Original Investigation

Comparing Thirty30 Tennis with Traditional Tennis

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Abstract

Thirty30 is a shorter format of tennis where games start at 30-30. This means that a greater proportion of points are game points or break points than would be the case in traditional tennis. The purpose of the current paper is to compare the probability of players of different abilities winning games, sets and matches between Thirty30 tennis and traditional tennis. This is done using probabilistic models of each format of tennis. The results show that there is reduced dominance of the serve and a greater probability of upsets in Thirty30 tennis than in traditional tennis. The models are also experimented with, adjusting the probability of winning points where the point is a game point or a break point. The paper shows that such scoreline effects have a greater impact in Thirty30 tennis than they do in traditional tennis. This has implications for player preparation for Thirty30 tennis.

Keywords: *Probabilistic model, scoreline effect, rule changes.*

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INTRODUCTION

As sports develop over time, rules are changed for a variety of reasons including commercial pressures, accounting for technological advances in equipment and due to physical changes in players competing in sports (Williams, 2008). The main commercial pressure is to retain audience levels for the sport, both live at sports venues and through media. Sports with larger audiences enjoy greater sponsorship from commercial organisations due to the exposure the sports bring to the sponsors. Therefore, some rule changes are developed specifically to maintain or increase the excitement of the sport.

The duration of contests has also been modified to retain audiences. For example, shorter formats of cricket and netball have been developed. These shorter formats of matches can lead to an increased chance of unexpected results where lower ranked teams and players win matches against higher quality opposition. This may be due to the shorter performances being less representative of teams' and players' abilities than longer performances. The increased uncertainty that comes with shorter formats of sports may make sports more appealing to audiences than if the sports were highly predictable. However, the uncertainty of the sport also needs to be balanced with a reasonable chance of the highest ranked performers being successful and reaching the latter stages. There is debate about what fairness in sport is. Torres (2014, p.106) describes sport as a "meritocratic practice" where quality of performance should be rewarded. An alternative view is that handicaps should be used to give performers of different abilities an equal chance of winning. Fairness in such sports is concerned with how well handicapping systems achieve an equal chance of winning (McHale, 2010).

A shorter version of netball (Fastnet) was developed by reducing the duration of quarters from 15 minutes to 6 minutes. Shorter versions of cricket have been developed by restricting the number of overs per innings to 50 and 20 in One-Day cricket and Twenty20 cricket respectively. These formats have been highly successful in increasing audiences and attracting sponsorship. However, traditional 60 minutes netball remains the dominant format of the game and many consider test cricket to be the most prestigious format to participate in.

Tennis matches are not contested over a fixed duration of time or number of points. Instead, matches are structured into hierarchies of sets, games and points with defined conditions for winning that mean that both the number of points played and the time duration of matches vary within the same format of the sport. Therefore, rule changes aimed at reducing the duration of tennis matches will modify the criteria for games and sets to be won. Traditional tennis involves sets being won where a player has won 6 games and at least 2 more games than the opponent. Tennis matches within the Grand Slam tournaments are the best of 3 sets in women's singles or 5 sets in men's singles. The requirement to win at least 2 more games than the opponent has led to lengthy sets in tennis. Therefore, different forms of tie-break were introduced with the format currently used in the US Open being used since 1975. This tie-break involves both players serving and is played until one player has won at least 7 points and at least 2 more points than the opponent. The US Open played tiebreaks at 6-6 in all sets, while the other Grand Slam tournaments initially used tie-breaks at 8-8 except in the final set. Wimbledon, the French Open and the Australian Open moved the tie-break to 6-6 in 1979 but did not use tie-breaks in the final set. There have still been some very long final sets with concern expressed for player welfare and chances of winning subsequent matches within the tournament (Standard, 2016). In 2019, Wimbledon introduced the tie-break to 7 points for matches where the final set reached 12-12. In the same year, the Australian Open introduced a tie-break to 10 points where the final set reached 6-6; a player needs to win at least 10 points and at least 2 more points than the opponent to win this type of tie-break. The tie-break to 10 points was used in the Tie-Break Tens format, prior to its use in the Australian Open. There are Tie-Break Tens competitions where the matches are composed of a single tie-break to 10 points. The Laver Cup uses the tie-break to 10 points as a deciding 3rd set.

A further shortened version of tennis is Fast4 tennis where sets are played to 4 games using a tie-break to 5 points if the score reaches 3-3. A major difference between traditional tennis games and games in Fast4 tennis is that when a game reaches a score of Deuce, the next point decides the game without a need for a player to win at least 2 more points than the opponent. If a tie-break to 5 points reaches a score of 4-4, the next point decides the tie-break. A further feature of Fast 4 tennis is that the player who serves the 9th point of a tie-break to 5 points is decided by a coin toss. The Fast4 tennis format is used at a range of levels from grass roots tennis right up to major international tournaments such as the Hopman Cup.

