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European Journal of Sport Science
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t714592354

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Online publication date: 17 January 2011

To cite this Article Torres-Luque, Gema , Cabello-Manrique, David , Hernández-García, Raquel and Garatachea, Nuria(2011) 'An analysis of competition in young tennis players', European Journal of Sport Science, 11: 1, 39 — 43
To link to this Article: DOI: 10.1080/17461391003770533
URL: http://dx.doi.org/10.1080/17461391003770533

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European Journal of Sport Science, January 2011; 11(1): 39–43

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ORIGINAL ARTICLE

An analysis of competition in young tennis players

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Abstract

The aim of this study was to analyse the temporal structure of individual tennis play on hard courts in adolescence. Thirty-two national-level tennis players (16 females, 16 males) participated in the study (age 15.6 ± 0.9 years, weight 61.7 ± 1.4 kg, height 1.70 ± 0.14 m). All participants played an official competition on hard courts and with the same type of balls. Games were recorded for later analysis of total play time, real play time, and resting time, both in absolute values and as a percentage of total time. The average duration of a point and the number of strokes per rally were also determined. Results showed no differences based on gender, with a total play time of 105.00 ± 20.00 min, real play time of 31.50 ± 5.83 min, and resting time of 73.5 ± 8.50 min. The ratio of work to resting time was 1:2.7, the number of strokes per rally was 5.12 ± 0.17, and a point lasted an average of 9.08 ± 0.60 s. Our results show the importance of keeping in mind the technical evolution of players at this age, with the goal of reaching maximum athletic performance. The adolescent players showed approximately the same number of strokes per rally, but with a greater average duration compared with adult elite athletes.

Keywords: *Tennis, competition, adolescents*

Introduction

Like badminton (Cabello, 2005; Cabello, Tobar, Puga, & Delgado, 1997), tennis is an intermittent sport, with repetitive short actions of moderate and high intensity (Kovacs, 2007). The temporal structure of such sports sees alternations in periods of work and rest, which results in a high number of plays and game actions representative of the competitive load both quantitatively and qualitatively.

The length of a tennis match varies from 1 to 5 h. Most matches are played best of three sets, with the average duration being 1.5 h (Bergeron et al., 1995; Kovacs, 2007; Torres-Luque, Cabello, & Carrasco, 2004). When matches are played best of five sets, they can last 5 h (Christmass, Richmond, Cable, Arthur, & Hartmann, 1998; Hornery, Farrow, Mújika, & Young, 2007).

One of the unique characteristics of tennis is the playing surface, which, depending on the competition can be hard, clay or grass. The rules also allow a 20-s break between points and a 90-s break between court changes (ITF, 2006). This means that the percentage of real play time is different in each match, between 16% and 26% of the total time (Christmass et al., 1998; Elliott, Dawson, & Pyke, 1985; Girard, Lattier, Micallef, & Millet, 2006; Kovacs, 2004; Reilly & Palmer, 1995; Schmitz, 1990; Smekal et al., 2001). These percentages are lower on clay, at around 16–18% (Fernandez, Fernandez-Garcia, & Mendez-Villanueva, 2005; Smekal et al., 2001), while on hard surfaces they are about 23–26% (Christmass et al., 1998; Elliott et al., 1985). Previous research reported a percentage of about 21% (Fernandez-Fernandez, Mendez-Villanueva, Fernandez-Garcia, & Terrados, 2007, Fernandez-Fernandez, Sanz, Fernandez-Garcia & Mendez-Villanueva, 2008; Mendez-Villanueva et al., 2007), revealing a small difference from nowadays, in line with the technical/tactical evolution of tennis play. Bernardini and colleagues (Bernardini, De Vito, Falvo, Marino, & Montellanco, 1998) observed that on clay courts, real game time varied in relation to game style, as attacking players

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ISSN 1746-1391 print/ISSN 1536-7290 online © 2011 European College of Sport Science
DOI: 10.1080/17461391003770533

recorded real play time values of about 21% of total time compared with 38% for baseline players. These times give a ratio of work time to resting time of about 1:2 to 1:4 (Christmass et al., 1998; Elliott et al., 1985; Fernandez-Fernandez et al., 2008; Kovacs, 2004, 2007; Reilly & Palmer, 1995; Schmitz, 1990; Smekal et al., 2001).

