IJoHS

International Journal of Healthcare Simulation Vol.2, Issue no.2

SHORT REPORTS ON SIMULATION INNOVATIONS SUPPLEMENT (SRSIS)

Immersive and screen-based virtual reality simulations enhance empathy

Tim Tomy[1], Cosima Neumann[1], Joshua Vognsen[2], Stella Major[2]

[1]*Division of Medical Education, Alumni of Weill Cornell Medicine - Qatar, Doha, Qatar*
[2]*Division of Medical Education, Weill Cornell Medicine - Qatar Alumni, Doha, Qatar*

Corresponding author: Stella Major, scm2009@qatar-med.cornell.edu

https://ijohs.com/article/doi/10.54531/GRKB7114

Introduction

Empathy is the ability to understand and share the feelings of another. In the practice of medicine, empathy in patient–physician communication remains an important skill for all professionals to have to deliver better care for their patients [1]; therefore, medical educators should prioritize uncovering novel educational approaches to enhance empathy among medical students.

Virtual reality (VR) is a powerful tool to build empathy allowing a user to experience what another person is experiencing and in turn, possibly, feel what they are feeling. While the term VR has come to encompass a wide variety of computer-generated audio-visual experiences [2], we are using the term 'immersive VR' to delineate the experience of VR via a computer-generated environment, wherein the participant is using a head-mounted display with environmental audio and spatial tracking [3].

Immersion is the level to which the participant becomes involved in the simulation and varying levels of immersion can have varying levels of impact among the participants [4].

Embodied Labs® is an immersive VR software app which creates a realistic environment and scenario for the user to experience how a person with a particular disability lives [5]. Dyer et al. describe medical, nursing and physical therapy students' increased expression of empathy for older adults with vision and hearing loss or Alzheimer's disease after using an Embodied Labs immersive VR simulation [6]. During the COVID pandemic Embodied Labs added a new online screen-based VR option which engages the user to interact with a computer to access and respond to the content.

Our pilot study explores learners' self-reported expression of empathy for older adults with social isolation after experiencing either an immersive or screen-based VR. Our hypothesis is that a greater level of immersion achieved through immersive VR as compared to screen-based VR would invoke a greater level of empathy among medical students.

Innovation

Embodied Labs'® Frank Lab, which focused on social isolation, was selected by the authors to be used for the study as it had a compelling story, especially with imposed isolation that everyone experienced during the COVID pandemic. The HTC Vive® [7] headset was used for the Immersive VR, while a 27-inch Apple iMac [8] with headphones was used for the screen-based VR. Study participants were

randomized to either screen-based or immersive VR in a 1:3 ratio, respectively. Pre- and post-surveys were created in Qualtrics® [9] to evaluate the intervention.

Evaluation

The Jefferson Scale of Empathy (JSE) Student (S Version) by Thomas Jefferson University was used to measure empathy. It is a 20-question survey that uses a 7-point Likert scale which provides a score **that** is a surrogate measure of empathy. Both pre- and post-surveys included JSE as well as various open-ended responses on demographics, extent of prior experience with VR and how immersed they felt during the VR intervention using a 5-point scale (1 = Barely Immersed to 5 = Very Immersed).

Outcomes

Forty-two medical students participated (14% of invited participants), 62% of whom were females. The majority (95.1%) reported a reasonable to more-than-reasonable level of immersion experience and most (95.2%) strongly recommended applying VR into the medical education curriculum. Examining the overall change in all participants' JSE pre- and post-VR revealed a mean increase of 6.47% ($p < 0.001$).

A paired *t*-test analysis on the 32 immersive VR participants' mean score revealed an increase of 7.76% ($p < 0.001$). Similarly, for the 10 screen-based VR participants the score change increased by 3.54% ($p = 0.049$).

A two-sample *t*-test analysis (Table 1) showed no significant difference between the change in difference in pre–post scores between the two groups ($p = 0.142$).

A Mann–Whitney *U*-test comparing the difference in the JSE scores among the different simulation modalities among the subgroups of gender, class group (premedical vs. medical), level of subjective immersion and prior experience with VR demonstrated no statistical significance. Notably, however, the difference between JSE scores among the immersive VR participants who felt less immersed was 3.20 while those who felt more immersed was 9.85. The difference between JSE scores among the immersive VR participants who had no VR experience was 6.00 while those who had VR experience was 12.00.

What's next?

