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Dynamics of players’ relative positioning during baseline rallies in tennis

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Abstract

This study analysed how the relative positioning of players on court influenced patterns of interpersonal coordination in baseline rallies in tennis. We developed a model (PA index) that assigns a weight to the position of each player on court and determines a positional advantage, based on the relative proportionality between the lateral and longitudinal displacement values during rallies. To test the model, data from 27 randomly-selected baseline rallies from three ATP World Tour matches (professional tennis players’ tournaments organized by Association of Tennis Professionals) on clay were analysed. Results revealed that the PA index of players on court described their interpersonal coordination dynamics during baseline rallies. It also identified the emergence of rally breaks in the interpersonal coordination patterns of competing dyads that led to a point being scored. Data suggest that positional advantage data may assist coaches in the design of training tasks to enhance players’ court coverage and performance during competitive interactions, acting as a valuable tool for performance analysis in tennis.

Keywords: interpersonal coordination, positional advantage, performance analysis, match dynamics, perturbations

Introduction

One of the main goals of sport performance analysis is to provide indicators that describe and explain players’ behaviours during competitive performance (Hughes & Bartlett, 2002). One issue that has attracted the attention of researchers to improve traditional performance analysis is the provision of theoretically-driven explanations of the dynamics of interactions between players (McGarry, 2009; Vilar, Araújo, Davids & Button, 2012). There have been some attempts to rationalise how actions emerge from the range of possible performance solutions offered by a competitive context (see, Araújo, Davids, Chow, & Passos, 2009). In this respect, the complex nature of competitive tennis has made it difficult to ascertain the relevant information sources in games that constrain performance during interactions between the players (Davids, Button, & Bennett, 2008). Identification of performance conditions that objectively characterise when a player leads an interaction is a key issue for game understanding and practice enhancement. A condition that determines which player is leading an interaction has been identified as his or her relative positioning on court (i.e., positional advantage) (see Crespo & Miley, 1998).

Ecological dynamics is a theoretical rationale showing that sports competitions evolve as a non-linear system based on continuous spatial-temporal interrelations between performers (Glazier, 2010; McGarry, 2009; Vilar et al., 2012). Functional behaviours, such as decisions and actions, of performers are considered to emerge from their ongoing interactions according to the ecological constraints of performance (for a detailed review see, Araújo et al., 2009). For example, in different sports the spatial-temporal coordination (interpersonal coordination) patterns between competing performer dyads have been revealed through analysis of a set of bio-physical variables, including relative: angles, distances and velocities between players (see Araújo, Davids, & Hristovski, 2006; McGarry, 2006; Passos,
Araújo, Davids, Gouveia et al., 2009; Travassos, Araújo, Vilar, & McGarry, 2011).

In tennis, spatial-temporal interactions of players have been considered through their oscillatory movements in relation to the central mark of the baseline, either to hit the ball or to defend space on court (Lames, 2006; Palut & Zanone, 2005). In this approach, these interactions have been regarded as identical to those observed in physical systems formed by components acting as two coupled, nonlinear oscillators. Interpersonal interactions emerging between competing tennis players have been analysed as a system of coupled oscillators using relative phase (Lames, 2006; Palut & Zanone, 2005). This measure captures the synchronisation in space and time of two agents or system components by quantifying the phase difference of their continuous oscillatory behaviours (see, Rosenblum, Pikovsky, Kurths, Schäfer, & Tass, 2001). This research approach by Palut and Zanone (2005) and Lames (2006) has revealed the existence of stable modes of synchronisation (ordered system states), which correspond to the individual players moving in the same (in-phase) or opposite directions (anti-phase) on court. As observed in other biological systems, stable modes of coordination into which systems tend to settle are considered “attractors” (Schmidt, O’Brien, & Sysko, 1999). The resistance of a system to change (due to a perturbation) expresses the strength of the stability of an attractor (Kelso & Engström, 2006).

Behavioural variability (e.g., the diversity of individual movements used to perform each stroke according to competitive demands) is viewed as an essential source of adaptability in system dynamics, rather than a source of undesirable noise (Kelso, 1995). When stable modes of interpersonal coordination are perturbed (i.e., fluctuations of agent behaviours in the dyadic system), different relations between players in a dyad may arise and stabilise (order-order transitions) or decay (order-disorder transitions). This means that, in a game of tennis, the instability originating from players' behaviours may lead to the emergence of new patterns of (interpersonal) coordination, characterised by equilibrium in the dyadic system. Alternatively, an unstable state of coordination may emerge when one of the players attempts to break an existing pattern of interpersonal coordination in order to win a point (i.e., rally break) (see also McGarry, Anderson, Wallace, Hughes & Franks, 2002).