The duration of the rally is also variable, between 6 and 10 s, and times are lower on fast courts and grass courts than on clay courts (Fernandez-Fernandez et al., 2007, 2008; Hornery et al., 2007; O'Donoghue & Ingram, 2001; Reilly & Palmer, 1995; Smekal et al., 2001). If we consider elite tennis players on clay, the duration of the rally is significantly longer in the women's than the men's game (7.2 s and 5.2 s, respectively) (Fernandez, Mendez-Villanueva, & Pluim, 2006).

The number of strokes per rally has rarely been determined, although it has been cited at around 3–5 strokes per rally on average (Girard & Mollet, 2004; O'Donoghue & Ingram, 2001; Smekal et al., 2001). Verlinden et al. (2004) reported that on a clay court (Roland Garros), the number of strokes per rally was 4.5 and 5.8 in the men's and women's game, respectively. On grass (Wimblendon), the number of strokes per rally was lower, 2.6 for males and 3.2 for females (Verlinden et al., 2004). More recent research has reported that the number of strokes per rally is tending to decrease, with values of about 2–3 strokes per rally in the men's and women's game respectively revealing the evolution of this sport (Fernandez-Fernandez et al., 2007, 2008; Mendez-Villanueva et al., 2007).

The analysis of the temporal structure of tennis play will depend on the type of competition, court surface, category, and level of play. There are few studies based on young tennis players.

Temporal structure has been studied in several sports, including basketball (Ibañez et al., 2008; Ortega, Giménez, & Olmedilla, 2008). The performance marks the interest of temporal structure, since it could contribute to the knowledge base of the sport and to setting specific training (Gómez, Lorenzo, Ortega, & Olmedilla, 2007; Sampaio, Ibañez, Gómez, Lorenzo, & Ortega, 2008).

The aim of this study was to analyse the temporal structure of individual tennis in adolescent players. We wished to contribute to a greater specialization in practice with the goal of reaching maximum athletic performance.

Methods

Participants

The sample consisted of 32 Spanish tennis players (16 males, 16 females), with an average age of 15.6 ± 0.9 years, weight of 61.7 ± 1.4 kg, and height of 1.70 ± 0.14 m. To participate, the following requirements had to be met: experience (minimum of 3 years of systematic tennis practice) and competition (minimum of 15 tournaments per season regionally or nationally). All of the participants were in the 15–16 years category and were among the top 30 tennis players of their respective sex. All participants received written permission from their coach to take part in this research.

All tennis players participated in an official regional competition in one of three regions of Spain within their scheduled competitions for the 15–16 years category, and all games were semi-finals or finals in each of the tournaments. All matches (16 matches, 8 men's and 8 women's) were played on outside hard tennis courts and began with new tennis balls. The temperature was $21 \pm 2^{\circ}$C with 40% relative humidity. The participants performed a 10–15 min warm-up before each match. The tennis matches were best of three tiebreak sets. Each player's water intake was recorded. Matches were recorded (SONY DCR-DVD92E) and analysed (Pinnacles Studio, version 11.1).

Measures

Analysis of all games was done following the methods of Anguera (2003). Total play time (from the beginning of the game when the first player serves until the last point ends), real play time (from the moment the player begins the technical motion until the line judge determines that the ball passes the limit of the court or the ball does not pass to the other court and touches the net), and resting time (from the end of the point until the player begins the next serve) were determined. Point duration, resting duration (rest time between points), number of stroke per rally, and number of points during the competition were also registered.

Statistical treatment of data was done using the SPSS software package for Windows (version 15.0). The data are presented as means and standard deviations. Comparison of variables between the different groups was done using the Kruskal-Wallis and Mann-Whitney tests (for independent samples).

