

Reducing Injuries by Substantially Decreasing the Likelihood of Long Tennis Matches

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Long matches can cause problems for tournaments. For example, the starting times of subsequent matches can be substantially delayed causing inconvenience to players, spectators, officials and television scheduling. Long matches can even be seen as unfair in the tournament setting when the winner of a very long match, who may have negative after-effects from such a match, plays the winner of an average or shorter length match in the next round. Long matches can also lead to injuries to the participating players.

One factor that can lead to long matches is the use of the advantage set as the fifth set, as in the Australian Open, the French Open and Wimbledon. Other factors are long rallies and a greater than average number of points per game. These tend to occur more frequently on the slower court surfaces such as at the French Open. This paper considers two long matches played in grand slam tennis, and shows that the likelihood of long matches can be substantially reduced by using the tiebreak game in the fifth set. It also shows that long matches can be reduced even more effectively by using a new type of game, the 50-40 game, throughout the match. The no-ad game has been used in ATP and ATP Challenger doubles matches since the beginning of 2006. However, the 50-40 game is more effective than the no-ad game in several ways, including in reducing the number of points played in a match.

Different types of games in tennis

Standard game

The standard game is the most commonly used game in tennis. The first player to reach 4 points and be ahead by at least 2 points wins the game. If the points' score reaches 3 points each (known as "deuce"), the game continues until one player is two points ahead, thus winning the game. This type of game has no upper bound to the number of points played.

No-ad game

The no-ad game has been used in doubles matches since the beginning of 2006. As in the standard game, the first player to win 4 points wins the game. Thus, in the no-ad game, only one point is played to determine the winner of the game if deuce is reached. This type of game has at most 7 points played.

50-40 game

The 50-40 game is a new type of game (Pollard and Noble [3]), developed to reduce the likelihood of long matches, increase the efficiency of the tennis scoring system, and to reduce the standard deviation of the number of points played in the match. For this game, the server must win the standard 4 points, whilst the receiver has to win only 3 points. This type of game involves at most 6 points.

Matches not completed in grand slam tennis

Table 1 represents the percentage of matches not completed in grand slam tennis across genders. It shows that this percentage is higher for men than for women at all four grand slam tournaments. Men play best-of-5 sets matches whereas women play only best-of-3 sets matches. Thus, Table 1 provides some indication that reducing the length of matches will reduce the number of player injuries.

	Period	Wimbledon	Aust. Open	French Open	US Open
Men	1995-2004	2.0%	3.1%	3.6%	4.3%
Women	2001-2005	0.6%	1.9%	0.6%	0.8%

Table 1: Percentage of matches not completed in grand slam tennis

2003 Australian Open: Roddick versus El Aynaoui

In the quarter-finals of the 2003 Australian Open Men's Singles, Andy Roddick defeated Younes El Aynaoui 21-19 in the fifth set, a match taking 83 games to complete and lasting a total duration of 5 hours. The night session containing this long match required the following match to start at 1 am. Long matches can arise because of the advantage set, which gives a greater chance of winning to the better player (Pollard and Noble [2]), but has no upper bound on the number of games played.

Table 2 represents the predicted characteristics for the Roddick versus El Aynaoui match, based on the predicted probabilities of each player winning a point on service (Barnett and Clarke [1]). Note that the mean, standard deviation, and coefficients of skewness and kurtosis, are conditional on Roddick serving first, and El Aynaoui serving first, respectively. It can be seen that Roddick was expected to win 72.3% of points on serve and El Aynaoui 68.0% of points on serve. Also, Roddick was expected to win 92.6% of games on serve and El Aynaoui 87.5%. This means it was difficult for either player to break serve when the match reached an advantage fifth set. The table also shows that the mean, standard deviation, and coefficients of skewness and kurtosis of the number of points in a tiebreaker set are less than the corresponding values for an advantage set. Thus, given the values for the means and standard deviations in particular (and even the skewness), it is clear that the advantage set can be substantially longer than the tiebreaker set, particularly when both players have 'big' serves. Yet, it can be seen that the chance of the better player winning the match from the outset remains very similar for the two match-scoring systems. For this reason, to reduce the likelihood of injuries, and to increase fairness in the

tournament setting, consideration could be given to using the tiebreaker fifth set in all four grand slams. Out of all the men's singles matches played at the 2003 Australian Open, the Roddick-El Aynaoui match had the highest predicted mean number of points, standard deviation, and coefficients of skewness and kurtosis for an advantage set. Thus, it would be reasonable to conclude that the Roddick-El Aynaoui match had the potential to go on for the longest if a fifth set was reached.

