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ESPAÇO PARA A SAÚDE

REVIEW PROTOCOLS

VIRTUAL REALITY IN ADVANCED LIFE SUPPORT: SCOPING REVIEW PROTOCOL

Realidade virtual no suporte avançado de vida: protocolo de revisão de escopo.

Realidad virtual en el soporte vital avanzado cardiovascular: protocolo de revisión de alcance

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ABSTRACT

This is a scoping review on the use of Virtual Reality (VR), through serious games, in training healthcare students and professionals in Advanced Life Support (ALS). The objective is to map and describe the available evidence on these educational technologies. The protocol is based on the JBI methodology, registered in the OSF, and reported according to PRISMA-ScR. Searches will be conducted in MEDLINE/PubMed, Scopus, CINAHL, LILACS, EMBASE, Web of Science, IEEE Xplore, ACM Digital Library, and grey literature, with no language or time restrictions. Original studies evaluating VR with serious games applied to ALS will be included. Findings will be synthesized narratively and presented in tables and figures.

Keywords: Nursing. Virtual Reality. Advanced Cardiac Life Support.

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RESUMO

Trata-se de uma revisão de escopo sobre o uso da Realidade Virtual (RV), por meio de serious games, no treinamento de estudantes e profissionais da saúde em Suporte Avançado de Vida (SAV). O objetivo é mapear e descrever as evidências disponíveis sobre essas tecnologias educacionais. O protocolo é baseado na metodologia do JBI, registrado no OSF e reportado conforme o PRISMA-ScR. A busca abrangerá MEDLINE/PubMed, Scopus, CINAHL, LILACS, EMBASE, Web of Science, IEEE Xplore, ACM Digital Library e literatura cinzenta, sem restrições de idioma ou período. Serão incluídos estudos originais que avaliem RV com serious games aplicados ao SAV. Os achados serão sintetizados narrativamente e apresentados em tabelas e gráficos.

Palavras-chave: Enfermagem. Realidade Virtual. Suporte Avançado de Vida.

RESUMEN

Se trata de una revisión de alcance sobre el uso de la Realidad Virtual (RV), mediante serious games, en la formación de estudiantes y profesionales de la salud en Soporte Vital Avanzado (SVA). El objetivo es mapear y describir las evidencias disponibles sobre estas tecnologías educativas. El protocolo se basa en la metodología del JBI, está registrado en OSF y se reporta según PRISMA-ScR. La búsqueda incluirá MEDLINE/PubMed, Scopus, CINAHL, LILACS, EMBASE, Web of Science, IEEE Xplore, ACM Digital Library y literatura gris, sin restricción de idioma o período. Se incluirán estudios originales que evalúen RV con serious games aplicados al SVA. Los hallazgos se sintetizarán de forma narrativa y se presentarán en tablas y figuras.

Palabras clave: Enfermería. Realidad Virtual. Soporte Vital Avanzado Cardiovascular.

INTRODUCTION

The training of healthcare professionals has undergone a significant transformation, with the transition from traditional teaching models to approaches that integrate innovative technologies, aiming to provide more dynamic and interactive learning[1]. In this context, Virtual Reality (VR) emerges as a promising educational tool, offering immersive three-dimensional environments that allow practicing procedures in highly realistic simulated scenarios. This technology favors the development of technical skills and decision-making in a safe and controlled environment, aligning sensory experience with intuitive knowledge[2-3].

Virtual Reality (VR) is a three-dimensional computational environment that, through physical devices, allows immersive and sensory interaction with virtual elements, generating a sense of presence to explore with sight, hearing, and touch; in health education, this enables practices in interactive scenarios that react to students' actions, favoring knowledge retention and decision-making in critical situations[4].

Highly interactive VR interfaces align the sensory experience and intuitive knowledge, support repeated practice and experiential learning, and are crucial for acquiring technical skills and performing procedures safely; by faithfully simulating clinical situations, VR helps train professionals who are better prepared and more confident for emergencies and complex hospital settings. As a strategy within active learning methodologies, VR promotes student protagonism, broadens perspectives on the content learned, and, combined with teacher intervention personalized feedback, deepens the learning experience and retention of knowledge[5-6].

The combination of VR and *serious games* and gamification elements further enhance the teaching-learning process, especially in training complex skills such as Advanced Life Support (ALS). This approach promotes student engagement, enhances clinical reasoning, and strengthens non-technical skills such as leadership and teamwork, which are essential in emergency situations[7-10].

Despite the growing interest in the application of these technologies, there is a gap in the scientific literature regarding the systematization of existing knowledge produced. There is a lack of review studies that

consolidate the available evidence on the effectiveness and best practices in the use of VR-based *serious games* for ALS training. This deficiency hinders the assessment of the current research landscape and the identification of directions for future developments in the field.

Therefore, this study aims to map and describe the evidence available in the literature on the use of VR, through *serious games*, for training professionals and students in the health field in the context of Advanced Life Support (ALS).

METHOD

Type of study

The protocol will follow the methodology of the JBI *Manual for Evidence Synthesis methodology* for scoping reviews and is registered with the *Open Science Framework* (OSF; Center for Open Science, Charlottesville, United States) under the DOI: https://doi.org/10.17605/OSF.IO/QVY5K. The *Preferred Reporting Items for Systematic Reviews and Meta-Analyses – Extension for Scoping Reviews* (PRISMA-ScR) will be used to report the review results[11-12].

