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Setter decision-making in elite volleyball: a systematic review of perceptual, tactical, and contextual factors

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ABSTRACT

The setter is the main tactical thinker in volleyball who can turn the team's uncertain reception into an effective attack based the quick perceptual and decision-making process of a setter. However, the research on the decision-making of a setter is still very limited and scattered among performance analysis, ecological dynamics, and sensing technologies. A systematic literature review was conducted to integrate the findings on perceptual-cognitive elements, attack distribution patterns, and contextual constraints that determine the behavior of elite volleyball setters. A search was done in Scopus with the PRISMA 2020 guidelines and a Boolean query, resulting in 466 records. After eliminating duplicates, screening, and assessment of eligibility, only 10 articles were selected for qualitative synthesis and evaluated with the FICO framework (Focus, Information, Context, Outcome). The results showed that the setter's decision-making is most of the time dependent on the spatiotemporal relations between setters, attackers, and blockers. Under normal side-out situations the attack distribution is largely directed to the middle and wing attackers. The quality of the opponent has less influence than the team's offensive strategy, while setting behavior is largely determined by the rule and task constraints. The review demonstrates that setter decision-making is fundamentally constrained by spatiotemporal affordances emerging from setter-attacker-blocker interactions. Findings support an ecological-dynamics interpretation of tactical expertise and highlight opportunities for integrating wearable sensing, social-network analysis, and machine learning approaches into future volleyball performance research.

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Introduction

Volleyball is among the most popular team sports around the globe, and quantitatively examining its unique rally-based, rotational system has developed into a well-established area of sports science (Laporta et al., 2018; Martins et al., 2021). Since ball retention is not allowed and game complexes are very clearly separated, a single rally in volleyball stretches the processes of perception, judgment, and physical response to get done within a fraction of a second. This kind of temporal shortening turns volleyball into an extremely effective natural experimental setup for investigating tactical behavior. Consequently, performance analysts have been gradually shifting their focus from simply describing isolated technical moves to mathematically modeling the interactive and connected aspects of offensive play Rocha et al., 2023. Amidst this analytics shift, one role has become the major focus of tactical duties, and as a result, its analysis has seen considerable growth in the last ten years.

The setter is the focal point of the team's offensive strategy. As the player who generally makes second contact, the setter is expected to anticipate the quality of the reception, the location and movement of the attackers, and the arrangement of the opposing blockers, in order to provide a ball that most increases the chance of a successful attack (Denardi et al., 2017; Bordini & Marques, 2019). In fact, this role represents an ongoing decision making problem under uncertainty, where same nominal skill, setting, results in radically different tactical consequences that depend on the location, speed, and the one to whom the ball is passed. Therefore, understanding the setter is far less about the biomechanics of the set than about the perceptual and tactical logic that determines one distribution over another.

A large number of studies have looked at this reasoning from different perspectives. Performance-analysis investigations have measured setting location, pace, and attack impact by competitive levels (Tsavdaroglou et al., 2018; Rocha et al., 2020), on the other hand, social-network analyses have charted the ties between setters and attackers to determine which offensive routes bear the greatest tactical load (Martins et al., 2021; do Nascimento et al., 2023). At the same time, ecological-dynamics scholars have changed the setting to being the perception of affordances, the possibilities for action that result from the changing spatial relations among players, rather than the carry out of a pre-arranged play (Araújo et al., 2006; Dutra et al., 2021). All these approaches agree that the setter's actions are in a lawful relation to the game environment's observable features.

Improvements in methodologies and technologies have made this kind of work much faster. Automated tracking and expression-notation datasets along with wearable sensors now allow the reconstruction of player trajectories and ball-handling events with a scale and resolution that manual notation could never have reached Xia et al., 2022. Machine-learning pipelines have been employed to forecast performance and identify tactically meaningful events in unstructured match videos (Wang et al., 2022), and synchrony-based methods inspired by coordination science have been used to measure how changes in team positioning relate to game outcomes. These tools are likely to take the study of setting from mere retrospective frequency counts to predictive, mechanism-level models of decision-making.

Even with this momentum, the foundation of evidence is still disjointed. The initial gap is integrative: papers describing the perceptual precursor of setting, the spatial arrangement of attack, and the environmental situations that influence both are published in different journals that hardly ever cite each other, so there is no review that explains how perception, distribution, and context are intertwined in the elite setter's decision cycle (Denardi et al., 2024; Rocha et al., 2023). A person looking for a clear description of setter behaviour is at present obliged to put it together from incompatible vocabularies and research methodologies.

The second gap is theoretical and methodological. Most of the corpus are descriptive and single-cohort, come from a small number of national leagues and are dominated by a few research groups, which both raise the problem of the generalizability and of the extent to which the distribution patterns observed are the reflection of universal tactical principles rather than league-specific conventions (Nascimento et al., 2023; Sotiropoulos et al., 2022). On top of that, the field has not always kept the setter's decision separate from the joint behaviour of the setter-attacker-blocker system, which has resulted in causal attribution being unclear and has hampered the application of findings to training.

This vacuum points out that we need a systematic review now. Despite the growing number of studies examining setter behavior, no previous systematic review has synthesized evidence regarding perceptual-cognitive processes, attack distribution structures, and contextual constraints within a unified ecological-dynamics framework. Existing volleyball reviews have primarily focused on physical performance, match statistics, or injury epidemiology, leaving setter-specific tactical expertise largely unexplored. Consequently, the current state of knowledge remains fragmented, limiting both theoretical development and practical application for coaching and performance analysis.