Parameter	Scoring unit	Roddick	El Aynaoui
Probability of winning	point on serve	72.3%	68.0%
	game on serve	92.6%	87.5%
	tiebreaker game	57.5%	42.5%
	tiebreaker set	63.1%	36.9%
	advantage set	65.5%	34.5%
	tiebreaker match	73.4%	26.6%
	advantage match	74.2%	25.8%
Mean	tiebreaker set	65.3	66.1
	advantage set	84.8	85.5
Standard deviation	tiebreaker set	15.7	15.1
	advantage set	53.0	52.6
Coefficient of skewness	tiebreaker set	0.25	0.27
	advantage set	2.5	2.5
Coefficient of kurtosis	tiebreaker set	-0.86	-0.79
	advantage set	8.7	8.9

Table 2: Predicted characteristics for the Roddick-El Aynaoui match played at the 2003 Australian Open

2004 French Open: Clement versus Santoro

There was a match between Arnaud Clement and Fabrice Santoro played at the 2004 French Open that lasted for 6 hours 36 minutes. Although only 71 games were played in this match, the time duration was longer than the Roddick versus El Aynaoui match played at the 2003 Australian Open.

Table 3 represents the percentage of points won on serve for each player for each set, the time taken to complete each set and the corresponding game score. It took an average time of 56 minutes to play each of the first four tiebreaker sets. Given the games' scores, it would appear that these relatively long tiebreaker sets were due to the length of time taken to play each game, and this was probably due to a combination of the number of points played in the games and the length of time taken to play each point. The percentage of points won on serve for each player in the first four sets was 55% for Clement and 56% for Santoro, and these percentages are both less than the ATP tour average of 62%. Since there was a lack of dominance on serve, it is quite likely that the average length of time taken to play each point was higher than the corresponding ATP tour average. It is interesting to note that both players recorded their highest percentage of points won on serve in the advantage fifth set, thus contributing to the 173 minutes of play in that set.

	Serving statistics (%)		Time (min)	Score
	Clement	Santoro		
Set 1	56	61	51	4-6
Set 2	50	64	46	3-6
Set 3	55	56	74	7-6
Set 4	57	43	52	6-3
Set 5	64	64	173	14-16
Match	58	60	396	

Table 3: The statistics of each set for the Clement versus Santoro match played at the 2004 French Open

It can be seen that the Clement-Santoro match would have been a long one even if the fifth set had been a tiebreaker set. One way to reduce the length of the tiebreaker set, and ultimately the duration of the match, is to replace the standard game with the no-ad game, as used in ATP doubles. In the no-ad game only one point is played to determine the winner of the game if deuce is reached. The issues of which service court should be used for this point, and in doubles which player should receive, are unattractive aspects of the no-ad game structure. (Indeed, it can even be shown that in mixed doubles the no-ad game can be unfair!) There is, however, an alternative game structure that does not have these issues. It is the 50-40 game which requires at most 6 points (not 7) to be played (Pollard and Noble [3]). For this 50-40 game, the server must win the standard 4 points, whilst the receiver has to win only 3 points. Table 4 gives the probabilities of the better player (player A) winning and the mean number of points played in a match under these three different scoring systems. The notation used is as follows:

p_A and p_B represent the probabilities of player A and player B winning points on their respective serve

p^m represents the probability that player A wins a best-of-5 tiebreaker sets match

M represents the mean number of points played in a best-of-5 tiebreaker sets match

p_A	p_B	standard games		no-ad games		50-40 games	
		p^m	M	p^m	M	p^m	M
0.51	0.50	0.57	271	0.56	234	0.55	198
0.55	0.50	0.80	256	0.77	224	0.75	191
0.60	0.50	0.95	222	0.93	200	0.92	172
0.61	0.60	0.56	270	0.56	237	0.56	202
0.65	0.60	0.79	256	0.77	228	0.76	195
0.70	0.60	0.94	227	0.93	205	0.93	175
0.71	0.70	0.56	273	0.56	246	0.56	210
0.75	0.70	0.76	265	0.76	240	0.77	203

Table 4: The probability that player A wins and the mean number of points played in a match under three different best-of-5 tiebreaker sets scoring systems

The table indicates that all three scoring systems have comparable values for the probability that the better player wins. However, as can be seen in the table, the average number of points played in a match is reduced by using the no-ad game, and reduced even further by using the 50-40 game. Further, it can be shown (Pollard and Noble [3]) that, for doubles in particular, the efficiency of the scoring system is increased, and the standard deviation and skewness reduced by using the 50-40 game rather than the no-ad game.

Conclusions

Noting two long matches played in grand slam tennis, it has been shown that the likelihood of very long matches can be substantially reduced by using the tiebreak game in the fifth set. It has also been shown that the length of matches can be even more substantially reduced by using the 50-40 game rather than the no-ad game throughout the match. Further, the probability that the better player wins the match remains comparable when standard games are replaced with 50-40 or no-ad games.

Acknowledgement

The authors would like to thank Professor Rod Cross for providing the data for Table 1.

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