The current research investigates a further format of tennis called Thirty30 tennis. Sets within Thirty30 tennis are won by the first player to reach 6 games and be 2 games ahead of the opponent, or by a score of 7-5 or by a tie-break if the set reaches a score of 6-6. The differences between Thirty30 tennis and the sets played in Grand Slam tennis are that the games start at 30-30 rather than Love-All and that the tie-breaks differ. The tie-breaks in Thirty30 tennis are played to 5 points but differ from those played in Fast4 tennis in that the player who served first in the set serves the deciding point if the tie-break reaches 4-4. The exception to this is the final set of a Thirty 30 match where a player must finish at least 2 games ahead of the opponent to win the match. The claim of those who created Thirty30 tennis is that "every point really counts" (Milne, 2018). Certainly, points from 30-30 have been shown to be more important than points before 30-30 in traditional tennis games (Morris, 1977).

A topic of interest with respect to any rule change in sport is how it effects the chances of players of different qualities winning matches. Probabilistic models have been used to estimate the probability of a player winning games, sets and matches in different formats of tennis. These models are ultimately in terms of the probability of the serving player winning a point on serve. Croucher (1982) expressed the probability of winning a game on serve given the probability of winning a point on serve. Further work by Croucher (1986) provided the conditional probability of winning a game from each scoreline within a game. Further models have been produced for traditional sets (Pollard, 1983), tie-breaks to 7 points (Pollard, 1983), Tie-Break Tens tennis (O'Donoghue and Simmons, 2019), games, sets and matches in Fast4 tennis (Simmonds and O'Donoghue, 2018) and other short formats of tennis (Pollard and Barnett, 2018). These models have shown that lower ranked players have a higher chance of winning sets and matches in shorter forms of tennis than they do in traditional tennis matches. A limitation of these models is that they assume the probability of winning a point is independent of the scoreline within games, sets and matches and independent of the outcome of preceding points within games. However, Klaasen and Magnus (2001) have found that the chance of winning a point in professional tennis is only inflated by 0.3% or 0.5% in women's and men's singles respectively when the previous point is won. Furthermore, Newton and Aslam (2006) showed that the probabilistic models for tennis are robust to violation of the assumption of independence of points. O'Donoghue (2001) compared the proportion of points won at each score from Love-All to Deuce, finding no impact of points score on the proportion of points won.

Thirty30 tennis contains more pressure points than other formats of tennis because every other point within a game will either be a game point or a break point; in the current paper we use the term "critical points" to cover game points and break points. If there are players who perform better or worse during critical points than they do during other points, then it is particularly important that this is addressed by any models being used to compare Thirty30 tennis with traditional tennis. Therefore, the purpose of the current paper is to compare the probability of winning games, sets and matches between Thirty30 tennis and traditional tennis when the probability of winning critical points differs from the probability of winning other points. This is done for a realistic range of probabilities of winning points on serve. The paper represents traditional tennis matches using the US Open format where a tie-break to 7 points is used if the final set reaches a score of 6-6.

The models

The models used in the current research are extended versions of Croucher's (1982) model for winning a game in traditional tennis, the conditional probability of winning a tennis game from a score of 30-30 (Croucher, 1986), the probability of winning a tie-break to 7 (Fisher, 1980) and the probability of winning a tie-break to 5 (Simmonds and O'Donoghue, 2018 modified).

Figure 1 shows the possible ways of winning a game in traditional tennis. Croucher's (1982) model expresses the probability of the serving player winning a game, G, as equation (1) where p is the probability of the serving player winning a point and q (= 1 – p) is the probability of the receiving player winning a point. Figure 2 shows the possible ways of winning and losing a Thirty 30 tennis game with the probability of the serving player winning the game, G, shown in equation (2).

$$G = p^4(1 + 4q + 10q^2) + 20p^5q^3/(1 - 2pq) \quad (1)$$

$$G = p^2/(1 - 2pq) \quad (2)$$

Figures 1 and 2 extend Croucher's (1982, 1986) models by distinguishing between game points, break points and other points as follows:

The probability of the server winning or losing a break point are r and s (= 1 – r) respectively

The probability of the server winning or losing a game point are u and v (= 1 – u) respectively

The probability of the server winning or losing any other point are p and q (= 1 – p) respectively

Replacing p and q by r and s within break points and by u and v within game points extends equation (1) to equation (3) for traditional tennis games. Similarly, equation (2) is extended to equation (4) by introducing separate probabilities for break points, game points and other points.

$$G = p^3u(1 + v + 3q + v^2 + 3qv + 6q^2) + (p^3v(v^2 + 3vq + 6q^2) + q^3r(r^2 + 3rp + 6p^2))\ pu/(1 - pv - qr) \quad (3)$$

$$G = pu/(1 - pv - qr) \quad (4)$$

Traditional tennis sets and sets in Thirty30 tennis use a tie-break at 6-6. Let A be the player who serves first in a set and B be the opponent. Equation (5) represents the probability of the player A winning the set, S_A, in terms of the probability of players A and B winning service games (G_A and G_B respectively) and losing service games (H_A and H_B respectively). Note that H = 1 – G for each player's service games. T_A is the probability of player A winning a tie-break to 7 points and uses the model expressed by Fisher (1980). T_A in equation (5) is replaced by $G_AH_B/(1 - G_AG_B - H_AH_B)$ for the final set of a Thirty 30 tennis match. This is the sum of a geometric progression giving the conditional probability of player A winning the final set by two games given that the set has reached a score of 6-6.