The studies by Palut and Zanone (2005) and Lames (2006), despite recognising the importance of longitudinal displacement trajectories of competing players on court during performance, centred their analysis specifically on lateral displacement patterns, highlighting the apparent low levels of variability associated with the former. In competitive tennis, the efficacy of an attack that displaces an opponent laterally (known as “angle opening”), depends to a large extent on the distance of the opponent to the net. The farther away the opponent is from the baseline, the greater is the distance she/he has to run laterally to defend a position on court. From an ecological dynamics perspective, a full explanation of the players’ interpersonal interactions in a tennis rally should incorporate the dynamics of each player’s lateral and longitudinal displacement trajectories on court. For instance, in almost all competitive tennis games, the closer a player is to the central line or to the net, relative to an opponent, the greater is the positional advantage (see Figure 1) (see also Crespo & Miley, 1998). With different levels of positional advantage a different relation between competing players can emerge where one player commands the pace of a rally or wins the point (McGarry & Franks, 1996). In this sense, to better quantify positional advantage between players, a proportional measure is needed which incorporates the distance of both competitors relative to these spatial references (i.e., central line and net). Despite not considering the ball trajectory or the type of the stroke used by each player, this proposed measure might provide a better understanding of the dynamics of the game by identifying at any moment which player is best positioned to win the point (e.g., How Rafael Nadal positioned near the baseline moves an opponent away from the centre of the court and the baseline with his powerful topspin forehand).

The main goal of this study was to understand how the positioning of players relative to the central line of the court and the net constrained their spatial-temporal coordination in rallies from the baseline. We proposed a model that relates players’ lateral and longitudinal displacement trajectories and provides an evaluation of positional advantage according to their relative placement on court. Such an analysis might allow a player’s positional advantage over an opponent to be quantified as well determining the instant when a break emerges during a competitive rally. We hypothesised that positional advantage quantified by our model during competitive rallies might capture the interactions between players and explain eventual rally outcomes.

Methods

This study was conducted within the guidelines of the American Psychological Association and the protocol received approval from a local university ethics committee.

Data collection

Data were randomly selected from three matches in a database of matches on the central court of the
2008 ATP World Tour 250 (professional tennis players’ tournaments organized by Association of Tennis Professionals) in the Estoril Open, a tournament played on clay in Portugal. The movement displacements of the players during performance was captured by a digital video camera (Panasonic mini DV - NVG21E), placed in a superior plane at the central line of one end of the tennis court (parallel to the baseline) to cover the whole playing area (i.e., player 1 closest to the camera and player 2 farthest from the camera). Twenty-seven distinct rally sequences from the competitive matches were selected for analysis according to two basic criteria: (i) the point had to start with the players behind the baseline, with no obvious positional advantage for either of them (i.e., after a serve had been returned, when the two players were positioned behind the baseline and close to the central line); and (ii), existence of a shot (break shot) that changed the stability of players’ dyadic interactions with a point being scored. We excluded from analysis the part of the rally from the serve/return until the first selection criterion occurred. Two expert tennis coaches, blind to the aims of the study, independently performed the selection procedure based on the defined criteria. We obtained a percentage of agreement of coaches’ rallies selection of 98% and 100%, intra-observer, and of 96.2%, inter-observer, for the first criterion, and 100%, intra and inter-observer, for the second criterion (James, Taylor, & Stanley, 2007).

