

Decision making in men's high-level volleyball: analysis of the setter based on game performance

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Abstract:

The analysis of decision making in different sports is a procedure that has been investigated and allows a better ecological understanding of the game. However, little is known about the setter's decision making in volleyball and its influence on the game in high-level volleyball. Thus, the objective of the present research was to analyze the setter's decision making in the offensive construction of the side-out in high-level Brazilian men's volleyball, when there were all attack options available. The sample was constituted by the analysis of 132 games of the qualifying phase of the 12 teams participating in the men's volleyball Brazilian Super-League 2021-2022. Twenty two games were observed for each team, resulting in 5524 attacks after the reception that allowed the organized attack with all available attackers. Considering the results, we found that: I - teams would present higher eigenvector values for setting to position 3, attacks against simple blocks and the attack point, regardless of winning or losing the game; II - teams, when they were defeated, presented, for the most of times, higher eigenvector values for the setter starting in the initial position 6; III - when the teams won the game, it was noticed that, for the most part, the setting location was to position 3 with the middle-hitter's attack close to the setter, and the setter's initial position was diversified between the teams. From this, it was observed that under ideal distribution conditions, there was similarity in the offensive patterns of twelve high-level Brazilian volleyball teams, regardless of whether they won or lose the game.

Key Words: - Team Sports; Action Choices; Constraints; Game Ecology; Notational analysis

Introduction

Decision making (DM) in sport is characterized as the choice made by the player within the context of the game according to the ecological actors and to the complexity of the game (Gréhaigne et al., 2001). In this context, the most appropriate manner to analyze athletes' DM is through the analysis of the player in his ecological context (Araújo et al., 2017), as the cognitive processes inherent to open skills, as in team sports, are responsible for the perception of possibilities of action according to situational constraints (Araújo et al., 2017). In addition, ecology in the analysis of DM allows the interpretation of the game context as the action patterns change, enabling the identification of structural elements that can differentiate athletes and sporting success (Gil-Arias et al., 2019).

When considering volleyball, it is known that the setter is the player responsible for distributing the game, choosing which place and player will attack the ball, demanding from this player a greater number of decisions throughout the game (Conejero et al., 2017). In view of this scenario, the need for the setter to make decisions based on the context of the game is evident, in order to allow better attacking conditions from the constraints that constitute the offensive context of the game, as well as the availability of middle-hitter (Rocha et al., 2020b, 2021). In this context, it is observed that from the attack situations from the reception (side-out), the interpretations of the offensive scenarios emanate in higher complexity than in other initial attack conditions, as there is greater control of the ball and better conditions for the distribution of the game (Costa et al., 2014, 2016;

Laporta et al., 2019). Therefore, it is noted that the side-out allows more possibilities for DM about the distribution, requesting from the setter a better interpretation of the opponent's blocking system, as well as the availability of the attackers according to the ecological variables that constitute each situation (Rocha et al., 2020a, 2021).

Thus, research carried out in volleyball shows that the quality and location of reception influence the offensive construction (Costa et al., 2018; García-De-Alcaraz & Usero, 2019; Rocha et al., 2021), that there is a prevalence of powerful, rapid attacks that culminate in the point of attack (Costa et al., 2016; Costa et al., 2018), and that the distribution changes according to the distance from the setter to the attackers and also the opposing team blockers (Rocha et al., 2021).

Although there is already a vast literature on the analysis of the game in volleyball, there are few analyzes that sought to understand sports performance, based on the ecological theory and the DM process in sport, such as social network analysis (Laporta et al., 2019; Wäsche et al., 2017). The few studies in this line sought to analyze the interactions and characteristics of game complexes (Laporta et al., 2018a, 2022); the offensive organization in critical performance scenarios, that is, after the 16th point of the set (Martins et al., 2021); and the difference between the tactical-technical aspects according to different game contexts (Rodrigues et al., 2022). Furthermore, a previous study carried out an investigation on spatiotemporal analysis of setting per game complex and origin of the ball in junior women's volleyball players (Oikonomopoulou et al., 2022). Results from this study showed that junior female setters regardless of the complex and the origin of the ball choose zone 4 in a 3rd tempo. However, it remains open whether these findings can be extrapolated to high-level and male athletes? Perhaps a study that analyzes the ecology of the game based on the DM of high-level setters through social network analysis can clarify this issue. In addition, previous results indicate that the variables that predict success and performance level in elite men's volleyball are related to the effectiveness of attack after reception and the success rate of breakpoint complex (Drikos et al., 2021). However, these predictive variables depend, in part, on the setters' DM (Rocha et al., 2021); which reinforces the need to analyze the trend of setting in the offensive construction of the side-out.

