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ABSTRACT

This article provides information on the time structure of the doubles game in tennis and studies the influence of team experience on this time structure. The sample consisted of 2339 points corresponding to 19 complete ATP matches. Variables related to the point length and the number of shots per point were recorded, and teams were classified based on their experience playing together. The Mann–Whitney U test was performed to check the differences according to the types of teams and the Kruskal–Wallis test was used to check the differences depending on the match. The variables related to the duration and density of work presented lower values than in singles tennis. Regarding the data found based on the winning and losing team, the new teams used more time and more shots to win the points than the regular teams. Regarding the type of match, in the matches between two new teams, the duration of the points and the number of shots per point was greater compared to the other two types of matches. Offensive game strategies were adopted in the doubles matches, especially in regular teams, which reduced the length and density of the game.

1. Introduction

The time structure of the sport is one of the most important aspects that should be considered when designing training sessions that specifically reproduce the characteristics of the competition (Torres-Luque et al., 2014). In fact, there is a large number of research on singles tennis that has focused on this aspect by providing information on the length of matches and sets (Fernández et al., 2006; Martínez-Gallego et al., 2013), the duration of the points (Fernández et al., 2006; Kilit et al., 2018; Martínez-Gallego et al., 2013), the work/rest ratio (Fernández et al., 2006; Kilit et al., 2016; Torres-Luque et al., 2011) or the number of shots per point (O'Donoghue & Ingram, 2001).

Tennis doubles has a great tradition, since it has been present throughout the history of the modern game. The first doubles event at Wimbledon was played in 1884, just 7

years after the first singles tournament was played in 1877. Over the years, there have been great doubles specialists such as the Bryan brothers, and it has been widely recognised both at a sporting and economic level (Breznik, 2015). Currently, tennis doubles has a considerable relevance in professional tennis since it is played both at the highest levels of professional tennis (Grand Slams, Olympic Games or Masters 1000) and at the lowest levels (ITF World Tennis Tour). In addition, in the new competition formats of the major team tennis competitions, such as the Davis Cup, the Fed Cup or the ATP Cup, doubles matches are crucial as they are the decisive match in all the rubbers (Association of Tennis Professionals, 2020a; International Tennis Federation, 2020; Martínez-Gallego et al., 2019).

Despite this great tradition and importance, the discipline of doubles has not received much interest from research. Some authors have studied aspects such as the coordination between players (Blickensderfer et al., 2010), the team communication (Lausic et al., 2015, 2009), the tactical variations (Carboch et al., 2020) or the team and players' performance (Breznik, 2015). However, none of these studies has provided information regarding the time characteristics of the game. Only a previous study has analysed the structure of the game and the characteristics of the completion of the points, providing information on the number of points per game, the number of sets per game, the number of games per set, the number of points per game or the number of shots per point (Martínez-Gallego et al., 2019).

On the other hand, it is important to note that there are certain rules in doubles that differ from those adopted in the singles game. One of them is the match tie-break when each team wins a set, so that instead of playing a traditional set, the winning team of the match is the one that reaches 10 points, in the match tie-break. Another rule applied is the "no-ad", whereby, when the score reaches *deuce* or 40-all, the game is decided by playing a decisive point (Association of Tennis Professionals, 2020b). In addition to these rules related to the scoring system, the rules that can have a greater effect in the structure of the game are the differences in the size of the court, since in doubles the corridors are also used and, mainly, the number of players, which is two against two. Therefore, in the doubles game apart from the usual opposition seen in singles, there is also a collaborative relationship with one partner, so that coordination between the two partners is a fundamental aspect of the game (Carboch & Kočíb, 2016; Crespo & Miley, 1998). Effective communication, both verbal and non-verbal, is then crucial to solve the problems that arise during the game and achieve a good performance (Lausic et al., 2015, 2009). Some previous research that studied the familiarity of teams in amateur doubles found that those teams who had more experience playing together had higher values of shared knowledge and better implicit coordination that those with less experience (Blickensderfer et al., 2010). This is an aspect that will definitely affect the structure of the game. In addition, the choice of the partner in doubles is very relevant (Crespo & Miley, 1998) and knowing how different types of teams influence the game will be an aspect of vital importance.

