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Setting Decision Making in male high- level volleyball: a study from ecological theory and social network analysis perspective

La toma de decisiones en la distribución en el voleibol masculino de alto nivel: un estudio desde la perspectiva de la teoría ecológica y el análisis de redes sociales

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Abstract. The objective of the present study was to analyze and compare the setter's decision-making (DM) in the offensive construction of the side-out (attack from the reception) in high-level men's volleyball. The sample consisted of the analysis of 132 games of the Brazilian men's volleyball Super-League 2021/2022, with 22 games for each team. The results showed that the eigenvector values were higher for setting to position 3, central attacker next to the setter, simple block, and obtaining the attack point. In addition, the setter's DM was similar between teams, suggesting that the game strategies aim to provide subsidies for the setter to make the decisions according to the game context in a flexible way and generate benefits for the attackers about the number of blockers, being that under ideal conditions and due to the lifter's correct choices in distribution, central blockers avoid anticipating the setting, and this fact allows the conditions of a single block or double-broken blocks in most cases. As a practical application, setting for the central attacker in position 3 becomes an interesting option for point acquisition and is capable of influencing the number of blockers, as well as the optimal blocking condition. Another application would be for the central attacker to position themselves close to the setter, a strategy that would enable the use of the "pipe" attack in other areas of the court with lower defensive blocking power.
Keywords: Expert Decision-Making; Performance Analysis; Team Sports; Action Choices; Constraints.

Resumen. El objetivo del presente estudio fue analizar y comparar la toma de decisiones (TD) del colocador en la construcción ofensiva del side-out (ataque desde la recepción) en el voleibol masculino de alto nivel. La muestra consistió en el análisis de 132 partidos de la Superliga masculina de voleibol de Brasil 2021/2022, con 22 partidos por equipo. Los resultados mostraron que los valores de los autovectores fueron más altos al realizar la colocación en la posición 3, con el atacante central junto al colocador, bloqueo simple y obtención del punto de ataque. Además, la TD del colocador fue similar entre los equipos, lo que sugiere que las estrategias de juego buscan proporcionar subsidios al colocador para tomar decisiones de acuerdo con el contexto del juego de manera flexible y generar beneficios para los atacantes en relación al número de bloqueadores, siendo que bajo condiciones ideales y debido a las elecciones correctas del levantador en la distribución, los bloqueadores centrales evitan anticipar la colocación, lo que permite las condiciones de un solo bloqueo o bloques dobles rotos en la mayoría de los casos. Como aplicación práctica, la colocación para el atacante central en la posición 3 se convierte en una opción interesante para la obtención del punto y tiene la capacidad de influir en el número de bloqueadores, así como en la condición óptima de bloqueo. Otra aplicación sería que el atacante central se posicione cerca del colocador, una estrategia que permitiría el uso del ataque "pipe" en otras áreas de la cancha con un menor poder defensivo de bloqueo.
Palabras clave: Toma de Decisiones Expertas; Análisis de rendimiento; Deportes de equipo; Opciones de acción; Restricciones.

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Introduction

Sport is the most appropriate context to study and understand the decision-making (DM) of experienced athletes (Araújo et al., 2017). The deliberate practice across time allows the athletes to analyze different game perspectives, which may affect the DM (Eccles, 2020; Moran et al., 2019; Williams et al., 2018). Cognitive processes play an essential role in the development of open skills (e.g., setting in volleyball) from the point of view of what to do at each moment of the game, demanding the athlete to analyze the structural elements of the game's action that determine the success of the sport (Gil-Arias et al., 2019).

In this view, DM is defined as choice of an action by cognitive perspective that can change the course of action within the complexity of the game (high degree of instability and variability) (Araújo et al., 2017; Rodrigues et al., 2022). Thus, the study of DM in team sports should consider game actions that are influenced by ecological environments (Marasso et al., 2014), and the athlete's ability to self-organize within the context of the game, that tries to reduce the number of actions available in a dynamic system that is sport (Araújo et al., 2020).

Therefore, the analysis of DM during the game is based on ecological validity through the specifics and constraints of the game context (Raab et al., 2019). Hence, the need to use ecological analysis to understand the game emerges, as the interaction between the individual-environment, through the perception of the possibilities of actions available in the different conditions of the environment (Araújo et al., 2004; Araújo et al., 2006; Araújo et al., 2017) as well as individual interactions related to environmental constraints known as affordances (Gibson & Carmichael, 1966), make up the DM that emanates from the adaptations of behaviors to solve emerging problems during competitive performance (Woods et al., 2020). Therefore, transitions between stable behavioral patterns arise as a result of dynamic instability, providing a universal DM process to switch between distinct patterns, where stabilities and instabilities do not exist a priori in the player's structure or in that of the environment but are co-determined by the confluence of constraints and information (Raab et al., 2019).