Therefore, analyzing DM through ecological validity, considering the specifics and constraints of the game context, is essential (Raab et al., 2019), with social network analysis being the most appropriate tool for the analysis and interpretation of interactions (Wäsche et al., 2017). Therefore, understanding the interaction between the individual-environment, through the possibilities of actions that arise from the different configurations of the environment (Araújo et al., 2017), through the environmental restrictions known as affordances (Gibson, 1966), allows us to understand the adaptations in DM to solve problems intrinsic to competitive performance (Woods, McKeown, O'Sullivan, et al., 2020). In this bias, transitions between stable behavioral patterns arise from dynamic instability, alternating between distinct patterns that are co-determined by the constraints and information available in the game environment (Raab et al., 2019).

In view of what has been exposed, it is clear that little is known about the setter's DM and its influence on the game played in high-level volleyball. Thus, the objective of the present research was to analyze the setter's DM in the offensive construction of the side-out in high-level men's volleyball, when there were all attack options available, as this is the most complex scenario to interpret the possibilities of action.

Hence, we investigated whether there was a difference in the distribution strategy when teams won or lose the game. The study hypotheses are: I – teams will present higher eigenvector values for setting to position 3, simple blocks and attack point, regardless of winning or losing the game; II – in games in which the teams were defeated, the eigenvector values will be higher for the setting carried out from the setter's initial positions in zones 2, 3 and 4, as there is a lower number of attackers in the net; III – in games in which the teams won, the highest eigenvector values will be for the middle-hitter's attacking in positions close to the setter, as it is a faster ball and restricts the action options of the blocking and defense system opponent; as well as for setting carried out from the setter's initial positions in zones 1, 6 and 5, similarly to hypothesis 2.

Material & methods

Sample

The sample was constituted by the analysis of 132 games of the qualifying phase of the 12 teams participating in the Brazilian men's volleyball Super-League 2021-2022. Twenty two games of each team were observed, resulting in 5524 attacks after the reception that allowed the organized attack with all available attackers (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

Distribution: In order to verify how the distribution by team occurred, we considered the setting for: zones 4 (SETT-P4), 3 (SETT-P3), 2 (SETT-P2), 1 (SETT-P1), and 6 (SETT -P6) and also the ball attacked by the setter in the second touch (including the setter dump) (2SETT). Location of middle-hitter attack: we adopted the criteria presented by Fellingham et al. (2013) and Costa et al. (2016): considering the place where the

middle-hitter jumped to carry out the attack: the middle-hitter jumps ahead and close to the setter (TF); he jumps behind and close to the setter (TC); he jumps ahead and away from the setter (T7). Set moments: we consider the beginning of the set from 0 to 8 points (INI), the middle of the set from 9 to 16 points (MED) and the end of the set from 17th to the end of the set (FIN). 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 10th point until the end of the set.

Number of Blockers: To analyze the effect the distribution had on subsequent play procedures, the number of blockers was considered. Blocks were classified as triple [1x3], broken triple [1x(2 + 1)], double [1x2], broken double [1x(1 + 1)], single [1x1], no block by merit of the setter [1x0], as pointed out by Rocha et al. (2020a).

Effect of the attack: the effects of the attacks were: error (the attacker strikes the ball into the net, out of bounds or violates the regulations), blocked (the attacker fails due to opponent block), continuity (the attack does not result in a final action and allows the counter-attack), and point (the attack results in a direct point as the ball touches the opponent's side 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), and zone 6 (P6). From the setter's initial position, it is possible to understand the offensive organization. For example, when the setter is in P1, there are three attackers in the net, but the outsider hitter is in P4 and the hitter is in P2. On the other hand, when the setter is in P5, there are three attackers in the net, but the outsider hitter is in P2, and the hitter in P4.

Data collection

All matches were filmed with a view from above the court, with a high-definition (1080p) Sony® camera 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 conducted the analysis of the actions used in the study. For reliability testing, 30% of the actions were reanalyzed, which is above the 10% reference value (Tabachnick & Fidell, 2013). Cohen's Kappa values for intra-observer ranged between 0.93 and 0.99 with the respective standard errors of 0.03 and 0.01. Inter-observer value was 1 with standard error 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 (Version 23, USA) for data quality control and exploratory statistics. The social network analysis was performed using the software Gephi 0.8.2-beta for Windows (Version 10.10.3, France). In this study, we chose to use social network analysis for the possibility of analyzing 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).

Results

The results are presented following the ranking order of the teams in the qualifying phase of the Brazilian Super-League 2021-2022. Therefore, Team 1 obtained the highest number of points (by wins and number of sets won) in the qualifying phase and Team 12 was the last team in this phase.