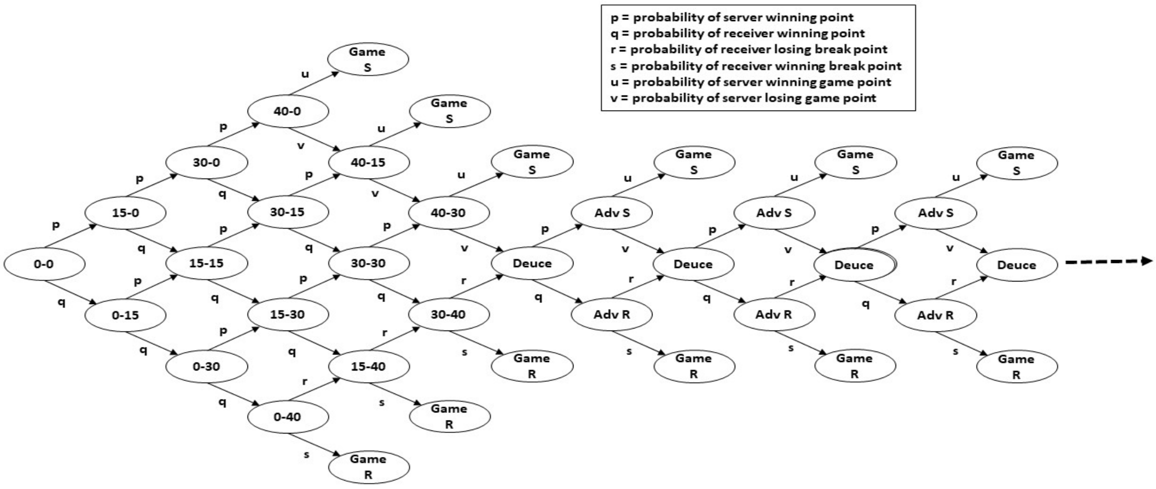

Figure 1. Pathways to winning or losing a traditional tennis game.

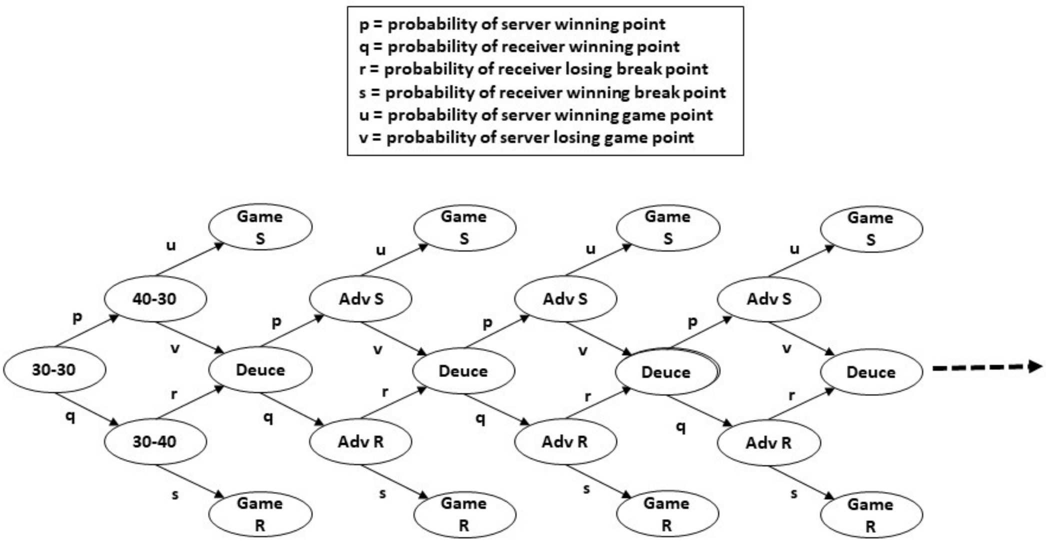

Figure 2. Pathways to winning or losing a Thirty30 tennis game.