Results

Table I show the mean values for total play time, real play time, and resting time in for the male and female tennis players. There were no statistically significant differences between the sexes.

In Table II, the percentages of real play time and resting time are shown in relation to total play time. The male tennis players had a real play time of $31.06 \pm 3.20\%$ and a resting time of $65.86 \pm 5.13\%$,

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Table I. Temporal structure of tennis play by gender (mean ± *s*)

	Total play time (min)	Real play time (min)	Resting time (min)
Males ($n=16$)	108.33 ± 16.11	33.65 ± 5.25	71.35 ± 10.56
Females ($n=16$)	99.66 ± 18.55	30.00 ± 5.93	69.66 ± 9.60
Total ($n=32$)	105.00 ± 20.00	31.50 ± 5.83	73.5 ± 8.50

Table II. Real play time and resting time as a percentage of total play time together with the rest-to-work ratio by gender (mean ± *s*)

	Real play time (%)	Resting time (%)	Work-to-rest ratio
Females ($n=16$)	31.06 ± 3.20	65.86 ± 5.13	1:2.2
Males ($n=16$)	30.10 ± 3.43	69.89 ± 4.95	1:2.5
Total ($n=32$)	31.50 ± 5.83	73.5 ± 6.49	1:2.7

while the female players had a real play time of 30.10 ± 3.43% and a resting time of 69.89 ± 4.95%. There were no significant differences between the sexes.

Table III shows average strokes per minute and average time per point throughout the game for the male and female tennis players. Male players had an average 5.45 ± 0.22 strokes per rally compared with 5.93 ± 0.12 strokes for females. This reflects a total of 223.83 ± 22.12 points for the males and 197.80 ± 18.65 points for the females. The average time per point was 9.02 ± 0.55 s for males and 9.10 ± 0.75 s for females. The average resting time between points was 19.12 ± 0.45 s for male players and 21.18 ± 0.30 s for female players, a difference that was not statistically significant (Table III).

Discussion

The games selected for study were played on hard courts during official competition. There were no statistically significant differences between the sexes in relation to total play time, real play time or resting time. Given the few studies that examined these parameters in adolescent players, we will compare our results with other populations. Total play time was approximately 105 min in our sample, which is in accordance with the times reported in other studies (Bergeron et al., 1995; Kovacs, 2007; Torres-Luque et al., 2004). A review published by Kovacs (2007) indicated a mean total play time of 90 min on hard courts. Play time is influenced by the type of tournament, age and competitive standard of the players.

Total play time is less than resting time, fundamentally due to the rules, which allow no more than 20 s between points and no more 90 s at change of ends (ITF, 2006). During the pauses between hitting the ball or a change of ends, tennis players think about the next point or next game. Real play time in the present study was approximately 34 min for male players and 30 min for female players, compared with 71 and 70 min of resting time, respectively (Table I). These differences are not statistically significant (Table I), and as a percentage of total time, these values represent about 30–31% for real play time and 65–70% for resting time, corroborating data from other research, although using samples from different categories and competitive standards (Christmass et al., 1998; Elliott et al., 1985; Kovacs, 2004; Reilly & Palmer, 1995; Schmitz, 1990; Smekal et al., 2001). On hard courts, these percentages are slightly lower compared with other research (23–26% of real play time) on national-level senior players and among players older than those in our sample (Christmass et al., 1998; Elliott et al., 1985).

Even in junior elite players, few studies show values around 21% on Greenset© court (Fernandez-Fernandez et al., 2007), highlighting the importance of the standard and category for the best planning in specific periods.

The work-to-rest ratio in the players as a whole evaluated in the present study, since there was no difference between the sexes, was approximately 1:2.7, which is in agreement with other authors who put this ratio between 1:2.5 and 1:3.5 on surfaces with the same characteristics as in our study (Christmass et al., 1998; Elliott et al., 1985; Fernandez et al., 2005; Kovacs, 2004; Reilly & Palmer, 1995; Schmitz, 1990; Smekal et al., 2001).

