ORIGINAL ARTICLE

How do match location and opponent level influence complex I offensive strategy in men's volleyball? The case of the Brazilian Men's Superleague

Marcos Henrique do Nascimento. *Centre for Advanced Study and Research in Sports. Federal University of Goiás. Goiás, Brazil.*
Lorenzo Laporta. *Center for Studies in Sports Performance Analysis. Federal University of Santa Maria. Rio Grande do Sul, Brazil.*
Pedro Henrique Cavalcante Vieira. *Centre for Advanced Study and Research in Sports. Federal University of Goiás. Goiás, Brazil.*
Marcelo Couto Jorge Rodrigues. *Centre for Advanced Study and Research in Sports. Federal University of Goiás. Goiás, Brazil.*
Augusto Cezar Rodrigues Rocha. *Centre for Advanced Study and Research in Sports. Federal University of Goiás. Goiás, Brazil.*
Crislaine Couto Rangel. *Federal University of Minas Gerais. Belo Horizonte, Brazil.*
Auro Barreiros Freire. *Centre for Advanced Study and Research in Sports. Federal University of Goiás. Goiás, Brazil.*
Juracy da Silva Guimarães. *Centre for Advanced Study and Research in Sports. Federal University of Goiás. Goiás, Brazil.*
Gustavo Ferreira Pedrosa. *Federal University of Santa Maria – UFSM. Rio Grande do Sul, Brazil.*
Herbert Ugrinowitsch. *Federal University of Minas Gerais. Belo Horizonte, Brazil.*
Gustavo De Conti Teixeira Costa ✉ **.** *Centre for Advanced Study and Research in Sports. Federal University of Goiás. Goiás, Brazil.*

ABSTRACT

Match analysis identifies patterns in both defensive and offensive systems and key performance parameters, which should be applied in the practice context. This study examined the offensive game patterns in high-level Brazilian men's volleyball, considering the opponent's ranking and match location. The sample comprised twenty-two matches involving the top four teams competing against each of the twelve participants in the 2021/2022 Brazilian Men's Volleyball Superliga. Each team played both home and away matches, leading to an analysis of 1,699 Complex I attack actions. The results indicated that the highest eigenvector centrality values were observed for settings primarily directed to positions 3 and 4, regardless of the opponent. Attacks were typically executed by the middle blocker positioned in front of and near the setter against single blocks, frequently resulting in points. Variations were observed depending on the team's rotation and the set phase. High-level Brazilian volleyball teams exhibited minimal variations in their Complex I offensive strategies. However, finalist teams demonstrated differences in the distribution and attack patterns of the middle blocker.

Keywords: Performance analysis, Game complex, Match analysis, Network analysis, Team sports.

Cite this article as:
do Nascimento, M. H., Laporta, L. Vieira, P. H. C, Rodrigues, M. C. J., Rocha, A. C. R., Rangel, C. C., Freire, A. B., Guimarães, J. dS., Pedrosa, G. F., Ugrinowitsch, H., & Costa, G. DC. T. (2025). How do match location and opponent level influence complex I offensive strategy in men's volleyball? The case of the Brazilian Men's Superleague. *Journal of Human Sport and Exercise, 20*(4), 1265-1276. https://doi.org/10.55860/qm882954

✉ **Corresponding author.** *PhD, Núcleo de Estudo e Pesquisa Avançada em Esportes -UFG, Goiânia, Goiás, Brasil.*
E-mail: conti02@ufg.br

Submitted for publication May 30, 2025.
Accepted for publication August 07, 2025.
Published August 23, 2025.
Journal of Human Sport and Exercise. ISSN 1988-5202.

doi: https://doi.org/10.55860/qm882954

INTRODUCTION

Match Analysis is a valuable tool in sports, allowing for the identification of key performance parameters that contribute to team success. This analytical approach facilitates the structuring and adaptation of training programs or competitive environments to maintain or enhance observable performance (Drikos et al., 2021, 2022; Laporta et al., 2023; Martins et al., 2021). Match analysis is well established in the literature and has evolved to incorporate more contextualized assessments, applying an ecological perspective to sports performance (Giatsis et al., 2023; Lima et al., 2023). Within this framework, match analyses that overlook contextual factors such as opponent level and match location fail to fully capture the complexity of competitive dynamics (do Nascimento et al., 2024; Ribeiro et al., 2022; van Meurs et al., 2023; Yu et al., 2020, 2021).

Studies indicate that match location significantly impacts game patterns in volleyball, with home and away matches exhibiting differences in team performance (Pollard et al., 2017). This effect is attributed to crowd influence on players' performance (Pollard et al., 2017; van Meurs et al., 2023). The prevailing assumption is that a larger benefits the home team while disadvantaging the away team. This idea gave rise to the social support hypothesis, suggesting that higher spectator density creates an intense supporting atmosphere, which could translate into improved performance (van Meurs et al., 2023). Given the likelihood that match location influences game dynamics, it is essential to account for this factor when analysing offensive and defensive performance in volleyball. Elements such as familiarity with the environment, crowd support, and psychological advantages for the home team can directly impact decision-making, technical execution, and tactical strategy. Ignoring this influence may introduce bias into performance assessments. Playing at home has increased the likelihood of victory compared to away matches, which is more pronounced in men's competitions (Pollard et al., 2017; van Meurs et al., 2023). The home advantage is likely influenced by travel-related fatigue, familiarity with the playing venue, referee bias, tactical adjustments, psychological factors, and other contextual elements (Pollard, 2008).

