

INPLASY

"From Multi-Parameter to Single-Parameter: A Systematic review of Wearable Sensors sensitivity in Seizure Detection"

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None reported.

ADMINISTRATIVE INFORMATION

Support - Not applicable.

Review Stage at time of this submission - Completed but not published.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY2023120011

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 02 December 2023 and was last updated on 02 December 2023.

INTRODUCTION

Review question / Objective "How does the sensitivity of single-parameter wearable sensors for seizure detection compare to multi-parameter wearable sensors in individuals with epileptic seizures?"

Rationale This systematic review aims to consolidate current evidence on the sensitivity of multi-parametric and single-parameter wearable sensors in seizure detection.

Condition being studied Seizures and epileptic seizures.

METHODS

Search strategy - Databases Used: PubMed, IEEE Xplore, and Google Scholar.

- Search Strings: "seizure detection", "epilepsy monitoring", "wearable sensors", "machine learning", and "IoT in seizure detection."

- Time Frame: Articles published between 2010 and 2023 were considered to ensure the relevance and recency of the findings.

Participant or population Population (P): Individuals with a medical diagnosis of seizures (Epileptic seizures).

Intervention Intervention (I): Single-parameter wearable sensors for seizure detection.

Comparator Comparator (C): Multi-parameter wearable sensors or standard clinical seizure detection methods.

Study designs to be included Randomized Controlled Trials (RCTs), Observational Studies (including cohort and case-control studies), Cross-sectional Studies, Case Series (if relevant to the technology or detection methods being reviewed).

Eligibility criteria Inclusion Criteria: Studies employing wearable sensors, machine learning algorithms, or IoT-based solutions for seizure

detection. Studies reporting the sensitivity rate of the seizure detection system. Studies conducted on human subjects. Studies published in English. *Exclusion Criteria: Studies that did not provide sufficient data on the performance metrics of the seizure detection system. Studies conducted on animal models. Review articles, meta-analyses, and case reports. Studies not available in full text.

Information sources Electronic Databases: The review primarily sourced articles from PubMed, IEEE Xplore, and Google Scholar.

Main outcome(s) Main Outcomes: The sensitivity rates of wearable sensors in seizure detection.

Data management - Data Extraction: Identifying relevant data from selected studies, such as study design, participant characteristics, type of sensors used, and seizure detection results.

-Data Handling: Using Rayyan platform

- Data analysis: Using Excel for tables and R studio for plotting.

Quality assessment / Risk of bias analysis - Quality Assessment Tool Used: The Risk Of Bias In Non-randomized Studies - of Interventions (ROBINS-I) tool.

- Process: Two reviewers independently assessed the risk of bias and applicability concerns in the included studies.

- Resolution of Discrepancies: Any disagreements between reviewers were resolved through discussion or consultation with a third reviewer.

Strategy of data synthesis Data Synthesis: The review employed a narrative synthesis approach due to the heterogeneity of the studies. This involves summarizing and explaining the findings of the included studies qualitatively.

Subgroup analysis Inability to access Raw materials of the studies and small samples were a inconvenience to do the subgroup analysis. Also, the research question focuses on the accuracy so the researchers got limited to the accuracy.

Sensitivity analysis An in-depth sensitivity was not conducted due to the following:

- Scope and Focus of Review: The authors have focused on providing a general overview rather than a detailed methodological exploration.

- Varying Sample Sizes: The studies had varying sample sizes, which can influence the reliability and generalizability of the findings. For instance, studies with smaller sample sizes, such as that by Cogan et al., might have results that are less generalizable to the broader population.

- Lack of Confidence Intervals: The absence of confidence intervals in the reported studies makes it challenging to assess the precision of the reported sensitivities. Confidence intervals provide a range within which the true value likely lies, and without them, it's hard to gauge the reliability of the reported figures.

- Diverse Methodologies: The diversity of methodologies used across studies introduces heterogeneity. This heterogeneity can make direct comparisons between studies challenging, as even similar technological frameworks can yield different sensitivities due to factors like sensor calibration, validation, and the physiological manifestations of seizures.

Language restriction Yes, only articles published in English will be accepted.

Country(ies) involved Moroccans working in the emirates school establishment.

Keywords Seizure detection, Wearable sensors, multi-parameter systems, Neurological monitoring.

Dissemination plans - Publishing in Scientific Journals: Submitting the findings of the systematic review to relevant peer-reviewed journals for publication.

- Presentations at Conferences: Presenting the results at academic and medical conferences.

- Sharing with Healthcare Professionals: Disseminating the findings among healthcare providers and professionals, especially those involved in seizure management.

- Online Platforms and Social Media: Utilizing online platforms and social media to reach a broader audience, including researchers, clinicians, and potentially affected individuals.

- Collaboration with Patient Groups: Sharing the results with patient advocacy groups or organizations focused on seizure disorders.

Contributions of each author

Author 1 - Ayoub Imzilene - Leading the project. Formulating the review question and methodology. Conducting the literature search. Screening studies for eligibility. Extracting and analyzes data. Writing the majority of the manuscript.

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Author 2 - Ayoub Lanssi - Assisting in formulating the methodology. - Independently screening studies for eligibility to ensure unbiased selection.- Assisting in data extraction and analysis. - Reviewing and contributes to the writing of the manuscript. - Handling revisions and addresses reviewers' comments.

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