Losing

When analyzing the defeat by team, it can be seen (Table 1) that:

Team 1 presented higher eigenvector values for setting to P3 (0.09), T7 (0.09), regardless of the moment of the set (0.09 for all moments of the set), blocking 1x1 (0.10), point of attack (0.10) and the initial position of the setter in P6 (0.09).

Team 2 showed higher eigenvector values for settings to P3 (0.14), and P4 (0.14), TF (0.16), at INI (0.15), and MED (0.15). 1x1 (0.15) and 1x [1+1] (0.15) blocking, attack point (0.15) and the setter in the starting positions in P2 (0.12), P3 (0.12), and P6 (0.12).

Team 3 presented higher eigenvector values for setting to P3 (0.34), TF (0.39), at FIN (0.37), blocking 1x[1+1] (0.36), point of attack (0.36), and continuity (0.36) and the setter starting position in P6 (0.32).

Team 4 presented higher eigenvector values for setting to P3 (0.35), and P4 (0.35), TF (0.39), at INI (0.38), 1x1 (0.38), and 1x[1+1] (0.38) blocking, continuity (0.37) and the setter starting positions in P4 (0.32), and P5 (0.32).

Team 5 presented higher eigenvector values for settings to P3 (0.36), and P4 (0.36), TF (0.43), regardless of the moment of the set (0.40 for all moments of the set), blocking 1x1 (0.40), attack point (0.39) and the setter starting position in P4 (0.35). Team 6 presented higher eigenvector values for settings to P3 (0.61), TF (0.65), at MED (0.65), blocking 1x1 (0.61), continuity (0.62) and the setter initial position in P6 (0.57).

Table 1: Eigenvector by team when losing

	Teams											
	1	2	3	4	5	6	7	8	9	10	11	12
SETT-P1	0.05	0.10	0.29	0.30	0.31	0.48	0.40	0.49	0.51	0.74	0.58	0.75
SETT-P2	0.07	0.10	0.28	0.33	0.30	0.54	0.42	0.49	0.51	0.82	0.52	0.74
SETT-P3	0.09	0.14	0.34	0.35	0.36	0.61	0.52	0.53	0.57	0.85	0.69	0.91
SETT-P4	0.08	0.14	0.32	0.35	0.36	0.59	0.49	0.54	0.54	0.78	0.64	0.87
SETT-P6	0.06	0.05	0.31	0.25	0.35	0.45	0.47	0.48	0.46	0.81	0.64	0.91
2SETT	0.00	0.04	0.10	0.00	0.20	0.15	0.30	0.20	0.18	0.59	0.38	0.66
TF	0.10	0.16	0.39	0.39	0.43	0.65	0.60	0.63	0.62	0.94	0.75	1.00
TC	0.06	0.10	0.14	0.25	0.00	0.59	0.35	0.55	0.26	0.84	0.67	0.97
T7	0.09	0.09	0.34	0.34	0.39	0.64	0.45	0.58	0.63	0.91	0.74	0.95
INI	0.09	0.15	0.36	0.38	0.40	0.64	0.58	0.62	0.60	0.93	0.75	1.00
MED	0.09	0.15	0.35	0.36	0.40	0.65	0.58	0.60	0.59	0.93	0.75	0.98
FIN	0.09	0.13	0.37	0.37	0.40	0.63	0.58	0.62	0.62	0.91	0.74	0.98
1X0	0.04	0.04	0.21	0.09	0.19	0.59	0.41	0.41	0.52	0.80	0.62	0.73
1X1	0.10	0.15	0.34	0.38	0.40	0.61	0.55	0.58	0.57	0.88	0.71	0.93
1X(1+1)	0.08	0.15	0.36	0.38	0.39	0.56	0.53	0.58	0.54	0.85	0.69	0.89
1X2	0.03	0.06	0.32	0.33	0.37	0.54	0.46	0.56	0.51	0.85	0.69	0.89
1X(2+1)	0.00	0.00	0.15	0.04	0.04	0.16	0.28	0.15	0.29	0.50	0.25	0.53
1X3	0.00	0.00	0.00	0.00	0.00	0.15	0.14	0.15	0.12	0.00	0.00	0.48
POINT	0.10	0.15	0.36	0.36	0.39	0.61	0.56	0.60	0.59	0.90	0.72	0.96
CONTI.	0.09	0.12	0.36	0.37	0.37	0.62	0.55	0.59	0.58	0.90	0.70	0.96
BLOCK	0.03	0.07	0.28	0.30	0.38	0.56	0.49	0.51	0.53	0.84	0.63	0.88
ERROR	0.03	0.11	0.29	0.35	0.31	0.58	0.44	0.53	0.54	0.87	0.69	0.91
P1	0.06	0.10	0.27	0.31	0.31	0.54	0.45	0.51	0.50	0.75	0.61	0.75
P2	0.08	0.12	0.26	0.29	0.33	0.51	0.45	0.49	0.47	0.75	0.61	0.79
P3	0.08	0.12	0.31	0.26	0.32	0.55	0.44	0.51	0.49	0.71	0.61	0.81
P4	0.07	0.08	0.25	0.32	0.35	0.51	0.50	0.52	0.52	0.84	0.64	0.85
P5	0.03	0.11	0.30	0.32	0.31	0.53	0.49	0.54	0.50	0.84	0.65	0.87
P6	0.09	0.12	0.32	0.30	0.33	0.57	0.48	0.49	0.53	0.84	0.60	0.87