Furthermore, when analysing sports performance in volleyball, it is essential to account not only for technical, tactical, and match location but also for the opponent's level, as game patterns also depend on the adversary's quality (Drikos et al., 2022). Regarding volleyball, research has evolved from generalized analyses that consider all teams in a tournament to more team-specific assessments (Rocha, Laporta, Rodrigues, de Lira, et al., 2023; Rocha, Laporta, Rodrigues, Guimarães, et al., 2023).

Team-specific analyses reveal that in world championships, higher-ranked teams exhibit superior reception quality, allowing for more structured offensive plays with faster and more powerful attacks, with the championship-winning team scoring more points than others (Rocha, Laporta, Rodrigues, Guimarães, et al., 2023). However, variations exist in game strategies among international teams, as higher-ranked teams tend to accelerate plays even in suboptimal situations, diversify their attack options, and opt for powerful attacks following consecutive opponent errors (Martins et al., 2022).

An analysis of the European Men's Volleyball Championship indicated that match performance and final tournament rankings influence game patterns (Drikos et al., 2022). The primary performance indicators distinguishing winning and losing teams vary, as matches between teams of different levels tend to feature more opponent errors, whereas evenly matched teams prioritize avoiding blocked attacks (Drikos et al., 2022). However, it remains unclear whether this effect is indeed due to the quality of the opponent, as other factors may influence it, such as the stage of the competition or the execution of performance aligned with training routines. Therefore, further studies are needed to understand the impact of opponent quality better, considering other scenarios, such as national-level matches. In Brazilian volleyball, studies have shown that

reception quality affects offensive organization, set location, and game strategy (Costa et al., 2016). However, offensive patterns do not appear to be significantly influenced by the opponent's level, as setters tend to favour traditional, low-risk strategies to minimize errors (Nascimento, Laporta, Pedrosa, et al., 2023). Analysing performance about match location is essential to understanding potential variations in this pattern. A comprehensive evaluation considering the match location and the opponent's rankling will provide deeper insights into this issue.

Given these findings, analysing team-specific offensive patterns in men's volleyball is crucial while considering match location to avoid overgeneralization and account for the home-court advantage observed in this sport. Based on this context, the present study aims to analyse the offensive game patterns of high-level Brazilian men's volleyball, considering the opponent's ranking and whether the match was played at home or away. The study proposes the following hypotheses: 1 - In home matches, higher eigenvector centrality values will be observed for sets directed to position 3, with the middle blocker positioned in front of the setter, against a single block, resulting in attack points; 2 - In away matches, higher eigenvector centrality values will be observed for sets directed to positions 4 and 2, against a double block, resulting in attack points; 3 - Differences in offensive patterns will be observed depending on the opposing team.

METHODS

Sample

This study examined twenty-two matches featuring the top four teams competing against each of the twelve participants in the 2021/2022 Brazilian Men's Volleyball Superliga. Each team engaged in both home and away matches, resulting in the analysis of 1,699 Complex I attack actions. The Complex I Attacks corresponding on attacks initiated following receptions that enabled structured offensive plays with multiple attack options (Hurst et al., 2016).

Variables

Setter's initial position

The onset of each rally was analysed, with rotations categorized from Rotation 1 (R1) to Rotation 6 (R6). The setter's position offers insights into the offensive structure, as all teams utilized a 5-1 offensive system. For instance, in R1, three attackers were positioned at the net, with the opposite hitter in position 4 and the outside hitter in position 2.

Middle-blocker attack location

The attack location of the middle-blocker was categorized based on the spatial position relative to the setter. The attack could occur in front of and near the setter (TF), behind and near the setter (TC), or in front but at a greater distance from the setter (T7) (Costa, Ceccato, Evangelista, et al., 2016; Fellingham et al., 2013).

Setting distribution

To evaluate how setters allocated the ball across offensive zones, the study considered sets directed to zones 4 (SETT-P4), 3 (SETT-P3), 2 (SETT-P2), 1 (SETT-P1), and 6 (SETT-P6). Additionally, attacks executed by the setter on the second contact, including setter dumps, were recorded (2SETT).

Attack efficacy

The outcomes of attacks were classified into four categories: (1) error, where the attacker committed a fault such as hitting the net, sending the ball out of bounds, or violating regulations; (2) blocked, where the opponent successfully neutralized the attack; (3) continuation, where the attack allowed a counterattack

without immediately determining the point; and (4) point, where the attack directly resulted in a score by either landing in the opponent's court or deflecting off the block out of bounds (Marcelino et al., 2011).

Number of blockers

The number of blockers was recorded to assess the impact of the setter's distribution on subsequent actions. Blocking formations were categorized as follows: triple block [1 × 3], broken triple [1 × (2 + 1)], double block [1 × 2], broken double [1 × (1 + 1)], single block [1 × 1], or no block, where the setter effectively prevented a blocking attempt [1 × 0] (Rocha et al., 2020).

Moment of set

Furthermore, the study examined different phases of the game set, categorizing them as follows: the initial phase (INI), ranging from 0 to 8 points; the middle phase (MED), spanning from 9 to 16 points; and the final phase (FIN), starting from the 17th point until the conclusion of the set. For the analysis of the fifth set, the classification was adjusted accordingly: the INI phase included 0 to 5 points, the MED phase covered 6 to 10 points, and the FIN phase encompassed all points from the 11th onward until the set's completion.

