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Research article

Tactical determinants of setting zone in elite men's volleyball

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Abstract
The interactions between two opposing teams lead to the emergence of unique game patterns. In volleyball, attack efficacy emerges as the strongest predictor of the final result and thus it becomes of foremost importance to understand which game patterns afford the attaining of higher attack efficacies. These rely on the quality of the setting action. In turn, the serve and the serve reception constrain the setter's actions and the attacker's efficacy. Therefore, the purpose of this study was to examine predictors of the setting zone in elite-level men's volleyball. Thirty-one matches of the 2007 World Cup were analyzed, in total 5117 rallies. The dependent variable was the *setting zone*, and the independent variables were the *server player*, *serve type*, *serve direction*, *serve depth*, *reception zone*, *receiver player* and *reception type*. Multinomial logistic regression was applied, in order to obtain the estimated likelihood of occurrence of the dependent variable, based on the values of the independent variables ($p \leq 0.05$). Only the serve direction showed not to be predictive of the setting zone. Concerning the remaining variables, the tennis jump serve, serves from the middle-player, deep serves, reception near the endline or sidelines, reception by the zone 4 attackers when in defensive zone, and low reception all proved to impair the quality of reception, demanding the setter to play more often in the *not acceptable setting zone*. Results suggest that, at this level, practice of serve-reception should preferably cover the deep tennis jump serve, and attempt to afford the libero more opportunities to receive. By focusing on the variables with the most predictive power, performers may better allocate their attention towards the most pertinent cues at each moment. Knowledge of these interactive models provides valuable insights into the dynamics of the action sequences, affording coaches important information and guidance.

Key words: Notational analysis, performance, predictive models.

Introduction

Elite-level sport is a highly demanding activity, requiring a long-term investment in an arduous process in order to optimize training and competition processes (Jäger and Schöllhorn, 2007). At this point, performance analysis emerges as a powerful research field, providing answers to scientific questions and practical training issues (Hughes and Bartlett, 2002). Within this scope, match or notational analysis allows a comprehensive framework for analyzing the game, as long as it considers the dynamics concerning the interactions between game events (Hale, 2001).

The interactions between the two opposing teams lead to the emergence of unique game patterns. This specificity is strongly related to the momentary conditions and critical events due to their inherent variability from condition to condition. Therefore, extrapolating the findings to other matches is not only difficult, but may also be misleading (Lames and McGarry, 2007). Nonetheless, there might be sequential patterns that are common to a diversified set of matches, levels and competitions, and research has been following this trend (Afonso and Mesquita, 2011; Eom and Schutz, 1992; Jäger and Schöllhorn, 2007; Newton and Aslam, 2009).

As deterministic approaches are seldom applicable to sports, the concept of situational probabilities must be addressed in team sports (Ranyard and Charlton, 2006; Ward and Williams, 2003). Each game scenario presents distinct possibilities of evolution, but their probabilities of occurrence are not evenly distributed. Therefore, an accurate knowledge of situational probabilities allows performers to act based upon what the possibilities of action with the highest likelihood of happening are (Walter et al., 2007), economizing attentional resources (Eckstein et al., 2006; Williams, 2009). To unfold situational probabilities, or probable chains of actions, the uni- or bivariate statistical analysis should be surpassed, giving place to multivariate statistics (Lames and McGarry, 2007), since they are capable of grasping interactions between several variables. Indeed, notational analysis research tends to follow Thelen's (2005) recommendations, avoiding the establishment of simple cause-and-effect relationships and accepting the possibility of numerous interactions being non-linear (Hale, 2001). Among such statistics, match analysis has increasingly recurred to t-patterns (Magnusson, 2000), log-linear analysis (Eom and Schutz 1992), Markov chains (Blanco et al., 2003; Bukiet et al., 1997; Lames and McGarry 2007; Newton and Aslam 2009), sequential lag analysis (Afonso et al., 2010), and multinomial logistic regression (Afonso and Mesquita, 2011).

