

# Grand Slam men's singles tennis 1991-2009

## Serve speeds and other related data

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### ABSTRACT

Data from men's singles at the four Grand Slam events is presented to show how the game has been changing over the last ten years or so. The biggest change has been the increase in serve speed at the French Open. The average first serve speed is now about the same at all four events. Serve speed continues to increase at all events, as does the number of aces, while the number of double faults is decreasing. It is clearly harder to serve an ace on clay, despite the comparable serve speeds. Data is also presented on the % of tie-break sets, games per set and points per game.

**Key words:** Tennis, serve speed, aces, tiebreaks, statistics.

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### INTRODUCTION


The evolution of the game of tennis at the highest levels can be analysed in terms of statistical data for each of the four Grand Slam events held each year in Melbourne, Paris, London and New York. Data are available in several different formats, including set scores published for each of the 127 matches played in men's and women's events, and temporary data made available on the tournament web site during and shortly after each event. The latter data includes, for example, the average serve speeds for each set and match, the number of aces and double faults, and the number of points won by the opposing players.

We have collected together a large amount of men's singles data spanning the period 1991 to 2009 and present the data in this paper to show the trend over the years in parameters such as serve speeds, aces, double faults, the percentage of sets reaching a 6-6 score, games per set and so on. Some of the data shows clear differences between the four events, reflecting differences in surface pace or "speed" of the four court surfaces. The French Open is played on a relative slow clay surface, Wimbledon is played on faster grass courts and the US and Australian Opens are played on medium speed hardcourts.

Several previous studies (1, 2, 3) have reported trends in men's and women's tennis up to the year 2000, but there is very little published data after that time. The earlier studies indicated that the speed of the game was increasing at a steady rate, particularly in men's tennis, and that measures might need to be taken to counter that trend. A larger tennis ball was trialled by the ITF for a short period in an attempt to reduce the speed of the game, but the larger ball was not popular with professional players and was not used in Grand Slam events. Since 2000, average serve speeds have continued to increase but now appear to have reached almost the same plateau value at all four events. Despite the increase in serve speeds, and a remarkable decrease in the number of double faults, the probability of the server winning a point has remained relatively constant over the years (except at the French Open) reflecting an increase in the ability of opponents to return high speed serves.

### SERVE SPEED

The average first and second serve speeds in men's singles tennis, since 1999, is shown in Fig.~1. Data were recorded by one of the authors (RC) during 1999-2001, in 2004 and again during 2007-2009. Serve speeds are not recorded for every match, due to the fact that radar guns are not employed on every court. The 1999-2001 data were averaged over 38 to 136 players at each event (19 to 68 individual matches from round 1 to the final) while the 2007-2009 data were averaged over 28-30 players in 2007, 60-156 players in 2008 and 150-196 players in 2009. Players proceeding from one round to the next were included more than once in the match averages.

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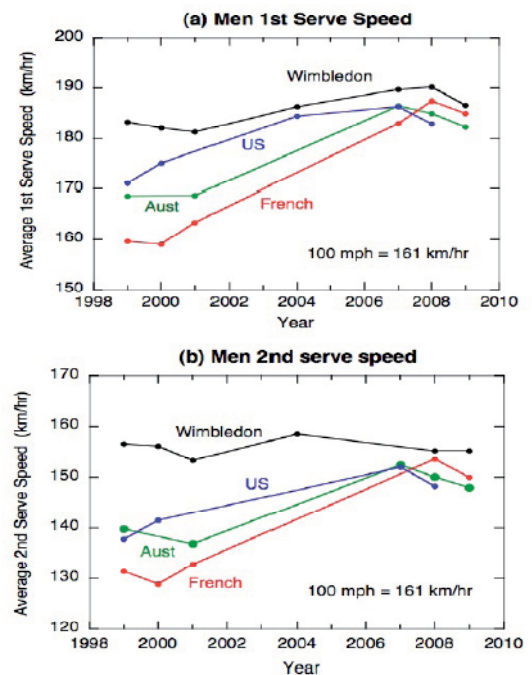


Figure 1. Average 1st and 2nd serve speeds, men's singles, 1999 to 2009.