Considering all of the above, it is evident that the demands and characteristics of the doubles game are different from those of singles tennis. Despite having a significant amount of information about singles tennis, it is obvious that these data are not completely transferable to the doubles game. It is then necessary to

have information that will help coaches and trainers to plan and design their doubles training sessions and match preparation more specifically. Therefore, the two objectives of this article were on the one hand, to describe the time characteristics of doubles tennis, and on the other, to analyse the influence of teams' experience on the characteristics of the points.

2. Analysis of data

2.1. Sample

The sample of this study was made up of 2339 points from 19 complete doubles matches of the 2018 ATP World Tour Masters 1000 tournament played in Canada on outdoor hard courts. In total, 19 teams made up of 38 players participated, with an average age of 31.87 (5.03) year-old. The doubles rankings at the time of the tournament were: 8 players with rankings between 1 and 10, 12 players with rankings between 11 and 20, 6 players with rankings between 21 and 30, 1 player with ranking between 31 and 40, 10 players with rankings higher than 50, and 1 player without doubles ranking.

2.2. Process

In order to register the variables of interest for the matches, a data collection system was designed using Microsoft Excel. This system allowed the inclusion of general variables such as the name, the ranking, and the age of the players, the round of the tournament and the result of the match, and subsequently, the recording and calculation of the specific variables for the analysis. The definition of each of these variables is indicated below:

2.2.1. Dependent variables

- Match duration: time from the beginning of the first point of the match to the end of the last point of the match.
- Set duration: time from the beginning of the first point in the set to the end of the last point in the set.
- Duration of the match tie-break: time from the beginning of the first point of the match tie-break to the end of the last point of the match tie-break.
- Tie-break duration: time from the beginning of the first tie-break point to the end of the last tie-break point.
- Game duration: time from the start of the first game point to the end of the last game point.
- Point duration: time from the start to the end of each point. The start occurs when the server hits a serve which is considered good. The end of the point is determined when the ball passes the opponent, in the event of a winning shot, bounces off the court or does not cross the net.
- Shots per point: the number of shots hit by the players during the point. The first service was only considered in case it was in.
- Active time of the game: sum of the duration of all the points of the game.

- Passive time of the game: difference between the game duration and the active playtime.
- Density of the game: result of dividing the active time of the game by the passive time of the game.
- Rest work ratio: ratio of passive time per unit of active time.
- Hitting frequency: result of dividing the number of shots per point by the duration of that point.

2.2.2. Independent variables

- Type of team: a regular team was considered a team that had played 10 matches or more during the 12 months prior to the start of the tournament. A team who had played less than 10 matches during the 12 months prior to the start of the tournament was considered a new team.
- Type of match: three different types of matches were established depending on the types of teams that played it: regular vs. regular, regular vs. new, and new vs. new.

2.3. Reliability analysis

In order to carry out the reliability analysis, 3 months after the first observation, the analyst in charge of collecting the data recorded the information for a complete set ($N = 68$ points) of the study sample. The analysis was carried out for the following variables: point duration, type of team, type of match and shots per point, which were the ones recorded by the observer, the rest of the variables in this study were automatically calculated from these variables. To verify the reliability of the duration of the points, heteroscedasticity was checked using the Spearman correlation coefficient and the intraclass correlation coefficient was calculated, obtaining a very high reliability ($\rho = 0.98$; ICC = 0.99). The Kappa test was used to check the reliability of the team type, match type and points per point variables, obtaining very good reliability for all the variables (Altman, 1990).

2.4. Statistical analysis

The SPSS 26.0 program (Chicago, Illinois, USA) was used for the statistical analysis. The descriptive analysis included the mean, median, standard deviation, minimum and maximum. The normality and homogeneity of the variances were verified using the Kolmogorov–Smirnov test and the Levene test, obtaining deviations from normality and non-homogeneous variances, so non-parametric tests were used. The Mann–Whitney U test was performed to check the differences according to the types of teams. The level of significance was established at a value of 0.05 or less. The Kruskal–Wallis test was used to check if there were differences depending on the type of team. The level of significance was established at a value of 0.05 or less. Subsequently, to perform pairwise comparisons, the Mann–Whitney U test was used with the Bonferroni correction, setting the significance level to a value of 0.01 or less. For all comparisons, the size of the effect was calculated using Cohen d. Small effect values were considered less than 0.2, medium effect values were considered less than 0.5 and a high effect values were considered less than 0.8 (Cohen, 1988).