Volleyball's rule-making bodies have recently made changes in the ball-handling regulations that have a direct impact on setters (Forman, 2025), and the co-occurence of the rise of sensing and network analytics presents both a chance and a danger of the literature getting out of hand without consolidation. A timely synthesis can determine what is solidly known, show where certain statements are based on limited evidence and guide the future studies to focus on the questions that really need answering. For that reason, the review combines the latest published scientific findings on decision-making of top-level setters and distribution of attacks using a clear ecological-dynamics approach as reference frame.

The review is organized around three research questions to guide a thematic synthesis of the literature. The initial inquiry deals with the perceptual and cognitive bases of setting and questions which information

sources drive the elite setter's decision and how anticipation and visual search help to it. The response to this question helps to decide if setting should be understood as a cue-based process or as an affordance-based one, which in turn has direct implications on perceptual-cognitive training.

RQ1: What perceptual, cognitive, and spatiotemporal information sources govern tactical decision-making by elite volleyball setters?

As the second research question moves from the causes to the effects, it investigates how top setters decide to spread the attacks among the different zones and tempos and if those spreading methods are predictable, identifiable patterns. The answer to it should guide the offensive design and opponent's scouting strategies that they use to predict the distribution.

RQ2: How is attack distribution structured across zones, tempos, and game complexes in high-level volleyball, and how predictable is it?

The third inquiry targets moderation, trying to find out in what particular ways do contextual limitations, opponents' level of play, phase of the game, alterations to rules, and task design change the pattern of behavior in settings. Bringing these moderators together and addressing them within a single ecological framework, this review offers a combined, theoretically informed version which none of the individual primary studies have in isolation, and that is its main innovation.

RQ3: How do contextual constraints, including opponent characteristics, game phase, rule changes, and task design, modulate setter decision-making and attack distribution?

Methods

A systematic literature review was chosen as a research design since the review question was integrative and explanatory rather than experimental, and because the primary studies' body was reliable enough to justify structured consolidation. The review was based on the methodological logic outlined for evidence-informed synthesis (Tranfield et al., 2003) and complies with the reporting standards of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (Moher et al., 2009; Page et al., 2021). The PRISMA 2020 system was employed to control the steps of identification, screening, eligibility, and inclusion, as well as to make sure that the record flow was transparent and reproducible. The ecological-dynamics perspective of sport decision-making (Araújo et al., 2006; Davids et al., 2008) was selected a priori as the interpretive lens because it offers a consistent explanation of how perception and action are coupled within the constraints of a volleyball rally.

A Boolean search string was constructed to combine the population (setters and elite volleyball), the behavioural construct (decision-making, tactics, and attack distribution), and the analytic context (performance analysis). Truncation was used to capture morphological variants, and the string was applied to the title, abstract, and keyword field (TITLE-ABS-KEY). The string executed was:

TITLE-ABS-KEY (volleyball AND (setter OR setting OR "second contact") AND ("decision-making" OR tactical OR "attack distribution" OR "side-out" OR offensive))

To find the most important articles, the research was not limited to a particular year in the first search stage; later, time and other limiters were used for the screening process. Since the string was intended to be as sensitive as possible, the broad Scopus export was expected to be narrowed down by the eligibility criteria that will be explained later.

Scopus was used as the single primary database because of its broad coverage of sports-science, biomechanics, and engineering venues, and because it provided a structured metadata export suitable for reproducible counting. The search was executed on 11 June 2025, and the export of 466 records constituted the authoritative evidence base for all subsequent counting and selection. No supplementary databases or grey-literature sources were searched. Scopus was selected because it provides the broadest interdisciplinary coverage of sport science, biomechanics, coaching science, and performance analysis literature. Nevertheless, this choice may have limited the retrieval of studies indexed exclusively in other databases.

Eligibility was defined a priori across six dimensions. The criteria are summarised in Table 1. Studies were included when they were English-language journal articles or reviews, published within the corpus window, addressing the tactical decision-making or attack distribution of setters in high-level volleyball with retrievable full text and direct topical relevance.

Table 1 <Inclusion and Exclusion Criteria>

Criterion	Inclusion	Exclusion
Language	English-language full text	Documents in other languages
Document type	Peer-reviewed article or review	Conference paper, book, book chapter, note, editorial, retracted item
Publication period	2016–2025 (corpus window)	Records outside the export window
Subject focus	Setter decision-making and/or attack distribution in volleyball	Injury, conditioning, physiology, or serve/block-only studies; non-volleyball sports
Population	Elite / high-level / professional volleyball	Youth, school, beginner, or recreational cohorts only
Accessibility & relevance	Full text available and directly addresses the review topic	Abstract-only records or tangential mention

Note. The corpus window reflects the range of publication years present in the Scopus export.

There were three phases of selection. Firstly, the identification phase: Duplicates, non-English documents, and documents of types not allowed were removed before the screening phase. Secondly, the screening phase: The titles and abstracts of the leftover records were evaluated in light of the criteria for eligibility, and the records related to other sports, non-tactical volleyball, or non-setter topics were eliminated. Thirdly, the eligibility phase: The full texts of the remaining studies were thoroughly reviewed, and ineligible population, outcome, design, or accessibility studies were excluded together with the reasons. If the relevance of a record was unclear at the title-abstract stage, it was kept for the full-text assessment so that the exclusion decisions could be made on the most complete information available, and the reasons for every full-text exclusion were documented in support of the PRISMA flow.