Data collection

Match footage was obtained using a Sony® high-definition (1080p) camera, positioned 7 to 9 meters behind the end line and elevated 5 meters from the ground to capture a bird's-eye perspective of the court. The analysis was conducted by three physical education professionals, each with over five years of experience in performance analysis. To ensure reliability, 30% of the recorded actions were re-evaluated, exceeding the standard reference of 10% (Tabachnick & Fidell, 2013). Intra-observer reliability was confirmed with a Cohen's Kappa coefficient of 1 (standard error = 0), while inter-observer reliability values ranged from 0.93 to 0.99 (standard errors of 0.03 and 0.01, respectively), all surpassing the recommended threshold of 0.75 (Fleiss et al., 2013). These recordings were provided by the Brazilian Volleyball Team's technical staff.

Data analysis

Eight networks were constructed using Social Network Analysis and Eigenvector Centrality (Bonacich, 2007), with two networks examined per team representing home and away matches. Data were compiled in a Microsoft Excel 2015 for Windows spreadsheet, followed by quality checks and exploratory statistical analysis using IBM SPSS Statistics (version 23, Armonk, NY, USA). Social network analysis used Gephi 0.8.2-beta for Windows (version 10.10.3, France). This methodological approach was selected for its capacity to evaluate the connectivity and complexity of interactions among all variables, providing a comprehensive perspective (Borgatti, 2005).

Eigenvector centrality was employed to determine node importance within the network, considering the number of direct connections and the centrality of interconnected nodes (Bonacich, 2007; Borgatti, 2005). The visualization of eigenvector values was achieved by adjusting node sizes and edge thicknesses, ensuring a proportional representation of importance within the network. Both direct and indirect connections between variables were highlighted (Laporta et al., 2018a, 2018b). To optimize network organization, the Fruchterman-Reingold algorithm was implemented (area set to 100,000), positioning nodes with the highest eigenvector centrality at the centre of each subnetwork (Newman, 2006).

Supplementary material details the eigenvector values per team and match. Nodes representing home matches are prefixed with 'H,' while those for away matches begin with 'A.' Additionally, matchups were labelled according to the ranking positions of competing teams. For example, in a game where Team 1 played at home against Team 10, nodes were labelled "*H_01x10*." For middle-blocker attack locations, the

corresponding nodes were denoted as "*H_01x10_TF*," "*H_01x10_TC*," "*H_01x10_T7*," and "*H_01x10_2SETT*."

RESULTS

Considering the extensive volume of results (Table1, provided upon request), we present only the nodes with eigenvector values equal to or greater than 0.9 for home matches (Figure 1) and away matches (Figure 2). For the 1st place team, in home matches, the highest eigenvector values were observed in the game against the 5th place team, specifically for the variables attack point (1.00), middle attack in front and far from the setter (0.97), and attacks occurring at the end of the set (0.92). In away matches, the highest eigenvector values were recorded in the game against the 3rd place team, particularly for attack point (0.95) and attack continuity (0.93), middle attack in front and far from the setter (0.92 and 0.96, respectively), as well as for attacks occurring at the beginning (1.00) and end of the set (0.95).

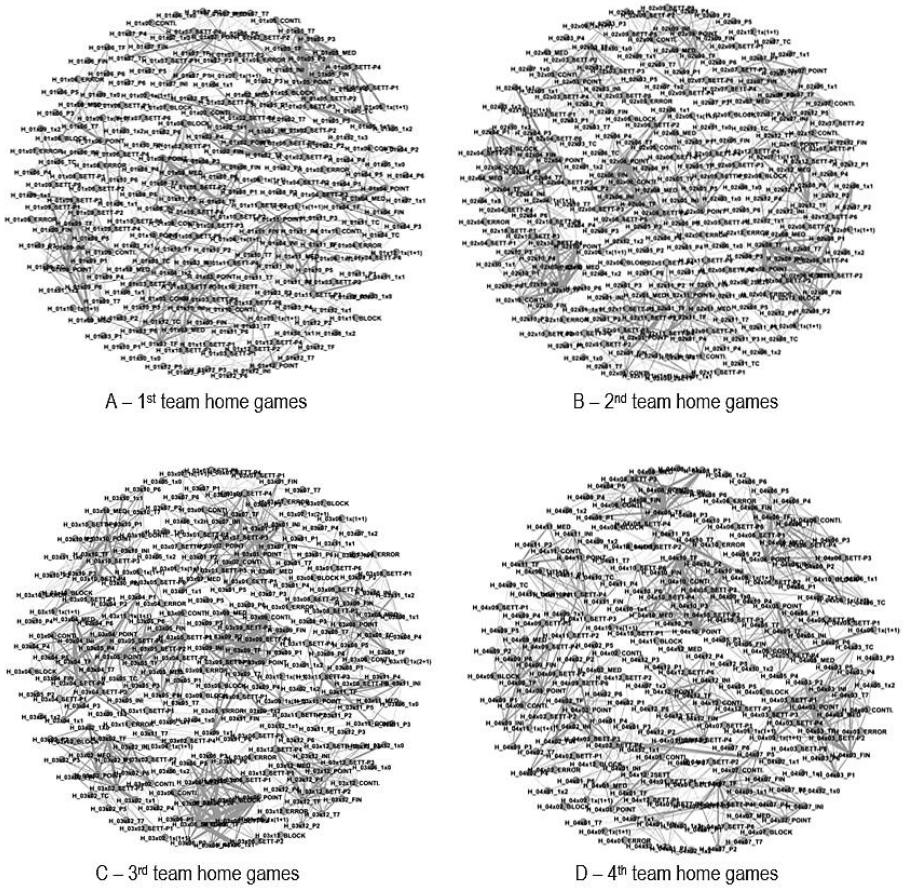

Figure 1. Eigenvector values for games played at home by teams ranked 1st to 4th.