3. Results

3.1. Time characteristics of doubles tennis

Table 1 shows the main descriptive variables of the time structure of doubles tennis, including the duration of the match, set, match tie-break, tie-break, game and point, shots per point, active and passive times, effective playing time, work/rest ratio and hitting frequency.

3.2. Time characteristics of the points depending on the type of winning and losing teams

The time characteristics of the points based on the winning and losing teams are shown in Table 2. As can be seen, in general, the points won by regular teams had shorter durations and fewer shots per point. Specifically, the points won by new teams against regular teams had a significantly greater duration than points won by regular teams against regular teams ($z = 5.34$; $p < 0.01$; $d = 0.3$), regular teams against new teams ($z = 3.76$; $p < 0.01$; $d = 0.3$) and new teams against new teams ($z = 3.90$; $p < 0.01$; $d = 0.3$). Similarly, as regards the number of shots, the points won by new teams against regular teams had a significantly greater number of shots than points won by regular teams against regular teams ($z = 4.98$; $p < 0.01$; $d = 0.3$), regular teams against new teams ($z = 3.62$; $p < 0.01$; $d = 0.3$) and new teams against new teams ($z = 3.70$; $p < 0.01$; $d = 0.2$). Regarding the hitting frequency, no differences were observed ($z = 6.50$; $p = 0.08$; $d = 0.09$).

Table 1. Descriptive variables of the time structure of doubles tennis.

Variables	M (Dt)	Mn	Min	Max
Duration of the match (min)	79.4 (7.2)	77.1	59.4	107
Duration of the set (min)	35.8 (8.3)	34.5	19.6	50.4
Duration of the match tie-break (min)	9.9 (2.5)	10.5	5.1	13.1
Duration of the tie-break (min)	7.4 (2.3)	6.6	5	10.1
Duration of the game (min)	2.3 (0.8)	2.2	0.9	4.8
Duration of the point (s)	3.45 (2.91)	2.47	0	26.35
Shots per point	3.4 (2.3)	3	1	18
Active time of the game (s)	18.17 (9.14)	16.32	4.92	59.89
Passive time of the game (s)	120.19 (48.49)	114.19	43.8	262.72
Effective playing time (%)	0.16 (0.07)	0.14	0.03	0.52
Work/rest ratio	1: 6.6	1: 7	1: 30.2	1: 1.9
Frequency of rallies (shots/s)	1.06 (0.37)	1.01	0.06	3. 49

Table 2. Characteristics of the points depending on the type of winning and losing teams.

Variables	Regular won vs. Regular (RwR)	Regular won vs. New (RwN)	New won vs. Regular (NwR)	New won vs. New (NwN)	p	d
Point duration	3.44(2.85)*	3.48(2.55)+	4.47(3.44)* +^	3.65(2.80)^	<0.01	0.14
Shots per point	3.36(2.26)*	3.35(2.07)+	4.09(2.59)* +^	3.55(2.32)^	<0.01	0.11
Hitting frequency	1.07(0.30)	1.07(0.33)	1.01(0.25)	1.06(0.33)	=0.08	0.09

*Significant differences between RwR and NwR ($p < 0.01$); +Significant differences between RwN and NwR ($p < 0.0 1$); ^Significant differences between NwR and NwN ($p < 0.01$).

3.3. Time characteristics of the points depending on the type of match

Table 3 shows the time characteristics of the points depending on the type of match. The duration of the points was significantly longer in those matches where two new teams played each other than in those matches where two regular teams played each other ($Z = 5.34$; $p < 0.01$; $d = 0.3$) or a regular team played a new one ($Z = 4.19$; $p < 0.01$; $d = 0.24$). Similarly, in games where two new teams played each other, the number of shots per point was higher than in games where two regular teams faced each other ($Z = 4.98$; $p < 0.01$; $d = 0.27$) or a regular and new team ($Z = 4$; $p < 0.01$; $d = 0.22$). Regarding the hitting frequency, although the pairwise comparisons did not show significant differences, a trend was observed indicating that in the matches where two new teams played each other, the hitting frequency was lower than in the matches in which two regular teams played each other ($z = 2.56$; $p = 0.01$; $d = 0.15$) or in which one regular team played one new team ($z = 2.06$; $p = 0.04$; $d = 0.12$).