Team 6 presented higher eigenvector values for settings to P3 (0.61), TF (0.65), at MED (0.65), blocking 1x1 (0.61), continuity (0.62) and the setter initial position in P6 (0.57).

Team 7 presented higher eigenvector values for setting to P3 (0.52), TF (0.60), regardless of the moment of the set (0.58 for all moments of the set), blocking 1x1 (0.55), point of attack (0.56) and the setter starting position in P4 (0.50).

Team 8 presented higher eigenvector values for settings to P4 (0.54), TF (0.63), at INI (0.62), and FIN (0.62), 1x1 (0.58) and 1x[1+1] (0.58) blocking, attack point (0.60) and the setter starting position in P5 (0.54).

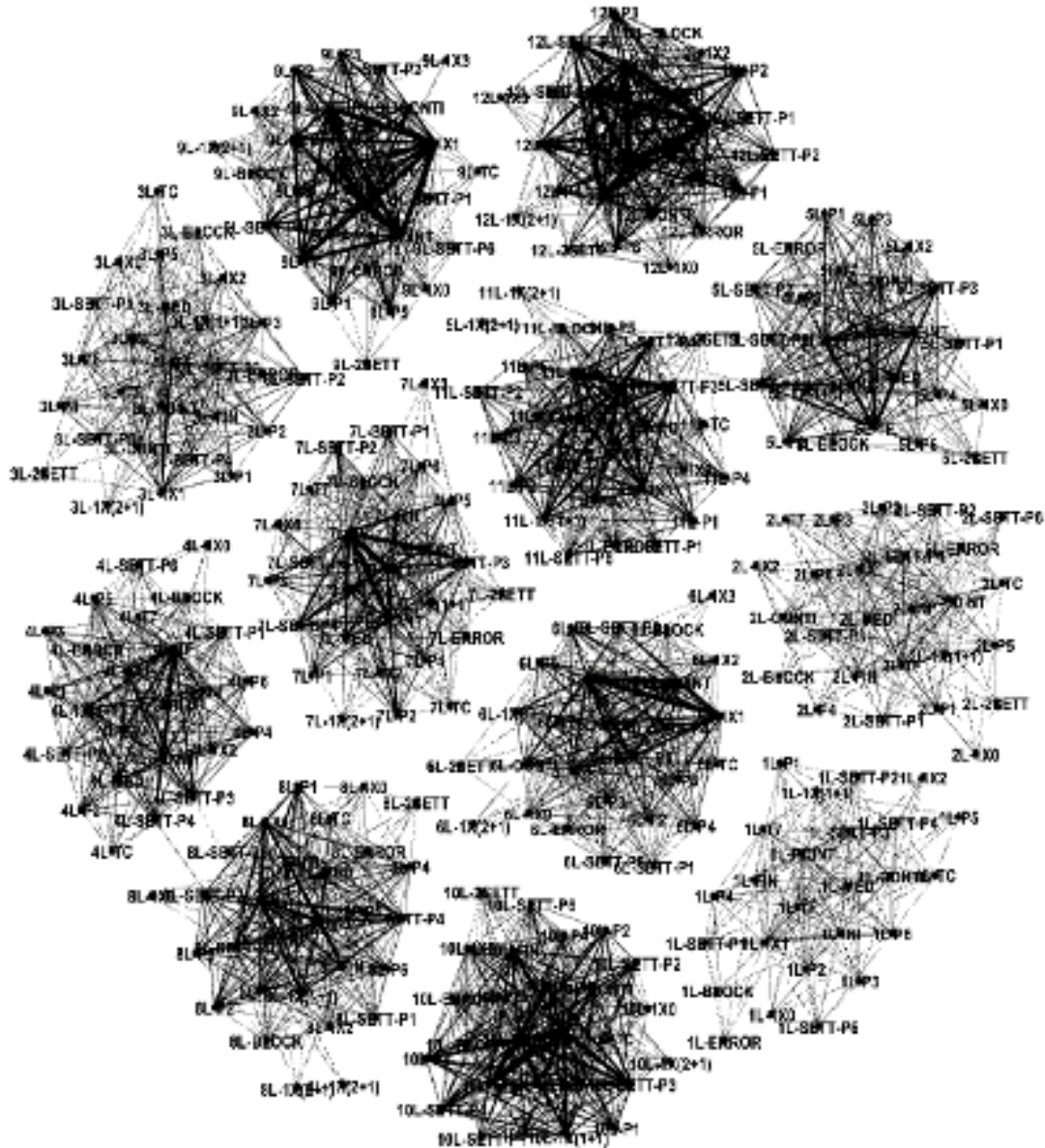
Team 9 presented higher eigenvector values for setting to P3 (0.57), T7 (0.63), at FIN (0.62), blocking 1x1 (0.57), attack point (0.59) and the setter initial position in P6 (0.53).