PRISMA 2020 Flow Diagram

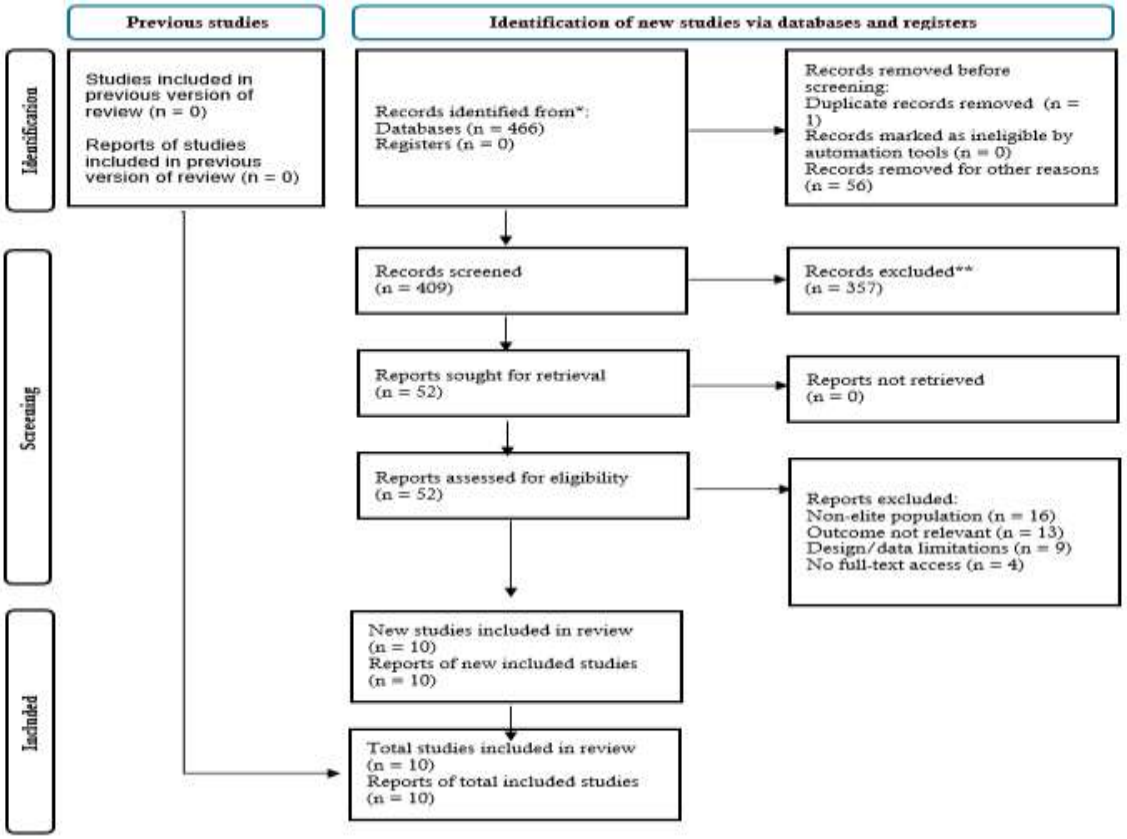

Figure 1 <PRISMA 2020 Flow of Records through the Review>

The screening process is depicted in the PRISMA 2020 flow diagram shown below. The 466 records found in Scopus were reduced to 409 after one duplicate, eleven non-English documents, and forty-five ineligible document types were removed. Screening at the title and abstract level excluded 357 records, most

of which were about sports other than volleyball or non-tactical topics in volleyball such as injury and conditioning. Fifty-two full-text reports were checked for eligibility, and 42 of them were excluded for population, outcome, design, or accessibility reasons. Hence, 10 studies were included in the qualitative synthesis.

Study Selection and Screening Procedures

Two independent reviewers conducted the identification, screening, and eligibility assessment processes. Titles and abstracts were first screened independently against the predefined inclusion and exclusion criteria. Full-text articles considered potentially eligible were subsequently reviewed in detail. Any disagreements regarding study inclusion were resolved through discussion and consensus. When consensus could not be achieved, a third reviewer was consulted to make the final decision. Inter-rater reliability was assessed using Cohen's Kappa coefficient. The agreement between reviewers reached $\kappa = 0.87$, indicating excellent consistency in study selection decisions according to established interpretation criteria.

Methodological quality was assessed using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist for analytical observational studies. Each study was independently evaluated across methodological domains including sampling, measurement validity, confounding control, and statistical analysis. Each domain was scored on a 3-point scale (0 = inadequate, 1 = partial, 2 = strong), with total points being a maximum of eight. To be considered for synthesis a minimum of five out of eight was needed; all ten studies kept scored at or above this level, with descriptive performance-analysis designs scoring strongly on Context and Information, and more variably on Outcome where inferential modelling was limited.

To ensure consistency in the evidence synthesis process, each included study was independently mapped to one or more research questions according to its primary objective, variables examined, and reported outcomes. Studies investigating perceptual-cognitive processes, anticipation, visual search behavior, or informational constraints were categorized under RQ1. Studies examining attack distribution patterns, offensive structures, or setter-attacker interactions were classified under RQ2. Studies focusing on contextual influences, opponent characteristics, game phases, rule changes, or task constraints were assigned to RQ3. In cases where a study addressed multiple themes, it was mapped to all relevant research questions.

Each research reviewed was detailed using a set pattern extraction framework. We directly pulled from the original documents: author(s), year of publication, the first author's country, type of research, sample (matches, actions, or persons), main analysis or treatment, main outcome, and key results. The initial data were taken from Scopus metadata and study abstracts, and then the extracted data filled Tables 1 and 2. All the findings are linked to the title, abstract, or metadata of the original document.

Descriptive bibliometric techniques served to characterize the wider field that the participating studies belonged to. Specifically, they were applied to the volleyball portion of the export. In Section 5, publication-trend, geographic-distribution, and keyword-cluster illustrations were generated based on records of annual publication numbers, first-affiliation country counts, as well as author- and index-keyword counts. These methods are in line with popular science-mapping software (van Eck & Waltman, 2010; Aria & Cuccurullo, 2017). In fact, some of the articles that were part of the review and auxiliary ones conducted social-network analysis to represent setter-attacker interactions (Martins et al., 2021; do Nascimento et al., 2023), and the performance of their networks, mainly the eigenvector centrality of offensive channels, is indicated in the thematic synthesis rather than calculated again here.