In volleyball, stable game patterns have been detected in several studies (Afonso and Mesquita, 2011; Afonso et al., 2011; Eom and Schutz, 1992; Marcelino et al. 2008) with a relatively deterministic structure due to its non-invasion character (Mesquita, 2005). This feature might augment the probability of association of certain variables, thus allowing research to detect nuclear determinants of the game derived from variables related to the sport's internal dynamics.

Since team sports encompass dynamic processes of cooperation and opposition, characterized by the pursuit of the point and by the avoidance of the same goal being achieved by the opposite team (Lames and McGarry, 2007), the attack efficacy, namely in volleyball, emerges as the strongest predictor of the final result (Castro and Mesquita, 2008; Laios and Kountouris, 2004; Marcelino

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et al., 2008; Palao et al., 2005). At this ambit, it is of foremost importance to understand which game patterns afford the attaining of higher attack efficacies. Indeed, according to the literature, a great percentage of the attack efficacy relies on the quality of the setting action (Bergeles et al., 2009), which, in high-level volleyball, is performed by a specialist player, *the setter*. It is known that the quality of attack is mainly dependent on the zone where the setter performs the set (Afonso et al., 2010). For instance, quick and multiple attacks are more likely to be performed when the setter contacts the ball within the excellent zone (i.e., an area of 1-2 meters away from the net, and 2-3 meters from the right sideline) providing ideal conditions for the establishment of a good relationship between the attackers and the setter (Coleman, 2002).

In turn, the setter's action is constrained by a number of factors that should be taken into account in a thorough analysis (Mesquita and Graça, 2002). Studies have shown that preceding actions, namely the features of the opponent serve and the first contact in reception and defence, could predetermine the setter's actions and, consequently, the attacker's efficacy (Barzouka et al., 2006; Papadimitriou et al., 2004). For instance, the tennis jump serve is known to impair performance in reception, thus conditioning the subsequent actions (Katsikadelli, 1998b; Stromsik et al., 2002) and being prevalent in high-level volleyball (Lirola, 2006). However, these studies have used bivariate statistics, which appear to be limited, oversimplifying the complex nature of team sports. Through the interplay analysis of the factors that might interfere with the action of setting, it may be possible to better comprehend the nature of the game, thus contributing with valuable information both for the practice and research (Afonso et al., 2010).

In team sports, the analysis of interactions between game actions should be examined considering the game phase where they emerged, since its nature and configuration is determined for it. Particularly, in high-level men's volleyball, the complex I, or side-out, is considered a decisive phase of the game (Barzouka et al., 2006; Palao et al., 2007). This game complex comprises the actions of serve-reception, set, and attack, always following a serve from the opponent (Selinger and Ackermann-Blount, 1986), and encompassing a specific logic of attack organization, distinct from that of other game complexes, such as complex II or transition. A hallmark of complex I is the strong relationship established between the opponent's serve and the quality of the reception influencing the space where the set is performed. Since the setting zone is highly determinant of the attack efficacy, and being limited by the nature and quality of the serve-reception and opponent serve it becomes relevant to analyze possible game actions related to these factors (Afonso et al., 2005; Mesquita et al., 2007; Palao et al., 2005).

Therefore, the purpose of this study was to examine probabilistic relationships that might predict the setting zone, in the complex I in elite-level men's volleyball. This will allow perceiving what the precedent game actions that emerge as determinants of the setting zone are, offering new insights to volleyball match analysis as well as to the practice field.

Methods

Sample

Thirty-one volleyball matches comprising of 114 sets, and 5117 rallies, were analyzed encompassing all teams that participated in the 2007 FIVB World Cup. Twelve of the best world teams play for this important title, after which the best-ranked teams gain direct access to the Olympic Games. The observed teams were: Argentina, Australia, Brazil, Bulgaria, Egypt, Japan, Korea, Puerto Rico, Spain, Tunisia and United States. Only sequences in which the serve allowed serve-reception with sufficient quality to warrant the setting action to take place were analyzed. Furthermore, sequences culminating with attack by the setter were removed.