For the 2nd place team, in home matches, the highest eigenvector values were found in the game against the 6th place team, particularly for the middle attack in front and close to the setter (1.00), attacks occurring at the end of the set (0.93), and attacks resulting in continuity (0.95) or points (0.95). In away matches, the highest eigenvector values were recorded for middle attack in front and close to the setter against both the 2nd place team (0.99) and the 6th place team (1.00), as well as for attack point against the 6th place team (0.95).

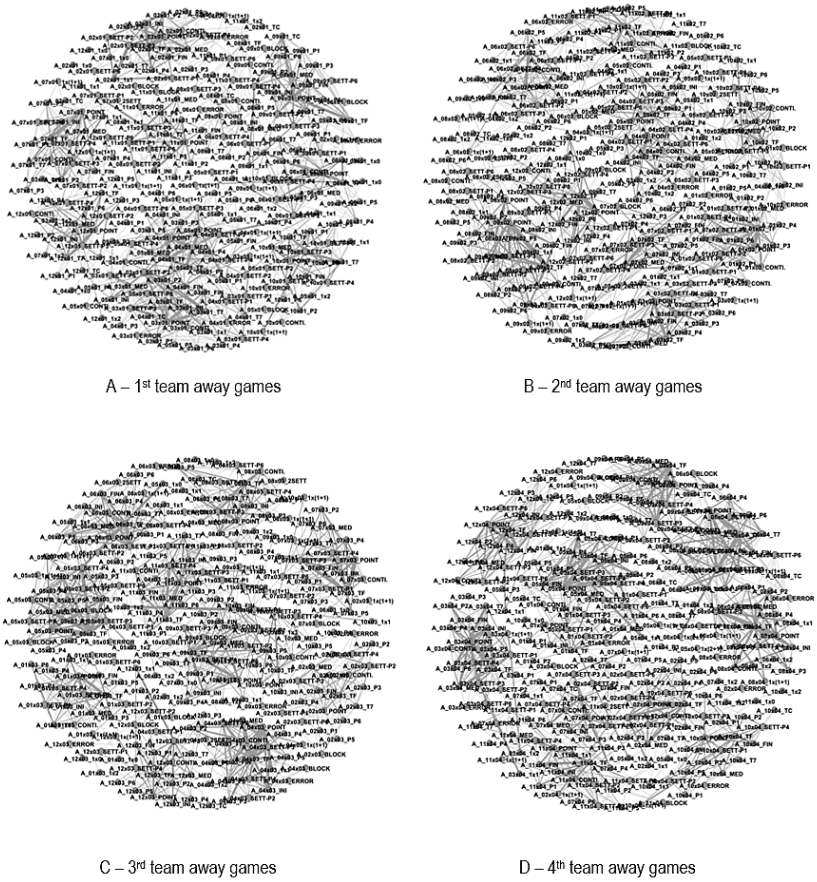

Figure 2. Eigenvector values for games played away from home by teams ranked 1st to 4th.

For the 3rd-place team, in home matches, the highest eigenvector values were observed in the game against the 6th place team, specifically for middle attack in front and close to the setter (1.00), middle attack in front and far from the setter (0.98), sets to positions P3 and P4 (0.91 for both), attacks occurring in the middle of the set (0.94), and attack point (0.93). In away matches, the highest eigenvector values were found against the 5th place team, specifically for the middle attack in front and close to the setter (1.00) and attack point (0.92).

For the 4th-place team, in home matches, the highest eigenvector values were observed in matches against the 3rd and 10th-place teams, specifically for middle attacks in front and close to the setter (0.99 and 1.00, respectively), attacks occurring at the end of the set (0.943 for both), and attack points (0.99 and 0.93, respectively).

DISCUSSION

Match analysis assists coaches in developing training programs and evaluating the strengths and weaknesses of their teams (González-Rodenas et al., 2019; Silva, Marcelino, et al., 2016). The current literature includes numerous studies analysing volleyball matches (Fernandez-Echeverria et al., 2019; García-de-Alcaraz & Marcelino, 2017; Marcelino et al., 2011; Silva et al., 2013). However, most of these analyses are general and do not capture the nuances that influence team performance indicators (García-de-Alcaraz & Marcelino, 2017; Lima et al., 2023; Millán-Sánchez et al., 2019). Furthermore, factors such as match location and type of competition can influence performance (van Meurs et al., 2023; Yu et al., 2021).

In this context, the present study aimed to analyse the offensive game patterns in Brazilian high-level men's volleyball, considering the opponent and the match location, whether played at home or away.