$$
\begin{aligned}
S_A = {} & G_A{}^3H_B{}^3 + 3G_A{}^4H_B{}^2G_B + 3G_A{}^3H_AH_B{}^3 + 3G_A{}^4H_B{}^2G_B{}^2 \\
& + 12G_A{}^3H_AH_B{}^3G_B + 6G_A{}^2H_A{}^2H_B{}^4 + 4G_A{}^5H_BG_B{}^3 \\
& + 24G_A{}^4H_AH_B{}^2G_B{}^2 + 24G_A{}^3H_A{}^2H_B{}^3G_B + 4G_A{}^2H_A{}^3H_B{}^4 \\
& + G_A{}^5H_BG_B{}^4 + 20G_A{}^4H_AH_B{}^2G_B{}^3 + 60G_A{}^3H_A{}^2H_B{}^3G_B{}^2 \\
& + 40G_A{}^2H_A{}^3H_B{}^4G_B + 5G_AH_A{}^4H_B{}^5 + G_A{}^6H_BG_B{}^5 \\
& + 25G_A{}^5H_AH_B{}^2G_B{}^4 + 100G_A{}^4H_A{}^2H_B{}^3G_B{}^3 + 100G_A{}^3H_A{}^3H_B{}^4G_B{}^2 \\
& + 25G_A{}^2H_A{}^4H_B{}^5G_B + G_AH_A{}^5H_B{}^6 \\
& + (G_A{}^5G_B{}^5 + 25G_A{}^4H_AH_BG_B{}^4 + 100G_A{}^3H_A{}^2H_B{}^2G_B{}^3 + 100G_A{}^2H_A{}^3H_B{}^3G_B{}^2 + 25G_AH_A{}^4H_B{}^4G_B + H_A{}^5H_B{}^5)(G_AG_B + H_AH_B)T_A
\end{aligned} \quad (5)
$$

The probability of winning a set is not affected by who serves first in traditional tennis. Therefore, the probabilities of player A winning a best of 3 and 5 sets match, M_A, in traditional tennis is given by equations (6) and (7) respectively.

$$M_A = S_A{}^2 + 2S_A{}^2(1 - S_A) \quad (6)$$

$$M_A = S_A{}^3 + 3S_A{}^3(1 - S_A) + 6S_A{}^3(1 - S_A)^2 \quad (7)$$

The model for the 5 point tie-break used in Thirty30 tennis differs slightly from that used in Fast 4 tennis (Simmonds and O'Donoghue, 2018) in that the player, A, who served first in the set, and hence who served first in the tie-break, serves the 9th point of the tie-break. The model for the probability of player A winning this form of tiebreak, T_A, is given by equation (8) where p_A and q_A (= $1 - p_A$) are the probabilities of player A winning and losing points on their serve during the tie-break and p_B and where q_B (= $1 - p_B$) are the probabilities of player B winning and losing points on their serve during the tie-break.

$$T_A = p_A{}^3q_B{}^2 + 2p_A{}^3q_B{}^2p_B + 3p_A{}^2q_Aq_B{}^3 + 3p_A{}^3q_B{}^2p_B{}^2 + 9p_A{}^2q_Aq_B{}^3p_B + 3p_Aq_A{}^2q_B{}^4 + 4p_A{}^4q_Bp_B{}^3 + 18p_A{}^3q_Aq_B{}^2p_B{}^2 + 12p_A{}^2q_A{}^2q_B{}^3p_B + p_Aq_A{}^3q_B{}^4 + p_A{}^5p_B{}^4 + 16p_A{}^4q_Aq_Bp_B{}^3 + 36p_A{}^3q_A{}^2q_B{}^2p_B{}^2 + 16p_A{}^2q_A{}^3q_B{}^3p_B + p_Aq_A{}^4q_B{}^4 \quad (8)$$

The player to serve first in a set alternates in a Thirty30 match and the player who serves first does have a higher probability of winning the set where both players have an equal probability of winning a point on serve that is greater than 0.5. Let A be the player who serves first in the first set and B be the opponent. S_A and S_B represent the probability of players A and B winning a set where they serve first respectively. Tie-breaks are not used in the final set of Thirty30 tennis. Therefore, F_A is used to represent the probability of player A, who serves first in the final set, winning this set. Equations (9) and (10) are the models for the probability of player A winning a Thirty30 match, M_A, when the match is the best of 3 and 5 sets respectively.

$$M_A = S_A(1-S_B) + S_AS_BF_A + (1-S_A)(1-S_B)F_A \quad (9)$$

$$M_A = S_A{}^2(1-S_B) + 2S_A(1-S_A)(1-S_B)^2 + S_A{}^2S_B(1-S_B) + S_A{}^2S_B{}^2F_A + (1-S_A)^2(1-S_B)^2F_A + 4S_AS_B(1-S_A)(1-S_B)F_A \quad (10)$$

Analysis process

This paper contains two stages of analysis. The first stage is a summary of differences in the probability of winning games, tie-breaks, sets and matches between traditional and Thirty30 tennis. The second stage examines the impact of performing better or worse during critical points on the probability of winning a game. This research was approved by the Natural Science (Sport) panel of the Ethics Committee of the School of Sport and Health Sciences of Cardiff Metropolitan University (Project STA-2757).