Variables and instrument

The dependent variable was the *setting zone*, and the independent variables were *the server player*, *serve type*, *serve direction*, *serve depth*, *reception zone*, *receiver player* and *reception type*. These variables were chosen due to their direct influence upon the first contact, which will, in turn, constrain the setting action.

The *server player* corresponds to the player who makes the serve action (setter, zone 4 attacker, middle-attacker or opposite), following the division proposed by Selinger and Ackermann-Blount (1986).

For *serve type*, three categories were considered (Laios and Kountouris, 2004; Lirola, 2006; Palao et al., 2004 and 2005): float serve (serve with unpredictable changes in the path of the ball due to a firm and quick hit with no follow-through of the arm); jump float serve (performed with jump, preceded or not by displacement; the trajectory of the ball is not uniform along its route); and tennis jump serve (strong, attack-like movement).

Serve direction concerns the trajectory of the ball in the serve action. Three categories were considered (Marcelino et al., 2011): crosscourt to right (right diagonal), crosscourt to left (left diagonal) and down the line (parallel).

Regarding *serve depth*, three categories were also established, after adaptation of the proposal of Marcelino et al. (2011): short (between the net and the three-meter line), intermediate (between the three-meter line and two meters away from the endline), and long (the last two meters of the court).

Concerning the *receiver player*, six categories were defined: *libero* (a player specialized in serve-reception and defensive tasks), best zone 4 attacker (the one closest to the setter in the rotation) when in defensive position (zones 5, 6 or 1), best zone 4 attacker when in offensive position (zones 4, 3 or 2), second zone 4 attacker when in defensive position, second zone 4 attacker when in offensive position, and others (other players who may occasionally perform this action).

Reception type comprised two categories (Castro and Mesquita, 2010): high reception (reception performed with an overhand pass) and low reception (using the forearm pass).

Two strategies were used to develop the categories of the *reception zone* and *setting zone*, while fulfilling the requirements for content and construct validity. These

models were created in agreement with the changing trends of high-level male volleyball; they were firstly based on extended literature analysis (Castro and Mesquita, 2010; Esteves and Mesquita, 2007; Selinger and Ackermann-Blount, 1986), and subsequently submitted to a validation process conceived in two phases. In the first phase, a pilot study was implemented to analyze if the considered zones allowed distinctive reception and setting conditions. Subsequently, expert validation process was achieved (a doctorate in volleyball and a coach who was twice a World Champion). The experts were given a list of variables, categories, and a sample of volleyball matches and were asked to observe and categorize the rallies. The inter-rater agreement exhibited Cohen's Kappa values above 0.80.

The *reception zone* refers to the location where players receive the opponent's serve. In assessing this variable, four categories were defined (Esteves and Mesquita, 2007): reception zone 1 (a zone 7 meters wide and 3.5m deep, starting 2m away from the net and 1m of each sideline), reception zone 2 (a zone 3.5m wide and 2.5m deep, located 1m from the left sideline and 1m from the endline), reception zone 3 (a zone 3.5m wide and 2.5m deep, located 1m from the right sideline and 1m from the endline), and reception zone 4 (corresponding to an area with 1 meter of the both sidelines, center line and endline) (Figure 1).

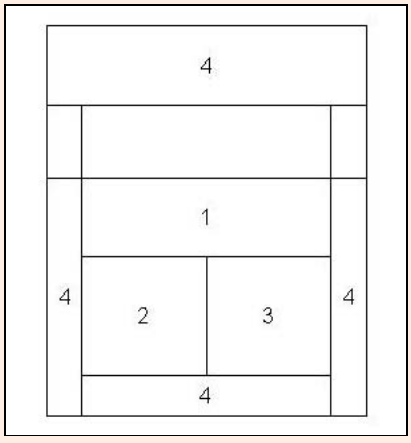

Figure 1. Topographical model for reception zone.