Data capture

Movements of the players during the selected rallies were digitised at 25 Hz using the TACTO 8.0 software (see, Duarte, Ferreira, Folgado, & Fernandes, 2010; Fernandes, Folgado, Duarte, & Malta, 2010) to obtain the virtual coordinates \((x, y)\) of the players’ positioning on court over time. The procedure consisted of following with a computer mouse the projection on the floor of the midpoint of the two feet of each player, during the course of each rally, frame by frame. The virtual coordinates (in pixels) of the position of the players on court were converted into real (metric) coordinates using the direct method of linear transformation (2D-DLT) (Abdel-Aziz & Karara, 1971). The 2D-DLT method relates a point located on the field and on the computer screen based on the previous definition of 9 non-collinear points clearly identified (for more details see (Duarte, Araújo, et al., 2010)). After that the data were smoothed with a 6 Hz filter (a Butterworth low-pass filter) (Winter, 2005). From the time series data we determined the distance of each player to the central line of the court \((dcl)\) and to the net \((dn)\). Lateral displacements of players on court corresponded to the \(x\)-axis, and the longitudinal displacements corresponded to the \(y\)-axis (see Figure 1).

Modelling players’ positional advantage during a rally

We developed a model to explain how the interactions between players may be constrained by their relative positioning on court. This model considers each player’s positioning in relation to key spatial referents: the central line of the court and the net. In line with previous work (e.g., Greenwood, Davids, & Renshaw, 2012), the model was predicated on the experiential knowledge acquired in a short semi-structured interview with four expert coaches \((M = 15, s = 3.6\) years of practice as coaches of professional tennis players). All the elite coaches clearly expressed that the information they used to understand players’ positional advantage over the game is the momentary positioning of each player in relation to the central line of the court and the net.

Given the rules of the game (i.e., in a rally from the baseline, as the ball bounces on the court surface before the stroke, the players mostly placed behind the baseline) and the geometry of the court (i.e., the distance from the baseline to the net is twice the distance from the central line to the sideline), the relationship between the distance of a player from these spatial referents and positional advantage is not
linear. At a critical value of this distance, any small variation may have a significant impact on the dynamics of the interactions by augmenting or reducing positional advantage of an individual player. Furthermore, these game conditions require a relation of proportionality between lateral and longitudinal displacements that should be taken into account mainly in analyses of rallies from the baseline. Based on the idea of dividing the court into different zones (see Schönborn, 1999), it is thus possible to conceive that certain locations on court, at distinct distances to the central line and the net, express similar possibilities for gaining positional advantage of an individual player during a rally. According to the opinion of the expert coaches, one possibility for modelling players’ positional advantages during the rallies could be by identifying on court equal positional values. In this way, any position occupied by a player on court matches an associated positional value. Thereby, we proposed a model assigning a relative weight to the position of each player on court. This approach was based on a relation between the squares of the lateral and longitudinal displacement values relative respectively, to the central line and the net. Therefore, we included a weighting proportion of 2:1 between the distance values of each player to the central line and to the net in this model. Players’ positioning (P) in the playing area can thus be expressed by the following equation:

\[ P_{(x,y)} = (2'd_{cl})^2 + d_{n}^2 \]  

(1)

where, dcl is the distance to the central line (x component) and dn is the distance to the net (y component).

In the model, equal values of \( P_{(x,y)} \) represent equal values of positional advantage. For each value of \( P \), the equation can be represented by an ellipse (see Figure 2), centred in the middle of the court, with a major semi-axis along the central line and minor semi-axis along the net. These semi-axes display a symmetry on both sides of the central line and also, with the other side of the court. The size of both semi-axes are dependent on \( P_{(x,y)} \). The major semi-axis will have the value of \( (P_{(x,y)})^{1/2} \) and the minor semi-axis the value of \( (P_{(x,y)}/4)^{1/2} \). Lower values of \( P_{(x,y)} \), will move the ellipse closer to the net.

As observed in Figure 2, elliptic curves of equal positional value grow tighter as the players approach the net, aligned with changes in positional values. As they move towards the central line, they have to move away from the net in a proportional way. This relation of proportion contributed to enhance the sensitivity of the model to capture the dynamics of the positional relations between players over time.

By comparing the position \( P \) of each player through the computation of the difference between player 1 (\( P_{Pl1} \)) and player 2 (\( P_{Pl2} \)) over time, it was possible to quantify the dynamics of positional advantage/disadvantage during the rallies. Then the positional advantage difference between the two players can be calculated by the following equation:

\[ \text{PA index} = \frac{((2'd_{clP1})^2 + d_{nP1}^2)}{(2'd_{clP2})^2 + d_{nP2}^2} \]  

(2)

**Data analysis**

The dynamics of the rallies were initially evaluated through visual inspection, relating the graphic
representation of the positional advantage (PA) produced by the model with data on the players’ relative positioning as observed on the video recording of performance. To understand if the PA index adequately described the relative positioning of the players during the rallies, we compared the positional advantage shown by the PA (obtained with the model) with the experts’ perceptions of each player’s positional advantage in 15 randomly chosen situations in which players were located in different positions on court (via still images of performance). This comparison verified that the expert coaches’ opinions about which player held the positional advantage on court coincided with the PA index value obtained from the model in all the situations that were assessed (100% coincidence).