Our first hypothesis proposed that in home matches, eigenvector values would be higher for settings directed to position 3, with the middle attacker positioned in front of the setter against a single block, resulting in attack points, was partially confirmed. The results showed that the highest eigenvector values were observed for settings directed predominantly to positions 3 and 4, regardless of the opponent, with the middle attacker positioned in front of and close to the setter, leading to successful attacks. These findings align with previous research indicating that high-performance teams adopt a more conservative playing style, favouring sets to positions 2, 3, and 4, with a preference for playing in front of the setter (positions 3 and 4), utilizing the middle attacker in front of the setter (TF), and resulting in attack points (Conti et al., 2018; Rocha et al., 2022; Rocha, Laporta, Rodrigues, de Lira, et al., 2023). Although these data consistently illustrate team tendencies, some matches, particularly those involving the 1st and 2nd place teams, exhibited variations in setting locations, suggesting specific adaptations to the opponent's defensive system. In this regard, the literature indicates that considering game ecology, the interaction between the environment and the opponent facilitates adaptations in playing strategies, with new patterns emerging in response to environmental constraints (Araújo et al., 2006, 2017; Dutra et al., 2021; Woods et al., 2020). Conversely, in some matches played by the 2nd and 4th place teams, higher eigenvector values were observed for attack continuity, suggesting difficulties in modifying offensive patterns to overcome the defensive system. This finding implies that players demonstrated a lower ability to read the game context, possibly due to maintaining a consistent attacking approach regardless of the opponent (Nascimento, Laporta, Rocha, Lira, et al., 2023; Nascimento, Laporta, Pedrosa, et al., 2023; Nascimento, Laporta, Rocha, De Lira, et al., 2023).

Our second hypothesis, which suggested that in away matches, eigenvector values would be higher for sets directed to positions 4 and 2, with attacks against a double block resulting in points, was partially confirmed. The highest eigenvector values were observed for settings directed to zones 3 and 4. In zone 3, attacks occurred close to (TF) and far from the setter (T7) against single blocks and resulted in points. These findings indicate that teams preferred to play with speed, a strategy well established in the literature (Martins et al., 2021; Rocha et al., 2022; Rocha, Laporta, Rodrigues, Guimarães, et al., 2023). Additionally, the high eigenvector values for position 4 may indicate the adoption of conservative setting strategies (Nascimento, Laporta, Rocha, Lira, et al., 2023; Nascimento, Laporta, Pedrosa, et al., 2023; Nascimento, Laporta, Rocha, De Lira, et al., 2023), as well as the use of combination plays based on the movement of the middle blocker, the objective is to fixate the opposing middle blocker, making it more difficult for them to block the outside hitter (Nascimento, Laporta, Rocha, Lira, et al., 2023; Silva, Sattler, et al., 2016). In the analysed matches, this was characterized by the middle attacker jumping for an attack in front of and far from the setter while the position 4 attacker jumped to attack in zone 4, close to the middle attacker, a play known as the "*overball*." Another explanation for the high eigenvector values for position 4 is the possibility of attacking in the setter's blocking zone, resulting in a lower block reach and better attacking conditions (Silva et al., 2013; Silva, Sattler, et al., 2016). Overall, these findings suggest that the teams' game strategies remained unchanged despite match location, although extensive literature indicates that these variable influences performance and can lead to strategic adaptations (van Meurs et al., 2023; Yu et al., 2021).

Our third hypothesis, which stated that there would be differences in game patterns depending on the opposing team, was partially confirmed. We observed that the trends presented in hypotheses 1 and 2 were maintained in most matches, with sets directed in front of the setter against single or broken double blocks, resulting in a successful attack. However, there was variation in eigenvector values based on team rotation and set timing, indicating that specific rotations, depending on the match, allowed for better team

performance, as did particular moments within the set. These findings demonstrate that performance depends on the relationships that constitute game constraints, with team rotation influencing critical aspects of game dynamics (Đurković et al., 2008; López et al., 2023; Silva, Sattler, et al., 2016), such as serve-reception, setting-blocking, and attack-blocking interactions.

Although game patterns, considering variables such as middle-blocker attack location, setting distribution, number of blockers, and attack outcome, exhibited minor variations, suggesting stability in playing style regardless of the opponent, as previously described in the literature (do Nascimento et al., 2024; Nascimento, Laporta, Pedrosa, et al., 2023), it is possible that a team's rotation at the beginning of the set, depending on the opponent's rotation, could enhance performance, and this is due to the interplay of offensive and defensive aspects across the net, as team performance varies based on rotation (Silva et al., 2013; Silva, Sattler, et al., 2016). Furthermore, these rotational advantages may emerge in specific phases of the set, justifying the differences in eigenvector values across different set periods. In this context, a team's playing pattern is adjusted in response to the opponent's structure across the net, allowing higher-ranked teams to establish dominance over lower-ranked teams.

Although the results of this study indicate similarities between teams when playing at home and away, regardless of the opponent, it is important to emphasize that, in high-performance teams, even slight differences can significantly impact match outcomes (Laporta et al., 2015). On the other hand, it is also necessary to consider that teams recruit athletes based on a desired playing pattern, which tends to be maintained throughout the competitive season. While gameplay requires adaptations to the context, under pressure conditions, players often execute actions with which they are most familiar, which may explain the minor variations observed in this study. Additionally, it should be noted that coaches have a defined playing philosophy, and its implementation may shape the team's style of play, potentially restricting tactical adjustments. As a practical implication, we suggest that high-level teams be trained to adapt to game contexts beyond just the physical attributes of the athletes. In this regard, teams should develop a flexible tactical game plan that can be adjusted according to the opponent.

CONCLUSION

High-level Brazilian men's volleyball teams exhibit minimal variations in their playing style within the complex system, with finalist teams showing differences in the distribution and attack patterns of the middle-blocker. Additionally, it was observed that teams modified their initial positioning at the beginning of the set, with the setter adjusting their starting position. These findings suggest that minor adjustments, such as the team's initial formation and middle-blocker distribution, at the highest level of Brazilian volleyball, can significantly impact performance, ultimately distinguishing team outcomes.