Team 10 showed higher eigenvector values for settings to P3 (0.85), TF (0.94), at INI (0.93), and MID (0.93), blocking 1x1 (0.88), point of attack (0.90), and continuity (0.90) and the setter initial positions in P4 (0.84), P5 (0.84), and P6 (0.84).

Team 11 showed higher eigenvector values for settings to P3 (0.69), TF (0.75), at INI (0.75), and MID (0.75), blocking 1x1 (0.71), point of attack (0.72) and the setter starting position in P5 (0.65).

Team 12 showed higher eigenvector values for settings to P3 (0.91), and P6 (0.91), TF (1.00), at INI (1.00), blocking 1x1 (0.93), point of attack (0.96), and continuity (0.96) and the setter starting positions in P5 (0.87), and P6 (0.87).

Figure 1 - Network of eigenvectors of teams participating in Brazilian men's Super-League 21-22 when losing the game.



Winning

When analyzing the victory by team (Table 2),

Team 1 presented higher eigenvector values for settings to P6 (0.79), TF (0.82), at INI (0.85), 1x1 (0.80), 1x[1+1] (0.80), and 1x2 (0.80) blocking, attack point (0.82) and the setter starting position in P5 (0.72).

Team 2 presented higher eigenvector values for settings to P3 (0.67), P4 (0.67), and P6 (0.67), TF (0.77), and T7 (0.77), at MID and FIN (0.76 for both), blocking 1x1 (0.74), point of attack (0.74) and the setter initial positions in P2 (0.66), and P5 (0.66).

Team 3 presented higher eigenvector values for settings to P3 (0.91), TF (1.00), at INI (0.99), blocking 1x1 (0.92), attack point (0.95) and the setter initial position in P6 (0.85).

Team 4 presented higher eigenvector values for settings to P3 (0.58), TF (0.64), at INI (0.63), and FIN (0.63), 1x1 (0.60) and 1x[1+1] (0.60) blocking, attack point (0.61) and the setter starting position in P6 (0.54).

Team 5 presented higher eigenvector values for settings to P3 (0.72), P4 (0.72), and P6 (0.72), TF (0.83), at MID (0.81), blocking 1x[1+1] (0.75), point of attack (0.79) and the setter starting position in P4 (0.71).

Table 2: Eigenvector by team when winning.