Our data show that VR simulation, whether immersive or screen-based increases levels of empathy in medical students. There is a 2-fold increase in the difference between pre- and post-simulation JSE scores in the immersive when compared to the screen-based simulation. Whilst not statistically significant, this may be explained in part by the small number of overall participants and our 3:1 modality allocation. For future reference, a crossover study with more participants in each group can further validate these findings.

How might this innovation be relevant in other settings

Immersive VR and screen-based VR are viable options for educators to consider. Our study reveals that learners benefitted from the immersive experience, and empathy scores increased with different levels of immersion, mostly among those with prior experience of VR use, suggesting that access to the technology for wider use may make its use in the educational setting more effective.

Acknowledgement

© Thomas Jefferson University, 2001. All rights reserved. Jefferson, as the sole copyright holder, maintains the copyright for granting or declining permission for any additional use of all versions of the JSE. The teams at Embodied Labs® and Thomas Jefferson University for providing us with their VR program and the JSE survey, respectively. The authors acknowledge statistical support of the Biostatistics, Epidemiology, and Biomathematics Research Core at Weill Cornell Medicine – Qatar and WCM-Q faculty, Dr. Mai Mahmood for reviewing the research proposal.

Authors' contributions

All authors contributed to writing, editing and reviewing this work. SM, TT and CN designed the protocol, JV provided technical support. TT and CN lead the data collection and all authors contributed to the data analysis and reporting.

Funding

The corresponding author (SM) was an awardee of a Medical Education Research Grant from the Division of Medical Education at Weill Cornell Medicine – Qatar for the sum of 11,500 USD to purchase Immersive Virtual Reality equipment and software app to develop a VR lab for medical students to explore the use of Virtual Reality in Undergraduate medical student training on empathy. This publication was made possible by joint funding from the Medical Education Department and the Biomedical Research Program, both at Weill Cornell Medicine – Qatar. Both medical students (TT and CN) were mentees of SM on this project and conducted the research work as part of the Areas of Concentration Course, which is a graduation requirement in the 3rd phase

Table 1: Mean JSE score and their change in the study participants

Jefferson score	Overall	Immersive VR	Screen-based VR
Pre-simulation	114.02	113.50	115.70
Post-simulation	121.71	122.31	119.80
Overall change	7.69	8.81	4.10
% Change	6.74	7.76	3.54

The change between the scores for each participant was also calculated and averaged.

of their WCM-Q MD program. Each student received a sum of 1,643.46 USD and 1,606.13 USD, respectively, to purchase access to SPSS license for data analysis and a license to use the complete Jefferson Empathy Survey tool, in this research.

Availability of data and materials

None declared.

Ethics approval and consent to participate

Protocol title: Using Virtual Reality to improve Empathy in Medical Education. IRB protocol number: 1763880-1 was approved by the IRB board at Weill Cornell Medicine – Qatar. All research subjects' informed consent was obtained.

Competing interests

None declared.

References

1. Derksen F, Bensing J, Lagro-Janssen A. Effectiveness of empathy in general practice: a systematic review. Br J Gen Pract. 2013 Jan;63(606):e76–84.
2. Kardong-Edgren SS, Farra SL, Alinier G, Young HM. A call to unify definitions of virtual reality. Clinical Simulation in Nursing. 2019;31:28–34.
3. Meese MM, O'Hagan EC, Chang TP. Healthcare provider stress and virtual reality simulation: a scoping review. Simulation in Healthcare. 2021 Aug 1;16(4):268–274.
4. Gutiérrez F, Pierce J, Vergara VM, et al. The effect of degree of immersion upon learning performance in virtual reality simulations for medical education. Studies in Health Technology and Informatics. 2007;125:155–160.
5. Embodied Labs. Immersive training platform. Embodied Labs. Available from: https://embodiedlabs.com/ [Accessed 7 February 2022].
6. Dyer E, Swartzlander BJ, Gugliucci MR. Using virtual reality in medical education to teach empathy. J Med Libr Assoc. 2018 Oct 1;106(4):498–500.
7. HTC Vive. HTC Vive. HTC, New Taipei City, Taiwan. 2015. Available from: https://www.vive.com/us/product/ [Accessed 22 December 2022].
8. iMac. iMac. Apple, California, USA. 2020. Available from: https://www.apple.com [Accessed 22 December 2022].
9. Qualtrics. Qualtrics XM - experience management software. Qualtrics, Seattle, USA. 2022. Available from: https://www.qualtrics.com/ [Accessed 22 December 2022].