AUTHOR CONTRIBUTIONS

All authors contributed significantly to the final version of this manuscript and to the interpretation of the results. Study design: MHN, LL, HU, and GDCTC. Data collection: MHN, ACRR, ABF. Statistical analysis: PHCV, MCJR, and CRC. Data interpretation: JSG, GFP, and GDCTC. Literature search: LL and HU. Writing - preparation of the original draft: CRC, ABF, and JSG. Writing - review and editing: all authors. Supervision: GDCTC. Project administration: GDCTC. All authors read and agreed to the published version of the manuscript.

SUPPORTING AGENCIES

This study was partially financed by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES), Brasil—Finance Code 001.

DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

ETHICS STATEMENT

The Federal University of Goiás Ethics Committee approved the study under protocol number CAAE: 15137319.6.0000.5083.

DATA AVAILABILITY STATEMENT

The supplementary material contains data supporting this study's conclusions. If the raw data need to be sent, the corresponding author should be contacted.

ACKNOWLEDGEMENTS

To the Faculty of Physical Education and Dance (FEFD) of the Federal University of Goiás, who welcomed us and provided us with the institutional and academic support essential for developing this research.

REFERENCES

Araújo, D., Davids, K., & Hristovski, R. (2006). The ecological dynamics of decision making in sport. Psychology of Sport and Exercise, 7(6), 653-676. https://doi.org/10.1016/j.psychsport.2006.07.002

Araújo, D., Hristovski, R., Seifert, L., Carvalho, J., & Davids, K. (2017). Ecological cognition: expert decision-making behaviour in sport. International Review of Sport and Exercise Psychology, 12(1), 1-25. https://doi.org/10.1080/1750984X.2017.1349826

Bonacich, P. (2007). Some unique properties of eigenvector centrality. Social Networks, 29(4), 555-564. https://doi.org/10.1016/j.socnet.2007.04.002

Borgatti, S. P. (2005). Centrality and network flow. Social Networks, 27(1), 55-71. https://doi.org/10.1016/j.socnet.2004.11.008

Conti, G., Freire, A., Evangelista, B., Ferreira Pedrosa, G., Ugrinowitsch, H., & Castro, H. (2018). Brazilian high-level men's volleyball: Characterization of the attack performed by the opposite player. Kinesiology, 50(2), 211-217. https://doi.org/10.26582/k.50.2.4

Costa, G. C. T., Ceccato, J. S., Evangelista, B. F. B., Freire, A. B., de Oliveira, A. S., Milistetd, M., Rodrigues, H. A., & Ugrinowitsch, H. (2016). Tactic determinants of game practiced by middle attacker in men's volleyball. Revista Brasileira de Cineantropometria e Desempenho Humano, 18(3). https://doi.org/10.5007/1980-0037.2016v18n3p371

Costa, G. D. C., Ceccato, J. S., Oliveira, A. S. de, Evangelista, B. F. de B., Castro, H. de O., & Ugrinowitsch, H. (2016). Voleibol Masculino de Alto Nível: associação entre as ações de jogo no side-out. Journal of Physical Education, 27(1), e-2752. https://doi.org/10.4025/jphyseduc.v27i1.2152

do Nascimento, M. H., Castro, H. de O., Rocha, A. C. R., Freire, A. B., Pedrosa, G. F., Ugrinowitsch, H., Savassi Figueiredo, L., Laporta, L., & Costa, G. D. C. T. (2024). Social Network Analysis:

Understanding Volleyball Dynamics through Match Opponents. Applied Sciences, 14(13), 5418. https://doi.org/10.3390/app14135418

Drikos, S., Barzouka, K., Balasas, D. G., & Sotiropoulos, K. (2022). Effect of quality of opposition on game performance indicators in elite male volleyball. International Journal of Sports Science & Coaching, 17(1), 169-177. https://doi.org/10.1177/17479541211013701

Drikos, S., Barzouka, K., Nikolaidou, M.-E., & Sotiropoulos, K. (2021). Game variables that predict success and performance level in elite men's volleyball. International Journal of Performance Analysis in Sport, 21(5), 767-779. https://doi.org/10.1080/24748668.2021.1945879

Đurković, T., Marelić, N., & Rešetar, T. (2008). Influence of the position of players in rotation on differences between winning and loosing teams in volleyball. International Journal of Performance Analysis in Sport, 8(2), 8-15. https://doi.org/10.1080/24748668.2008.11868431

Dutra, L. N., Ugrinowitsch, H., Medeiros, A. I. A., Clemente, F. M., Da Matta, G. B., Figueiredo, L. S., Laporta, L., & Costa, G. D. C. T. (2021). Is there a setting distribution pattern in high-level men's volleyball? An ecological approach to the game. Journal of Physical Education and Sport, 21. https://doi.org/10.7752/jpes.2021.s3279

Fellingham, G. W., Hinkle, L. J., & Hunter, I. (2013). Importance of attack speed in volleyball. 9(1), 87-96. https://doi.org/10.1515/jqas-2012-0049

Fernandez-Echeverria, C., Mesquita, I., Conejero, M., & Moreno, M. P. (2019). Perceptions of elite volleyball players on the importance of match analysis during the training process. International Journal of Performance Analysis in Sport, 19(1), 49-64. https://doi.org/10.1080/24748668.2018.1559544

Fleiss, J. L., Levin, B., & Paik, M. C. (2013). Statistical methods for rates and proportions (3o ed, Vol. 1). John Wiley & Sons.