4. Discussion

Knowing the time structure of a sport is essential for the design and planning of training (D. G. T. Torres-Luque et al., 2014). In fact, many previous studies have focused on describing the variables that determine the time structure in singles tennis and, in addition, relating them to variables such as surface (Fernández-García et al., 2019; O'Donoghue & Ingram, 2001), gender (Martin et al., 2011) or playing level (Fernández-Fernández et al., 2009). However, despite the importance and tradition of the doubles game and its specific rule characteristics, only a previous study was found that provided information related to the structure of the game doubles (Martínez-Gallego et al., 2019). The present study is the first to provide data based on a notational analysis, related to time aspects of doubles tennis and, in addition, to analyse how the experience of teams affects these aspects. As per the descriptive variables in this study, all of the ones related to the duration had lower values than those found in previous studies that analysed singles tennis. Regarding the variables related to work density, the results in this study indicated that, the density in the doubles discipline is notably lower than in the singles game. As per the data found on the winning teams, it was observed that the regular teams used less time and needed fewer points to win points that the new teams. Finally, the results related to the type of match showed that, the matches in which two new teams played each other, the duration of the points and the number of shots per point were greater as compared to the other two types of matches. In addition, a trend was observed which indicated that the shot frequency in matches in which two new teams played each other was lower than that of the other types of matches.

Table 3. Point characteristics depending on the type of match.

Variables	Regular vs. Regular	Regular vs. New	New vs. New	p	d
Point duration	3.28 (2.87) [+]	3.41 (2.76) [^]	4.40 (3.46) [+][^]	<0.01	0.22
Shots per point	3.25 (2.26) [+]	3.37 (2.25) [^]	4.04 (2.60) [+][^]	<0.01	0.20
Hitting frequency	1.07 (0.30)	1.07 (0.33)	1 (0.25)	<0.05	0.09

[+]Significant differences between Regular vs. Regular and New vs. New ($p < 0.0$ 1); [^] Significant differences between Regular vs. New and New vs. New ($p < 0.0$ 1).

4.1. Time characteristics of doubles tennis

As previously stated, no previous studies have been found that have provided information related to time variables in the doubles game. Therefore, the results found in this study will be discussed based on the data found in research on the singles game.

In relation to the duration of the matches, previous studies that have analysed singles professional matches on hard courts played to the best of three sets, have reported average durations that vary between 101,27 and 119,36 min (Fernández-García et al., 2019; Hornery et al., 2007; Kilit et al., 2018), which are considerably higher than the 79.4 min that were found in the doubles game in this study. As previously indicated, and will be elaborated, the sets, games and points durations in the doubles game were lower than those of the singles game, it seems clear that the match times were also lower. In addition, it is very important to remember that, when the doubles match is one set all, a match tie-break is played, and considering that the average duration of a match tie-break (9.9 min) is much shorter than a normal set (35.8 min), it is logical to conclude that the match duration in doubles is significantly shorter than in singles. In the same way, when comparing the average duration of sets in doubles with the duration of professional singles matches on hard courts, with these ranging from 40 and 47 min (Blanca-Torres et al., 2019; Martínez-Gallego, 2012), this is again lower in the doubles game than in singles.

Regarding the duration of the games, in singles professional matches on hard courts, values were found to be slightly under 5 min (Martínez-Gallego, 2012), which are twice as long as that of doubles (2.3 min). This is mainly caused by two factors, the short duration of the points, which will be discussed below, and the "no-ad" rule, which significantly reduces the number of points played by game (Martínez-Gallego et al., 2019).

As per the duration of the points, in doubles, it was shown an average value of 3.5 s, which is well below to the point duration in singles matches at this level on hard courts, where the values ranged from 5 to 7 s (Hornery et al., 2007; Kilit et al., 2018; O'Donoghue & Ingram, 2001). These results confirm, as stated by Martínez-Gallego et al. (2019) that in doubles, where the serve has a great importance and allows many points to be finished quickly, more offensive strategies than in singles are used. This, in addition, is confirmed with the value of the mean of shots per point (3.4) that coincides with the value found by Martínez-Gallego et al. (2019) and which is less than the values found in singles matches, which vary between 3.9 and 4.7 shots per point (Hornery et al., 2007; Kilit et al., 2016).