In this bias, Social Network Analysis has contributed to the understanding of sports performance based on ecological theory and the DM process (Laporta et al., 2019; Wäsche et al., 2017). Specifically, in volleyball, the Social Networks Analysis seeks to: a) understand the interactions and characteristics between the game actions in each game complex (Laporta et al., 2018b; Laporta et al., 2022); b) analyze the attack process considering critical game scenarios after the 16th point of the set (Martins et al., 2021), and; c) understand the relationship between the tactical-technical aspects in different game contexts (Jorge Rodrigues et al., 2021). In this context, research reveals that side-out (offensive organization from reception and setting) is the most effective for obtaining points of attack (Loureiro et al., 2017; Sotiropoulos et al., 2021) due to the greater control of the ball and better conditions for the distribution of the game (Costa et al., 2017; Costa et al., 2016; Laporta et al., 2019).

Considering side-out, research shows that receptions efficacy influence the offensive construction (Costa et al., 2018; García-de-Alcaraz & Usero, 2019), that the reception area influences and differentiates the speed and way of playing in the distribution (Rocha, Laporta, Lira, et al., 2021), that power attacks are prevalent (Costa et al., 2018) and fast attacks associated with the point (Costa et al., 2014), and also, that situational restriction from the reception, influence the distribution, precisely the distance from the setter to the attackers and the opponent blockers (Rocha, Laporta, Modenesi, et al., 2021).

Although research in the area demonstrates the superiority of the effectiveness of side-out 1 in obtaining attack points and that the environment influences the game played, little is known about the DM of high-level setters in situations in which the reception allows organized attack with all available attack options. Thus, the present research aims to analyze and compare the DM of the setter in the offensive construction of the side-out in high-level men's volleyball. The hypotheses of the study are: 1) the teams will present higher eigenvector values for the setting to position 3, with the central attacker close to the setter, against simple blocks, which will result in points and the positions that the setter can set for the attackers from positions 4, 3 and 2 (net attackers); II – the finalist teams will differ from the other teams because they present higher eigenvector values for attacks carried out by position 6 and 1, with the central attackers further away from the setter and with higher eigenvector values to obtain the point of attack.

Material and Methods

Sample

The sample was constituted by analyzing 132 games of the qualifying phase of the 12 teams participating in the Brazilian men's volleyball Super-League 2021-2022. Twenty-two games were observed for each team, resulting in 5524 attacks from high quality receptions that allowed organized attacks with all the attackers available (Hurst et al., 2016). The choice of the sample is justified by the high performance demonstrated in the analyzed competition. Thus, these teams are expected to show the main game trends in elite men's volleyball.

Variables

When analyzing the setting, two parameters were considered, being the location of the setting (distribution) and the place where the center jumped to perform the attack. We obtained the following categories:

Distribution: To verify how the setter of each team distributed the game, we considered the setting for zones 4 (SETT-P4), 3 (SETT-P3), 2 (SETT-P2), 1 (SETT-P1), 6 (SETT-P6) and also the setter dump (2SETT) (Figure 1A). When considering the place where the center jumped to carry out the attack, regardless of having attacked, we adopted the criteria presented by Fellingham et al. (2013) and Costa et al. (2016), being: the center jumped ahead, and close to the setter (TF), center jumped behind and close to the setter (TC), center jumped ahead and away from the setter (T7). In addition, we analyzed the moments of the game set, considering the beginning of the set (INI) from 0 to 8 points, the middle of the set (MED) from 9 to 16 points, and the end of the set (FIN) from 17th point until the end of the set. For the analysis of the 5th set, we considered the INI from 0 to 5 points, the MED from 6 to 10 points and the FIN from the 10th point until the end of the set.

In addition to the distribution itself, we analyzed the effect that the distribution promotes on subsequent game procedures. Considering the ecology of the game and the influence of the actions performed in side-out on subsequent actions, the number of blockers was considered. Block actions were classified as triple [1x3], broken triple [1x(2 + 1)], double [1x2], broken double [1x (1 + 1)], single [1x1], and no block by merit of the setter (1x0) (Rocha et al., 2020). Furthermore, the effect of the attack was also considered, as follows: error - the attacker spike the ball into the net, out of bounds or violates the regulations; block - the attacker fails due to the opponent's blocking; continuity - the attack does not result in a final action and allows the counter-attack; point - the attack results in a direct point as the ball touches the opponent's field or is deflected by blocking off the court (Marcelino et al., 2011). Finally, we analyze the initial position of the setter, at the beginning of the rally, identifying the configuration of the net, being: zone 1 (P1), zone 2 (P2), zone 3 (P3), zone 4 (P4), zone 5 (P5), zone 6 (P6) (Figure 1B). From the setter's initial position, it is possible to understand the offensive organization, for

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example, when the setter is in P1, there are three attackers in the net, but the opposite attacker in zone P4 and the hitter in P2. On the other hand, when the setter is in P5, there are three attackers in the net, but the opposite attacker is in P2, and the hitter in P4.