The probability of winning games, sets and matches in the two formats of tennis is analysed using realistic values for the probability of points being won by the serving player. A recent study of the Australian Open revealed that players win more points when serving than receiving in both women's and men's singles (Reid, Morgan, and Whiteside, 2016). The Australian Open is played on a surface which is faster than that of the French Open, similar to the US Open and slower than that of Wimbledon. The terms "faster" and "slower" here are used to broadly represent the coefficients of friction and restitution that influence how much speed the ball loses in the horizontal and vertical directions when it bounces. The proportion of points won when serving at the Australian Open is greater than that observed at the French Open and less than that observed at Wimbledon and the US Open (O'Donoghue and Ingram, 2001; O'Donoghue, 2013). Therefore, values from the Australian Open are used to represent typical Grand Slam performance. Gale's (1971) formula can be applied to the proportion of points where the first serve is in, the proportion of points won when the first serve is in and the proportion of points won when a second serve is required. These are derived from Reid et al.'s (2016) results and yield a probability of 0.532 for the serving player winning a point in women's singles and 0.612 in men's singles. The winning player's proportion of points won on serve is typically 0.1 greater than that of losing players' in both women's and men's singles at all four Grand Slam tournaments (O'Donoghue, 2013). Therefore, values of 0.582 and 0.482 are used for the probability of winning and losing players winning points on serve in women's singles and 0.662 and 0.562 are used for the probability of winning and losing players winning points on serve in men's singles. While the outcome of these matches is known, we use these probabilities to determine the probability each player had of winning games, tie-breaks, sets and matches at the beginning of these units of play.

The second stage of analysis considers the effect of performing better or worse on critical points than on other points. This needs to be done using a realistic range of values for the probability of winning points on serve. O'Donoghue (2013) reported on the distributions of the proportion of points won on serve in women's and men's singles at all four Grand Slam tournaments. Normal distributions were found in six of the eight events. This allows a range of probabilities that covers 95% of performances to be estimated for each event (mean$\pm$1.96 SD). The lowest lower limit of the middle 95% of any of these distributions is 0.315 for the losing players in women's singles matches at the US Open. The highest upper limit is 0.817 for the winning player in men's singles matches at Wimbledon. Therefore, the analysis of differing performances during critical points uses a range of probabilities of winning a point on serve from 0.3 to 0.8. It is also necessary to adjust the probabilities of winning points on serve by realistic differentials when players face critical points. O'Donoghue (2012) compared receiving performances by the World's top 4 men's singles players during break points and non-break points in Grand Slam matches. One of the player's percentage of points won during break points was 5.0% higher than during non-break points while another's was 5.1% lower. The other two players were in between these values. These differences also reflect realistic differences on game points because an opponent is serving a game point when one of these players faces a break point. Therefore, the current study adds and subtracts 0.05 to and from the probability of winning a point during critical points.

RESULTS

Figure 3 shows that there is a higher probability of a service break occurring in Thirty30 tennis than in traditional tennis when the serving player has a probability of winning a point on serve greater than 0.5. Table 1 shows the probabilities of winning games, tie-breaks, sets and matches in traditional and Thirty30 tennis. These use probabilities of winning and losing players winning points on serve derived from Reid et al.'s (2016) study to determine their probabilities of winning games, tie-breaks, sets and matches at the beginning of these units of play. Probabilities of winning points that are greater than 0.5 inflate to higher probabilities of winning service games in traditional tennis than they do in Thirty30 tennis. Players who win more points on serve than their opponents also have a higher chance of winning tie-breaks, sets and matches in traditional tennis than in Thirty30 tennis.

Table 2 shows the probability of the serving player winning a game when the probability of winning a point differs during critical points to the probability of winning other points in the game. The impacts of performing differently during critical points than other points are larger in Thirty30 tennis than in traditional tennis in all cases. The only exceptions are where p = 0.5 and a player's change in performance on game points is opposite to their change in performance on break points. In these situations, there is no impact on the probability of winning the game. When p is greater than 0.5, performing better or worse during break points has a larger impact on the probability of winning the game than equivalent differences in performance during game points. Where players win a minority of points on serve, changes in how they perform during game points have a higher impact on their probability of winning the game than equivalent changes in performance during break points. Table 2 also shows the probability of the serving player winning the game when the probability of winning a point is different during both game and break points to what it is during other points. When p is greater than 0.5, a reduced probability of winning game and break points leads to a greater reduction in the probability of winning the game than the increase in probability of winning the game achieved by equivalent increases in the probabilities of winning game and break points. When the serving player wins a minority of points on serve, however, increased probabilities of winning both game and break points cause a larger increase in the probability of winning a game than the decrease resulting from equivalent decreases in the probability of winning game and break points. When p is greater than 0.5, it is more beneficial to perform better on break points and worse on game points (where the differences to performing on other points are of the same magnitude) than it is to perform better on game points and worse on break points. The opposite is the case where p is less than 0.5.

