INPLASY PROTOCOL

To cite: Kovanur Sampath et al. The role of virtual reality (VR) with haptic feedback in enhancing physical examination skills of health care students – a systematic review protocol. Inplasy protocol 202220055. doi: 10.37766/inplasy2022.2.0055

Received: 15 February 2022

Published: 15 February 2022

Corresponding author:
Kesava Kovanur Sampath

kesava.sampath@gmail.com

Author Affiliation:
Waikato Institute of Technology.

Support: **Nil.**

Review Stage at time of this submission: **The review has not yet started.**

Conflicts of interest:
None declared.

The role of virtual reality (VR) with haptic feedback in enhancing physical examination skills of health care students – a systematic review protocol

Kovanur Sampath, K[1]; Arumugam, A[2]; Yaghi, E[3]; Chidambaranathan, K[4]; Andersen, P[5].

Review question / Objective: **1) Will VR with haptic feedback in health education improve physical assessment skills of students? 2) What are the facilitators and barriers for implementing/incorporating VR with haptic feedback as a health education tool to teach physical examination skills for students?**
Condition being studied: **Physical Assessment Skills.**
Information sources: **The lead investigator (KKS) in consultation with an experienced subject librarian identified the following electronic databases: PubMed, AMED, EMBASE, CINAHL, Cochrane Library, Physiotherapy Evidence Database (PEDro), and SCOPUS. Additional search will also be undertaken on protocol registries such as PROSPERO. Furthermore, two reviewers will independently screen the reference list and citations of the included full-text articles for any additional citations.**

INPLASY registration number: This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 15 February 2022 and was last updated on 15 February 2022 (registration number INPLASY202220055).

INTRODUCTION

Review question / Objective: **1) Will VR with haptic feedback in health education improve physical assessment skills of students? 2) What are the facilitators and barriers for implementing/incorporating VR with haptic feedback as a health education tool to teach physical examination skills for students?**

Rationale: **Physical examination is a procedure that includes skilled hands-on techniques undertaken by a health practitioner (doctors, nurses, physiotherapists and others) to examine a**

patient for any possible signs and symptoms related to a health condition(Michels, Evans, & Blok, 2012). The process of learning these clinical skills combines theoretical knowledge acquired in a classroom followed by a hands-on laboratory session (Bugaj & Nikendei, 2016). This traditional model is underpinned by the 'See one, do one, teach one' approach, where trainees are expected to become increasingly independent after observing an expert clinician or teacher for a few times (Kotsis & Chung, 2013). However, this approach has been criticized for various including lack of supervision, reflection on action, performance evaluation and structured feedback (Lenchus, 2010; Rodriguez-Paz et al., 2009). Finally, the ongoing COVID-19 pandemic has made it difficult if not impossible to teach physical examination techniques (that need palpation/palpatory feedback). The role of technology such as VR may therefore important to facilitate teaching these important techniques. Haptics refers to the sense of touch, including both tactile and kinaesthetic perceptions/feedback of an object. The addition of haptic feedback in VR environments creates more realistic scenarios, while providing trainees with a safe environment in which they can develop their skills (Kirkman et al., 2014). It is through palpation (diagnosis through touch) that a clinician/student obtain important information to clinical reasoning, diagnosis and treatment in MT (Loh et al., 2015; Tong et al., 2018). Hence, haptic feedback may be considered an important feature of any 3D technology that aims to aid palpatory skills and thereby physical examination skills of a learner (Kirkman et al., 2014). However, the use of VR in health education, especially in improving physical examination skills for of learners is still largely not well understood.

Condition being studied: Physical Assessment Skills.

METHODS

Search strategy: Keywords such as "Virtual reality", "serious game", "educational technology", "avatars", "haptics", "virtual physical examination", "physical examination", "diagnosis", "nursing education", "medical education", "health education", "physiotherapy education", "undergraduate education", "medical students", "students", "teaching", "learning", "evaluation", "critical thinking", "concentration", "self-efficacy", "performance". The Boolean operators "OR" and "AND" will be used to combine the search terms within and between each of the subject areas respectively.

Participant or population: Health Students.

Intervention: Virtual Reality with Haptic Feedback.