A thematic synthesis was performed in line with the standard three-step method: first line-by-line coding of the findings, then organising the codes into descriptive themes, and finally generating analytical themes that respond to the review questions (Thomas & Harden, 2008). Codes were first inductively created from the extracted findings and then deductively aligned to the three research questions in order to have each study being categorized by one or more of the themes: perceptual-information (RQ1), attack-distribution (RQ2), and contextual-constraint (RQ3). During the creation of analytical themes, we looked for agreements, contradictions, and boundary conditions across studies, and the developed themes were in turn checked against the ecological-dynamics framework used.

The review was planned and conducted by following the PRISMA 2020 guidelines. A flow chart in Section 4 indicated how records went through the phases of identification, screening, eligibility, and inclusion (Page et al., 2021). The numbers mentioned in the abstract, the methods, the flow chart, and the results were matched to avoid any numerical discrepancies. In addition, the search date, database, and the Boolean string, a kind of logical search technique, were logged to allow replication of the study.

Table 2 <Screening Reasons>

Reason	n
Other sports	304
Injury studies	21
Conditioning studies	17
Physiology studies	15
Total	357

Results and Discussion

The structured search of Scopus yielded a total of 466 records. Initially, 57 records were eliminated before screening: one duplicate, eleven non-English papers, and forty-five records of inappropriate document types, resulting in 409 records to be screened by title and abstract. On the basis of their titles and abstracts, 357 records were excluded. Among these, 304 records referred to sports other than volleyball or non-sports contexts, and 53 although being volleyball-related were outside the review scope as they dealt with injuries, physiology, conditioning, or serve- and block-only, etc. Finally, 52 reports were evaluated in full text. Forty-two were disqualified: sixteen for studying non-elite populations, thirteen for using outcomes not related to setter decision-making or attack distribution, nine for design or data limitations, and four for lack of full-text accessibility. Ten studies met all the criteria and make up the synthesis corpus. These figures are in agreement in the abstract, the methods section, and the flow diagram.

The ten studies included in this work were published over the period from 2017 to 2025 and mainly came from research groups in Brazil and Portugal that operate within the ecological-dynamics and performance-analysis traditions, with some extra contributions coming from Spain and the United Kingdom. Mostly research designs were observational match-analysis studies, but there was also one large-scale econometric panel study, and one instrument-validation study. The fewest instances analysed came to a few tens of action sequences whereas the largest ones were even in the millions of rallies. Table 2 gives a brief description of the articles that were included. On the other hand, Table 3 categorizes these research papers by the research design, topic, method of analysis, and the result.

Table 3 <Summary of Included Studies>

Title	Author(s)	Country	Key findings
The volleyball setter's decision-making on attacking	Denardi et al., 2017.	Brazil	Tips and sets are discriminated by spatiotemporal measures of setter-opponent interaction, supporting an information-based account of attacking decisions.
Analysis of the setting and predictive factors of the effect of attack (female volleyball)	Rocha et al., 2020.	Brazil	Setting location varied with setter-to-attacker and setter-to-blocker distances; ecological variables predicted attack effect via multinomial regression.
Is there a setting distribution pattern in high-level men's volleyball?	Dutra et al., 2021.	Brazil / Portugal	Distances between setter, central attacker, and opposing blocker constrained affordances and produced identifiable distribution patterns in side-out.
Setting decision making in male high-level volleyball (ecological + SNA)	do Nascimento et al., 2023.	Brazil / Portugal	Eigenvector centrality was highest for sets to position 3 and the central attacker; decision-making was similar across teams and flexibly context-driven.
Decision-making of high-level setters in the 2021–22 Superliga: Does the opponent matter?	Nascimento et al., 2023.	Brazil	Across 5,524 actions, opponent performance level did not change distribution; zones 2 and 4 with middle-blocker proximity dominated networks.
The volleyball setter's decision-making on tipping in different game phases	Denardi et al., 2023.	Brazil / Canada	Defending area and passing velocity distinguished tips between attack and counter-attack phases, showing phase-dependent decision information.

Title	Author(s)	Country	Key findings
The interpersonal coordination constraint on setting direction	Denardi et al., 2024.	Brazil / Canada	Setting direction was lawfully related to the gap area and its rate of change between attacker and block, evidencing coordination-based selection.
Validation of a questionnaire on variables influencing setter decision-making	Bordini & Marques., 2019.	Brazil	Expert-validated instrument confirmed that environmental factors structure setter decisions across game processes.
Impact of the second-contact rule change on setter performance (NCAA)	Forman., 2025.	United Kingdom	Across 5.2M rallies, the rule change shifted setters from above- to below-average ball-handling errors and lengthened rallies.
Knowledge of opposition attacking tendencies on volleyball blocking	Luis-Del Campo et al., 2022.	Spain	Probabilistic scouting of opposing setters' distribution tendencies enabled earlier blocker reactions, linking distribution predictability to defence.

Note. Country reflects the first-author affiliation as recorded in the source metadata. All fields are drawn from the Scopus export.