García-de-Alcaraz, A., & Marcelino, R. (2017). Influence of match quality on men's volleyball performance at different competition levels. International Journal of Performance Analysis in Sport, 17(4), 394-405. https://doi.org/10.1080/24748668.2017.1348058

Giatsis, G., Drikos, S., & Lola, A. (2023). Analysis of match report indicators in men's volleyball Olympics and world championships (2014-2021) depending on the type of final score. International Journal of Sports Science and Coaching, 18(3), 874-882. https://doi.org/10.1177/17479541221086779

González-Rodenas, J., Aranda-Malavés, R., Tudela-Desantes, A., Calabuig Moreno, F., Casal, C. A., & Aranda, R. (2019). Effect of Match Location, Team Ranking, Match Status and Tactical Dimensions on the Offensive Performance in Spanish 'La Liga' Soccer Matches. Frontiers in Psychology, 10. https://doi.org/10.3389/fpsyg.2019.02089

Hurst, M., Loureiro, M., Valongo, B., Laporta, L., Nikolaidis, T. P., & Afonso, J. (2016). Systemic Mapping of High-Level Women's Volleyball using Social Network Analysis: The Case of Serve (K0), Side-out (KI), Side-out Transition (KII) and Transition (KIII). International Journal of Performance Analysis in Sport, 16(2), 695-710. https://doi.org/10.1080/24748668.2016.11868917

Laporta, L., Afonso, J., & Mesquita, I. (2018a). Interaction network analysis of the six game complexes in high-level volleyball through the use of Eigenvector Centrality. PLOS ONE, 13(9), e0203348-. https://doi.org/10.1371/journal.pone.0203348

Laporta, L., Afonso, J., & Mesquita, I. (2018b). The need for weighting indirect connections between game variables: Social Network Analysis and eigenvector centrality applied to high-level men's volleyball. International Journal of Performance Analysis in Sport, 18(6), 1067-1077. https://doi.org/10.1080/24748668.2018.1553094

Laporta, L., Costa, G. D. C. T., Fernandes, L. G., Pastori, I. A., Rocha, A. C. R., Hileno, R., Lima, R. F., Castro, H. de O., & Afonso, J. (2023). Sequence and efficacy of game complexes in high-level women's volleyball: A novel perspective through Social Network Analysis. International Journal of Sports Science & Coaching, 18(3), 867-873. https://doi.org/10.1177/17479541221087688

Laporta, L., Nikolaidis, P., Thomas, L., & Afonso, J. (2015). Attack Coverage in High-Level Men's Volleyball: Organization on the Edge of Chaos? Journal of Human Kinetics, 47(1), 249. https://doi.org/10.1515/hukin-2015-0080

Lima, V. da S., Rocha, F. B. F., Diniz, I. B., Garcia-de-Alcaraz, A., Palao, J. M., Costa, G. D. C. T., Mesquita, I., Medeiros, A. I. A., & Batista, G. R. (2023). Status of Match Analysis Research in Indoor and Beach Volleyball: A bibliometric analysis . Retos, 50, 838-848. https://doi.org/10.47197/retos.v50.100039

López, E., Molina, J. J., Díaz-Bento, M. S., & Díez-Vega, I. (2023). Spike performance in K1: influence of rotation and reception area on high level men's volleyball teams. Retos, 48, 213-221. https://doi.org/10.47197/retos.v48.93875

Marcelino, R., Mesquita, I., & Sampaio, J. (2011). Effects of quality of opposition and match status on technical and tactical performances in elite volleyball. Journal of Sports Sciences, 29(7), 733-741. https://doi.org/10.1080/02640414.2011.552516

Martins, J. B., Afonso, J., Mendes, A., Santos, L., & Mesquita, I. (2022). Inter-team variability in game play under critical game scenarios: a study in high-level men. Retos, 43, 1095-1105. https://doi.org/10.47197/retos.v43i0.90505

Martins, J. B., Mesquita, I., Mendes, A., Santos, L., & Afonso, J. (2021). Inter-team variability in high-level women's volleyball from the perspective of Social Network Analysis: an analysis in critical game scenarios. International Journal of Performance Analysis in Sport, 21(4), 564-578. https://doi.org/10.1080/24748668.2021.1924524

Millán-Sánchez, A., Rábago, J. C. M., & Espa, A. U. (2019). The middle blocker in volleyball: A systematic review. Journal of Human Sport and Exercise, 14(1), 24-46. https://doi.org/10.14198/jhse.2019.141.03

Nascimento, M. H. do, Laporta, L., Rocha, A. C. R., Lira, C. A. B., Campos, M. H., Pedrosa, G. F., Guimarães, J. da S., Clemente, F. M., Lima, R. F., Leonardi, T. J., Rodrigues, M. C. J., Castro, H. de O., & Costa, G. D. C. T. (2023). Setting Decision Making in male high- level volleyball: a study from ecological theory and social network analysis perspective. Retos, 50, 1098-1107. https://doi.org/10.47197/retos.v50.98679

Nascimento, M. H., Laporta, L., Pedrosa, G. F., Rocha, A. C. R., de Lira, C. A. B., Campos, M. H., da Silva Guimarães, J., Leonardi, T. J., Rodrigues, M. C. J., Savassi Figueiredo, L., de Oliveira Castro, H., & De Conti Teixeira Costa, G. (2023). The Decision-Making of High-Level Volleyball Setters in the 2021-2022 Volleyball Men's Superliga: Does the Opponent Matter? Perceptual and Motor Skills, 130(6), 2603-2620. https://doi.org/10.1177/00315125231201943