The breaks in all the rallies were analysed with descriptive statistics such as the mean, standard deviation, magnitude of PA (maximum and minimum values of PA index), and the PA range, (i.e., difference between the maximum values of PA after the break shot and the values at the moment of break shot). To evaluate the reliability of the model to discriminate the rally breaks, the time series were synchronised with the stroke responsible for the rupture (break shot) identified by the expert tennis coaches. The variability of positional advantage values between rallies, was analysed before and after the occurrence of a break shot through the calculation of the mean and standard deviation corresponding to each position (data point) in the set of analysed rallies, represented in the shape of a band (average band, James, 2004).

Since the variability of the players’ interpersonal coordination tendencies is a function of both attractor strength (λ) and the magnitude (Q) of the stochastic noise that continuously operates to perturb the system (see, Richardson, Lopresti-Goodman, Mancini, Kay, & Schmidt, 2008; Schönler, Haken, & Kelso, 1986), we applied nonlinear Recurrence Quantification Analysis (RQA) to the PA index values before and after the break shot (cf., Pellecchia, Shockley, & Turvey, 2005; Shockley & Turvey, 2005). This method involves embedding a pair of time series in a higher-dimensional, time-delayed embedding space (Abarbanel, 1996; Takens, 1981), which permits the reconstruction of the phase space of the time series (for a detailed review, see Shockley, 2005; Shockley, Butwill, Zbilut, & Webber, 2002; Webber & Zbilut, 2005; Zbilut, Giuliani, & Webber, 1998). Following the studies by Richardson et al. (2008), and Shockley and Turvey (2005), we used the percentage of data points that are recurrent (%REC) to understand the influence of the amount of noise that disturbs the system (Q). We also used the longest parallel trajectory of consecutive recurrent points (MAXLINE) to evaluate the strength of the attractor and the stability of the time series (λ). We individually selected the RQA input parameters for each time series (cf. Abarbanel, 1996) due to the short length of some time series (i.e., a minimum of 70 points). To carry out this analysis MatLab routines, specifically designed for this purpose, were used.

For statistical purposes, the data distributions of the PA index (mean values and standard deviation), % REC and MAXLINE were evaluated for assumptions of normality and homogeneity. All comparisons between moments before and after the break shot were made through the Wilcoxon signed rank test.

Reliability

One of the 27 rallies analysed was selected at random to attest the accuracy and the reliability of the digitisation process through the technical error of measurement (TEM) and coefficient of reliability (R) (Goto & Mascie-Taylor, 2007). The TEM revealed values in the x component of 0.02 metres (0.16%) and of 0.06 metres (0.47%), and in the y component of 0.01 metres (0.15%) and 0.12 metres (0.33%), in the positions of player 1 and player 2, respectively. The coefficients of reliability found in both components of the two players were above $R = 0.998$.

Results

Dynamics of interpersonal interactions and identification of rally breaks

In this section we present the dynamics of positional advantage that results from the interpersonal interaction between players, as well as the abrupt transitions that emerge in these interactions, that we call rally breaks, as expressed by the PA index. Based on the computation of our model when the PA index displayed negative values, the advantage was with the player closest to the camera (Pl1), and when PA index assumed positive values, the positional advantage was with the player farthest from the camera (Pl2). As an exemplar rally, Figure 3 reveals the dynamics of positional advantage between players. In this exemplar rally, the positional advantage was initially with Pl1, until second 12. From this moment on, Pl2 recovered from this disadvantageous position near second 15 and created a positional advantage (PA > 200) from which the point was obtained. The vertical line signalled the break shot identified by the expert coaches, which induced a rupture in the players’ interactions.
In order to better understand the emergence of rally breaks, as indicated by the expert coaches, the values of the PA index for the specific moments of the emergence of the dynamics of positional advantage were analysed. On average, the magnitude of PA in the rally breaks was 176.5 ± 54.3 m², with a maximum of 286 m² and a minimum of 99 m². The PA magnitude reached values above 120 m² in 89% of the rally breaks, and the variation of the PA index (the PA range), was greater than 100 m² in 85% of the rallies analysed. The mean value of PA at the moment of an opponent’s return to the break shot was 74.9 ± 54.4 m², with values larger than 40 m² in 81.5% of the situations. As observed in Figure 3, the initial positional advantage of Pl1 reached a critical value (according to the mean values presented previously) near second 12 of the performance timeline. After the break shot identified by the expert coaches (second 14.3) we observed a large increase in the PA index to values close to 200 m² that represents a rupture in the players’ ongoing interactions. We also noted in this example a PA range greater than 30 m².