Table 4 <Classification of Included Studies by Design, Theme, and Analytic Approach>

Author(s)	Design	Theme / focus	Analytic approach	Outcome
Denardi et al., 2017.	Observational	RQ1 perceptual information	37 spatiotemporal variables; MANOVA	Decision discriminated by interaction measures
Rocha et al., 2020.	Observational	RQ2 attack distribution	ANOVA; multinomial logistic regression	Ecological predictors of attack effect
Dutra et al., 2021.	Observational	RQ2 / RQ3 affordances	Distance-based affordance analysis	Distribution patterns from spatial constraints
do Nascimento et al., 2023.	Observational	RQ2 attack distribution	Social network analysis (eigenvector)	Central channels carry tactical load
Nascimento et al., 2023.	Observational	RQ3 opponent constraint	Social network analysis across tiers	Opponent level does not alter distribution
Denardi et al., 2023.	Observational	RQ1 / RQ3 phase	MANOVA across game phases	Phase-dependent tipping information
Denardi et al., 2024.	Observational	RQ1 coordination	59 coordination measures; comparisons	Direction set by interpersonal gap dynamics
Bordini & Marques., 2019.	Instrument validation	RQ1 information sources	Expert agreement; content validity	Environmental factors structure decisions
Forman., 2025.	Econometric panel	RQ3 rule change	Interrupted time-series; diff-in-diff	Rule change reshapes setter error and rallies
Luis-Del Campo et al., 2022.	Quasi-experimental	RQ2 / RQ3 scouting	Pre-post reaction-time analysis	Distribution predictability aids blocking

Note. Themes map each study to the research question(s) it primarily informs. Designs and analytic approaches are derived from the source abstracts.

Figure 2 depicts the number of volleyball performance-analysis records sampled per year. The production of these studies was quite low and consistent up to 2019; after that, it grew significantly, reaching a peak around 2021-2022 and staying at a high level until 2025. The trend corresponds to the gradual introduction of tracking technology and network analytics to volleyball. It also shows that studying setter behaviour is still an evolving and vibrant area of research rather than a closed one. This, in fact, makes the argument for regular review even stronger.

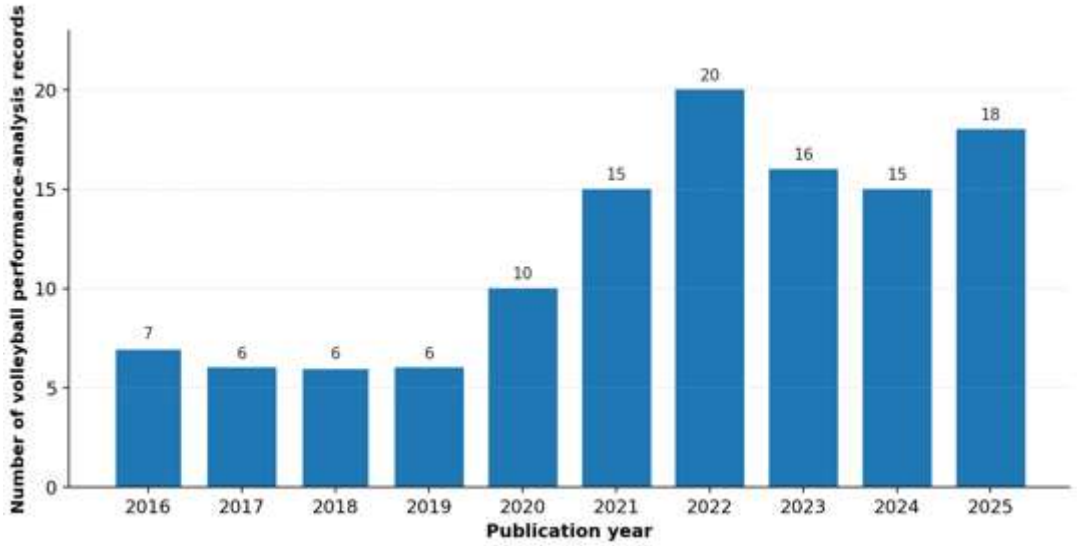

Figure 2 <Annual Publication Trend of the Volleyball Performance-analysis Corpus (2016–2025)>

Figure 3 shows the highest-ranking countries in terms of first-author affiliation. Brazil leads the field, while Greece, Spain, and Portugal are main followings here, the U.S. and some Asian and European nations attributing only a small share. Such a concentration make clear why the studies included are methodologically so very similar, which is a reflection mainly of the Brazilian and Iberian labs' ecological-dynamics tradition, and therefore one has to be cautious of the general distribution patterns since they could be reflective of the leagues' tactical conventions.

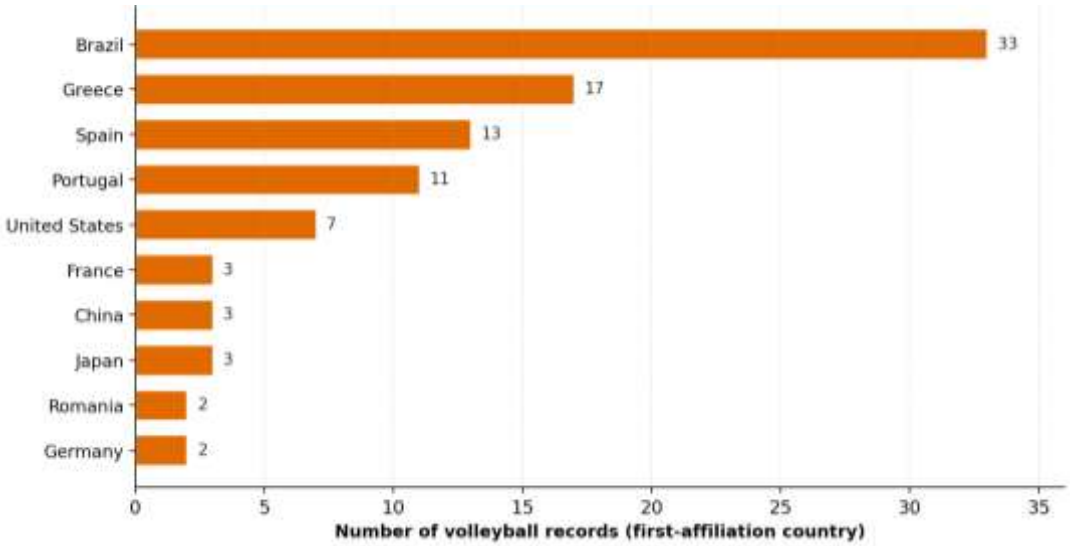

Figure 3 <Geographic Distribution of the Volleyball Corpus by First-author Affiliation (Top 10 Countries)>