The topographical model for the setting was composed of three well defined zones (Castro and Mesquita, 2010): *excellent setting zone* (ESZ), an area of 8m^2, 2m deep from the net and 4m wide, at a distance of 2m from the right sideline and 3m from the left sideline; *acceptable setting zone* (ASZ), an area of 6m^2, 2m deep from zone 1 and 3m wide, at a distance of 2m from the right sideline and 4m from the left sideline; and *not acceptable setting zone* (PSZ), roughly equivalent to the playable area, excluding the two previously mentioned zones (Figure 2).

Data gathering and analysis

Data was collected with a digital video camera used by the Research Office of the Portuguese Volleyball Federation, and directly recorded into a computer. The camera was mounted at the bottom of the court, affording a longitudinal view. An observation form for recording the information (Excel) was used, including general information about the game, data regarding each set, complementary information, and data pertinent for this study. Multinomial logistic regression was applied, in order to obtain the estimated likelihood of occurrence of the dependent variable, based on the values of the independent variables ($p \leq 0.05$). First, each variable was tested individually; as all proved to be related to setting zone, a final adjusted model was tested, encompassing all variables in study. The adjusted model excluded the serve direction. In this non-linear model of regression, the estimated regression coefficients represent the estimated change in the log-odds, corresponding to a unit change in the corresponding explanatory variable conditional on the other explanatory variables remaining constant (Landau & Everitt, 2004).

Concerning observation reliability, 116 sequences were analyzed, totaling 17.85% of the sample. The sequences were retrieved from four distinct matches and teams (Russia, Italy, Azerbaijan, and China). Intra-observer reliability presented Kappa values ranging from 0.965 to 1.000, while inter-observer reliability ranged from 0.936 to 1.000, in all cases fulfilling the minimum of 0.75 appointed by the literature (Fleiss, 2003).

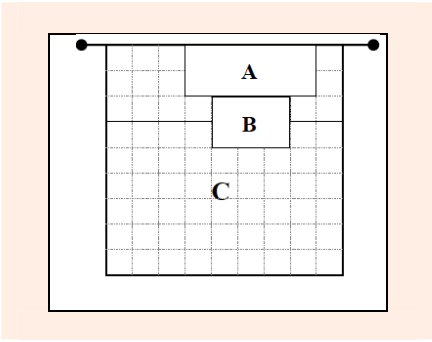

Figure 2. Topographical model for setting zone.

Results

The adjusted model for the *Setting Zone* showed to be statistically significant ($\aleph^2 = 214.708$, $p = 0.001$), with the reference category for the dependent variable being *excellent setting zone*. Tables 1 and 2 present the results concerning the adjusted model. While Table 1 presents results related to the serve, Table 2 presents results related to the serve-reception. As they concern the same model, this division intends merely to facilitate the reading of the data.

As shown in Table 1, only s*erve direction* was excluded from the adjusted model, as it did not reveal statistical meaning for predicting the setting zone. Regarding the *serve type*, the *jump float serve* induced a lower likelihood of the set being performed in the *not acceptable zone* (Adj. OR: 0.610), compared with the *excellent zone*. Also, the *jump float serve* reduced the likelihood of the setting action occurring in the *acceptable setting zone* (Adj. OR: 0.738), compared to the *tennis jump serve*. Therefore, the *jump float serve* proved less effective than the *tennis jump serve*.

Table 1. Prediction model for setting zone. Variables related to the serve.

