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Markers of Expertise Development and Future Potential in Adolescent Volleyball Players: A Scoping Review Protocol

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ADMINISTRATIVE INFORMATION

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Review Stage at time of this submission - The review has not yet started.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 1 July 2026 and was last updated on 1 July 2026.

INTRODUCTION

Review question / Objective The review question is "What markers are considered to assess and differentiate expertise development and future potential in adolescent volleyball players?"
The present review aims to critically identify, characterise, categorise and synthesise markers of expertise development and future potential in adolescent volleyball players. Specifically, this review seeks to: (i) identify and map markers used to assess, differentiate, or infer expertise development and future potential in adolescent volleyball players; (ii) characterise and categorise them according to the person, process, context, and time dimensions of Bronfenbrenner's bioecological model, while documenting the multidimensional domains through which they have been operationalised; (iii) provide a structured synthesis of these markers that may inform subsequent research on volleyball expertise development, including work conducted within the ECHO-BASE Project (DOI: https://doi.org/10.62658/COFAC/ILIND/CIDEFES/2/2025).

Background Adolescent volleyball development is a complex and dynamic process influenced by interactions among biological, psychological, technical, tactical, and environmental factors (Castillo et al., 2022; Koopmann et al., 2023; Sgrò et al., 2024; Zentgraf & Raab, 2023), over time (Sedeaud et al., 2025). Although considerable research has examined characteristics associated with volleyball performance, the evidence remains fragmented across domains and often focuses on isolated indicators rather than on the broader developmental processes underlying expertise acquisition and future potential (de Oliveira et al., 2024). This fragmentation may limit the ability of

coaches, practitioners, and researchers to identify which markers are most relevant for assessing athlete development during adolescence.

Contemporary developmental perspectives emphasise that expertise emerges through the interaction of individual characteristics and environmental influences over time rather than through the accumulation of isolated traits (Bronfenbrenner & Morris, 2007; Baker et al., 2020). In volleyball, markers associated with performance and development may encompass anthropometric, physical, technical, tactical, perceptual-cognitive, psychological, maturational, and contextual dimensions. However, the extent to which these markers have been investigated, operationalised, and linked to expertise development or future potential remains unclear.

A comprehensive mapping of the available evidence is therefore needed to identify which markers have been considered in adolescent volleyball research and how they have been used to assess developmental progression and future performance potential. Such evidence may support the development of more holistic and ecologically informed approaches to athlete assessment and development.

The present review constitutes the first phase of the ECHO-BASE project, which adopts a multistage exploratory sequential mixed-methods design for framework development and validation (Anguera et al., 2012; Creswell & Clark, 2018; Fetters et al., 2013). Findings from this review will be integrated with evidence generated through interviews with expert youth volleyball coaches to identify and contextualise markers of expertise development and future potential. Finally, a subsequent systematic review will examine the nature, consistency, and strength of empirical evidence supporting the framework's constituent markers, contributing to its empirical support and informing future applications in players assessment, monitoring, and development.

Rationale The development of expertise in volleyball is increasingly recognised as a dynamic, non-linear process that transcends simple physical evaluation. Accordingly, the identification and interpretation of expertise development markers and future potential require a theoretically informed framework capable of accommodating the complex interactions between individual, processual, contextual, and temporal indicators that shape players' developmental trajectories (Bronfenbrenner & Morris, 2007).

From a bioecological model standpoint (Bronfenbrenner, 2005), expertise development cannot be understood through isolated individual characteristics, it emerges from dynamic interactions between the player, with their individual characteristics and dispositions, the activities in which they engage, the relationships they experience, the environments they inhabit, and the developmental transitions they undergo over time. Consequently, no single marker can adequately capture expertise development, and relevant markers must be understood as distributed across interacting systems and evolving throughout the player's developmental process. Thereby, attention should be directed not only toward current players' characteristics but also towards their development trajectories, as variations in rate and pattern of change may offer more meaningful insights into future expertise than single-point evaluations (Baker et al., 2020; Sedeaud et al., 2025). This is also consistent with contemporary perspectives on talent identification and development, which emphasise the multidimensional and context-dependent nature of athlete development (Till & Baker, 2020).