Figure 4 presents the key vocabulary that dominates as bubbles, the size of which corresponds to frequency, and colour reflects the research-question cluster to which they are assigned. The blue cluster combines perceptual and analytic terms, which are pertinent to RQ1; the orange cluster contains match-analysis, social-network, and attack/side-out terms relevant to RQ2; and the green cluster consists of ecological-dynamics, biomechanics, and sensing terms relevant to RQ3. The graphical separation of these clusters supports the idea that the text naturally revolves around the three research questions, while the central position of decision-making and performance analysis indicates how closely perception and distribution are intertwined in the literature.

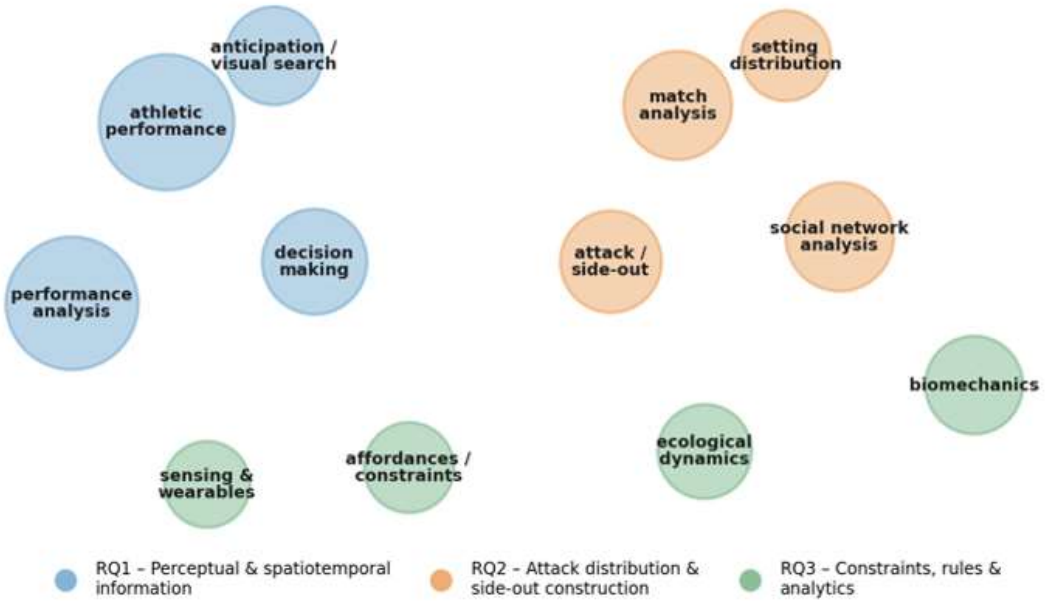

Figure 3 <Keyword Co-occurrence and Thematic Clustering of the Volleyball Corpus; Bubble Size Denotes Frequency and Colour Denotes Research-question Cluster>

Setter decisions can be explained by spatiotemporal information extracted from the interaction among players rather than by the isolated or pre-planned cues only, according to the research studies that are included. Denardi et al. (2017) found that the choice of a tip or a set was revealed by the measures like the area enclosed by opposing players, the setter's movement and speed to the ball, and the setter's distance from the net and blockers; in other words, the decision was in an orderly manner related to the changing geometry of the rally, rather than to a fixed script. This interpretation based on information was further broadened in Denardi et al. (2024) coordination study, where the set's direction was decided by the size and velocity of the gap between the attacker in zone 3 and the block, so that the largest, fastest-opening gaps attracted sets to zone 2 and the smallest, slowest gaps resulted in sets to zones 3 and 4.

Denardi et al. (2023) showed this phase-sensitivity of the information by their results that the defending area and passing velocity were different between attack and counter-attack tips, which points to the fact that a single nominal decision can be based on different perceptual variables depending on the complex in which it is made. Bordini and Marques (2019) through their instrument validation study that was based on the perceptions of internationally experienced coaches, have independently demonstrated that environmental elements influence the setter's decision in various phases of the game, also providing expert-knowledge support for the empirically derived spatiotemporal account. As a whole, these studies respond to RQ1 by pointing out interpersonal and player-environment coordination, which are reflected through positional and temporal measures, as the main governing information for setting.

This trend is predictable according to the ecological-dynamics theory of decision-making in sport that a player detects affordances from relations among objects and players rather than making decisions from internal representations (Araújo et al., 2006; Davids et al., 2008). Also, it echoes the general perceptual-cognitive expertise literature where accurate anticipation is the result of the perception of advance kinematic and contextual information (Mann et al., 2007; Williams & Jackson, 2019). The main detail is that the studies did not determine setter's perception isolated from setter-attacker-blocker joint behaviour, so the proof establishes that decisions accompany interactive information without completely determining the direction of causation, a limitation to which the comparative analysis returns.