	Teams										
	1	2	3	4	5	6	7	8	9	10	11
SETT-P1	0.59	0.57	0.76	0.50	0.65	0.51	0.37	0.54	0.22	0.46	0.24
SETT-P2	0.64	0.54	0.75	0.47	0.60	0.42	0.42	0.51	0.25	0.50	0.34
SETT-P3	0.78	0.67	0.91	0.58	0.72	0.59	0.52	0.67	0.31	0.58	0.44
SETT-P4	0.78	0.67	0.87	0.56	0.72	0.56	0.49	0.66	0.32	0.55	0.41
SETT-P6	0.79	0.67	0.86	0.51	0.72	0.48	0.34	0.53	0.00	0.55	0.36
2SETT	0.24	0.43	0.36	0.22	0.34	0.15	0.28	0.45	0.18	0.28	0.14
TF	0.82	0.77	1.00	0.64	0.83	0.64	0.58	0.73	0.35	0.66	0.48
TC	0.81	0.51	0.70	0.44	0.44	0.45	0.42	0.67	0.09	0.56	0.34
T7	0.80	0.77	0.97	0.63	0.81	0.61	0.33	0.72	0.35	0.62	0.46
INI	0.85	0.74	0.99	0.63	0.80	0.63	0.55	0.73	0.34	0.65	0.47
MED	0.84	0.76	0.96	0.62	0.81	0.62	0.53	0.72	0.33	0.64	0.45
FIN	0.83	0.76	0.93	0.63	0.79	0.62	0.56	0.72	0.32	0.65	0.45
1X0	0.67	0.61	0.84	0.38	0.58	0.54	0.49	0.56	0.12	0.50	0.30
1X1	0.80	0.74	0.92	0.60	0.73	0.60	0.54	0.68	0.33	0.64	0.45
1X(1+1)	0.80	0.72	0.90	0.60	0.75	0.60	0.49	0.70	0.33	0.62	0.45
1X2	0.80	0.72	0.90	0.58	0.72	0.53	0.39	0.54	0.26	0.56	0.38
1X(2+1)	0.00	0.00	0.32	0.15	0.49	0.00	0.00	0.18	0.00	0.00	0.00
1X3	0.20	0.00	0.41	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00
POINT	0.82	0.74	0.95	0.61	0.79	0.61	0.54	0.71	0.33	0.64	0.46
CONTI.	0.81	0.72	0.93	0.58	0.72	0.60	0.49	0.68	0.32	0.57	0.42
BLOCK	0.73	0.63	0.82	0.48	0.72	0.47	0.45	0.56	0.27	0.49	0.28
ERROR	0.76	0.66	0.87	0.51	0.66	0.58	0.46	0.50	0.26	0.57	0.38
P1	0.71	0.61	0.82	0.51	0.62	0.51	0.46	0.54	0.27	0.55	0.35
P2	0.71	0.66	0.80	0.48	0.66	0.54	0.42	0.57	0.26	0.55	0.39
P3	0.71	0.61	0.80	0.44	0.63	0.48	0.40	0.54	0.27	0.53	0.39
P4	0.67	0.63	0.80	0.49	0.71	0.51	0.44	0.62	0.25	0.51	0.35
P5	0.72	0.66	0.83	0.51	0.70	0.49	0.45	0.61	0.29	0.53	0.36
P6	0.71	0.61	0.85	0.54	0.68	0.49	0.45	0.57	0.26	0.47	0.35

Team 6 presented higher eigenvector values for settings to P3 (0.59), TF (0.64), at INI (0.63), 1x1 (0.60) and 1x[1+1] (0.60) blocking, point of attack (0.61) and the setter starting position in P2 (0.54).

Team 7 presented higher eigenvector values for settings to P3 (0.52), TF (0.58), at FIN (0.56), blocking 1x1 (0.54), attack point (0.54) and the setter starting position in P1 (0.46).

Team 8 presented higher eigenvector values for settings to P3 (0.67), TF (0.73), at INI (0.73), blocking 1x[1+1] (0.70), point of attack (0.71) and the setter starting position in P4 (0.62).

