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Immersive Interventions: A Systematic Review of VR intervention on Stress Reduction and Wellness in Healthcare Professionals

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ADMINISTRATIVE INFORMATION

Support - None.

Review Stage at time of this submission - Piloting of the study selection process.

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 11 November 2025 and was last updated on 11 November 2025.

INTRODUCTION

Review question / Objective Among healthcare professionals in outpatient or clinical settings, does the use of virtual reality-based relaxation or mindfulness interventions reduce perceived stress, anxiety, or fatigue compared to standard relaxation methods?

Rationale Existing research on VR's psychological benefits has primarily focused on patients—for instance, those undergoing painful procedures or experiencing clinical anxiety—rather than on healthcare professionals themselves. Only a limited number of studies have examined VR-based relaxation or mindfulness interventions for clinicians, most of which were conducted during the COVID-19 pandemic and in inpatient or intensive care settings. While several systematic reviews have synthesized evidence on VR for pain management and anxiety reduction in patients, few

have evaluated its role in mitigating occupational stress among healthcare professionals. Addressing these gaps is essential to inform how VR can be integrated into occupational wellness programs, particularly for shift-based clinicians who often lack time for traditional wellness practices. A systematic synthesis of current evidence can help identify effective intervention strategies to support sustainable clinician well-being.

Condition being studied This review will focus on the healthcare professional population, specifically physicians, nurses, physician assistants, and other allied health staff. The intervention will include any virtual reality-based program targeting relaxation, mindfulness, or stress reduction of which may be compared to standard wellness interventions, non-VR relaxation, or no intervention at all. Perceived stress, burnout, and fatigue (measured via validated scales) will serve as the primary outcomes of interest.

METHODS

Search strategy This systematic review is conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guidelines. Five databases were systematically searched in October 2025: CINAHL Ultimate, Cochrane Central Register of Controlled Trials (CENTRAL), Cochrane Database of Systematic Reviews, MEDLINE with Full Text, and PubMed.

The search combined controlled vocabulary and free-text terms to capture studies examining virtual reality-based relaxation, mindfulness, or stress-reduction interventions among healthcare professionals. The following search terms were applied:

("virtual reality" OR "VR" OR "immersive technology" OR "augmented reality")

AND ("healthcare workers" OR "medical staff" OR "caregivers" OR "health personnel" OR "nurses" OR "nursing staff" OR "physicians")

AND ("stress" OR "burnout" OR "fatigue" OR "mental health" OR "well-being" OR "relaxation" OR "anxiety")

AND ("night shift" OR "shift work" OR "rotating shifts").

Filters were applied to include English-language, human studies published from January 2015 through October 2025, limited to randomized controlled trials (RCTs), crossover trials, pilot, or feasibility studies involving adults (≥ 19 years).

Participant or population Studies were included if they enrolled healthcare professionals such as physicians, nurses, or allied health staff.

Intervention Virtual Reality-based intervention designed for relaxation, mindfulness, stress management, or fatigue reduction. These interventions could be stand-alone programs or part of broader workplace wellness initiatives.

Comparator Studies were also included if they contained a comparison group, such as standard care, no intervention, or a non-VR control, and if they reported at least one primary outcome related to stress, burnout, fatigue, well-being, or quality of life.

Study designs to be included Eligible studies were randomized, crossover, or pilot trials published in peer-reviewed journals.

Eligibility criteria Studies were included if they enrolled healthcare professionals such as physicians, nurses, or allied health staff, and if they implemented a VR-based intervention designed for

relaxation, mindfulness, stress management, or fatigue reduction. These interventions could be stand-alone programs or part of broader workplace wellness initiatives. Studies were also included if they contained a comparison group, such as standard care, no intervention, or a non-VR control, and if they reported at least one primary outcome related to stress, burnout, fatigue, well-being, or quality of life. Eligible studies were randomized, crossover, or pilot trials published in peer-reviewed journals.

Studies were excluded if they focused on patient populations such as those involving pain management, PTSD, or rehabilitation settings. They were also excluded if they used VR for simulation-based education or procedural training rather than relaxation, included non-healthcare or pediatric populations, or were non-English, non-peer-reviewed.

Information sources CINAHL Ultimate, Cochrane Central Register of Controlled Trials (CENTRAL), Cochrane Database of Systematic Reviews, MEDLINE with Full Text, and PubMed Trial registries: ClinicalTrials.gov.

Other: Reference lists of included studies.

Main outcome(s) Perceived stress, burnout, and fatigue (measured via validated scales).

Data management Study screening and data extraction will be performed independently by two reviewers using Covidence. Data will be extracted into a standardized form, with consensus or thirdparty adjudication for discrepancies.

Quality assessment / Risk of bias analysis Risk of bias will be assessed using the Cochrane Risk of Bias 2.0 (RoB 2.0) tool for randomized controlled trials and the Risk Of Bias In Non-randomized Studies of Interventions (ROBINS-I) tool for non-randomized studies. Each study will be rated as low risk, some concerns, or high risk of bias according to the respective tool. For the RoB 2 tool, bias will be assessed across all five domains (randomization, deviations, missing data, measurement, reporting). For the ROBINS-I tool, bias will be assessed across all seven domains (confounding, selection, classification of interventions, deviations, missing data, outcomes and reported results).

Strategy of data synthesis The data will be abstracted from articles into tabular format and direction of effect will be noted along with statistical significance. Due to the variability in training modalities and outcome measurements, a meta-analysis is unable to be performed.

Subgroup analysis Not applicable.

Sensitivity analysis Not applicable.

Language restriction Only English-language publications will be included.

Country(ies) involved United States.

Keywords anxiety reduction, immersive technology, non-pharmacological interventions, stress reduction, virtual reality, wellbeing, burnout, healthcare professionals.

Dissemination plans The findings will be disseminated through peer-reviewed publication, presentation at simulation and digital healthcare conferences.

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