected. Why do servers at Wimbledon get a significantly higher percentage of their first serves in (63.0-60.8%)? Are they able to serve at slower speeds and get more serves in because their serves are harder to return? Later we will examine service speed of individuals at the two tournaments. While getting more first serves in, servers at Wimbledon nevertheless tended to have more double faults than at the French, at a marginally significant level. Perhaps servers are willing to try for a harder second serve because they know that they have a large advantage in serving and are less afraid of giving up a point through double-faulting.

Table 4 shows performance measures for the top ten players that played at both tournaments. For each of these measures a paired-sample t-test was performed to determine whether the average change of the individual players on that measure between the French and Wimbledon was significant.

While 102 players competed in both tournaments, the other 26 players at each were selected by the host country and perhaps were chosen because their games were better suited either to clay or to grass. In that case these players may have had some effect on the overall statistics. Therefore, this comparison of individual players who played in both tournaments should add to the picture.

Although the percentage of first serves in was significantly higher at Wimbledon for the entire field, in our comparison for the top ten players there was no significant difference. The top ten players at the French had a higher percentage of first serves in than did the rest of the field, so their average at the French was virtually identical to their average at Wimbledon, which in that case was very similar to the overall field.

The top ten players won significantly more first-serve points at Wimbledon than at the French, as did the overall field. However, the top players won about 3% more of their first-serve points at both places than did the overall field. On the second serve the

percentage of points won was not significantly higher at Wimbledon, while for the overall field it was. Since the paired-sample t tests had a sample size of only 10, it was much harder to prove that the differences were significant.

The percentage of net approaches won by the top ten players was a little higher at Wimbledon, but not enough to be significant. In both cases net approaches resulted in winners about 2/3 of the time. While there were probably a lot more net approaches at Wimbledon, those that were made at the French were most likely in situations that also had a high probability of resulting in a winning shot. This statistic was not available for the overall field.

One of the most interesting comparisons between the French and Wimbledon is the average serving speed. The serve is hit, of course, before the court surface has any chance to affect the ball. However, it often seems that players are hitting their serves harder at Wimbledon than at the French (adding to the difficulty of the receiver, who already has to face a faster bounce). The firmness of the footing could have

some effect and the balls tend to pick up particles of clay at the French, making them heavier.

There could also be an intentional strategic difference in the amount of speed a player applies to his serve at the two tournaments. For the top ten players there was indeed a small increase in average serve speed at Wimbledon, up from 116.23-117.84. However, with a one-tailed p-value of .1091, this difference was not significant. On the other hand these players hit their second serves about 4 MPH faster at Wimbledon, up from 95 MPH at the French, a very significant increase in speed.

The top ten players differed quite a bit in their average first serve speed, from Verdasco's average of 105.27 MPH to Soderling's average of 126.63 MPH at the French and from Ferrer's 112.27 MPH to Soderling's 125.92 MPH at Wimbledon. While we might expect that those players with the faster serves would have a lower percentage of first serves in, there was no significant relationship between the two measures, either at the French or at Wimbledon (Table 5).