The largest change has been the increase in the average first and second serve speeds at the French Open during the period from 2000 to 2009. Around 2000, most players at the French Open sacrificed serve speed in order to apply a greater amount of topspin to the ball. There were a few notable exceptions. In 1999, Safin served at an average speed of 191 km/hr at the French Open. The next fastest player served at 177 km/hr. Safin served many more aces than any other player. In 2000, Philipoussis served at an average speed of 197 km/hr at the French Open. Since about 2006, all players serve at about the same speed at all four events, some having an average first serve speed over 200 km/hr. For example, Roddick's average first serve speed at his most recent events were 204 km/hr (US Open, 2008), 201 km/hr (Australian Open 2009), 197 km/hr (French Open, 2009) and 200 km/hr (Wimbledon, 2009), averaged over at least four rounds at each tournament.

Table 1. Average 1st serve speed,  $V_1$ , and average height,  $H$ , for  $N$  match winners and  $N$  match losers in each Grand Slam event in 2008 or 2009

Event	Aust 2009		French 2009		Wimb 2009		US 2008	
	W	L	W	L	W	L	W	L
N	82	82	98	98	75	75	73	73
$V_1$ km/hr	184.1	180.6	186.7	183.3	187.7	185.5	184.0	181.1
SD ( $V_1$ )	8.9	10.9	9.3	10.3	9.5	8.8	10.0	10.2
H (cm)	187.1	185.1	186.1	185.1	186.8	185.4	187.5	185.6
SD (H)	5.7	7.2	6.6	6.7	6.9	6.6	5.8	7.3

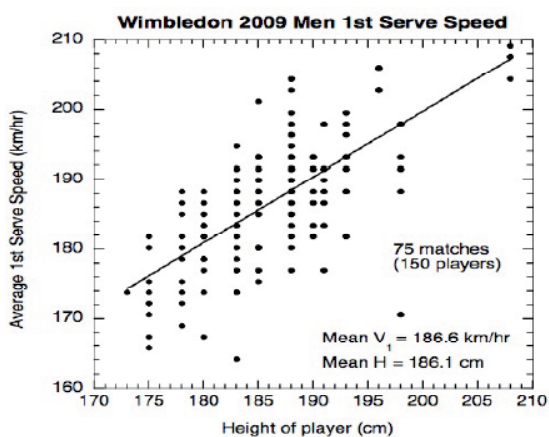


Figure 2. Average first serve speed vs player height at Wimbledon, 2009. The straight line is a linear fit to the data, showing that serve speed (in km/hr) is about equal to player height (in cm) on average.

The distribution of first serve speeds during 2008-2009 was essentially the same at all four events, as indicated in Table 1. Match winners are typically one or two cm taller than their opponents and serve 2-4 km/hr faster on average. Serve speed is related to player height, as shown in Fig.~2 for the 2009 Wimbledon event. The best linear fit to the first serve speed vs player height data, for all four Grand Slam events, shows that the average first serve speed for any given player, in km/hr, is close to the numerical value of the player's height in cm. The average height of players has not changed significantly since 1999 when the mean height in men's singles was 185.5~cm at Wimbledon ( $N = 60$ ), and 186.4~cm at the Australian Open ( $N = 78$ ). The corresponding mean heights ten years later were 186.3~cm for match winners ( $N = 4 \times 127 = 508$  players, including all four events) and 185.0~cm for match losers ( $N = 495$  players). The mean heights listed in Table 1 are for the smaller sub-group of the more highly ranked players whose serve speeds were measured.

### ACES

The total number of aces served in all 127 matches at each event is shown in Fig.3, over the period 1991 to 2009. About 28,000 points are played at each event each year, so a total of 2,000 aces at any one event corresponds to one ace on average every 14 points. Alternatively, about 17,000 first serves at each event are successful, so about one good first serve in eight, on average, results in an ace. However, the percentage of good first serves resulting in an ace can be quite variable for any given player, from one match to the next.