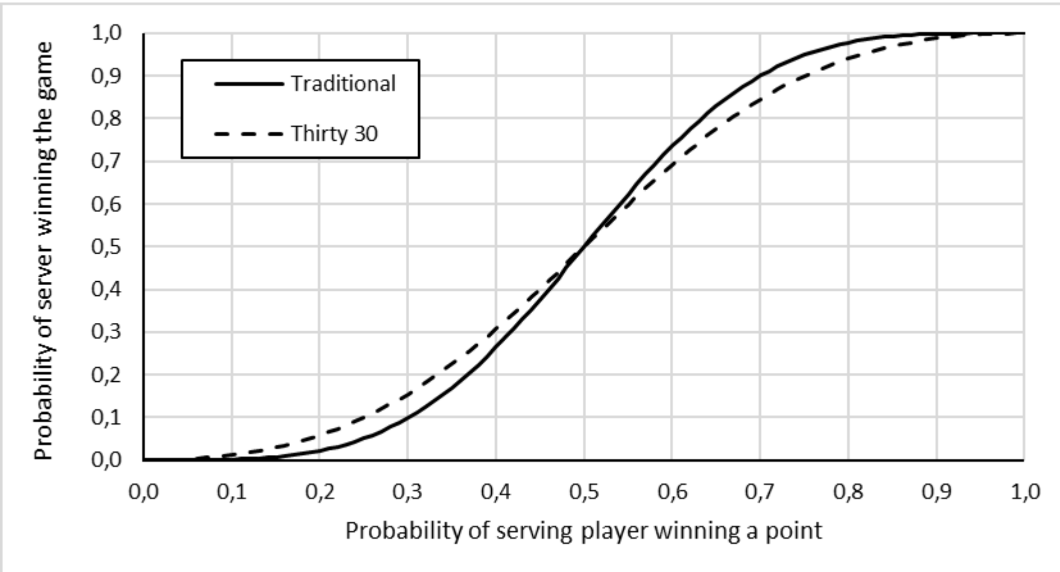

Figure 3. The probability of the serving player winning a game.

Table 1.
Probabilities of players winning points, games, tie-breaks, sets and matches in typical Australian Open singles performances (probabilities are at the start of the given units of play).

Variable	Women's Singles				Men's Singles			
	Winner		Loser		Winner		Loser	
	Traditional	Thirty30	Traditional	Thirty30	Traditional	Thirty30	Traditional	Thirty30
Probability of winning a point on serve, p	0.582	0.582	0.482	0.482	0.662	0.662	0.562	0.562
Probability of winning service game	0.697	0.660	0.455	0.464	0.849	0.793	0.651	0.622
Probability of winning a tie-break when serving first	0.655	0.630	0.345	0.387	0.659	0.654	0.341	0.406
Probability of winning set when serving first (excluding final set)	0.814	0.764	0.186	0.238	0.804	0.759	0.196	0.249
Probability of winning the final set	0.814	0.770	0.186	0.230	0.804	0.765	0.196	0.235
Probability of winning match (best of 3 sets)	0.909	0.860	0.091	0.140	0.900	0.853	0.100	0.147
Probability of winning match (best of 5 sets)	0.952	0.911	0.048	0.089	0.945	0.904	0.055	0.096

Table 2.
Change in the probability of a player holding serve when their probability of winning game or break points is 0.05 higher or lower than when playing any other point on serve.

Difference in probability to p	Version of tennis	The probability of winning points on serve when neither a game point nor a break point (p)										
		0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80
Game point 0.05 higher	Traditional	0.0119	0.0156	0.0182	0.0192	0.0182	0.0155	0.0118	0.0080	0.0048	0.0025	0.0010
	Thirty30	0.0213	0.0241	0.0256	0.0256	0.0238	0.0207	0.0168	0.0126	0.0088	0.0057	0.0033
Game point 0.05 lower	Traditional	-0.0129	-0.0172	-0.0204	-0.0218	-0.0210	-0.0181	-0.0140	-0.0096	-0.0058	-0.0030	-0.0013
	Thirty30	-0.0223	-0.0256	-0.0276	-0.0278	-0.0262	-0.0230	-0.0187	-0.0142	-0.0099	-0.0063	-0.0036
Break point 0.05 higher	Traditional	0.0059	0.0097	0.0141	0.0182	0.0211	0.0219	0.0205	0.0173	0.0130	0.0086	0.0049
	Thirty30	0.0100	0.0143	0.0188	0.0231	0.0263	0.0279	0.0277	0.0257	0.0224	0.0184	0.0140
Break point 0.05 lower	Traditional	-0.0047	-0.0079	-0.0117	-0.0154	-0.0181	-0.0191	-0.0181	-0.0155	-0.0118	-0.0079	-0.0045
	Thirty30	-0.0087	-0.0125	-0.0167	-0.0206	-0.0237	-0.0255	-0.0255	-0.0240	-0.0212	-0.0175	-0.0135
Game point 0.05 higher & Break point 0.05 higher	Traditional	0.0185	0.0260	0.0329	0.0377	0.0392	0.0370	0.0317	0.0246	0.0172	0.0107	0.0057
	Thirty30	0.0323	0.0394	0.0452	0.0490	0.0500	0.0480	0.0435	0.0373	0.0302	0.0231	0.0166
Game point 0.05 higher & Break point 0.05 lower	Traditional	0.0066	0.0069	0.0059	0.0034	0.0000	-0.0033	-0.0058	-0.0068	-0.0065	-0.005	-0.0032
	Thirty30	0.0115	0.0105	0.0081	0.0044	0.0000	-0.0043	-0.0080	-0.0104	-0.0114	-0.011	-0.0096
Game point 0.05 lower & Break point 0.05 higher	Traditional	-0.0077	-0.0083	-0.0070	-0.0040	0.0000	0.0041	0.0071	0.0084	0.0078	0.0060	0.0039
	Thirty30	-0.0136	-0.0125	-0.0097	-0.0053	0.0000	0.0054	0.0098	0.0126	0.0137	0.0130	0.0112
Game point 0.05 lower & Break point 0.05 lower	Traditional	-0.0171	-0.0245	-0.0316	-0.0369	-0.0391	-0.0376	-0.0328	-0.0259	-0.0184	-0.0115	-0.0061
	Thirty30	-0.0301	-0.0372	-0.0434	-0.0479	-0.0499	-0.0489	-0.0451	-0.0393	-0.0322	-0.0249	-0.0180