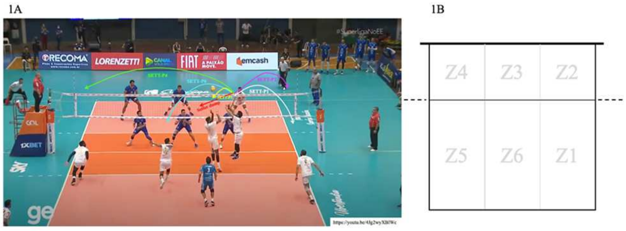

Figure 1. A – Setter Distribution for each zone (source: https://youtu.be/4Jg2wyXBlWc); B – Setter's initial position.

Data collection

A high-definition camera filmed all matches (1080p - Sony®) positioned approximately 7–9 m behind the court bottom line and five meters above ground level. All footage was provided by the technical staff of the Brazilian Volleyball Team. Three physical education professionals with more than five years of experience as performance analysts in volleyball analyzed the actions used in the study. For reliability testing, 30% of the actions were reanalyzed, above the 10% reference value (Tabachnick & Fidell, 2013). Cohen's Kappa values for intra-observer ranged between 0.93 and 0.99 with respective standard errors of 0.03 and 0.01. Inter-observer values were 1, with standard errors equal to 0. These values exceed the recommended value of 0.75 (Fleiss et al., 2013).

Data analysis

Data were recorded in a Microsoft Excel 2015 for Windows spreadsheet and the IBM SPSS Statistics for Windows (Version 23, USA) for data quality control and exploratory statistics in cross tables. The Social Network Analysis was performed using the software Gephi 0.8.2-beta for Windows (Version 10.10.3, France). We chose to use Social Network Analysis for the possibility of exploring and examining the connectivity and specificity of the relationships between all setting variables, providing a global view. We used the eigenvector centrality based on the notion that a node has greater centrality when it is related to nodes that are also more central (Bonacich, 2007; Borgatti, 2005). Therefore, the centrality of a node depends not only on the number of its adjacent nodes but also on its interaction characteristics (Hurst et al., 2016).

The node size and edge thickness were manipulated to evidence the magnitude of the eigenvector measure. Thus, the node size determines the visual contrast of the variables according to the centrality of the eigenvector. Thus, when a variable is directly or simultaneously related to another, it receives a connection, and through the centrality of eigenvector, the indirect connections that a node has been also weighed (Laporta et al., 2018a, 2018b).

In addition, we compared the eigenvector values between teams. To this end, we calculate the eigenvector values, game by game, obtaining twenty-two eigenvector values per team and for each node. After verifying the normality of the data, ANOVA was performed and the post-hoc of Bonferroni was used. The significance level adopted was 5%. IBM SPSS Statistics for Windows (Version 23, USA) was adopted.

Results

At the end of the qualifying phase the 12 teams were ranked by the number of points obtained across the competition (defined by the competition rules, i.e. victories number, sets won and points number acquired in each set played). By this ranking, Team 1 represents the team with highest score among all teams and Team 12 is the team with lowest score. Thus, individual analysis of each team is presented in sequence according to the ranking defined in the qualifying phase (from Team 1 to Team 12).

These analysis (Figure 2 and Table 1) showed that the highest eigenvector values were: 1 - for Team 1, with setting to P6 (SETT-P6), central attacker in front of and away from the setter (T7), at the beginning of the set, with attacks against single blocks (1x1), broken double [1x(1+1),] and double (1x2), obtaining the attack point and the setter initial position in net P5; 2 – for Team 2 with the setting to P6 (SETT-P6), central attacker in front of the setter (TF) and away from the setter (T7), there was no distinction regardless the moment of the set, with attacks against simple blocks (1x1), obtaining the point of attack and the initial position of the setter in the net P5; 3 – for Team 3 with setting to P2 (SETT-P2), central attacker next to the setter (TF), at the beginning of the set, with attacks against simple blocks (1x1), obtaining the attack point and the setter initial position in net P6; 4 – for Team 4 with setting to P3 (SETT-P3), central attacker close (TF) and far (T7) from the setter, at the end of the set, with attacks against single blocks (1x1), double broken [1x (1+1)] and double (1x2), attack that allows game continuity and obtaining the attack point and the setter's initial position in the net P5.

Already, 5 (Figure 3 and Table 1) – for Team 5 with setting to P4 (SETT-P4), central attacker close to the setter (TF), at the INI and MED of the set, with attacks against double broken [1x(1+1)] and double blocks (1x2), obtaining the point of attack with setter initial position in the net P4; 6 - for Team 6 with setting to P3 (SETT-P3), central attacker close to the setter (TF), at the INI and MID of the set, with attacks against single (1x1) and double broken blocks [1x(1+1)], attack that allows game continuity and the setter's initial position in the net P6; 7 - for Team 7 with setting to P3 (SETT-P3), central attacker close to the setter (TF), at the FIN of the set, with attacks against simple blocks (1x1), obtaining the attack point and the initial position of the setter in the P4 net; 8 - for Team 8 with setting to P3 (SETT-P3), central attacker close to the setter (TF), at the INI of the set, with attacks against broken double blocks [1x(1+1)], attack that allows game continuity and obtaining the attack point and the setter's initial position in the net P6;