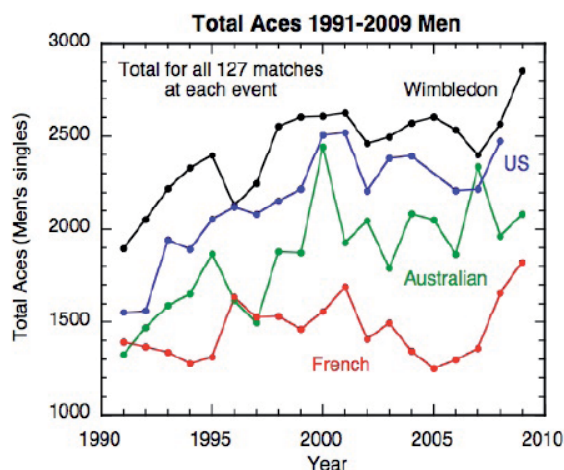


Figure 3. Total number of aces at each men's singles event, 1991-2009.

Aces are more common at Wimbledon and least common at the French Open, reflecting the relative speeds of the different court surfaces.

The increase in the number of aces at the French Open since 2005 can be attributed to the increase in serve speed during that time, but the number of aces at the French Open is still well below the number of aces at Wimbledon. Given that the serve speeds at these two events were about the same in 2008 and 2009, it is clear that the speed of the court surface has a strong effect on the number of aces served. Conversely, if the serve speeds at each event are about the same, then the number of aces can be interpreted as a simple indication of the speed of the court. In that respect, the Australian Open surface is slower than the US Open surface, which is now almost as fast as the grass courts at Wimbledon. The relatively large fluctuations in the number of aces each year at the Australian Open may reflect differences in court speed arising from the fact that the courts are resurfaced each year with a new coat of acrylic paint mixed with fine abrasive particles. The speed of the court can therefore be adjusted by choosing specific abrasives.

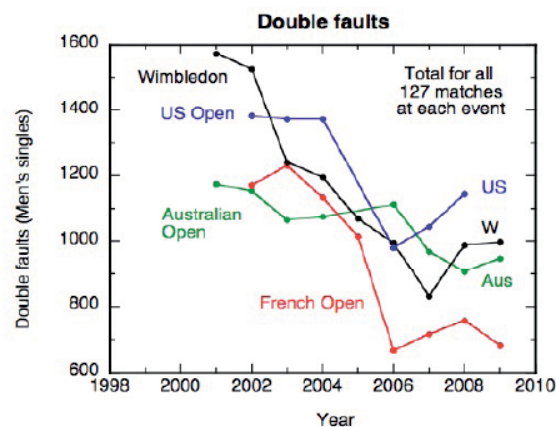


Figure 4. Total number of double faults at each of the four men's singles events, 2001-2009.

The total number of double faults, summed over 127 matches at each event, is shown in Fig.~4 for the period 2001-2009. The decrease in this period is remarkable, and presumably indicates that players have improved their ability to serve more accurately as well as at higher speed. One of the best servers in this respect is Federer. In one match

at the Australian Open in 2008 he served 39 aces and one double fault. It is now very common for the best players to serve many more aces than double faults.

### TIEBREAK SETS AND OTHER 6-6 SCORES

A set that reaches a 6-6 score generally indicates that the players are fairly evenly matched. The result is usually decided by a tiebreak game, unless it occurs in the fifth set where the set is won by the player winning two games more than his opponent (eg 8-6 or 9-7 etc). At the US Open, the fifth set is decided by a tiebreak game if it reaches a 6-6 score. The percentage of men's singles sets reaching 6-6 in each Grand Slam event is shown in Fig. 5 for the period 1995-2009. The percentage is largest at Wimbledon, indicating that it is more difficult for a player to break an opponent's serve when playing on a fast court.