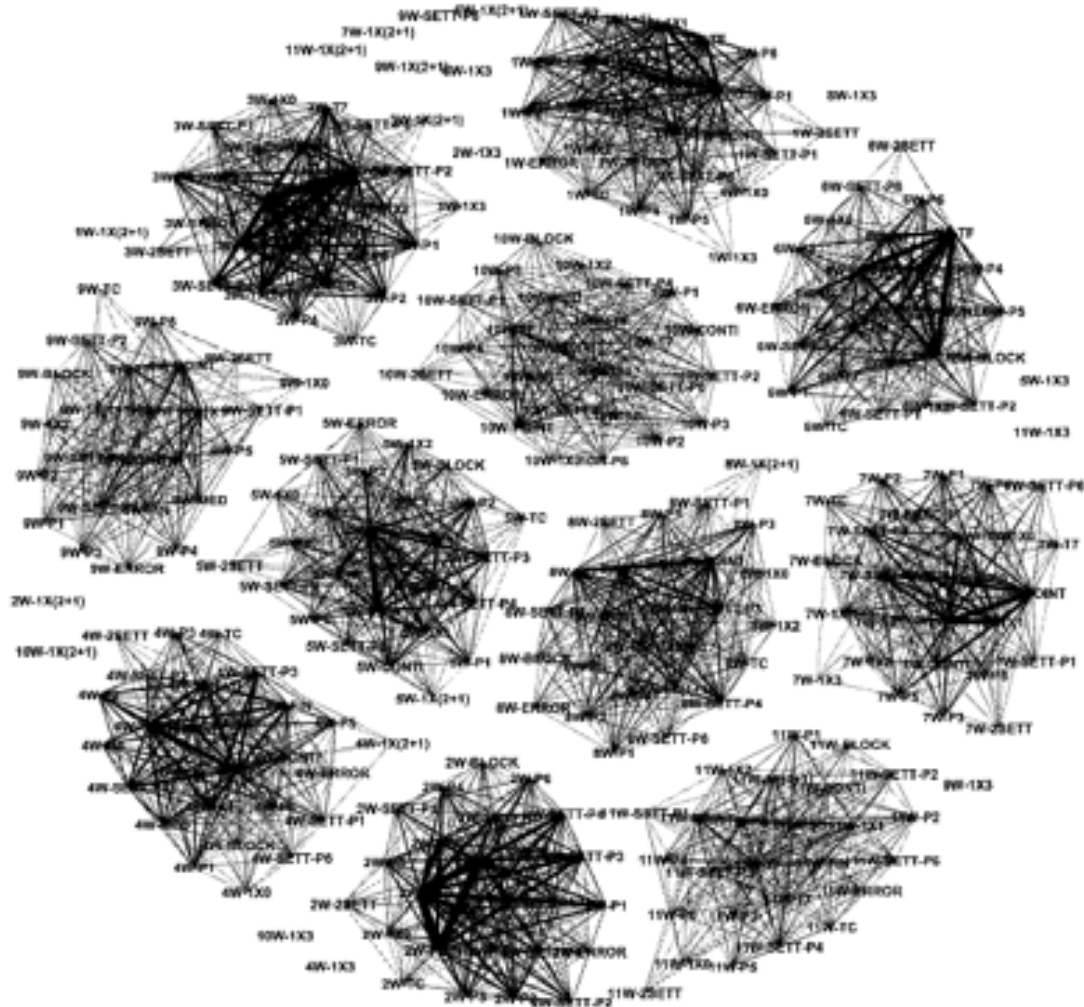
Team 9 presented higher eigenvector values for settings to P4 (0.32), TF (0.35), and T7 (0.35), at INI (0.34), 1x1 (0.33), and 1x[1+1] (0.33) blocking, attack point (0.33) and the setter starting position in P5 (0.29).

Team 10 presented higher eigenvector values for settings to P3 (0.58), TF (0.66), at INI (0.65), and FIN (0.65), blocking 1x1 (0.64), attack point (0.64) and the setter starting positions in P1 (0.55), and P2 (0.55).

Team 11 presented higher eigenvector values for settings to P3 (0.44), TF (0.48), at INI (0.47), 1x1 (0.45), and 1x[1+1] (0.45) blocking, point of attack (0.46) and the setter starting positions in P2 (0.39), and P3 (0.39). It is worth to noting that

Team 12 did not win any game and its data could not be processed and, therefore, presented.

Figure 2. Network of eigenvectors of teams participating in the Brazilians men's Super-League 2021-2022 after winning the game.



Dicussion

DM in the sports is adapted according to the context of the game, as well as the possibilities of action (Araújo et al., 2017) and the behavior is variable and allows flexibility in the observable action patterns (Raab et al., 2019). Considering this reasoning, the objective of this study was to analyze the setter's DM in the side-out when the teams won and also lose the game, considering the high-level men's volleyball and the receptions that allowed all options attack. Our first hypothesis that teams would have higher eigenvector values for settings to P3, attacks against simple blocks and the attack point, regardless of winning or losing the game, was confirmed. Most studies on volleyball side-out indicate that, under ideal distribution conditions, this pattern of play is the most recurrent (Costa et al., 2016; Laporta et al., 2019; Rocha et al., 2021, 2022).

In this context, when the setting conditions allow the use of all attack options, it is preferable to set the ball to the middle-hitter for the 1st tempo attack (Costa et al., 2017), making it difficult to anticipate the opponent's blocking system (Fellingham et al., 2013). Under the risk of incorrectly anticipating the location of the attack, a fact that would create opportunities for attack situations without blockers; there is a tendency not to anticipate what generates attacks against simple blocks. In this scenario, in which attackers face simple blocks, the offensive system overlaps the defensive system, making it possible to obtain the point of attack (Costa et al., 2016; Rocha et al., 2021).

Our second hypothesis is that in the games in which the teams were defeated, the eigenvector values would be higher for the settings carried out from the setter's initial positions in P2, P3, and P4 was refuted. When analyzing the games where the teams were defeated, for the most part, the setter's initial position was in P6. In volleyball, the number of attackers in the net influences the setter performance and when the setter is in P1, P6 or in P5, your performance tends to be higher (Đurković et al., 2008).