DISCUSSION

The results reveal that there is a greater probability of an upset in Thirty30 tennis than in traditional tennis. Upsets can result from Simpson's Paradox (Wright, Rodenberg, and Sackmann, 2013) where a player might win against a higher ranked opponent having won a minority of points in the match. A player can win a five set traditional tennis match by only winning 37% of the points. This is done with a score of 0-6, 0-6, 7-6, 7-6, 7-6 when the player loses all of the opponents serving games to Love, loses their own service games to Love in the first two sets, wins all of their own service games in sets 3, 4 and 5 after the first Deuce, and wins the three tie-breaks 7-5. This gives the player 111 out of 300 points. Simpson's Paradox does not impact on Thirty30 tennis to the same extent because all games with the exceptions of tie-breaks are won by exactly 2 points. A player could win a five set Thirty30 tennis match having won 42.4% of the points. The score would be 0-6, 0-6, 7-6, 7-6, 8-6. The player loses all of their opponent's services games to Love except the last one, loses their own service games to Love in the first 2 sets, wins their own service games to Love in sets 3, 4 and 5, wins the 2 tiebreaks 5-4 and wins their opponent's final service game to Love. This is 50 out of 118 points. Given that Simpson's Paradox is less of an issue in Thirty30 tennis than in traditional tennis, the primary explanation for the greater number of upsets in Thirty30 tennis is due to the games being shorter and hence less representative of player ability. This is consistent with research into other shorter formats of tennis which has found that they also have a higher chance of upsets than traditional tennis (Simmonds and O'Donoghue, 2018; O'Donoghue and Simmonds, 2019). This knowledge may be useful to tournament organisers who need to decide on game formats. Tournament organisers need to balance the chance of top players progressing to the later stages of tournaments with the excitement due to unpredictability of match outcome. The probabilities of superior players winning matches are reduced by a small amount (0.041 in both women's and men's singles). This is expected to result in an additional five upsets in knockout tournaments on 128 players and hence 127 matches.

Serve dominance is reduced in Thirty30 tennis compared to traditional tennis as shown by the lower probability of winning service games for all probabilities of winning a point on serve above 0.5 (Figure 1). Values determined from previous research suggest that 64% of points are won by the serving player on average in professional men's tennis (Gerchak and Kilgour, 2017). This is determined by applying Gale's (1971) equation to the retrospective probabilities of first and second serves being in and the retrospective conditional probabilities of a point being won when these serves are in. The probability of service being held when the probability of winning a point on serve is 0.64 is 0.812 in traditional tennis but reduced to 0.760 in Thirty30 tennis. When p is 0.68 in Figure 1, the difference between holding serve in traditional tennis and Thirty30 tennis is maximised. The probability of serve being held in men's singles matches at Grand Slam tournaments is 0.63 compared to 0.56 for women's singles matches (O'Donoghue, 2013). Therefore, the reduction in serve dominance in Thirty30 tennis would be greater in men's singles at this level than in women's singles. This is especially true on grass courts given that the probability of male players winning points on serve is 0.66 at Wimbledon (O'Donoghue, 2013) which is closer to the 0.68 probability that maximises the difference in holding serve between traditional and Thirty30 tennis. The reduced serve dominance in Thirty30 tennis also has implications for players of different heights. Taller players win more points on serve than shorter players (Söğüt, 2018). However, this translates into a lower probability of holding serve than would be the case in traditional tennis. Therefore, Thirty30 offers a greater chance of success to shorter players.