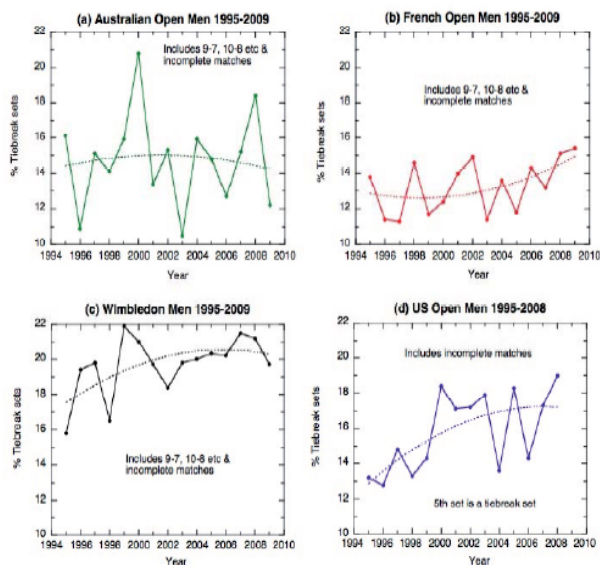


Figure 5. Percentage of sets reaching a 6-6 score, over the period 1995 to 2009. Dashed lines are quadratic fits to the data.

The International Tennis Federation (1) analysed the results of 55,000 sets for men, from 1968 to 1998 and found a gradual increase in the number of tiebreak sets over the whole 30-year period. It was concluded that there was an increasing dominance of the serve over time, on all court surfaces, and that the nature of the game had changed significantly since the old, wood racquet era. Since the year 2000, the percentage of sets reaching 6-6 has remained relatively steady, except for a gradual increase at the French Open. The latter increase is presumably due to the increase in serve speeds at the French Open during that time.

Some 6-6 scores occur because each player wins six service games in a row without dropping a serve, while other 6-6 scores occur because each player loses the same number of service games during the set. At Wimbledon about 75% of 6-6 scores result because neither player loses his serve. At the Australian, French and US Open events, about half of all 6-6 scores result from the opposing players breaking serve an equal number of times.

### POINTS PER GAME AND GAMES PER SET

Figure 6 shows, for men's singles matches during the period 2001 to 2009, the number of games per set and the number of points per game, determined from the total number of sets, games and points played in all 127 matches at each event.

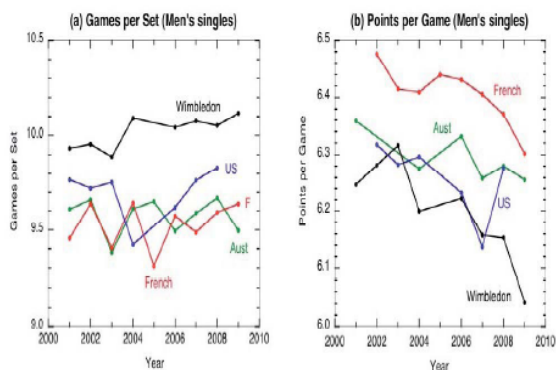


Figure 6 Games per set and Points per game for men's singles 2001-2009.

Given that it is more difficult to break serve at Wimbledon, the average number of games in a set is larger at Wimbledon than at the other events, while the average number of points in a game is smaller. The number of games per set has remained relatively constant at each event during the 2001-2009 period, but the number of points per game has decreased by about 3% over the same period.

The average number of sets in a match varies from 3.55 to 3.85 at all four events with no clear differences between events and no clear trends over the years. At each event there are typically 60-70 three-set matches, 30-40 four-set matches and 20-28 five-set matches. The number of sets in a match appears to depend more on the luck of the draw than on the court surface.

### CONCLUSIONS

Analysis of data from the men's singles event at the four Grand Slam events shows that the nature of the game of tennis is continuing to change. Serve speeds are now higher than they have ever been and the number of aces continues to rise. Remarkably, the number of double faults has been decreasing over the last ten years. The number of tiebreak sets is largest on the grass courts at Wimbledon, but has remained relatively constant at all events over the last ten years, except for a gradual increase at the French Open. Likewise, the number of games per set remains largest at Wimbledon, due to the faster court surface, but has remained relatively constant at each event over the last ten years.

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