Research examining expertise development, sporting potential, and talent identification in volleyball has expanded considerably in recent years. Existing studies have investigated a broad range of markers, including anthropometric and physical-motor characteristics (Albaladejo-Saura et al., 2023; Hajilou & Anbarian, 2024), psychological attributes (Hajilou & Anbarian, 2024), perceptual-cognitive abilities and declarative tactical knowledge (Sgrò et al., 2024), psychomotor and coordination-related characteristics (Klocek et al., 2023), maturation-related variables (Albaladejo-Saura et al., 2023; Cobley et al., 2025), developmental sport experiences and participation pathways (Coutinho et al., 2021), environmental influences and training engagement (Cobley et al., 2025), as well as coaches' subjective evaluations and talent-identification practices (de Oliveira et al., 2024). This growing body of evidence reflects increasing recognition that expertise development is multidimensional and cannot be adequately explained solely through physical performance or anthropometric advantages.

Despite growing interest in multidimensional approaches, existing evidence remains fragmented. Studies frequently focus on isolated domains, employ heterogeneous conceptualisations of expertise, sporting potential, and performance, and rely predominantly on cross-sectional designs (de Oliveira et al., 2024). Literature continues to be dominated by assessments of anthropometric and physical-motor characteristics, while comparatively less attention has been devoted to psychological, perceptual-cognitive, maturational, sociocultural, relational, and developmental-process indicators (de Oliveira et al., 2024). Furthermore, the

predominance of cross-sectional research limits understanding of how markers interact, evolve, and contribute to developmental trajectories over time (Cobley et al., 2025). As a result, the research field has become increasingly sophisticated in identifying potential markers of expertise development, yet considerably less successful in understanding how these markers relate to one another within the broader developmental process.
To date, there is no comprehensive synthesis of the range of markers that have been used to assess, differentiate, or infer expertise development and future potential in adolescent volleyball players, nor of how such markers have been conceptualised across the literature. Given the breadth, heterogeneity, and multidimensional nature of the available evidence, a scoping review represents an appropriate first step to systematically identify, map, and characterise the markers currently used within the research field, while also identifying conceptual, methodological, and empirical gaps requiring further investigation (Munn et al., 2018; Peters et al., 2020).

METHODS

Strategy of data synthesis The search strategy will be developed in accordance with the Joanna Briggs Institute (JBI) methodological guidance for scoping reviews and reported following the PRISMA Extension for Scoping Reviews (PRISMA-ScR) recommendations (Tricco et al., 2018; Peters et al., 2020).
The search strategy will follow the three-step approach proposed by the JBI. First, an initial limited search will be conducted in two relevant databases to identify key articles and examine the terminology used in titles, abstracts, and index terms. Second, a comprehensive search strategy will be developed and adapted for each selected database. Third, the reference lists of all included studies and relevant review articles will be screened to identify additional eligible studies.
Electronic searches will be conducted in SPORTDiscus, Web of Science, Scopus, PubMed, and PsycINFO. These databases will be selected because they ensure a comprehensive coverage of sport sciences, psychology, human development, and interdisciplinary research relevant to expertise development in volleyball.
Search terms will combine controlled vocabulary (where available) and free-text keywords related to volleyball, expertise development, future expertise potential, athlete development, talent identification, talent development, performance pathways, and associated markers. Search strings will be interactively refined to maximise sensitivity and capture the diverse terminology used across the literature.
The search period will extend from database inception to the date of the final search.
All stages of study identification, screening, and data extraction will be managed using the CADIMA evidence synthesis tool (Kohl et al., 2018). Duplicated records will be removed prior to screening. The complete search strategies for all databases will be reported in an appendix to ensure transparency and reproducibility.

Eligibility criteria Given the exploratory nature of this scoping review and its objective to critically identify, characterise, categorise and synthesise markers of expertise development and future potential in adolescent volleyball players, a broad range of study designs will be considered. Though only full-text publications available in peer-reviewed journals will be included, eligible studies will include quantitative, qualitative, and mixed-methods research, including cross-sectional, longitudinal, prospective, retrospective, cohort, case-control, case-study, observational, and validation studies. Studies examining talent identification, player development pathways, expert sport performance development, or related assessment processes in adolescent volleyball players will be eligible for inclusion.
Systematic reviews, scoping reviews, narrative reviews, editorials, commentaries, opinion papers, and conference abstracts will be excluded from the evidence synthesis. However, the reference lists of relevant review articles will be screened to identify additional eligible primary studies.
No restrictions will be placed on study design, provided that the study contributes evidence regarding the identification, assessment, operationalisation, or interpretation of markers relevant to expertise development and future expertise potential in adolescent volleyball players.
Eligibility criteria and search terms will be informed by the Population–Concept–Context (PCC) framework recommended for scoping reviews (Peters et al., 2020):

Population:
Studies involving adolescent volleyball players inserted in organised competitive settings, aged 13-19 years old will be eligible for inclusion. The age frame corresponds to the beginning of a developmental stage in which volleyball players typically transition from diversified sport participation towards increased sport-specific engagement and specialisation, while simultaneously entering more structured competitive pathways (Coutinho et al., 2016), up to

what is defined by the World Health Organisation as the end of adolescence (WHO, n.d.).
Studies including wider age ranges will be considered if data for the target age group can be extracted separately.
Studies exclusively involving adult players, recreational participants, coaches, referees, or other stakeholder groups will be excluded, unless they contribute directly to the identification, assessment, or interpretation of markers associated with expertise development in adolescent volleyball players.