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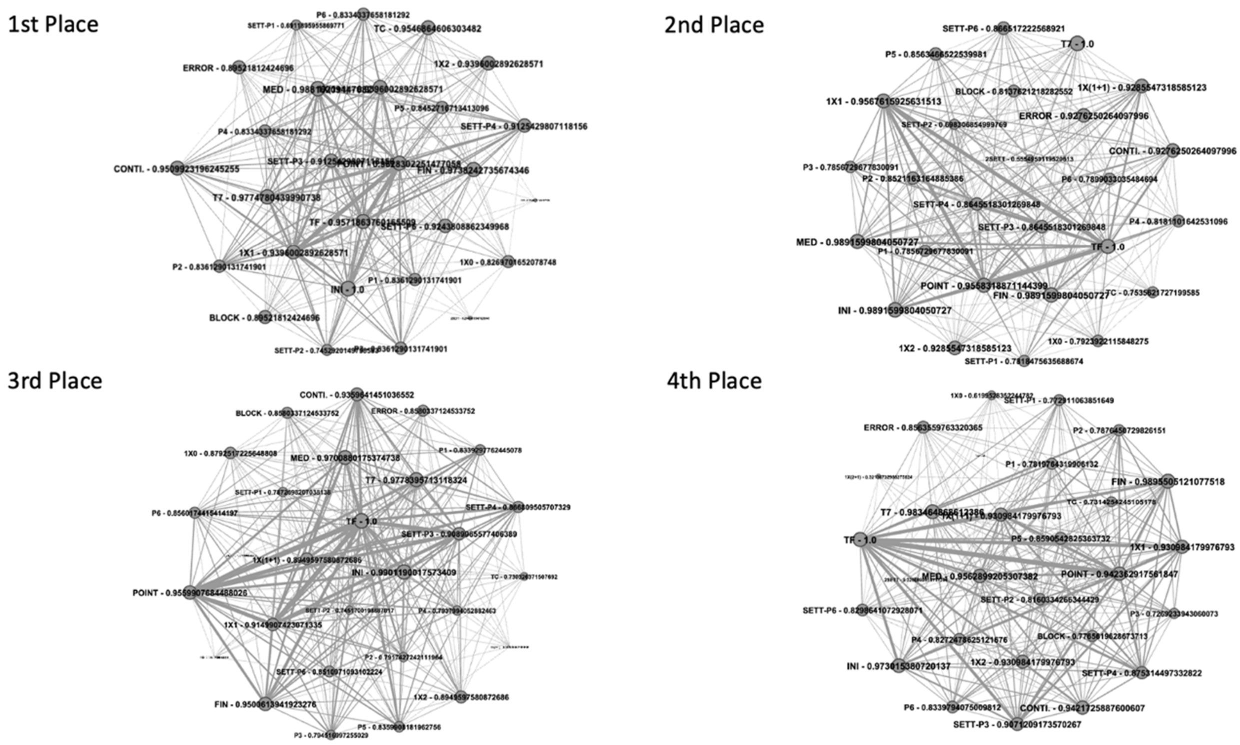

Figure 2. Social Network Analysis of the 1st to 4th teams with eigenvector centrality.