Comparator: Nil.

Study designs to be included: Quantitative, Qualitative and Mixed Methods.

Eligibility criteria: Setting: Studies should have taken place only in health care (medicine, nursing, physiotherapy, etc.) educational setting (university, polytechnic, teaching clinic, etc.). Limiters:To ensure relevancy and recency for clinical education, only studies published since January 2010 will be included. Due to unavailability of language translators, only studies published in the English language will be included in this review. Exclusion criteria: Studies will be excluded if: (1) they were not conducted in an health education setting; (2) the study design is one of the following: secondary research, pilot study, expert opinion, practice guidelines, editorial, letter to the editor, and commentary; (3) non-peer reviewed studies and (4) non-English studies.

Information sources: The lead investigator (KKS) in consultation with an experienced subject librarian identified the following electronic databases: PubMed, AMED, EMBASE, CINAHL, Cochrane Library, Physiotherapy Evidence Database (PEDro), and SCOPUS. Additional search will also be undertaken on protocol registries such as PROSPERO. Furthermore, two reviewers will independently screen the reference list

and citations of the included full-text articles for any additional citations.

Main outcome(s): Studies will be included if they report any quantifiable outcome and/or qualitative outcome/feedback.

Data management: Articles obtained by the systematic search in the above-mentioned databases will be exported and saved into reference management software (EndNote X9 Thomson Corporation) which will be used throughout the review process.

Quality assessment / Risk of bias analysis: The quality of the studies will be assessed by two independent reviewers (KSK and AA). Both reviewers will record the rationale for study scores to enable comparison. A third reviewer (PA) will be consulted in case of any disagreements. The Mixed Methods Appraisal Tool (MMAT) (Pluye, Gagnon, Griffiths, & Johnson-Lafleur, 2009) will be used to appraise the quality of included studies.

Strategy of data synthesis: For quantitative studies, if at least two studies with similar interventions, assessment methods, and adequate homogeneity are identified, then the feasibility of a meta-analysis (Hedges & Pigott, 2001) will be explored. Heterogeneity will be assessed statistically using the standard I2 tests; I2 >40% will be indicative of significant heterogeneity. A Random-effects models will be used for pooling the data. Subgroup analysis will be carried out based on covariates, such as health profession, context, and population (student group), where they have the potential to have impact on estimates. Where statistical pooling is not possible, the findings will be presented in narrative form including tables and figures to aid in data presentation. For qualitative studies, a thematic analysis will be the method of choice for synthesising data (Thomas & Harden, 2008). If included studies are a combination of quantitative and qualitative studies, a convergent data integration (the process of bringing qualitative and quantitative approaches together in a parallel fashion) will be used (Hong, Pluye, Bujold, & Wassef, 2017). If included studies are a combination of quantitative, qualitative and mixed methods studies, meta-integration for synthesising data will be undertaken (Frantzen & Fetters, 2015).

Subgroup analysis: Not Applicable.

Sensitivity analysis: A sensitivity analysis will be performed (if required) based on risk of bias in included studies.

Language: Only studies published in English will be included.

Country(ies) involved: New Zealand and United Arab Emirates.

Keywords: Health Care Education; Virtual Reality; Haptic Feedback; Physical Assessment; Physical Examination; Barriers and Facilitators.

Dissemination plans: The protocol and the systematic review are to be published in a peer reviewed Journal. The review findings will also be presented at a conference.

Contributions of each author:

Kesava Kovanur Sampath - Author 1 conceived the project and initiated the review.
Email: kesava.sampath@gmail.com
Ashokan Arumugam - Author 2 provided critical inputs including data synthesis strategy and development of the manuscript.
Email: aarumugam@sharjah.ac.ae
Esra Yaghi - The author was the second reviewer and contributed to study selection and assessment of risk of bias.
Email: esra.yaghi@wintec.ac.nz
Kumaresan Chidambaranathan - Author 4 is a chief librarian and contributed to the development of search strategy.
Email: kumaresan.chidambaranathan@ara.ac.nz
Patrea Andersen - The author read, provided feedback and approved the final manuscript.
Email: patrea.anderson@wintec.ac.nz