Concept:
Eligible studies must investigate, assess, describe, operationalise, compare, or discuss one or more markers associated with expertise development and future expertise potential in volleyball. For the purposes of this scoping review, markers are defined as observable or assessable characteristics, processes, relationships, experiences, or contextual features that have been used to assess, describe, monitor, predict, differentiate, or infer expertise development and future expertise potential.
Markers may include, but are not limited to:
- Anthropometric characteristics;
- Physical and motor characteristics;
- Perceptual-cognitive characteristics;
- Technical and tactical characteristics;
- Psychological characteristics;
- Maturation-related factors;
- Developmental sport experiences;
- Training and practice characteristics;
- Coach-based assessments;
- Environmental and contextual influences;
- Relational and social factors.

Studies will not be excluded solely because they do not explicitly use the terms “expertise”, “talent”, or “potential”, provided that the study investigates characteristics or factors intended to assess, differentiate, predict, monitor, or support athlete development within competitive volleyball pathways.
Studies focusing exclusively on acute performance outcomes, match statistics, or competition indicators without explicit relevance to expertise development or future expertise potential will be excluded.

Context:
Studies conducted within organised volleyball settings, including club, academy, school, regional, national, and talent development programmes, will be eligible. Indoor volleyball studies will be considered where findings relate to expertise development processes in adolescent players.
Studies exclusively on Beach Volleyball or Sitting Volleyball will be excluded.
Studies conducted in other sports will be excluded unless volleyball-specific findings are reported separately.

Source of evidence screening and selection All identified records will be imported into CADIMA and screened according to the predefined eligibility criteria. The screening process will be conducted in two stages: (1) title and abstract screening and (2) full-text screening.
Title/abstract and full-text screening will be conducted independently by two reviewers. Disagreements will be resolved through discussion and consensus. Where consensus cannot be reached, a third reviewer (AP) will adjudicate.
Reasons for exclusion during full-text screening will be documented and reported. The study selection process will be presented using a PRISMA-ScR flow diagram (Tricco et al., 2018), detailing the number of records identified, screened, excluded, and included in the review.

Data management All records retrieved from the electronic databases will be imported into CADIMA, a web-based platform designed to support evidence synthesis workflows. Automatic and manual duplicate detection procedures will be applied to identify and remove duplicate records prior to screening. All screening decisions, exclusion reasons, and extracted data will be stored within the platform to ensure transparency, traceability, and reproducibility throughout the review process.
A standardised data-charting form will be developed and pilot tested before full data charting. Consistent with scoping review methodology (Peters et al., 2020), the form may be interactively refined during the review process to ensure comprehensive capture of relevant information. Data extracted from each study will include bibliographic details, study design, participant characteristics, competitive level, developmental stage, investigated marker(s), assessment methods, outcomes measured, and key findings relevant to expertise development and future potential.
Data extraction will be led by the primary reviewer using the standardised charting form and independently verified by a second reviewer. Additional members of the review team will contribute to data verification, interpretation, and categorisation according to their areas of expertise. Any disagreements arising during data extraction or categorisation will be resolved through discussion and consensus, with consultation of a third reviewer when necessary.

Reporting results / Analysis of the evidence The primary outcome of this scoping review will be identification, characterisation, categorisation and synthesis of markers used to assess, differentiate, or infer expertise development and future expertise potential in adolescent volleyball players.
A second primary outcome will be the organisation of identified markers according to the person, process, context, and time (PPCT) dimensions of Bronfenbrenner's bioecological model of human development, providing a bio-ecologically informed evidence map of expertise development in volleyball.
Additional outcomes will include to investigate:
- The conceptual definitions used to describe expertise development, sporting potential, talent identification, talent development, and related constructs;
- The operationalisation of identified markers, including assessment methods, testing procedures, observational approaches, and measurement tools;
- The multidimensional domains through which markers have been studied (e.g., anthropometric, physical-motor, perceptual-cognitive, technical-tactical, psychological, maturational, developmental, relational, and contextual);
- The characteristics of study populations, including age, sex, competitive level, role within the team, and geographical and socio-cultural context;
- The study designs and methodological approaches used to investigate expertise development and future expertise potential;
- The developmental stages at which markers have been examined;
- Conceptual, methodological, and empirical gaps identified.