	Excellent * (%)	Not acceptable (%)	OR Crude	OR Adjusted	P	Acceptable (%)	OR Crude	OR Adjusted	P
Serve type									
Jump float serve	82.7	6.9	.40 (.31-.50)	.61 (.46-.81)	.001	10.4	.68 (.55-.85)	.74 (.57-.95)	.020
Tennis jump serve†	71.7	15.2				13.2			
Server player									
Setter	76.4	12.3	.56 (.41-.77)	.63 (.45-.87)	.005	11.3	.87 (.61-1.2)	.94 (.66-1.35)	.750
Zone 4 attacker	74.3	12.1	.57 (.43-.74)	.61 (.46-.81)	.001	13.6	1.07 (.79-1.46)	1.15 (.84-1.57)	.392
Opposite	79.8	9.0	.39 (.29-.52)	.57 (.41-.78)	.000	11.2	.83 (.60-1.13)	1.01 (.72-1.42)	.949
Middle-attacker	68.6	19.7				12.1			
Serve depth									
Short	73.9	14.2	.56 (.33-.93)	1.45 (.77-2.73)	.252	11.9	.72 (.41-1.26)	.89 (.46-1.76)	.745
Intermediate	79.3	9.3	.34 (.28-.42)	.56 (.43-.73)	.000	11.4	.64 (.51-.80)	.78 (.59-1.04)	.087
Long†	63.6	22.0				14.4			

* reference category for the dependent variable † reference category for the independent variable

With respect to the *server player*, the opposite player (Adj. OR: 0.568), the zone 4 attacker (Adj. OR: 0.608), and the setter (Adj. OR: 0.628), made setting in the *not acceptable zone* less likely to occur, when contrasted to the serve performed by the middle-attacker. With respect to the *acceptable zone*, no statistically significant results were found.

Relatively to *serve depth*, it was noted that serves to the intermediate zone diminished the likelihood of setting in the *not acceptable zone* to occur (Adj. OR: 0.557), comparatively to the long serve. No statistically significant differences were found between the likelihoods of setting in the *acceptable zone* or in the *excellent zone*, regardless of serve depth.

Reception performed in *reception zones* 1 (Adj. OR: 0.277), 2 (Adj. OR: 0.517) and 3 (Adj. OR: 0.711) resulted in diminished likelihood of setting in the *not acceptable zone*, compared to reception in zone 4, as they promoted more frequent setting in the *excellent zone*. Additionally, reception in zone 2 reduced the likelihood of setting occurring in the *acceptable setting zone* (Adj. OR: 0.738), compared to reception in zone 4.

As for the *receiver player*, reception by the 1st (Adj. OR: 1.370) and 2nd zone 4 attackers (Adj. OR: 1.672) when in defensive position presented a greater likelihood of the set being carried out in the *not acceptable setting zone* as compared to the *excellent zone*, relative to the reception made by the *libero*. The model showed no statistically significant differences between the likelihoods of setting in the *excellent* and *acceptable* zones, with respect to the receiver player.

Finally, the analysis of the *reception type* revealed that the *low reception* variable induced a greater likelihood of the setter performing the set in *the not acceptable setting zone* (Adj. OR: 2.427) in relation to the *excellent zone*, in comparison with high reception. No differences were found for setting in the *excellent* or *acceptable* zones according to reception type.

Discussion

The main purpose of this study was to examine probabilistic relationships that could predict the setting zone in complex I, in elite-level men's volleyball. Indeed, this study provided valuable insights concerning the game actions, related with the opponent team and the own team, that determine the setting zone in elite level men's volleyball.

Only the *serve direction* showed not to be predictive of the setting zone, suggesting that the receiving angle of the ball did not affect its quality, similar to what was apparent in the study of Afonso et al. (2010), in elite level women's volleyball. At this level, technical influences are usually balanced between the teams, and tactical

Table 2. Prediction model for setting zone. Variables related to the serve-reception.