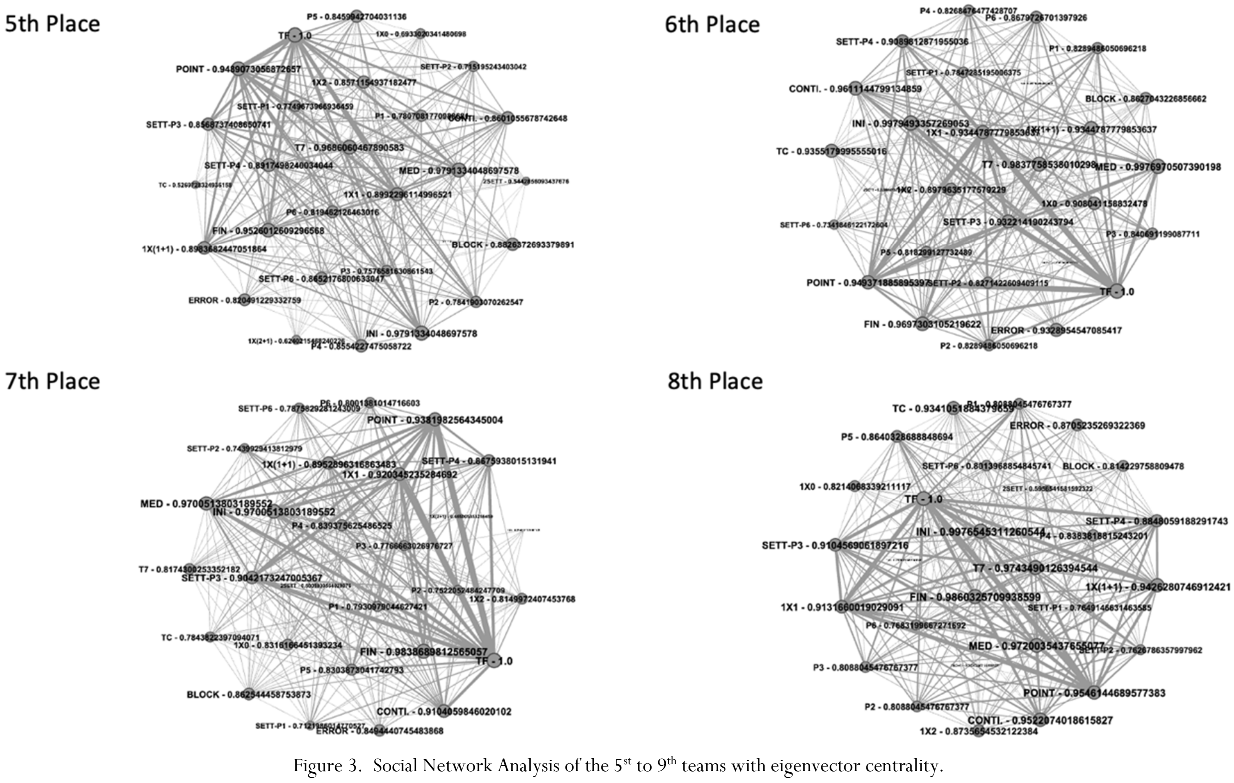

Figure 3. Social Network Analysis of the 5th to 9th teams with eigenvector centrality.

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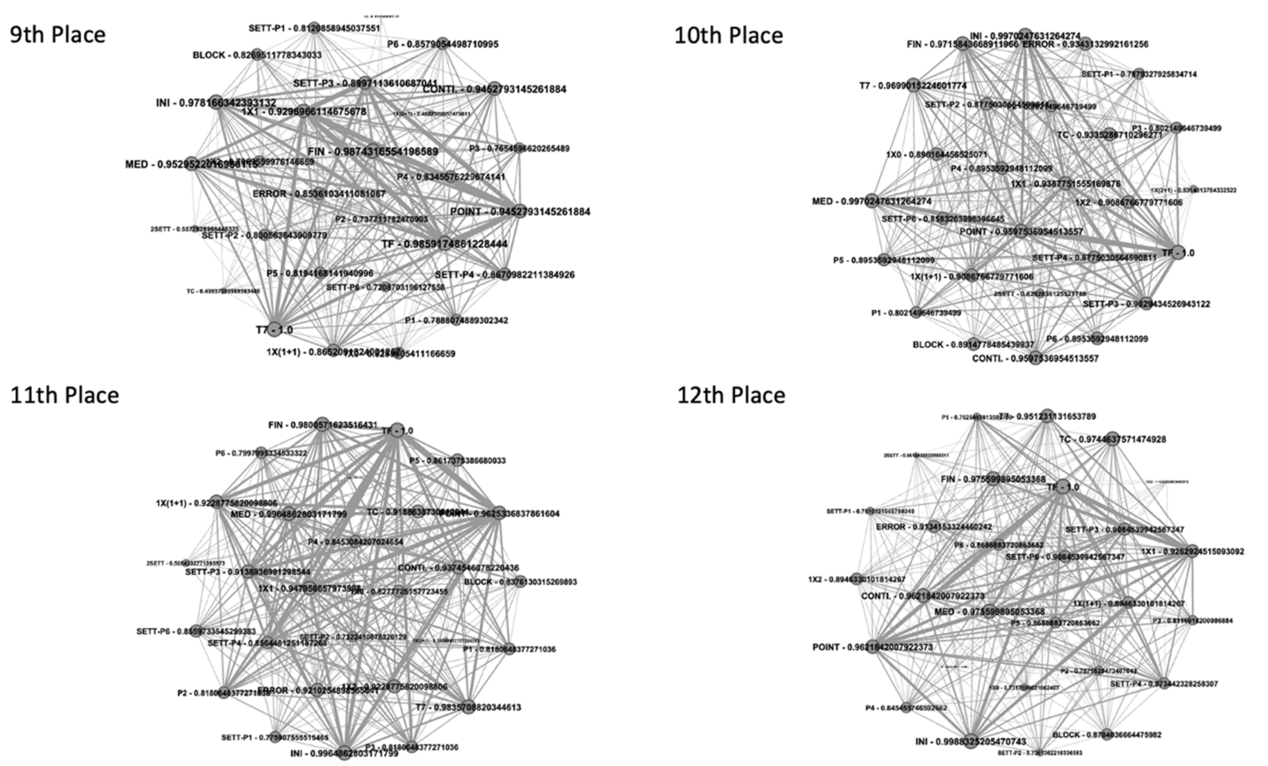

Figure 4. Social Network Analysis of the 9st to 12th teams with eigenvector centrality.

Table 1.
Eigenvector values per team following the classification in the 1st phase of the Brazilian Super-League - 2021-2022.