Due to the fact that the duration of the points in doubles was less than in singles, and considering that the rules establish the same rest time between points for both singles and doubles (Association of Tennis Professionals, 2020b), it is logical to think that the density of the game in doubles (1: 6.6) was also lower than that of singles (1:3) (Kilit et al., 2016; Martínez-Gallego et al., 2013).

Regarding the frequency of rallies, since teams in doubles use more offensive game styles and the number of shots played at the net is higher in doubles than in singles (Crespo & Miley, 1998; Martínez-Gallego et al., 2019), it is logical to understand that the shot frequency found in this study (1.06 shots/s) was greater than that found in studies that analysed the singles game, where values of 44 shots/m (0.7 shots/s) were found (Morante & Brotherhood, 2005).

4.2. Time characteristics of the points depending on the type of winning and losing teams

The results found in this study indicated that new teams used more time and more shots to win points than regular teams, especially in points won by new teams against regular teams. These results showed that, as it was stated in earlier studies (Blickensderfer et al., 2010), the experience of the doubles teams has an influence in their performance. Specifically, it has been found that teams that played more often together showed better implicit coordination, higher values of shared knowledge (Blickensderfer et al., 2010) and achieved a better performance by being more effective (Reynolds & Blickensderfer, 2014) than those who were newer. Furthermore, the winning teams showed greater and more homogeneous verbal communication (Lausic et al., 2009), and used non-verbal indicators more efficiently (Lausic et al., 2015) than the losing teams. On the other hand, it should be noted that doubles teams can use different tactical variations and formations even before the start of the point, since most of these are related to the position of the player at the net (Carboch et al., 2020). Therefore, it seems logical that the players of the regular teams showed better coordination and mutual knowledge, had more resources and were more efficient at the start of the points and, therefore, won a greater number of points using less time and fewer shots than the newer teams. Also, even when regular teams lost points against new teams, they forced the opponents to use more shots and more time to win the point.

4.3. Time characteristics of the points depending on the type of match

Regarding the time characteristics of the points depending on the type of match, it was found that, in those matches where new teams played each other, the duration of the points and the number of shots per point was greater than in the other types of matches. The reason for this could be that newer teams were less effective since they showed less coordination and mutual understanding (Blickensderfer et al., 2010), so they could take fewer risks and had more difficulty in finishing the points. This means that in matches where two new teams played each other, the points lasted longer and a greater number of shots were played per point. Moreover, it is interesting to note that in this type of matches it was found a trend which indicated that the rally frequency was lower than in the other type of matches. This confirmed that indeed, the tempo is slower since teams use more conservative strategies, which are characterised by lower ball speeds and a greater number of shots played from defensive or neutral positions (Crespo & Miley, 1998).

5. Conclusion

This is a seminal study in the provision of information on the time structure of the doubles game in tennis. Doubles tennis showed mean values of the duration of matches, sets, games and points which were significantly lower than those of the singles game, as well as a lower work/rest ratio and a higher rally frequency. These differences between doubles and singles play seem to be caused by the different scoring systems, the greater number of players on the court in doubles and the tactics used by them. In addition, the type of winning team influenced the time structure of the points, with the new teams

being those who needed more time and more shots to win the points, especially when they faced regular teams. The fact that regular teams can have a better knowledge, coordination and communication seem to be decisive. Finally, differences were also found regarding the type of match, where it was found that, when two new teams played each other, the duration of the points and the number of shots were greater than in the other types of matches. These results indicated that these types of teams took fewer risks and used less offensive game strategies than the regular teams.

The information provided in this article may be of considerable interest to coaches and trainers when planning and designing training sessions and competitive schedules that should be tailored to the specific demands of the doubles game. In addition, it shows how the experience of the teams influences the time structure of the points, so this variable should be considered when selecting doubles teams for competitions and preparing game strategies for doubles matches.

Finally, for future research, it is recommended to study in depth how the different technical and tactical aspects may influence the time characteristics of the doubles game. In addition, it would be of interest to know the various doubles-specific tactical patterns that allow regular teams to be more efficient and spend less time wining points than new teams.

Disclosure statement

No potential conflict of interest was reported by the authors.

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