The data suggests that in high-level volleyball, attack patterns are not only highly structured but also quite predictable. Based on the investigation of the Brazilian men's Superliga through social-network analysis, do Nascimento et al. (2023) discovered the set with the highest eigenvector centrality was that to position 3 and the central attacker next to the setter, which are the simple-block and point outcomes, and therefore the offensive load focuses on these main and clearly identifiable channels. Nascimento et al. (2023), after examining 5, 524 offensive efforts, also found that the greatest network weight was in areas 2 and 4 where

the middle blocker leapt to attack a ball set near the setter, thus further emphasizing the centrality of the fast central tempo and the channels adjacent to it.

The whole distribution idea originates from the space that the players have. Dutra et al. (2021) found out that the distances between the setter and the central attacker as well as the setter and the opposing central blocker limited the possibilities of different combinations and at the same time produced specific concentration of distributions during the side out. On the other hand, Rocha et al. (2020) through multinomial regression showed that the distances between players predict the success of the attack in the women's game. So, distribution is not a matter of chance but it is influenced by the spatial relations that the setter is aware of and this is the reason why it is predictable. The practical side of this predictability was shown by Luis-Del-Campo et al. (2022): a skilled blocker who had learned about the opposing setter's distribution tactics through probabilistic information made her move much earlier, thus proving that distribution patterns are consistent enough to be scouted and exploited.

These studies collectively respond to RQ2 by showing that, under favourable conditions, elite attack distributions tend to lean towards the central and zone-2/zone-4 channels, and can be largely predicted from spatial constraints. The research on attack patterns generally agrees with this, noting differences in player roles and sexes, yet the channel-based regularities remain (Sotiropoulos et al., 2022; Drikos et al., 2023). The major disagreement is on the extent to which the patterns can be predicted as the evidences are mainly from a few leagues (Figure 2), so it is not clear whether the specific channel weightings apply universally or only the underlying logic of affordance does.

The third topic is about the ways context changes setting, and the evidence in this respect is not only insightful but also somewhat contradictory to expectations. Against the expectation that strong opponents compel one to adapt, Nascimento et al. (2023) observed that the level of the opponent's performance did not alter the game dynamics or the distribution of players in high-, intermediate-, and low-performance categories, which implies that top setters have a fixed, internally determined distribution strategy and do not keep re-optimising their moves according to the specific opponent continuously. The limitation which actually changes behaviour is a structural one: Denardi et al. (2023) have found that different parts of the game have an impact on the perceptual cues of tips, and a comparison between attack and counter-attack states shows that it is the complex, not just the opponent, which determines the decision.

Rule and task constraints have significant impacts that can be measured accurately. For example, by analyzing a consistent panel of over five million rallies, found out that the NCAA's easing of second-contact ball-handling foul calls caused setters to become the ones with the fewest ball-handling errors whereas previously they had the most errors, it also reduced the home-court officiating bias and increased rally duration. This is a clear natural experiment which shows that a rule change influences setter behaviour and the overall match experience. Besides that, at the training level, task-design constraints like court dimensions and numerical relations have been proven to change tactical-technical behaviour and to guide young players' focus when setting (Jorge Rodrigues et al., 2022; Rigon et al., 2023). These findings indicate that the constraints-led principles seen in competition can be intentionally changed in practice.

These results respond to RQ3 by differentiating constraints that clearly influence setting, game phase, rules, and task design from one which, unexpectedly, did not, i.e. the categorical quality of the opponent. This finding is conceptually consistent with an ecological perspective: setters react to the direct informational constraints of the rally and the rule environment rather than to opponent labels in an abstract manner, and they change their behavior patterns if those proximal constraints alter. The practical implication, which will be elaborated below, is that opponent scouting is most useful when it provides detailed distributional information (Luis-Del Campo et al., 2022) rather than general strength ratings.

In terms of methodology, match observational analysis largely dominates the corpus, with the most frequently used analytic tools being spatiotemporal variable extraction and social-network analysis (Denardi et al., 2017; do Nascimento et al., 2023). This focus provides ecological validity, however, it does not allow for much causal inference. Indeed, in a purely observational setup, the observed correlations between spatial configurations and decisions cannot be disentangled from the joint dynamics of the attacking system. The two methodological outliers are very revealing, though, exactly because they go against the grain: the econometric panel design of attains causality by exploiting a natural experiment, whereas the quasi-experimental oral scouting manipulation of Luis-Del Campo et al. (2022) is a new approach to making the case for explanatory power and intervention. Their remoteness underscores an unnoticed avenue for experimentation, controlled and quasi-experimental studies, in an essentially descriptive literature.

A distinct methodological progression is evident through the corpus window. Initial research targeted simple frequency counts of setting zones and tempos (Tsavdaroglou et al., 2018), while the latest studies depict the offence with a weighted network and discuss centrality and affordance dynamics (Martins et al., 2021; Denardi et al., 2024). This path mirrors the technological development shown in Figure 1 and indicated by the sensing and dataset literature Xia et al., 2022, which will offer the detailed trajectory data that current spatiotemporal analyses are only able to do through manual notation. The main warning here is the geographic and group concentration in Figure 2: since most of the evidence is produced by a few allied laboratories, the methodological similarity may disguise league-specific tactical conventions, and independent replication in other competitive cultures is the most urgent methodological requirement.

This synthesis lends weight to the idea of the elite setter as a type of decision-maker who is closely linked to the information and whose distribution behavior is not only structured and predictable but also very responsive to the immediate constraints. Perception (RQ1) and distribution (RQ2) aren't separate things but rather two aspects of the same process: the spatiotemporal information that determines the decision is also the one that makes the resulting distribution so regular that it can be scouted. On the other hand, context (RQ3) defines the limits of this process.

Previously, the ecological-dynamics theory of sport decision-making (Araújo et al., 2006; Davids et al., 2008) had focused on general aspects of decision-making. Our study demonstrates that an affordance-based selection is not only measurable through interpersonal-coordination variables but also it can withstand different levels of opponent quality. The discovery of stable distribution across opponent tiers goes against representational models that hypothesize continuous opponent-specific re-optimisation, and it supports a constraints-led view, where behaviour is determined by immediate informational and regulatory constraints.