	Teams											
	1	2	3	4	5	6	7	8	9	10	11	12
SETT-P1	0.69	0.78	0.79	0.77	0.77	0.78	0.71	0.76	0.81	0.79	0.78	0.75
SETT-P2	0.75	0.70	1.00	0.82	0.72	0.83	0.74	0.76	0.80	0.88	0.73	0.74
SETT-P3	0.91	0.86	0.73	0.91	0.86	0.93	0.90	0.91	0.90	0.90	0.91	0.91
SETT-P4	0.91	0.86	0.98	0.88	0.89	0.91	0.87	0.88	0.87	0.88	0.86	0.87
SETT-P6	0.92	0.87	0.75	0.83	0.87	0.73	0.79	0.80	0.72	0.86	0.86	0.91
2SETT	0.28	0.56	0.91	0.33	0.54	0.33	0.50	0.60	0.56	0.63	0.51	0.66
TF	0.96	1.00	0.87	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00
TC	0.95	0.75	0.85	0.73	0.53	0.94	0.78	0.93	0.50	0.93	0.92	0.97
T7	0.98	1.00	0.41	0.98	0.97	0.98	0.82	0.97	1.00	0.97	0.98	0.95
INI	1.00	0.99	0.99	0.97	0.98	1.00	0.97	1.00	0.98	1.00	1.00	1.00
MED	0.99	0.99	0.97	0.96	0.98	1.00	0.97	0.97	0.95	1.00	1.00	0.98
FIN	0.97	0.99	0.95	0.99	0.95	0.97	0.98	0.99	0.99	0.97	0.98	0.98
1X0	0.83	0.79	0.88	0.62	0.69	0.91	0.83	0.82	0.83	0.90	0.83	0.73
1X1	0.94	0.96	0.91	0.93	0.90	0.93	0.92	0.91	0.93	0.94	0.95	0.93
1X(1+1)	0.94	0.93	0.89	0.93	0.90	0.93	0.90	0.94	0.87	0.91	0.92	0.89
1X2	0.94	0.93	0.89	0.93	0.86	0.90	0.81	0.87	0.80	0.91	0.92	0.89
1X(2+1)	0.00	0.00	0.45	0.32	0.62	0.23	0.46	0.28	0.46	0.53	0.33	0.53
1X3	0.23	0.00	0.41	0.00	0.00	0.23	0.27	0.23	0.18	0.00	0.00	0.48
POINT	0.96	0.96	0.96	0.94	0.95	0.95	0.94	0.95	0.95	0.96	0.96	0.96
CONTI.	0.95	0.93	0.94	0.94	0.86	0.96	0.91	0.95	0.95	0.96	0.94	0.96
BLOCK	0.90	0.81	0.86	0.78	0.88	0.86	0.86	0.81	0.83	0.89	0.84	0.88
ERROR	0.90	0.93	0.86	0.86	0.82	0.93	0.85	0.87	0.85	0.93	0.92	0.91
P1	0.84	0.79	0.83	0.78	0.78	0.83	0.79	0.81	0.79	0.80	0.82	0.75
P2	0.84	0.85	0.79	0.79	0.78	0.83	0.75	0.81	0.74	0.80	0.82	0.79
P3	0.84	0.79	0.79	0.73	0.76	0.84	0.78	0.81	0.77	0.80	0.82	0.81
P4	0.83	0.82	0.79	0.83	0.86	0.83	0.84	0.84	0.83	0.90	0.85	0.85
P5	0.85	0.86	0.84	0.86	0.85	0.82	0.83	0.86	0.82	0.90	0.86	0.87
P6	0.83	0.79	0.86	0.83	0.82	0.87	0.80	0.77	0.86	0.90	0.80	0.87

The analysis of the eigenvector values by ANOVA showed that there were differences between the teams [F(11.7380) = 3.455, p<0.001). When considering the location of the setting, the results showed that: 1 - the setting for position 2 was different from Team 7 in relation to Teams 8 (p=0.19), and 9 (p=0.45); 2 - the setting for position 3 differed for Teams 3 (p=0.003), 6 (p=0.006), 8 (p=0.020), 9 (p=0.001), and 12 (p=0.021), from Team 3 in relation to Team 5 (p=0.026) and from Team 5 to Teams 6 (p=0.049), and 9 (p=0.015); the setting for position 6 differed from Team 1 in relation to Team 9 (p=0.003), from Teams 2 and 5 in relation to Teams 8 (p=0.001) and 9 (p<0.001), from Team 6 in relation to Team 9 (p=0.047), Team 8 in relation to Team 11 (p=0.006), Team 9 in relation to Teams 10 (p=0.001), 11 (p<0.001) and 12 (p=0.046); 2SETT was different from Teams 2, 3, 4, 6, 7, 8, 9 to Team 12 (p<0.005).