In addition, considering the Brazilian men's volleyball Super-League, it is observed that the number of attacks carried out in P6 and P1 are reduced (Costa et al., 2016; Costa et al., 2017), but this fact did not limit the offensive construction of the analyzed teams. The analysis of the setter's initial position showed higher eigenvector values for P6, indicating that this position has greater importance in the game analyzed when the teams were defeated. This fact probably occurred because the eigenvector values were higher for the point of attack; indicating that this position (P6) was the most important for the points obtained. Due to it offers the best conditions for conquering the point, as it is not a critical game scenario in which the opposite attack in P4 and the outside-hitter in P2 (Martins et al., 2021), as well as the setter and the middle-hitter and opposite attackers are already close to the initial conditions for the offensive organization, considering the receptions that allow all attack options.

Our third hypothesis was partially confirmed, that the games in which the teams won, the highest eigenvector values would be for the middle-hitter's attacking in positions near the setter, as well as for the settings performed from the setter's initial positions in P1, P6, and P5. When analyzing the victory by team, it was noticed that, for the most part, the setting location was for P3, the middle-hitter's attack was close to the setter (TF) and the setter's initial position was diversified between the teams. The analysis of playing patterns in volleyball shows that the middle-hitter attacks, mostly, in front of and close to the setter under ideal distribution conditions (Costa et al., 2016).

This pattern probably indicates that in centralized receptions (in P3), keeping the middle-hitter close to the middle of the court makes it difficult for the end blockers to anticipate and helping the middle-blocker, at the same time making it difficult for the middle-blocker to move to the ends of the net and helping the end blockers. In this context, the setters manage to create a scenario of instability, making it difficult for the opposing defensive organization, considering that in receptions that allow all attack options, the number of attackers overlaps the number of blockers, with four attackers available (P4, P3, P6, and P1 or P2) and only three blockers in the net (Silva et al., 2013). Regarding the setter's initial position, the analyzed teams probably balanced the attack nets according to the rotations, allowing greater offensive balance, regardless of the setter's initial location. In this sense, the rotations were not distinguished as we hypothesized, given that the composition of the net attack was peculiar to each team and the qualities of their attackers (Shoval & Barron, 2021), as well as the attacker-blocker relationship that is inherent with each game, it results in action possibilities adjusted to the game context (Araújo et al., 2017).

From a general analysis of the results, it is observed that the ecological analysis of the setter's DM in the context of the game indicates that in men's high-level volleyball there are patterns of offensive construction regardless of victory or defeat in the match. This pattern of offensive construction shows that the multiple possibilities of action make it difficult for the opponent to anticipate, allowing the setter to increase the instability in the opponent's decisions, due to non-linearity, while at the same time making defensive self-organization difficult (Raab et al., 2019).

Thus, the restrictions caused to the opponent make it possible to achieve the objective proposed by the attack, obtaining the point, as there are restrictions caused by the offensive conditions (Crowther et al., 2020; Raab et al., 2019), with setters tending to more functional states (Raab et al., 2019; Woods, McKeown, Rothwell, et al., 2020). Therefore, the strategy of keeping the offensive game centralized, with the middle-hitter being the most important player, seems to be necessary, as the attempt to anticipate the blocking to the central areas of the court can create opportunities for attacks with less number of blockers or no blockers at the ends of the net (Conejero et al., 2017; Rocha et al., 2021).

Taking into account the limitations, this study did not consider changes in the distribution according to match status: possible changes in the distribution resulting from winning or losing the set. Furthermore, we do not consider whether the result in the previous game changed the distribution in the next game or the opponent's level. In view of this, it is suggested that future research consider the result in previous matches and make a comparison in the distribution of the game, as well as if the game was between better, intermediate or worse placed teams.

Conclusions

The ideal distribution conditions showed that men's high-level Brazilian volleyball teams have similar offensive patterns, regardless of winning or losing the game. Signaling that, perhaps, the setter's DM may not be affected by the game state, when the game's score is taken as a reference. In view of this, it is observed that from the availability of the middle-hitter and the possibility of quick attack, the defending teams avoid anticipation, specifically the blocking, a fact that reverberates in attacks against simple blocks. This result suggests that coaches should guide central attackers to make themselves available for the attack whenever the game occasion allows. However, the pattern is not altered when losing or winning the game, suggesting that it is necessary to better investigate the setter's DM mechanisms, especially the identification of relevant signs in a real game situation. Finally, Brazilian setters are alerted to be using pre-defined distribution patterns, disregarding to some extent the existing possibilities of action under ideal distribution conditions.

Conflicts of interest - There is no conflict of interest.

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