

INPLASY PROTOCOL

To cite: Clemente et al. Validity and reliability of the inertial measurement unit for assessment of barbell velocity: A systematic review. Inplasy protocol 2020120135. doi: 10.37766/inplasy2020.12.0135

Received: 27 December 2020

Published: 27 December 2020

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Support: None.

Review Stage at time of this submission: Preliminary searches.

Conflicts of interest:
None.

INTRODUCTION

Review question / Objective: This systematic review aimed to: (1) identify and summarize the studies that have examined the validity of wearable wireless IMU for measuring barbell velocity; and (2) identify

Validity and reliability of the inertial measurement unit for assessment of barbell velocity: A systematic review

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Review question / Objective: This systematic review aimed to: (1) identify and summarize the studies that have examined the validity of wearable wireless IMU for measuring barbell velocity; and (2) identify and summarize the studies that have examined the reliability of IMU for measuring barbell velocity.

Condition being studied: The validity and reliability of IMU for measuring barbell velocity.

Information sources: Electronic databases (Cochrane, EBSCO, PubMed, Scielo, Scopus, SPORTDiscus, and Web of Science) were searched for relevant publications prior to December 30, 2020. Additionally, the reference lists of the studies retrieved were manually searched to identify potentially eligible studies not captured by the electronic searches. Finally, an external expert has been contacted in order to verify the final list of references included in this scoping review in order to understand if there was any study that was not detected through our research. Possible errata was searched for each included study.

INPLASY registration number: This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 27 December 2020 and was last updated on 27 December 2020 (registration number INPLASY2020120135).

and summarize the studies that have examined the reliability of IMU for measuring barbell velocity.

Rationale: Inertial measurement unit (IMU) have been progressively increasing the applications in movement assessment. In

the case of velocity-based training (VBT) there is a need for measuring barbell velocity in each repetition. The use of IMU may turn easier the monitoring process, however the validity and reliability should be ensured.

Condition being studied: The validity and reliability of IMU for measuring barbell velocity.

METHODS

Search strategy: Keywords and synonyms were entered in various combinations in the title, abstract or keywords: (“inertial measurement unit” OR “IMU” OR “acceleromet*” OR “inertial sensor” OR “wearable” OR “MEMS” or “magnetometer”) AND (“Validity” OR “Accuracy” OR “Reliability” OR “Precision” OR “Varia*” OR “Repeatability” OR “Reproducibility” OR “Consistency” OR “noise”) AND (“barbell” OR “bar”).

Participant or population: Humans without injury or illness.

Intervention: Use of IMU in barbell movements.

Comparator: (i) an isoinertial dynamometer consisting in cable-extension linear position transducer; or (ii) optoelectronic system.

Study designs to be included: Observational analytic.

Eligibility criteria: Test of a wearable wireless IMU; Tests were conducted in barbell movements; Estimation of barbell velocity (m/s); In the case of validity, the IMU was compared with: (i) an isoinertial dynamometer consisting in cable-extension linear position transducer; or (ii) optoelectronic system; In the case of validity, one of the following measures were included: (i) typical error; (ii) mean absolute error; In the case of reliability, one of the following measures were included: (i) intraclass correlation test; (ii) coefficient of variation; (iii) standardized typical error; and (iv) standard error of measurement;

Only original and full-text studies written in English.

Information sources: Electronic databases (Cochrane, EBSCO, PubMed, Scielo, Scopus, SPORTDiscus, and Web of Science) were searched for relevant publications prior to December 30, 2020. Additionally, the reference lists of the studies retrieved were manually searched to identify potentially eligible studies not captured by the electronic searches. Finally, an external expert has been contacted in order to verify the final list of references included in this scoping review in order to understand if there was any study that was not detected through our research. Possible errata was searched for each included study.

Main outcome(s): The following information was extracted from the included original articles: (i) validity measure (e.g., typical error, absolute mean error); and (ii) reliability measure (e.g., intraclass correlation coefficient [ICC] and/or typical error of measurement [TEM] (%) and/or coefficient of variation [CV] (%) and/or standard error of measurement [SEM]).

Quality assessment / Risk of bias analysis: The STROBE guidelines for cross-sectional studies will be used for assessing the risk of bias.

Strategy of data synthesis: The following information was extracted from the included original articles: (i) validity measure (e.g., typical error, absolute mean error); and (ii) reliability measure (e.g., intraclass correlation coefficient [ICC] and/or typical error of measurement [TEM] (%) and/or coefficient of variation [CV] (%) and/or standard error of measurement [SEM]). Additionally, the following data items were extracted: (i) type of study design, number of participants (n), age-group (youth, adults or both), sex (men, women or both), training level (untrained, trained); (ii) characteristics of the wearable wireless IMU and comparator (isoinertial dynamometer consisting in cable-extension linear position transducer or optoelectronic system); (iii) characteristics

of the experimental approach to the problem, procedures and settings of each study.

Subgroup analysis: None.

Sensibility analysis: None.

Language: English.

Country(ies) involved: Portugal; Turkey; Spain.

Keywords: sports technology; sensors; accuracy; precision; performance; velocity-based training.

Contributions of each author:

Author 1 - Filipe Manuel Clemente - FMC lead the project, established the protocol and wrote and revised the original manuscript.

Author 2 - Rui Silva - RS wrote and revised the original manuscript.

Author 3 - Zeki Akyildiz - ZA wrote and revised the original manuscript.

Author 4 - José Pino-Ortega - JPO wrote and revised the original manuscript.

Author 5 - Markel Rico-González - MRG run the data search and methodological assessment and wrote and revised the original manuscript.