Games in Thirty30 tennis start at 30-30 meaning that there are more important points in Thirty30 tennis than traditional tennis due to games starting closer to Deuce. These points are also considered more exciting than other points (Pollard, 2002). Morris (1977) defined the importance of a point in a game of tennis as the difference in the probability of winning the game when the point is won and when the point is lost. When the probability of winning a point on serve is 0.6, 30-40 is the most important point (with an importance score of 0.692) with Deuce and 40-30 being among the 9 most important of the 16 points between Love-All and Deuce. The importance of the average point in traditional tennis is not as high due to points such as 40-0 (with an importance of 0.049) not being played in Thirty 30 tennis. Based on Morris's (1977) definition, players encounter more important points in Thirty30 tennis than in traditional tennis. This may present players with a dilemma when using the challenge system during Thirty30 tennis. The importance of the point is a factor that influences whether professional male players use the challenge system (Kovalchik, Sackmann, & Reid, 2017). The greater number of important points in Thirty30 tennis requires players to be especially selective where the importance of the point is one of the factors they are considering when deciding whether to challenge a decision. Break points are clearly more important than game points at higher levels of tennis where the serve is dominant. Players need to be aware of this if using the challenge system in Thirty30 tennis. They should also consider the score in games and sets when deciding to use the challenge system.

If players' performances are affected by the pressure of important points there are implications for fairness based on the order of events (Brams and Ismail, 2018). The player serving first could face break points earlier than the opponent. On the other hand, the player receiving first could face opponent game points earlier. Scoreline effects, such as those experimented with in Table 2, could arise from the performance of the serving player, the receiving player or both players being affected. For example, if the server has a lower probability of saving a break point than winning points where the score is level, this could be due to the performance of the server deteriorating under pressure or the performance of the receiving player being enhanced when there is a break point opportunity. The proportion of break points converted in Grand Slam singles tennis has been found to be greater than the proportion of other points won by the receiver (Knight and O'Donoghue, 2011). Knight and O'Donoghue interpreted this as being due to receiving players not performing as well during points like 40-0, 40-15 and 30-0 rather than receiving players performing better during break points. The scorelines 40-0, 40-15 and 30-0 do not occur in Thirty30 tennis making a comparison impossible before research is done to analyse actual proportions of points won at the different scorelines. None-the-less, the current theoretical study has shown the impact of scoreline effects on the probability of winning games, with bigger impacts being generated in Thirty30 tennis than in traditional tennis. Professional tennis players with higher mental toughness perform better during critical points than those with lower mental toughness (Cowden, 2016). Therefore, Thirty30 tennis may be a particularly difficult format for those with lower mental toughness. However, Thirty30 matches could be useful to help players cope with critical points as they prepare for traditional tennis matches. The greater exposure to such points offered by Thirty30 tennis can be used by players to develop strategies to minimise the impact of critical points or even enhance performance on such points.

There is also a role for performance analysis support where players win differing proportions of critical points than other points. Match analysis systems are used to record details of points permitting feedback of quantitative and related video sequences to players (Born and Vogt, 2018). Where a player's success within points is found to be scoreline dependent, more in-depth analysis is possible to determine the technical and tactical differences in play between game points, break points and other points. Point types can be classified as aces, double faults, shots per point, net points and baseline points (Fitzpatrick, Stone, Choppin, & Kelley, 2019). Point ending shots can be classified as winners, forced errors and unforced errors (Fitzpatrick et al., 2019), forehand and backhand ground strokes can be distinguished (Delgardo et al., 2019) and whether the point emanated from a first or second serve can be noted (Cui, Gomez, Goncalves, Lui, and Sampaio, 2017). These variables can be contrasted between points played at different scorelines and appropriate feedback given to players and coaches. Decisions relating to play that are based on such feedback can be put into practice during Thirty30 matches. This allows further analysis and feedback before decisions are made about performance during traditional tennis matches.

Starting games at 30-30 reduces the number of points played in matches which can help reduce match congestion. Match congestion is associated with decreased serve accuracy (Maraga, Duffield, Gescheit, Perri, and Reid, 2018), increased pain (Maraga et al., 2018), increased error rates (Gescheit et al., 2016) and fatigue (Fernandez-Fernandez, Sanz-Rivas, and Mendez-Villanueva, 2009). These problems can be addressed by the introduction of shorter formats of tennis such as Thirty30. Service games yield higher physiological demands than receiving games (Mendez-Villanueva, Fernandez-Fernandez, Bishop, Fernandez-Garcia, and Terrados, 2007; Kilit, Senel, Arslan, and Can, 2016). Thirty30 tennis has an additional advantage of reducing the duration of service games and thus further protecting player welfare. Pollard and Noble (2003) have suggested that shorter formats may also reduce injuries in tennis. Thirty30 tennis may, therefore, have a role in reducing injury rates.

In conclusion, Thirty30 tennis matches are shorter than traditional tennis matches, have a higher chance of upsets and reduce serve dominance. A greater proportion of points in Thirty30 tennis are game points and break points than is the case in traditional tennis. This has implications for psychological preparation of players who are competing in this format of the game.

DECLARATION

Mark Milne is the creator of the Thirty30 format of tennis.

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