	Excellent * (%)	Not acceptable (%)	OR Crude	OR Adjusted	P	Acceptable (%)	OR Crude	OR Adjusted	P
Reception zone									
Zone 1	83.8	5.4	.21 (.12-.39)	.28 (.14-.56)	.000	10.8	.60 (.38-.95)	.78 (.45-1.34)	.366
Zone 2	80.7	8,6	.35 (.28-.44)	.52 (.39-.69)	.000	10.7	.61 (.48-.78)	.74 (.56-.98)	.034
Zone 3	76.4	11.2	.48 (.37-.62)	.71 (.52-.98)	.037	12.4	.75 (.58-.97)	.91 (.66-1.26)	.576
Zone 4†	65.7	20.1				14.2			
Receiver player									
1st Z4 def. pos.	75.9	13.3	1.21 (.92-1.59)	1.37 (1.03-1.82)	.031	10.8	.91 (.69-1.21)	.95 (.71-1.27)	.733
1st Z4 off. pos.	75.0	11.6	1.06 (.78-1.45)	1.25 (.90-1.75)	.190	13.5	1.15 (.86-1.55)	1.27 (.93-1.72)	.137
2nd Z4 def. pos.	74.3	13.6	1.26 (.95-1.67)	1.67 (1.24-2.26)	.001	12.1	1.05 (.79-1.40)	1.15 (.85-1.55)	.359
2nd Z4 off. pos.	75.8	11.5	1.04 (.76-1.43)	1.08 (.76-1.55)	.662	12.7	1.08 (.79-1.46)	1.06 (.76-1.49)	.737
Libero†	77.8	10.4				11.8			
Reception type									
Low reception	86.1	3,8	3.96 (2.25-6.97)	2.43 (1.34-4.39)	.003	10.1	1.39 (.97-2.00)	1.10 (.74-1.64)	.629
High reception †	74.8	13.0				12.3			

* reference category for the dependent variable † reference category for the independent variable

aspects become determinant in differentiating the performance. As the serve is a very predictable action, constituting the most closed skill in volleyball (Mesquita, 2005), it may be classified as a predominantly technical action. Therefore, it is acceptable that serve direction does not predict the setting zone.

Concerning other serve variables, the tennis jump serve showed to be the most effective way of unbalancing the quality of serve-reception, as had been pointed out in previous studies (Katsikadelli, 1998b; Stromsik et al., 2002); hence, the prevalent choice of high-level male players to perform this type of serve (Lirola, 2006). Since the type of serve significantly influenced the setting zone, it is possible to understand that the practice of the serve-reception in high-level men's volleyball should preferably cover the tennis jump serve.

Furthermore, the middle-attacker revealed a more effective serve, which may be related to its technical-tactical versatility (Afonso and Mesquita, 2011; Afonso et al., 2010) and can show a new trend in the high-level men's volleyball. Since this player is usually free from defensive actions, as well as from serve-reception, he may invest more time practicing his serve, attack, and block. These results also suggest that the opposite's serve, usually powerful, no longer creates the same amount of damage to the opponent's reception, or that the reception has adapted to more strong and powerful serves. It is possible that, after a phase in which powerful serves have proved very effective, teams are now adjusting to it, hence more tactical serves may again arise to unbalance serve-reception. An alternative explanation resides in an overuse of the opposite player in the attack action, possibly promoting fatigue that impairs the serve action. Alternatively, it may be that high-level teams need to diversify their tactical solutions according to both situational demands and to strategic planning, as hinted in the study of Marcelino et al. (2011). Further studies are warranted in order to explore these lines of thought.

The depth of the opponents' serve was shown to determine the setting zone as the longer serve more often forced the receivers to make more pronounced movements towards the ball, thus impairing serve-reception quality and, possibly, slowing the attack velocity concerning players with the double function of both receiving and attacking, such as the zone 4 attackers. Serve reception is essential in determining the quality of the setting action (Afonso et al., 2010). Namely, serve depth merits analysis, considering that the distance to the setter's zone may influence the quality of the serve reception, as had already been noted in the study of Katsikadelli (1998a). This explanation, however, is only tentative, and further studies should approach this issue in more detail.