Presentation of the results Results will be presented through a combination of descriptive summaries, evidence tables, visual evidence maps, and thematic synthesis. Characteristics of included studies will be summarised in tabular format, including study design, participant characteristics, competitive level, developmental stage, investigated markers, and assessment methods.
Identified markers will first be organised into broad conceptual domains (e.g., anthropometric, physical, technical, tactical, perceptual-cognitive, psychological, maturational, and contextual). Subsequently, markers will be mapped onto Bronfenbrenner's bioecological framework (Bronfenbrenner & Morris, 2007) to examine how existing research conceptualises expertise development and future potential across interacting developmental systems. This mapping will allow the review to identify whether the literature predominantly focuses on individual athlete characteristics (Person), developmental interactions and experiences (Process), environmental influences (Context), or developmental trajectories and longitudinal factors (Time), as well as potential gaps across these dimensions.
Evidence tables and visual evidence maps will be used to illustrate the distribution of markers across domains, PPCT dimensions, developmental levels, and study characteristics. A narrative synthesis will accompany all tables and figures, highlighting research trends, methodological approaches, conceptual emphases, knowledge gaps, and areas requiring further investigation. Finally, the findings will be synthesised into a preliminary conceptual framework integrating the identified markers across the PPCT dimensions of Bronfenbrenner's bioecological model, thereby informing the subsequent empirical phases of the ECHO-BASE project.

Language restriction English title and abstract available.

Country(ies) involved Portugal.

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Keywords Volleyball; Expertise Development; Adolescent Players; Future Expertise Potential; Player Development; Bioecological Model; Scoping Review; Talent Development.

Dissemination plans Findings will be disseminated through publication in a peer-reviewed journal, conference presentations, and integration into subsequent phases of the ECHO-BASE project. Results will inform the development of a bioecological framework of expertise development in adolescent volleyball and support future empirical research and systematic review activities. Dissemination activities will include presentations to academic audiences, volleyball coaches, and sport organisations through scientific meetings, workshops, and project communication channels. Where appropriate, study outputs will be shared through open-access platforms to maximise accessibility and impact.

Contributions of each author

Author 1 - Luísa Lima - Luísa Lima (LL) will conduct title and abstract screening, contribute to data extraction, and participate in the reporting and interpretation of review findings. LL will co-author the Introduction, Methods, Results, and Discussion sections of the manuscript, contributing to the synthesis and communication of the review's theoretical, methodological, and applied implications.
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Author 2 - Ana Ramos - Ana Ramos (AR) will contributeto the conceptualisation and methodological design of the review and co-developed the search strategy; will support review coordination, resolution of screening disagreements and review coordination; marker classification and theoretical mapping; provide volleyball-specific interpretation of findings; participate in the narrative synthesis, and manuscript write-up.
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Author 3 - Rita Silva - Rita Silva (RS) will serve as a secondary reviewer during study screening and contribute to marker classification and theoretical mapping. RS will provide volleyball-specific interpretation of findings, participate in the narrative synthesis, and co-author the Discussion section of the manuscript.
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Author 4 - Manuel Loureiro - Manuel Loureiro (ML) will conduct title and abstract screening and contribute to the volleyball-specific interpretation of findings. ML will co-author the Results and Practical Applications sections of the manuscript and support the translation of findings into volleyball practice.
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Author 5 - Ricardo Lima - Ricardo Lima (RL) will contribute to data extraction and provide volleyball-specific interpretation of findings. RL will co-author the Practical Applications section of the manuscript and contribute to the interpretation of results from an applied coaching perspective.
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Author 6 - Lúcia Gomes - Lúcia Gomes (LG) contributed to the development of the search strategy and will serve as a secondary reviewer during study screening. LG will contribute to data verification, marker classification and theoretical mapping, narrative synthesis, and co-author the Methods section of the manuscript.
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Author 7 - Carla Santos - Carla Santos (CS) will contribute to data extraction and support the interpretation and contextualisation of findings related to growth, maturation, and developmental processes relevant to expertise development.
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Author 8 - Sara Pereira - Sara Pereira (SP) will provide methodological support throughout the review process and contribute to the critical review and refinement of the manuscript.
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Author 9 - Ana Paulo - Ana Paulo (AP) conceived the study, secured funding, and leads the overall coordination and management of the review; contributed to the conceptualisation and methodological design of the review; will oversee study selection and adjudicate disagreements; will contribute to data verification, marker classification, mapping, narrative synthesis, and manuscript write-up.
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