Table 4: Individual comparisons

Player	% 1st Serves in	% 1st Serve Points won	% 2nd Serve Points won	% Net Approaches won	Ave. 1st Serve Speed (MPH)	Ave. 2nd Serve Speed (MPH)
Federer-French	0.6400	0.7690	0.5950	0.7550	119.7100	97.8700
Federer-Wimb.	0.6350	0.7730	0.6040	0.6670	118.1100	99.2900
Difference	0.0050	-0.0040	-0.0090	0.0880	1.6000	-1.4200
Nadal-French	0.7460	0.7220	0.5610	0.6880	111.7900	88.5500
Nadal-Wimb.	0.6810	0.7900	0.6190	0.7560	115.4200	92.9700
Difference	0.0650	-0.0680	-0.0580	-0.0680	-3.6300	-4.4200
Djokovic-French	0.6530	0.7110	0.4560	0.6220	112.8700	94.7800
Djokovic-Wimb.	0.6350	0.7660	0.5690	0.7010	115.6700	99.9200
Difference	0.0180	-0.0550	-0.1130	-0.0790	-2.8000	-5.1400
Murray-French	0.5350	0.7250	0.4750	0.7160	119.5800	90.9800
Murray-Wimb.	0.5660	0.8330	0.6240	0.6900	119.0100	92.9700
Difference	-0.0310	-0.1080	-0.1490	0.0260	0.5700	-1.9900
Soderling-French	0.6270	0.7520	0.5740	0.6260	126.6300	103.7800
Soderling-Wimb.	0.6230	0.8470	0.4840	0.8030	125.9200	105.8000
Difference	0.0040	-0.0950	0.0900	-0.1770	0.7100	-2.0200
Roddick-French	0.6650	0.7070	0.4870	0.6400	123.0600	106.7700
Roddick-Wimb.	0.7060	0.8340	0.5410	0.6440	123.8800	107.9500
Difference	-0.0410	-0.1270	-0.0540	-0.0040	-0.8200	-1.1800
Verdasco-French	0.7330	0.6670	0.4700	0.5210	105.2700	92.3300
Verdasco-Wimb.	0.5710	0.7750	0.5170	0.5630	116.0000	103.0000
Difference	0.1620	-0.1080	-0.0470	-0.0420	-10.7300	-10.6700
Tsonga-French	0.6060	0.7980	0.5250	0.6670	116.6700	91.9100
Federer-Wimb.	0.6460	0.8010	0.5580	0.6560	119.1500	99.7600
Difference	-0.0400	-0.0030	-0.0330	0.0110	-2.4800	-7.8500
Ferrer-French	0.6390	0.7050	0.5750	0.7500	110.6300	93.3900
Ferrer-Wimb.	0.6450	0.7600	0.5200	0.6980	112.2700	97.0000
Difference	-0.0060	-0.0550	0.0550	0.0520	-1.6400	-3.6100
Cilic-French	0.5350	0.7110	0.5710	0.6800	116.1300	89.8300
Cilic-Wimb.	0.6760	0.6530	0.4720	0.6740	113.0000	92.0000
Difference	-0.1410	0.0580	0.0990	0.0060	3.1300	-2.1700
t	-0.0207	-3.0686	-0.8429	-0.7775	-1.3238	-4.1201
1-tailed p	0.4920	0.0067	0.2106	0.2284	0.1091	0.0013

Table 5: Regression statistics

			Coefficients	Standard error	t-Stat	P-value
French-1st serve speed and % 1st serves In						
Multiple R	0.4639	Intercept	1.2334	0.4026	3.0635	0.0155
R Square	0.2152	X Variable 1	-0.0051	0.0035	-1.4810	0.1769
Adjusted R square	0.1171					
Standard error	0.0657					
Observations	10					
Wimbledon-1st serve speed and %1st serves In						
Multiple R	0.0105	Intercept	0.6258	0.4232	1.4788	0.1775
R Square	0.0001	X Variable 1	0.0001	0.0036	0.0298	0.9770
Adjusted R square	-0.1249					
Standard Error	0.0473					
Observations	10					

CONCLUSION

The grass courts of Wimbledon have intentionally been slowed over the last decade in the interest of having longer rallies and presenting a more entertaining experience to the audience. It would be interesting to study the change in performance measures at Wimbledon over the last 20 years, including the number of shots per point, to see the effects of their slowing. However, there are still significant differences between these courts and the clay courts at the French Open. As expected, it is still much harder for the receiver to win points at Wimbledon than at the French and it is easier for players to hit aces and other outright winners. Because of the difficulty in breaking serve, there were more points, games and sets played per match at Wimbledon and sets were more likely to end in tiebreakers. It would be interesting to compare the total number of hits and the amount of distance covered by players in a match, though, since points at the French tend to be longer and involve more running. Despite playing fewer points, players at the French probably get much more of a workout.

Service speeds seem a bit higher at Wimbledon, especially on second serves, at least in the case of the top ten players. Yet the accuracy of first serves was actually higher at Wimbledon for the overall field and virtually identical for the top ten players. Serving speed showed no significant effect on serving accuracy for the top ten players.

Making the Wimbledon courts slower represents a marketing strategy by tournament organizers; it also has effects on players' chances of winning and therefore on their decision whether to enter the tournament. Many tennis fans decry this homogenization of the game and would prefer to watch players forced to compete under varying conditions and to see different players with different styles of play excel. As the French would say, "Vive la difference!"

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