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INPLASY

Studying musical experience with wearable devices: a systematic review

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ADMINISTRATIVE INFORMATION

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

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 24 July 2024 and was last updated on 24 July 2024.

INTRODUCTION

Review question / Objective What is the current state of research on musicians' use of wearable sensors to analyze physiological and aesthetic parameters related to performance?

Condition being studied We investigate the use of wearable sensors for detecting physiological and movement parameters in the study of interaction between musicians during musical performances.

METHODS

Search strategy Databases: Web of Science; Scopus. Publication date: no restriction. Language: English. Type of publication: Article.

Query:
Web of Science:
TS=(("wearable technolog*" OR "wearable sensor*" OR "wearable*" OR "imu" OR "mimu") AND music*) AND LA=(English) AND DT=(Article)
Scopus:
TITLE-ABS (("wearable technolog*") OR ("wearable sensor*") OR ("wearable*") OR ("IMU") OR ("MIMU") AND (music*)) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (DOCTYPE , "ar")
TITLE-ABS (("wearable technolog*") OR ("wearable sensor*") OR ("wearable*") OR ("imu") OR ("mimu") AND (music*)) AND (LIMIT-TO (LANGUAGE , "english")) AND (LIMIT-TO (DOCTYPE , "ar"))

We followed a PRISMA-2020 approach: we identified 164 studies from Scopus and 195 from Web of Science; we removed 113 duplicates before screening. We screened 246 studies and excluded 220 of them after abstract examinations. We retrieved 26 studies and excluded 4 after full

papers examinations. We added one more paper, that was published after database searches.

Participant or population Humans (including adults and children; healthy and clinical population, if any).

Intervention Given the large number of recent publications on wearable technologies, it might come as a surprise that research on using such technologies in crossmodal communication in music performance has only recently begun. This question seems especially intriguing, given its structural links with other foundational issues in the psychology of perception (e.g., the existence of amodal, or supramodal, perceptual attributes), aesthetics, and pedagogy related to music contexts. Additionally, exploring crossmodal coding in musical performance through the use of wearable technologies may open up interesting areas of application in the field of human health, such as music therapy. This includes potential benefits for rehabilitation, such as hand rehabilitation, Parkinson's disease, cognitive dementias, autism spectrum disorders and sensory impairments among others.

Comparator Not relevant.

Study designs to be included RCT, Cross-sectional studies, Observational, Behavioral, and Neurophysiological studies.

Eligibility criteria Exclusion criteria: Studies published in languages other than English; review papers and dissertations.

Information sources Web of Science and Scopus databases, limited to only English articles.

Main outcome(s) Illustrate the physiological processes that underlie musical performance across different modalities and their relationship to currently available wearable technologies. By understanding these processes, we can leverage wearable sensors to monitor and analyze various physiological and movement parameters in musicians. This approach can be clinically exploited to study patients with sensory impairments or neurodegenerative diseases, such as Parkinson's disease and cognitive dementia. Additionally, these technologies hold promise for enhancing rehabilitation strategies, including hand rehabilitation and therapy for autism spectrum disorders. The insights gained from this research could also inform the development of more effective music therapy interventions, providing a valuable tool for improving the quality of life and therapeutic outcomes for individuals with various health conditions.

Quality assessment / Risk of bias analysis The Cochrane Risk of Bias tool will be used to assess the quality and risk of bias of the included studies. This tool evaluates several domains, including:

1. Sequence generation (selection bias).
2. Allocation concealment (selection bias).
3. Blinding of participants and personnel (performance bias).
4. Blinding of outcome assessment (detection bias).
5. Incomplete outcome data (attrition bias).
6. Selective reporting (reporting bias).
7. Other sources of bias.

Assessment Process: Two independent reviewers will assess the risk of bias for each study included. They will use a predefined risk of bias assessment form to ensure consistency in the evaluation process. Each domain will be rated as low, high, or unclear risk of bias.

Conflict Resolution: Any disagreements between the reviewers will be resolved through discussion and consensus. If disagreements persist, a third reviewer will be consulted to provide an independent assessment and reach a final decision.

Strategy of data synthesis Data Categorization and Synthesis:

Studies will be categorized according to the following tentative items:

Gesture Recognition/Classification: Studies focusing on the recognition and classification of musicians' gestures using wearable technologies and sensors.
Measuring Physiological Parameters: Studies that measure physiological parameters (e.g., heart rate, skin conductance) using wearable sensors to study emotional components (e.g., stress levels) of musicians' performance.
Performance-Oriented Wearable Systems: Studies that explore wearable systems designed to enhance or monitor musical performance.
Sensory Translation/Sensory Mapping: Studies involving the translation or mapping of sensory data (e.g., converting motion into sound).

Synthesis Process: Data will first be synthesized based on the categories mentioned above by analyzing studies that share relevant features. This will involve:

1. Descriptive Synthesis: Summarizing and tabulating the characteristics and findings of the included studies within each category. This will include narrative descriptions and visual representations (e.g., tables, and graphs) to highlight similarities and differences.
2. Thematic Analysis: Identifying and analyzing key themes and patterns that emerge from the data within each category. This will provide a deeper understanding of the use and impact of wearable technologies in music performance.

Reporting Results: The results of the synthesis, whether descriptive or quantitative, will be reported by PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. This will ensure transparency and reproducibility of the review process and findings.

Subgroup analysis Study: subgroups will be created based on the technology domains and experimental paradigm.
Participant: subgroups will be created according to different cultural backgrounds/ethnicity; relevant expertise (e.g., musical expertise); healthy and clinical; age.

Sensitivity analysis Not relevant.

Language restriction English.

Country(ies) involved Italy.

Keywords Wearable technologies; Wearable sensors; Music performance; Music; Embodied music interaction; Movement based interaction; Audio-tactile mapping.

Contributions of each author
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