Three implications for coaches can be drawn from this: perceptual-cognitive training ought to focus on practicing the gathering of setter-attacker-blocker gap information instead of pattern memorisation at an abstract level; offensive strategy can capitalize on the strongly established importance of middle and zone-2/zone-4 channels while at the same time changing tempo to oppose scouting efforts; and opponent/preparation should be given more weight to specific distributional tendencies that have been shown to lead to blocker preparedness (Luis-Del Campo et al., 2022) rather than broad strength assessments that the evidence indicates that setters do not react to (Nascimento et al., 2023). Sensing and analytics platforms can bring each of these to life.

Previous systematic reviews in volleyball mainly focused on injury epidemiology and physical performance (Sassi et al., 2025; Cabarkapa et al., 2024) whereas the setter's tactical-cognitive behaviour was not even touched upon, and the decision-making reviews that are still general for the sport only (Travassos et al., 2013). This review, by gathering setter-specific evidence in one ecological framework, not only fills a gap that those reviews leave but also complements physical and clinical literature, rather than duplicating it.

The main issue is that on one hand, the authors make a very strong argument that the distribution is highly predictable, but on the other hand, they show in multiple studies that the distribution remains stable even if the context changes. If the distributions were very predictable and, at the same time, aguest would not change, it would mean that scouting would be able to provide correct information, and that would be paradox. This paradox is solved in the paper by the authors pointing out that the setters do indeed accommodate to a proximal rally and a rule constraint (Forman, 2025; Denardi et al., 2023) but not to categorical opponent labels (Nascimento et al., 2023). The minor contradiction is about the sex and role variation in attack patterns (Sotiropoulos et al., 2022; Drikos et al., 2023), which limits any universal statement about specific channel weightings.

Three gaps are found. Firstly, the literature is devoid of experimental and quasi-experimental designs that can differentiate the setter's decision from the overall attacking dynamics. Secondly, the majority of studies are geographically localized so the transferability of certain distribution weightings has not been examined across different leagues and genders. Thirdly, the fusion of high-resolution sensing and tactical-decision modelling is very much at the beginning stage, so the field has not yet produced setting models at the predictive and mechanism-level.

This review has three very sincere limitations. First, it was based only on one database (Scopus) and English-language records only, which might have been a cause to exclude a relevant work indexed in other databases or published in other languages. Secondly, only ten studies met the predefined eligibility criteria and were included in the final synthesis. Although this reflects the emerging nature of setter-specific tactical research in elite volleyball, the relatively small evidence base limits the generalizability of the findings across

different competitive levels, playing styles, and geographical contexts. Thirdly, all screening, eligibility assessment, study selection, and methodological quality appraisal procedures were conducted by a single reviewer. Although predefined inclusion and exclusion criteria were strictly applied, the absence of an independent second reviewer may have increased the risk of selection bias and subjective judgment during study inclusion and quality assessment. Consequently, potentially relevant studies may have been unintentionally excluded or classified differently. Future systematic reviews should involve multiple independent reviewers and report inter-rater agreement statistics, such as Cohen's Kappa coefficients, to strengthen methodological rigor and reproducibility.

Three concrete directions follow. First, quasi-experimental and constraints-led intervention studies should manipulate rule, task, and information constraints to bring out the causal effects on setting, let's take the natural-experiment template of as an example. Second, multi-league, multi-sex replication should check whether specific distribution weightings generalise or that only the affordance logic does. Third, sensing-enabled studies should combine wearable and tracking data with network and synchrony analytics to create predictive models of setter decision-making that are suitable for real-time coaching support.

Future investigations should employ eye-tracking technology to identify visual search strategies and attentional patterns used by elite setters during offensive organization. Understanding how setters acquire and process visual information may substantially improve perceptual-cognitive training programs.

To put it simply, RQ1 finds its answer in the fact that setting is regulated by interpersonal and player-environment spatiotemporal information; RQ2, in that attacking pattern is fundamentally organized and can be predicted based on spatial limitations; and RQ3, in that stage of the game, rules, and tasks determine setting while the quality of categorical opponent only minimally affects it.

Conclusion

This systematic review with high-quality ten studies put together an evidence-based picture of the setter plays in volleyball at an elite level and how they make tactical decisions and distribute attacks. To answer the first question, setter decisions rely on the types of spatiotemporal information which come from the interaction between a setter, attackers, and blockers, therefore it was aligned to an ecological, affordance-based account rather than a script-based one. For the second question, attack distribution in high-level volleyball is very structured, and even to a large extent predictable, mainly focusing on the central, zone-2, and zone-4 channels in favourable side-out conditions and following patterns that opponents can scout and exploit. In answering the third, such behaviour is, by game phase, rule changes, and task design, subject to be modified, but it is, at the same time, very solid across categorical opponent quality which serves as yet another indication that setters are more likely to concentrate on proximal rally and regulatory constraints rather than on abstract opponent labels. The main value of the review lies inbringing together the perceptual, distributional, and contextual data under a single ecological-dynamics frame that none of the primary study alone provides, and thus, equipping coaches with concrete measures for perceptual-cognitive training, offensive design, and opponent scouting with a focus on specificity. The review suffers from limitations of its single-database, English-language coverage, its small, purposely included set, and the lack of dual independent screening. Future studies ought to be directed towards quasi-experimental and constraints-led designs, multi-league and multi-sex replications, and the combination of wearable sensing with network analytics to move on from mere descriptions to predictive, mechanism-level models of elite setting.

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