Eligibility criteria

For the proper structuring of the eligibility criteria, a strategy based on the PCC (Population, Concept, and Context) method was adopted, in which the population comprises students and professionals in the health field, the concept refers to the use of Virtual Reality through *serious games*, and the context involves training and qualification in Advanced Life Support.

Studies that meet the criteria established by the PCC strategy will be included in this review. Original studies, whether quantitative, qualitative, or mixed, will be accepted, provided they present an application or evaluation of virtual reality in *serious games* for teaching advanced life support (ALS) to healthcare professionals and/or students. No restrictions will be applied regarding language or publication date.

Exclusion criteria

Studies whose main focus does not involve Advanced Life Support (ALS), addressing only Basic Life Support (BLS) or training conducted in contexts other than medical emergencies, such as general nursing simulations, chronic care, or non-critical scenarios, will be excluded. Publications unrelated to the training or practice of students and professionals in the health field will also be excluded, particularly studies directed exclusively at laypeople, patients, caregivers, or the general public, without correspondence to the defined target population. Studies that do not use *serious games*, considering only traditional simulations, e-learning environments, commercial games, or gamification strategies without a structured educational character and defined pedagogical objectives, will not be included. Furthermore, studies proposing games that have not yet been implemented or tested, as well as editorials, letters to the editor, book chapters, opinion articles, and conference abstracts without full text available, will be excluded. Finally, publications whose full text cannot be located, even after three attempts to contact the corresponding author within three weeks, will also be excluded.

Search strategy

Controlled descriptors from the DeCS (Descriptors in Health Sciences), MeSH (Medical Subject Headings), and Emtree vocabularies will be used, in addition to free-text keywords. Initially, an exploratory search will be conducted in the MEDLINE/PubMed and Scopus databases. This step will be carried out by the researcher, with support from a specialized librarian from the Federal University of Santa Catarina.

This scoping review will be conducted based on the methodological guidelines of the Joanna Briggs Institute (JBI), following the recommended steps for this type of review. The search will be carried out in the

following databases: EMBASE, *Cumulative Index to Nursing and Allied Health Literature* (CINAHL), *Medical Literature Analysis and Retrieval System Online/National Library of Medicine* (MEDLINE/PubMed), Latin American and Caribbean Literature in Health Sciences (LILACS), Scopus, Cochrane Library, *Web of Science*, the *ACM Guide to Computing Literature* (ACM Digital Library), and *Institute of Electrical and Electronics Engineers* (IEEE Xplore). In the grey literature, the following sources were used: Google Scholar (first ten pages) and *ProQuest Global Dissertations and Theses* (first ten pages). The search will be complemented by consultations with experts in the field and by manual review of the reference lists of the included studies, in order to identify additional relevant evidence.

Next, the identified terms will be organized and combined with controlled vocabulary, including synonyms and terminological variations relevant to the study scope. The construction of search commands will be carried out using the Boolean operators AND and OR. Thus, the search strategy will be systematized into five main stages: extraction, conversion, combination, construction, and application.

Selection of studies

After searching the databases, all retrieved references will be gathered and imported into *EndNote X9® software* (Thomson Reuters, Philadelphia, PA, USA), where duplicate will be automatically identified and removed. Then, the set of references will be exported to the Rayyan platform, which will be used for the study screening process, based on previously defined eligibility criteria[13-14].

Two independent reviewers will begin the screening process by conducting a pilot test of records (titles and abstracts) in order to calibrate the application of the eligibility criteria. After this stage, they will proceed with the selection of studies in two phases: analysis of titles and abstracts, followed by reading the full text, always considering the established inclusion criteria.

Any disagreements between reviewers regarding the inclusion or exclusion of a study will be resolved by a third reviewer, through discussion and consensus. When necessary, abstracts or articles will be translated using online translation tools to ensure accurate eligibility assessment[15].

The entire selection process will be described in detail, allowing the construction of the PRISMA flowchart, as shown in Figure 1[16]. The studies excluded after full-text reading, along with the reasons for exclusion, will be presented in a table entitled "Characteristics of the excluded studies".

Presentation and summary of the data

The data extraction and presentation steps will be guided by JBI recommendations[17]. A preliminary data extraction form will be developed. This extraction tool will be refined and adjusted as needed throughout the data extraction process for each included source of evidence. Any modifications made to the data extraction and presentation form will be clearly documented in the scoping review.

Therefore, the data will be organized in a table designed to ensure organization, quality, and clarity of the findings, consisting of: study characteristics (title, author(s), journal, year, country of publication, and study design), main findings on the use of VR in ALS training, as well as its effectiveness through detailed sampling, methodology, results, technological aspects, educational implications, and finally, the main conclusions and recommendations.

EXPECTED RESULTS

This review will include the extraction of quantitative and qualitative data, which will be analyzed according to methodological approaches appropriate to the nature of each piece of evidence. Quantitative data will be organized and synthesized using descriptive statistics, allowing a general characterization of the

included publications. Qualitative data will be examined through thematic analysis, enabling the identification of relevant patterns, categories, and meanings.

The presentation of the findings will include a flowchart detailing all stages of the search, screening, selection, and eligibility process for the publications. Following this, summary tables and illustrative figures will be created to summarize the main results. The final report will follow the PRISMA-ScR recommendations, ensuring transparency, consistency, and methodological rigor throughout the process.

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