When considering the place where the middle-blocker jumped to attack, it was observed that: there was a difference in the TF of Team 1 in relation to Teams 2 (p<0.001), 3 (p=0.006), 4 (p=p <0.001), 5 (p=0.002), 6 (p<0.001), 7 (p<0.001), and 8 (p=0.029). In the TC, Team 1 was different in relation to Teams 3 (p=0.031), 5 (p<0.001), 9 (p=0.002), Teams 2 and 3 were different from Teams 10 (p=0.019) and 12 (p<0.001), Team 4 was different from Team 12 (p<0.001), Team 5 was different from Teams 8 (p=0.003), 10 (p<0.001) and 12 (p<0.001), Teams 6 and 7 were different from Team 12 (p=0.001), Team 8 was different from Team 9 (p=0.012); Team 9 was different from Team 10 (p<0.001); and Team 11 was different from Team 12 (p=0.024). For T7, Team 1 was different from Teams 2 (p=0.011), and 7 (p<0.001), Team 2 was different from Teams 7 (p=0.023), 9 (p<0.001), and 11 (p=0.018), Team 3 was different from all Teams (p<0.001), Team 4 was different from Teams 7 (p=0.001), and 9 (p=0.007), Teams 5, 6, 8, 9, 10, 11 and 12 were different from Team 7 (p<0.001).

When considering the moments of the set, there was no difference between the Teams. When considering the opponent's block, it was observed that: 1 – in the 1x0 block, Team 4 was different from Team 7 (p=0.049); 2 – in the 1x1 block, Team 4 was different from Teams 9 (p=0.007), and 12 (p=0.030); Team 5 was different from Teams 6 (p=0.049), 9 (p=0.002), and 12 (p =0.011); 3 – in block 1x(1+1), Team 4 was different from Team 7 (p=0.024), Team 7 was different from Teams 8 (p=0.001), 10 (p=0.004), and 11 (p=0.012), Team 8 was different from Team 9 (p=0.002), Team 9 was different from Teams 10 (p=0.009), and 11 (p=0.030); in the other blocking configurations there was no difference between the teams.

When considering the effect of the attack, it was observed that: 1 – The attack point was different from Team 1 to Team 7 (p=0.001); 2 – continuity was different from Team 1 to Teams 3 (p=0.042), 8 (p=0.014), and 12 (p=0.020); 3 – the attack error was different from Teams 2, and 7 to Team 12 (p=0.020). There was no difference in the setter's starting position.

Discussion

Decision Making models, to some extent, assume that internalized knowledge structures are used to decide the best option for the task (Araújo et al., 2017). However, when considering the ecology of the game, there is no better decision, as the most functional decision can compromise future decisions (Araújo et al., 2010), and decisions must be expressed by actions, as they are the expression of the cognitive process (Beer, 2003; Raab et al., 2019). In addition, the game analysis provides an opportunity to understand DM in an ecological context, enabling the understanding that simultaneous and successive affordances support DM, changing environmental conditions and, therefore, allowing flexibility in subsequent actions (Gil-Arias et al., 2019; Raab et al., 2019; Woods et al., 2020; Hernández Wimmer et al., 2021). From this, the objective of the present research was to analyze and compare the DM of the setter in the offensive construction of the side-out in high-level men's volleyball. Our first hypothesis is that teams would present higher eigenvector values for setting to position 3, with the central attacker close to the setter, against simple blocks, which would result in points and the positions where the setter can set the ball for the attackers of the positions 4, 3 and 2 (net attackers), was partially confirmed.

In this context, it was observed that the eigenvector values were higher for in setting to position 3 in eight teams, central attacker close to the setter (TF), and single blocking and obtaining the point of attack in 11 teams. The general analysis of the data shows that, for the most part, setters make the decision, for receptions that allow all attack options, to keep the central attacker close to the setter, regardless of this attacker receiving the set, as this offensive disposition makes it difficult to anticipate the opponent's blocking system, as well as the displacement of the opponent's central blocker to the ends of the net, favoring the attack against simple blocks, promoting the obtaining of points by the attack.

Such findings are in line with the literature, as, in conditions of an organized attack, the setter decides to set, mainly, for the central attacker, as it configures the 1st tempo attack (Costa et al., 2017; Millán-Sánchez et al., 2019), making it difficult for the opponent central blocker to read the game (Fellingham et al., 2013). In other words, it is making unfeasible for the opponent blocker to anticipate, a fact that could generate the attack by the central with no blocking. In this context, the importance of the main attacker in quick attacks is perceived as a predictor of attack success (Asterios et al., 2009; Palao et al., 2007), mainly when the attack occurs between positions 2 and 3 with the ball close to the net (Mercado-Palomino et al., 2022). In addition, the fact that the setter decides to "keep" the central attacker next to him improves the game reading, as well as creates the opportunity to attack against simple blocking structures, as the high-level setter considers the affordances of the game context, precisely the disposition of the extremity blockers, to carry out the setting (Rocha et al., 2020).

The general analysis of the teams' DM may be a consequence of the teams' adaptation to the dynamic nature of the game, as the game's ecology is based on self-organization, non-linearity, and non-proportionality, coupling the relationship between information movement and possibilities of action (Araújo et al., 2020; Seifert et al., 2017), and the information-movement coupling and the athlete's behaviors and interactions in a competitive performance environment are regulated by the information available in the game context (Araújo & Davids, 2018; Raab et al., 2019). In this context, considering the high level of sports performance, it seems that the setters make decisions regarding the distance of the middle blocker, creating difficulties to the possibility of helping the other blockers to perform double blocks at the ends of the net, while they are not helped by the blockers of the net ends, considering that in receptions that allow an organized attack, the number of attackers overlaps the number of blockers, as there are four attackers available and only three blockers in the net (Silva et al., 2013).