For average number of strokes per rally, we recorded an average of 5.45 ± 0.22 strokes per rally for male players and 5.93 ± 0.12 strokes per rally for female players, a difference that was not statistically significant (Table III). These values are in contrast to those of other authors, who reported average number of strokes per rally of between 5.1 and 5.3 on the same surface (Elliott et al., 1985; Reilly & Palmer, 1998; Verlinden et al., 2004). Research on elite players on clay courts reported an average of 2.7 strokes per

Table III. Number of rallies per game, number of strokes per rally, duration of rally, and resting time per rally (mean ± *s*)

	Rallies per game (*n*)	Strokes per rally (*n*)	Duration of rally (s)	Resting time per rally (s)
Females ($n=16$)	223.83 ± 22.12	5.45 ± 0.22	9.02 ± 0.55	19.12 ± 0.45
Males ($n=16$)	197.80 ± 18.65	5.93 ± 0.12	9.10 ± 0.75	21.18 ± 0.30
Total ($n=32$)	208.14 ± 26.47	5.12 ± 0.17	9.08 ± 0.60	20.56 ± 0.38

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rally (Fernandez-Fernandez et al., 2007; Mendez-Villanueva et al., 2007), again highlighting the differences between playing surfaces. In a study of 17-year-old female elite tennis players, Fernandez-Fernandez et al. (2007) reported 2.7 strokes per rally on a hard Greenset© court. Our results indicate a longer duration than that reported by Fernandez-Fernandez et al. in elite female players, indicating the changing temporal structure of the game. The number of stroke per rally is strongly related to the average duration of rallies. In our study, the average duration of rallies in men's play was 9.02 ± 0.55 strokes compared with 9.10 ± 0.75 strokes for women's play. These values are not significantly different (Table III). In other studies, and with different samples, differences between the sexes have been observed, with males having a shorter duration per rally (Mendez-Villanueva et al., 2007; O'Donoghue & Ingram, 2001; Verlinden et al., 2004). Professional male players were determined to take an average of 5.7 s per rally, compared with 6.2 s in females. This is revealing since if we contrast these data with our study, we observe an exchange of approximately 5 strokes per rally over an average of 9 s in adolescents, compared with the 5–6 strokes in 6 s in national and/or international tennis players. Adolescent players take approximately the same number of strokes but with a greater average duration than older, higher-level athletes. This shows the importance of the player's evolution and developmental characteristics, because stroke speed, opening angles, power, etc., are not the same in an elite athlete as in an adolescent athlete, which justifies the importance of the category in relation to the studied parameters. Furthermore, a statistically significant difference between types of plays has been determined, as offensive plays last less than defensive plays (Bernardini et al., 1998; Smekal et al., 2001).

A limitation of the present study was that the type of plays (offensive vs. defensive) was not evaluated and it could support a better understanding of the results.

From the point of view of the tennis coach, knowing the dynamics of competition is of vital importance in daily practice, and coaches should know the total play time, real play time, resting time, the number of exchanges, etc., since it is recommended to train based on individual characteristics and not on those of elite players, especially when development is not yet completed. Based on the results of the present study, specific training for adolescents should be oriented towards short durations and short resting times to develop specific tennis endurance. Although we have observed numerous similarities between adolescents and adults in this research, it might be more interesting to observe the origin of the few differences, including what happens in previous stages of training, with the objective of attaining new goals in the tennis player's progression.

In conclusion, the temporal structure of individual tennis play in relation to total play time, real play time, and resting time in adolescent players is not different between the sexes. The duration of competition is approximately 105 min with a work-to-rest ratio of 1:2 to 1:3. Real play time is about 31% of total play time. Finally, the temporal structure of individual tennis play in adolescent players playing on a hard surface is similar to that of players at higher levels, including the number of strokes per minute. However, in the case of adolescents, execution time is higher, which makes clear the important differences with respect to physical conditioning and technique development.

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