

Internal and External Load During Volleyball
Match-Play: Protocol for a Systematic Review

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ADMINISTRATIVE INFORMATION

Support - N/A.

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 6 July 2025 and was last updated on 6 July 2025.

INTRODUCTION

Review question / Objective What are the activity demands and the perceptual and physiological responses experienced by volleyball players during match-play?

- Population: Volleyball players (male and female; across different competition levels and age groups)
- Concept: external demands (e.g., movements, distance, jumps) and internal responses (e.g., rating of perceived exertion, heart rate, lactate)
- Context: Match-play (official and friendly matches, across different competitions)

Primary Objective:
To systematically review the available literature on the external demands and internal responses of volleyball players during match-play.

Secondary Objectives:

- To compare external demands and internal responses across sets, player sex, playing positions, competitive levels, and/or geographical regions.
- To determine the methodologies used to assess external demands and internal responses in

volleyball (e.g., time-motion analyses, inertial sensors, heart rate monitors).
– To identify gaps in the literature that can inform future research and applied practice in this area.

Condition being studied This review does not investigate a clinical health condition but rather focuses on the match demands faced by volleyball players. Understanding the external and internal loads during volleyball match-play is important for optimizing training strategies, enhancing performance, and reducing the risk of sustaining injuries in volleyball players.

METHODS

Search strategy Four electronic databases will be used: PubMed, Scopus, SPORTDiscus, and Web of Science.
The search string will be the following:
(volleyball) AND (match-play OR match OR competition OR game OR gameplay OR matchplay OR matchday OR MD) AND ((heart rate* OR lactate OR "rating of perceived exertion" OR RPE OR ITL

OR "internal load*" OR "internal training load*" OR physiological response* OR physiological demand* OR perceptual response* OR perceptual demand* OR blood marker* OR biomarker* OR cortisol OR creatine kinase OR CK OR HRV) OR (jump* OR "jump count" OR "jump height" OR "time-motion" OR "movement analysis" OR GPS OR LPS OR "local positioning system*" OR UWB OR "ultra-wideband" OR accelerometer* OR IMU OR "inertial measurement unit*" OR ETL OR "external load*" OR "external training load*" OR "mechanical demand*" OR "locomotor demand*" OR "activity demand*" OR "physical demand*" OR swing OR "swing velocity" OR "arm swing" OR spike OR "spike velocity" OR velocity OR speed OR sprint* OR run* OR acceleration OR deceleration OR "lateral movement*" OR COD OR "change of direction"))).

Participant or population This review will include studies involving healthy volleyball players of any sex, age and competitive level. Participants must be actively engaged in indoor volleyball match-play during data collection. Beach volleyball players, para or modified volleyball players, and recreational participants not involved in structured competitive matches will be excluded.

Intervention Not applicable. This systematic review will focus on observational data and does not evaluate the effects of a specific intervention.

Comparator Not applicable. This review will not involve direct comparisons between intervention groups. However, data from studies that include intra-sample comparisons (e.g., between playing positions, competitive levels, or sex) will be analysed descriptively.

Study designs to be included Observational and intervention studies.

Eligibility criteria

Inclusion Criteria:

- Peer-reviewed articles written in English.
- Observational and intervention studies, with or without control groups.
- Participants: healthy volleyball players with no restrictions set according to their sex, age, or playing level.
- Setting: official and friendly matches.
- Studies reporting: external demands (e.g., movements, distance, jumps) and internal responses (e.g., rating of perceived exertion, heart rate, lactate).

Exclusion Criteria:

- Studies examining demands during training sessions or isolated drills.

– Studies involving: beach volleyball players, para or modified volleyball players, and recreational participants not involved in structured competitive matches will be excluded.

– Conference abstracts, editorials, reviews, and non-peer-reviewed sources.

Information sources Electronic searches will be conducted in the following databases: PubMed, Scopus, Web of Science, and SPORTDiscus.

Main outcome(s) The main outcomes include: (1) external demands during volleyball match-play (e.g., movements, distance, jumps; (2) internal responses (e.g., rating of perceived exertion, heart rate, lactate). For studies involving an intervention (e.g., pre-post testing surrounding a training or recovery protocol), only baseline data collected prior to the intervention will be extracted and included in the review, provided it meets all other inclusion criteria and represents match-play conditions.

Quality assessment / Risk of bias analysis The methodological quality of included studies will be assessed using the Observational Study Quality Evaluation (OSQE) tool. The appropriate version (cohort, case-control, or cross-sectional) will be selected based on each study's design. Two reviewers will independently score each study, and discrepancies will be resolved through consensus or consultation with a third reviewer.

Strategy of data synthesis A narrative synthesis will be conducted for all included studies, structured around the type of outcome (activity demands vs perceptual responses vs physiological responses). Where sufficient data are available and studies are homogeneous in design, a quantitative synthesis (e.g., pooled means or effect sizes) may be considered. However, meta-analysis is not anticipated due to the expected heterogeneity in study designs, methods, and outcome measures across included studies.

Subgroup analysis

If data permit, subgroup analyses will be conducted by:

- Player sex (male vs female)
- Competition level (e.g., Tier 1 vs Tier 2 vs Tier 3 vs Tier 4 vs Tier 5)
- Playing position (e.g., setter, outside hitter, libero)
- Set number (e.g., first vs third set).

Sensitivity analysis If a quantitative synthesis is feasible, sensitivity analyses will be performed by excluding studies rated as low quality (based on

OSQE score) to examine their impact on overall findings.

Country(ies) involved Portugal, Serbia, Spain, and Australia.

Keywords volleyball; activity; match; game; physiological responses; time-motion analysis; positioning system; microsensor; heart rate; RPE; perceptual; workload; internal load; external load.

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