**Characterisation of rally breaks in the dynamics of positional advantage between players**

To characterise the rally breaks in interpersonal dynamics between players, the average and standard deviation of the PA index were represented as an average band plus and minus standard deviation over time. The results revealed that, shortly after the break shot (represented by the vertical line), a sudden variation of PA index of 40 m² of the positional advantage values occurred (see second 20). This variation shows that a rally break occurred in the interactions of the dyad and that from that instant onwards it was being driven by one of the players (Figure 4).

Significant differences were found between the mean values of the PA index ($Z = -4.99, P < 0.001$) and of the standard deviation ($Z = -3.93, P < 0.001$) before and after the break shot, showing that the PA index captured the disturbance that moved interpersonal relations to the new organisational state. Furthermore, the regularity of the time series ($%REC$) data was significantly higher after the break shot ($Z = 2.42; P < 0.05$). Conversely, the longest trajectory of consecutive recurrent points (MAXLINE) decreased significantly after the break shot ($Z = 2.76; P < 0.01$; see Figure 5).

**Discussion**

The main goal of this study was to analyse the effects of the players’ relative positioning on court on their spatial-temporal coordination in rallies from the baseline. For that purpose, we designed a model that quantified positional advantage through the comparison of the weights assigned to the positioning of each player in relation to two fundamental spatial referents: the central line and the net. Generally, results showed that the proposed model successfully captured the positional advantage by considering the relative position of the players on court, based on a proportionality between their lateral and longitudinal displacements. Analysis of the dynamics of the interaction between players showed that, if both players maintained a similar spatial relation with the central line and with the net, their PA index was close to zero and their relation was stable. Accordingly, the positional disadvantage of one...
player would increase when he moved away from the central line and/or the net to hit the ball and at the same time the opponent recovered a central position on court. When the PA index oscillated far from zero, the players’ interpersonal relations were not stable (i.e., one player was pressing the other, see seconds 11 and 16 in exemplar trial at Figure 3). It seems that both players may have been exploring the landscape of opportunities to gain a positional advantage over each other. At a critical value of PA, an abrupt change in the coordination mode would occur, when one of the players occupied a position on court relative to the opponent, allowing him to lead the system’s interactions into another state of organisation, by constraining the opponent’s displacement tendencies (McGarry & Franks, 1996). In this sense, the PA index has built on previous research by supporting quantification and interpretation of the dynamical interaction tendencies between players based on their spatial-temporal configuration on court during rallies. Possibly, the PA index may have represented the spatial-temporal information used by the players to regulate their actions during performance (Vilar et al., 2012). Players may have explored the landscape of opportunities for action constrained by their positioning relative to the central line and the net, in relation to the opponent (i.e., relative position on court) (Araújo et al., 2009; Marsh, Richardson, Baron, & Schmidt, 2006).

For example, a player may hit the ball with more power to conclude the rally or move the opponent laterally, play the ball high and deep in the middle of the court or attempt a passing shot, according to the evolving position of him/herself and an opponent on court (Lames, 2006; Palut & Zanone, 2005). By using the PA index it is possible to capture the balance and alternations in the positional advantage between players, to capture the best positioned player (supposedly leading the interaction), and to capture players’ capabilities to create (attack), nullify (defend) or reverse these advantages (counter attack).