Nascimento, M. H., Laporta, L., Rocha, A. C. R., DE LIRA, C. A. B., Campos, M. H., Pedrosa, G. F., Guimarães, J. D. S., Rodrigues, M. C. J., Leonardi, T. J., Castro, H. D. O., & Costa, G. D. C. T. (2023). Decision making in men's high-level volleyball: analysis of the setter based on game performance. Journal of Physical Education and Sport, 23(3), 603-612. https://doi.org/10.7752/jpes.2023.03075

Newman, M. E. J. (2006). Modularity and community structure in networks. Proceedings of the National Academy of Sciences, 103(23), 8577-8582. https://doi.org/10.1073/pnas.0601602103

Pollard, R. (2008). Home Advantage in Football: A Current Review of an Unsolved Puzzle. The Open Sports Sciences Journal, 1(1), 12-14. https://doi.org/10.2174/1875399X00801010012

Pollard, R., Prieto, J., & Gómez, M. Á. (2017). Global differences in home advantage by country, sport and sex. International Journal of Performance Analysis in Sport, 17(4), 586-599. https://doi.org/10.1080/24748668.2017.1372164

Ribeiro, L. D. C., Fonseca, F. D. S., Costa, G. D. C. T., Castro, H. D. O., Santos, J. P. V. D. S., & Figueiredo, L. S. (2022). Did the Absence of Crowd Support during the Covid-19 Pandemic Affect the Home

Advantage in Brazilian Elite Soccer? Journal of Human Kinetics, 81(1). https://doi.org/10.2478/hukin-2022-0047

Rocha, A. C. R., Laporta, L., Andre Barbosa de Lira, C., Modenesi, H., Figueiredo, L. S., & Costa, G. D. C. T. (2022). Complex I in male elite volleyball: an interactional analysis according to reception location. International Journal of Performance Analysis in Sport, 22(1), 77-89. https://doi.org/10.1080/24748668.2021.2003961

Rocha, A. C. R., Laporta, L., Rodrigues, G. P., de Lira, C. A. B., de Oliveira Castro, H., & de Conti Teixeira Costa, G. (2023). Is it possible for the reception and the player-receiver to influence the offensive construction in volleyball? An ecological vision and Intragame procedural relationships in high-level teams. International Journal of Performance Analysis in Sport, 0(0), 1-15. https://doi.org/10.1080/24748668.2023.2229204

Rocha, A. C. R., Laporta, L., Rodrigues, G. P., Guimarães, J. da S., do Nascimento, M. H., Rodrigues, M. C. J., Leonardi, T. J., de Lira, C. A. B., Castro, H. de O., & Costa, G. D. C. T. (2023). Inter e intra-variability of the best ranked teams: A network analysis in male high-level volleyball. PLOS ONE, 18(2), e0280365. https://doi.org/10.1371/journal.pone.0280365

Rocha, A. C. R., Pedrosa, G. F., Freire, A. B., Praça, G. M., Ugrinowitsch, H., Castro, H. O., & Costa, G. C. T. (2020). Analysis of the setting and predictive factors of the effect of attack according to game ecology: The case of female volleyball. Kinesiology, 52(2). https://doi.org/10.26582/k.52.2.7

Silva, M., Lacerda, D., & João, P. V. (2013). Match analysis of discrimination skills according to the setter attack zone position in high level volleyball. International Journal of Performance Analysis in Sport, 13(2), 452-460. https://doi.org/10.1080/24748668.2013.11868661

Silva, M., Marcelino, R., Lacerda, D., & João, P. V. (2016). Match Analysis in Volleyball: a systematic review. Em J. Sports Sci. Med (Vol. 5).

Silva, M., Sattler, T., Lacerda, D., & João, P. V. (2016). Match analysis according to the performance of team rotations in Volleyball. International Journal of Performance Analysis in Sport, 16(3), 1076-1086. https://doi.org/10.1080/24748668.2016.11868949

Tabachnick, B., & Fidell, L. (2013). Using multivariate statistics (6o ed, Vol. 1). Pearson.

van Meurs, E., Rehr, J. P., Raue-Behlau, C., & Strauss, B. (2023). No relevant spectator impact on home advantage in male and female professional volleyball - A longitudinal multilevel logistic model analysis over 25 years. Psychology of Sport and Exercise, 66, 102401. https://doi.org/10.1016/j.psychsport.2023.102401

Woods, C. T., McKeown, I., O'Sullivan, M., Robertson, S., & Davids, K. (2020). Theory to Practice: Performance Preparation Models in Contemporary High-Level Sport Guided by an Ecological Dynamics Framework. Sports Medicine - Open, 6(1), 36. https://doi.org/10.1186/s40798-020-00268-5

Yu, Y., García-De-Alcaraz, A., Cui, K., & Liu, T. (2020). Interactive effects of home advantage and quality of opponent in Chinese Women's Volleyball Association League. International Journal of Performance Analysis in Sport, 20(1), 107-117. https://doi.org/10.1080/24748668.2020.1714414

Yu, Y., García-de-Alcaraz, A., Ji, X., Jin, H., Cui, K., & Liu, T. (2021). Effects of home advantage on set outcome and game actions performance in the Chinese Women's Volleyball Association League. International Journal of Performance Analysis in Sport, 21(4), 532-542. https://doi.org/10.1080/24748668.2021.1924527