The game actions related with serve-reception also determined the setting zone. Indeed, the space where receivers touch the ball showed to determine the setting zone as zone 4 attackers, when in defensive zone, presented some difficulties in the serve-reception action, receiving more often to the *not acceptable setting zone*. This may be due to the fact that they receive in conjunction with the libero, and therefore receive more times, as the opponents' server players tend not to serve to the libero, who is a specialist serve-receive and defensive player that has proved to enhance the quality of serve reception (João et al., 2006). For that reason, results suggest the need to expand the zone of intervention of the libero in order to release the zone 4 attackers from that responsibility as much as possible and deliver them to the attack.

With reference to the *reception zone*, zone 4 shows to be less effective than the other zones, which is an expected result, since this area is the most extended of the court (both in the sidelines and endline). Even though the serve to this zone is more effective, it also poses a greater risk, a risk that servers may not be willing to take. Marcelino et al. (2011) have demonstrated that, in high-level men's volleyball, risk management is a common strategy used in critical moments of the matches. In a study in soccer, Bar-Eli et al. (2009) described results hinting that same strategy. Although the most difficult penalty kicks to stop were those that reached the upper third part of the goal, only around 13% of the penalty kicks were actually directed at this zone. As such, the higher serving efficacy of the middle hitter could be related to the targeted zone. Future research is needed to develop a deeper understanding of this issue.

Analyzing the *reception type*, it was found that the low reception proved to be less effective than the overhead reception. This is an interesting result, since it seems that overhand passing improves the reception. Probably, it is not the case that overhead reception is a better technique *per se*, but it can only be applied in the less powerful serves with high trajectories; therefore, this should advise servers to avoid low-power serves with such trajectories, since they will improve the quality of serve-reception (Palao et al., 2004).

Applied statistics afford insights into the interaction dynamics of the game, allowing discriminating differentiated effects of distinct variables and establishing the power of certain predictors of performance. By focusing on the variables with the most predictive power, and on the nature of their interactions, performers may better allocate their attention towards the most pertinent cues at each moment (Eckstein et al., 2006; Williams, 2009). As volleyball presents a more deterministic structure than most team sports (Mesquita, 2005), knowledge of these interactional models provides valuable insights into the dynamics of the action sequences, therefore affording coaches important information and guidance concerning the training process and team management during competition.

Future studies should analyze these variables according to match status and quality of the opposition, since those aspects may induce variations in the teams' behaviors (Marcelino et al., 2011). Match status should consider the importance of the match outcome, as well as temporary variations in the result, factors that are expected to interfere with the teams' performance and strategies. Quality of the opposition might be based on teams' rankings and/or recent relevant results; it is likely that teams will change their game patterns depending on the difficulties presented by the opponents. The interaction of quality of opposition and match status as its inter-

ference in performance indicators should be examined, providing a deeper understanding of game performance and new insights for practice, competition, and research.

Conclusion

This study highlighted that the prediction of the *setting zone* was assessed by a wide range of game actions, including *serve type*, *server player*, *reception zone*, *serve depth*, *receiver player*, and *reception type*, therefore affording valuable data for coaches to better contextualize performance and guide the preparation process.

The tennis jump serve, commonly also a deeper serve, has posed substantial difficulties to the reception. Furthermore, although the libero is fulfilling its function, it seems advisable to improve the reception skills of the zone 4 attackers, since the opponents have been attempting to exploit them in this game action or if possible to expand the zone of the libero. It has also been shown that the middle-attackers exhibit a more effective serve, reflected upon the difficulties posed to the serve-reception. This facet may be widely explored in practice, especially since these players aren't usually involved in defensive actions.

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Key points

- A set of key variables interact and allow predicting the setting zone, an important variable in determining attack efficacy in high-level men's volleyball.
- The tennis jump serve, deep serves, receptions near the endline or sidelines, serves from the middle-players, receptions by the zone 4 attackers when in defensive zone, and low reception enhance the utilization of non-ideal setting zones.
- By focusing on the variables with the most predictive power, performers may better allocate their attention towards the most pertinent cues at each moment.
- Knowledge of these interactive models provides valuable insights into the dynamics of the action sequences, affording coaches important information and guidance.

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