In addition to describing the players’ interaction tendencies, our results revealed that the PA index permitted a characterisation of rally breaks in ongoing interpersonal dynamics during performance. The PA index values observed at the moment of an opponent’s return to the break shot, in addition with the PA range value, suggested that with a PA index of 40 m² and a PA range of 30 m² the emergence of a rally break is likely to occur. That is, in a critical region from these values onwards, the players’ spatial-temporal relations tend to become unstable, which forces the system to evolve to a new state of organisation, as observed in previous research in different sports (e.g., Araújo et al., 2006; Passos, Araújo, Davids, Milho, & Gouveia, 2009). After the break shot, the PA index values assumed high levels, revealing that the positional advantage was significantly greater. Importantly, the model identified rally breaks from the baseline in the same way that expert coaches did. The possibility to identify and objectively quantify perturbations during competitive performance, based on the positional advantage between players, is also an aspect that has never been reported in previous studies of competitive tennis.

On the characterisation of ruptures in interpersonal dynamics of players during performance, recurrence analysis of the time series of players’ positional advantage conveyed significant differences before and after the break shot; the PA index became significantly more regular (>%REC) and temporally less stable (< MAXLINE). In line with the previous work in squash (McGarry & Franks, 1996) this observation indicates that the spatial-temporal interactions of the players had changed under the constraint of the break shot. Following previous research on social interactions (e.g., Richardson et al., 2008; Shockley & Turvey, 2005), our results suggested that the increase in variability is due to a decrease in the strength of the attractor (MAXLINE) and not to an increase of the underlying noise (%REC). A possible explanation for this increase in the regularity of the patterns of interpersonal coordination could be the narrowing of the possibilities...
of the players’ action after the break shot, where an ultimate solution for goal-achievement may have emerged (Araújo et al., 2006). For example, if a player moves to the net, after an approach shot, the opponent has fewer possibilities for action because of the reduction of time and space available to hit the ball. In this situation, the opponent could only perform a passing shot, a lob or force the volley. On the other hand, less temporal stability after the break shot may express a decrease in the attractor strength. In this case, the system may have transited to a less stable state of order due to the change in the spatial-temporal interactions, related with greater positional advantage of one of the players (McGarry et al., 2002). As expected we verified that instabilities in the competing players’ interactions may result in the emergence of a new state of system organisation, which in our case determined the results of the rally. Identifying and quantifying perturbations in the interactions between players is also an aspect that has never been reported in previous studies in tennis.

Therefore, further research is needed to define the critical values of reference for the PA index and establish a relation between those values and certain match conditions. An interesting topic for the future, with implications for performance analysis and for the training process, is the identification of individual profiles of play for different players, or “invariant athletic behaviours”, as proposed by McGarry and Franks (1996). The identification of the individual profiles of play using the PA index may also reflect the strategies of play used by each player under specific game conditions, as well as their critical values of reference for the PA index. This observation implies applications of the model to a larger number of rallies between a player and different opponents and between different players. Our model was able to evaluate the effects of the players’ hitting actions through analysis of their displacement trajectories, relative to the central line and the net. However, the ball trajectory and the identification of the player who is hitting the ball should be considered in further research to improve the accuracy of the model.

**Practical applications**

Since the PA index allowed us to quantify the positional advantage of the players, it may be regarded as an important tool in the analysis of the players’ performance in tennis at the level of diagnosis, prescription and control of training exercises. Concerning performance diagnosis in tennis, if the mean value of the PA index, associated with the rally breaks, is below the PA critical value it could imply that a player’s displacement ability on court (court coverage) needs to be improved. The PA Index could also help coaches to understand which type of dynamics is more often used by players, for game preparation, for instance. This information could also help coaches to design more appropriate training tasks and enhance players’ performance. For example, a common training procedure that is typically not evidence-based, is to scale areas on court to invite players to explore possibilities for rally breaks according to the relative positioning of an opponent on court. Different areas on court may be designed that indicate a percentage of positional advantage in relation to a given referential (e.g., 20%). This referential, expressed by an ellipse, could represent neutral positioning, where players could pursue stable states of interaction with the opponent, or advantageous positioning, where players could achieve dominance states in relation to the opponent (see example in Figure 6).

The PA index may also play an important role in the evaluation of the effect of the training process that is being implemented, by monitoring changes over time in the critical values of the PA index. In short, the PA index may be a
valuable tool in the dynamic analysis of interaction in tennis.

In summary, this study showed that in competitive tennis, the relative positioning of players on the court constrained the dynamics of their performance. In addition, through the quantification of positional advantage, it was possible to identify and describe the emergence of rally breaks which led to the point being scored.

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