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New device(s) for monitoring and quantification of jumps and specific actions in volleyball: a scoping review

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Corresponding author:

João Gustavo Claudino

claudinojg@ufpi.edu.br

Author Affiliation:

Federal University of Piauí.

Silva-Junior, VC; Isaías-Oliveira, MC; Gianoni, RLS; Claudino, JG.

ADMINISTRATIVE INFORMATION

Support - None.

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

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202450074

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 15 May 2024 and was last updated on 15 May 2024.

INTRODUCTION

Review question / Objective The objective of the present study is to verify the devices available in the scientific literature for monitoring and quantifying jumps and specific actions in Volleyball through a systematic scoping review. This aims to identify the magnitude of errors, barriers to implementation, as well as the strategies used to overcome these obstacles and maximize the benefits of these technologies in volleyball.

Background Volleyball is one of the most popular and dynamic sports in the world (FORTHOMME et al., 2005), it stands out as one of the pioneers in the adoption of technologies to improve the accuracy and fairness of decisions (AKYÜZ, 2023). According to the website of the Fédération Internationale de Volleyball (FIVB), the Challenge System was officially launched in the sport at the Rio 2016 Olympic Games [1]. Representing a significant milestone between sport and technology in volleyball, promoting cleaner

competition, allowing players, coaches and judges challenge decisions for instant review.

In recent years, significant progress has been observed in the use of technologies for load monitoring in volleyball, which has allowed a more detailed understanding of players' performance (LIMA, 2019; PISA., et al 2022; SOUSA et al., 2023). One of the recent pieces of evidence in this area is the increasing use of inertial measurement unit (IMU) tracking devices, using a combination of accelerometers, gyroscopes, and sometimes magnetometers to monitor athletes (KUPPERMAN et al., 2021; LIMA et al., 2023). These devices provide information about the number and height of jumps, accelerations and other mechanical parameters of the sport (CHARLTON et al., 2017; VILLAREJO-GARCÍA et al., 2023). Accurately monitoring these variables can help coaches adjust the intensity and duration of training according to each player's individual needs, thereby maximizing the benefits of training and reducing the risk of fatigue and injury (RAWASHDEH, 2016; REBELO et al., 2024).

Monitoring and quantifying jumps and specific actions in training and games are fundamental processes for achieving objectives related to physical and/or sporting performances (CLAUDINO et al., 2017; 2018; 2019b; 2014; 2012; 2016). A device designed and marketed specifically for monitoring and quantifying volleyball actions is the Vert and it is probably the reason this device is most used in this sport (CHARLTON et al., 2017; VILLAREJO-GARCÍA et al., 2023).

[1] History (fivb.com): <https://www.fivb.com/en/thefivb/history>.

Rationale Sine qua non conditions for achieving these results are adequate validation processes and determination of the magnitude of errors in these available technologies. Understanding the potential, limitations of devices, as well as the difficulties in implementing technologies will allow advancement in the area of knowledge to overcome these challenges in the sporting context of volleyball.

METHODS

Strategy of data synthesis The results were summarized in relation to the characteristics of the identified technologies, including their advantages and limitations. Furthermore, the magnitude of errors associated with volleyball-specific jump and action monitoring technologies was assessed. Key barriers to implementing these technologies have been identified, along with strategies to overcome these obstacles and maximize the benefits of sports monitoring.

Eligibility criteria After removing duplicates, titles and abstracts will be reviewed based on the following inclusion criteria: (1) study published as original research in a peer-reviewed journal as a full-text article, (2) data reported from use of some monitoring device and/or quantification of jumps and/or specific volleyball actions. After this first screening, the PECO eligibility criteria will be applied to complete manuscripts that continue in the selection process:

(P)articipants: healthy, athletes of any age, sex and level.

(E)xposure: exposure to volleyball assessment, training and/or competition.

(C)omparators: control groups are acceptable, but not mandatory.

(O)utcomes: data reported from a device used to evaluate jumps and/or specific volleyball actions.

Source of evidence screening and selection

Search in Scientific Literature:

The following command line will be applied to 7 electronic databases (i.e., VHL, Cochrane Library, EMBASE, PubMed, Scielo, Scopus and Web of Science) and gray literature (e.g., Google Scholar, ResearchGate):

("volleyball") and ("acceleromet*" or "gyroscope" or "inertial" or "sensor" or "wearable" or "measurement unit" or "wearable system" or "device" or "IMU" or "MEMS" or "microelectromechanical" or "VERT") and ("jump" or "activity profiles" or "specific movements")

Initial Screening:

Titles and abstracts will be reviewed to determine initial relevance of studies based on inclusion criteria.

Secondary Screening:

The studies selected in the initial screening will undergo a more detailed evaluation, including full reading of the manuscripts, applying the eligibility criteria according to the PECO criteria.

Resolution of Disagreements between Reviewers

Independent Review Process:

Two independent reviewers will be appointed to conduct screening, data extraction and critical assessment of studies.

Supervision and Resolution of Disagreements:

A supervisor (JGC) was responsible for overseeing the entire process and resolving disagreements between reviewers.

If there was disagreement between the reviewers, the supervisor made the final decision after considering the arguments on both sides.

Quality Assessment:

To ensure consistency in quality assessment, the same reviewers will also perform quality assessment of selected studies using STROBE (VANDENBROUCKE et al., 2007).

Data management

Protocol Registration:

Before starting the review, the protocol will be registered, describing in detail the methodological plan, including inclusion criteria, search strategy,

quality assessment criteria, and data analysis procedures. This ensures transparency and replicability of the study.

The review protocol will be publicly registered at INPLASY, assigning it a registration number and a DOI to facilitate reference and dissemination.

Management Tools:

We use the Mendeley reference management tool and Excel to organize the search results.

Screening and Data Extraction:

During the screening of studies, spreadsheets or data management software will be used to record the search results, the inclusion and exclusion criteria applied to each study, and the reason for exclusion, if applicable.

During data extraction, standardized forms will be used to record key information from each study, such as sample characteristics, methods, results and conclusions.

Safety Storage:

All data related to the review, including protocol, search logs, screening and extraction spreadsheets, and quality assessments will be stored securely, ensuring confidentiality and data integrity.

Reporting results / Analysis of the evidence A data extraction form will be developed to collect key information from the selected studies. The data extracted will include the type of technology used, characteristics evaluated, reliability measures, results found, among others.

The results will be summarized in relation to the characteristics of the identified technologies, including their advantages and limitations. Furthermore, the magnitude of errors associated with technologies for monitoring and quantifying jumps and specific volleyball actions will be evaluated. Key barriers to implementing these technologies will be identified, along with strategies to overcome these obstacles and maximize the benefits of sports training load management.

Language restriction None.

Country(ies) involved Brazil.

Keywords accelerometer; training load management; technology; team sports; vertical jump; systematic review; performance; inertial measurement unit; initial measurement unit.

Contributions of each author

Author 1 - Vanderley Cardoso Silva-Junior.

Email: juniorcardoso@ufpi.edu.br

Author 2 - Maria Carolina Isaías-Oliveira.

Email: maria.isaias@ufpi.edu.br

Author 3 - Rodrigo Luiz da Silva Gianoni.

Email: rodrigogianoni@yahoo.com.br

Author 4 - João Gustavo Claudino.

Email: claudinojg@ufpi.edu.br

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