INPLASY

Shoulder Proprioception in Overhead Athletes: A Scoping Review Protocol

INPLASY202590062

doi: 10.37766/inplasy2025.9.0062

Received: 15 September 2025

Published: 15 September 2025

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ADMINISTRATIVE INFORMATION

Support - No financial support.

Review Stage at time of this submission - Preliminary searches.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202590062

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 15 September 2025 and was last updated on 15 September 2025.

INTRODUCTION

Review question / Objective The objective of this scoping review is to systematically map and synthesize the literature on shoulder proprioception in overhead athletes. The review will identify which sports and athlete populations have been studied, describe the methods used to assess proprioceptive function, summarize the key findings, and highlight methodological limitations and research gaps.

Background Proprioception is a fundamental component of motor control, athletic performance, and injury prevention. While deficits in proprioception have been extensively studied in the ankle and knee—where they are established risk factors for recurrent injuries—evidence on the shoulder is limited and fragmented. The glenohumeral joint is uniquely challenged in overhead sports such as handball, baseball, tennis, volleyball, and swimming, where extreme ranges of motion and repetitive loading may both enhance and impair proprioceptive acuity. Understanding these patterns is essential for developing effective injury prevention and rehabilitation strategies.

Rationale Despite the increasing incidence of shoulder injuries in youth and elite overhead athletes, no comprehensive review has mapped the available evidence on proprioceptive function of the shoulder in this population. Existing studies use diverse methods, populations, and outcome measures, making it difficult to interpret findings or establish standardized protocols. A scoping review will provide clarity by collating and organizing this evidence, identifying gaps, and informing future research directions.

METHODS

Strategy of data synthesis A comprehensive electronic search will be conducted in PubMed (including MEDLINE), Scopus, Web of Science, CINAHL (EBSCO), and SPORTDiscus (EBSCO) from inception. The search strategy will combine controlled vocabulary (e.g., MeSH terms) and free-

text keywords related to “shoulder proprioception” and “overhead sports.” The PubMed strategy will be: ("shoulder proprioception"[Title/Abstract] OR "joint position sense"[Title/Abstract] OR "position sense"[Title/Abstract] OR "reposition accuracy"[Title/Abstract] OR kinesthesia[Title/Abstract] OR kinaesthesia[Title/Abstract] OR "proprioceptive acuity"[Title/Abstract] OR "proprioceptive sense"[Title/Abstract] OR "sensorimotor control"[Title/Abstract] OR "sensorimotor function"[Title/Abstract]) AND ("athlete*"[Title/Abstract] OR sport*[Title/Abstract] OR "overhead sport*"[Title/Abstract] OR baseball[Title/Abstract] OR softball[Title/Abstract] OR handball[Title/Abstract] OR volleyball[Title/Abstract] OR tennis[Title/Abstract] OR swimming[Title/Abstract] OR "water polo"[Title/Abstract] OR basketball[Title/Abstract] OR badminton[Title/Abstract] OR cricket[Title/Abstract] OR javelin[Title/Abstract] OR discus[Title/Abstract] OR "shot put"[Title/Abstract] OR "throwing athlete*"[Title/Abstract])
This search will be adapted for the other databases. Reference lists of included studies and relevant reviews will also be screened. Grey literature will not be systematically searched.

Eligibility criteria Studies will be eligible if they meet the following criteria:
Population: Athletes engaged in overhead sports (e.g., handball, baseball, softball, tennis, volleyball, swimming, water polo, basketball) at recreational, competitive, or elite levels.
Concept: Quantitative assessment of shoulder proprioception, including joint position sense (JPS), threshold to detection of passive motion (TTDPM), kinesthesia, or force sense. Studies reporting proprioceptive measures together with functional outcomes (e.g., Y-Balance Test Upper Quarter, CKCUEST) will also be eligible.
Context: Laboratory- or field-based studies of healthy or injured overhead athletes.
Study type: Original peer-reviewed research of any design.
Exclusion criteria: Reviews, case reports, animal studies, studies of non-overhead populations, and those not reporting quantitative proprioception outcomes will be excluded.

Source of evidence screening and selection All records retrieved from the searches will be imported into a reference management system, and duplicates will be removed. Two reviewers will independently screen titles and abstracts against the predefined eligibility criteria. Full texts of potentially eligible studies will then be assessed in detail. Any discrepancies will be resolved through discussion, and if consensus cannot be reached, a third reviewer will be consulted. Reasons for exclusion at the full-text stage will be recorded. In addition, the reference lists of included studies and relevant reviews will be screened to identify further eligible records.

Data management All search results will be managed in a reference management software for deduplication and screening. Data extraction will be conducted using a standardized Excel form. Two reviewers will independently chart data items, and disagreements will be resolved by consensus or by consulting a third reviewer. Where terminology differs across studies, data will be harmonized under the relevant proprioception domain for consistency.

Reporting results / Analysis of the evidence Findings will be reported in accordance with the PRISMA-ScR guidelines. Results will be synthesized descriptively and presented in summary tables and figures, grouped by sport and by type of proprioception assessment. Due to expected heterogeneity in study designs and outcome measures, no meta-analysis will be performed. Narrative synthesis will summarize differences between populations, assessment methods, and key findings, with attention to methodological limitations and research gaps.

Presentation of the results Results will be presented in tables and figures alongside a narrative synthesis. Tables will summarize study characteristics, participant details, proprioception assessment methods, outcomes, and key findings. A PRISMA-ScR flow diagram will illustrate the study selection process. Where appropriate, figures will highlight sport-specific patterns and comparisons across assessment methods. Additional detailed tables may be provided as supplementary material to ensure transparency.

Language restriction Only peer-reviewed articles published in English, German, French, or Spanish will be included.

Country(ies) involved Hungary.

Keywords Proprioception; Position Sense; Sports; Athletic Performance; Shoulder Injuries; Overhead Athletes; Joint Position Sense; Shoulder Proprioception.

Dissemination plans The findings of this scoping review will be disseminated through submission to a peer-reviewed journal in the field of sports medicine and physiotherapy, as well as presentations at national and international

scientific conferences. The final report will adhere to the PRISMA-ScR guidelines and will also contribute to the doctoral research outputs at Semmelweis University.

Contributions of each author

Author 1 - Máté Chrenkó - Author 1 will lead the design of the review, develop the protocol, draft the manuscript, participate in the screening of records, and perform data extraction.
Author 2 - Ágnes Andrea Mayer - Author 2 will contribute to the development of the eligibility criteria and the strategy for risk of bias assessment, while also providing methodological guidance, supervising the review process, and contributing to the critical revision of the manuscript.
Author 3 - Márk Dániel - Author 3 will independently perform the title/abstract and full-text screening of all records alongside Author 1, and contribute to data extraction.
Author 4 - András Pavlik - Author 4 will act as the arbitrator in cases where consensus cannot be reached, and will additionally document reasons for study exclusion and support the preparation of the PRISMA-ScR flow diagram.
Author 5 - Attila Pavlik - Author 5 will provide methodological guidance, supervise the review process, and contribute to the critical revision of the manuscript.
Author 6 - András Terebessy - Author 6 will provide methodological guidance, supervise the review process, and contribute to the critical revision of the manuscript.