Our second hypothesis that the finalist teams would differ from the other teams by presenting higher eigenvector values for attacks carried out at positions 6 and 1, with the central attackers further away from the setter and with higher eigenvector values to obtain the point attack, has been partially confirmed. In this context, it was observed that the finalist teams of the Brazilian Super League presented higher eigenvector values for the setting to position 6 about the worst ranked teams in the competition, as well as the champion team of the Super League showed a lower eigenvector value for the near central attacker to the setter (TF) in relation to about most teams, while the eigenvector value for the main attacker away from the setter was lower for Team 7 with regard to most teams.

When considering the point of attack, few differences were observed between the teams, not confirming the hypothesis. In this context, it is clear that the type of game played by the teams is similar, possibly because the teams use (in a reduced view) the attacks carried out from the back of the court, that is, P1 and P6 (Marasso et al., 2014), the receiving attacker who is at the back of the court can prioritize the reception, culminating in high quality receptions favoring attacks with the central player (Hank et al., 2019). Considering that the DM of the setters was similar, there is a trend to set the ball to the front (to the center and the attacker of P4), as the opposite hitter is mainly required in situations that occur receptions of lower quality - that do not allow an organized attack with all attack options (Costa et al., 2017). In addition, adopting the attack system with four attackers available, allowing two attackers to occupy areas close to attack, as is the case of the central attacker jumping next to the setter and the back attacker jumping to the attack in P6, a move known as pipe, makes it possible for the positioning of the central blocker to remain centralized to the net, as the ideal setting conditions make it difficult for blockers to anticipate and can result in a smaller number of blockers, at the same time emanating the need to perform a powerful attack to overcome the defensive system (Denardi et al., 2017).

The analysis of the volleyball game at high level shows that the ecological conditions, specifically the setter's DM that occurs from situations that allow the organized attack, show similar characteristics between the teams, as the restrictions caused to the defensive system, in this case the blocking, diminish the possibilities of anticipation, at the same time allowing flexible choices by the setters, increasing the variability of the context, with the objective of achieving the proposed goals (Araújo et al., 2020; Crowther et al., 2020; Hristovski et al., 2012; Raab et al., 2019). Which in the case of the setter is to choose the attacker who will carry out the attack based on the values of effectiveness in this game procedure, as well as in situations with fewer blockers. In this bias, when considering the self-organization and self-regulation of behavior, we realize that setters, from emerging demands of the game, tend to more functional states (Araújo et al., 2020; Raab et al., 2019; Williams et al., 2018), as well as that behavior patterns will emerge from the specificity of the relationship between the game context, the environment and the player (Renshaw et al., 2019; Woods et al., 2020).

Notwithstanding, as with any research, there are limitations that must be explained. The observations made, although presenting high ecological validity, did not allow us to observe possible changes in the offensive strategy, in relation to the setter's DM, considering the conditions of victory or defeat in the set. As well as we did not consider whether there was any change in DM of the setter when there was a victory or defeat in the previous game. Thus, it is suggested that analyzes with high performance teams seek to understand how the setter's DM and subsequent distribution of the game alternate or remain stable after losing and winning games.

Conclusion

When considering the ideal conditions for offensive construction in volleyball, it is observed that high-level setters playing for Brazilian teams exhibit similar DM. Thus, the strategy to exploit the opponent's blocking system involves positioning the central attacker in front of the setter, facilitating the attack's ability to penetrate the block in the key court areas through the "pipe" move. Furthermore, under optimal conditions and due to the setter's accurate distribution choices, the central blockers avoid preempting the setter's actions. This circumstance permits the occurrence of both single-block and double-broken block scenarios in the majority of cases. Lastly, this game structure is employed as it aligns with international standards, and teams feature effective attackers who are well-equipped to challenge defensive systems and adapt to situations with fewer blockers. One practical application by these results is to implement the strategy of positioning a central attacker in front of the setter. This approach allows the attack to surpass the opposing block through the "pipe" movement in critical areas of the court. Additionally, precise setting distribution can prevent central blockers from anticipating the play, resulting in more favorable blocking configurations. This optimization enhances the attack's effectiveness and exploitation of weaknesses in the opposing blocking system.

Author Contributions

The following individual contribution were: Conceptualization, M.H.N and G.C.T; Methodology, G.C.T, TJL, and L.L; Software, G.C.T and L.L; Validation, M.H.N., M.C.R., and A.C.R.; Formal Analysis, G.C.T, JSG, and L.L.; Investigation, F.C., TJL, and H.O.C.; Resources, M.H.N. A.C.R., and JSG; Writing – Original Draft Preparation, G.F.P. and L.L; Writing – Review & Editing, G.F.P., F.C., R.F.L., and L.L; Visualization, C.A.B.L., M.H.C., F.C., R.F.L. and

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Conflicts of Interest

The authors declare no conflict of interest.

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