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Works-in-Progress

Cutting corners: donning under duress–a VR teaching tool

Enfiler son EPI en vitesse et brûler les étapes : la solution dans un outil pédagogique de RV

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Introduction

For highly infectious diseases, such as severe acute respiratory syndrome (SARS) or the novel coronavirus (COVID-19), healthcare workers (HCW) are at a high risk of personal exposure. Healthcare workers can reduce this exposure by taking airborne and contact precautions using personal protective equipment (PPE).[1] However, the COVID-19 pandemic has resulted in intense psychological stress in HCW,[2] and the time required to don PPE (typically 3-7 minutes)[3] can lead to an inner conflict and cognitive strain when there is an emergent need for patient treatment (e.g. cardiopulmonary resuscitation). HCW may fail to don PPE properly, resulting in exposure to the virus by 'cutting corners' or making mistakes in an attempt to act quickly.[4] Thus, training and practice in donning and doffing PPE as per individual hospital protocol are of paramount importance to protect HCW.

Virtual reality (VR) may offer a potential solution to this problem for several reasons. We have previously used immersive VR-360 videos to reduce patient perioperative anxiety by placing the viewer (in the first person) in a virtual environment, as a form of exposure therapy, where one can emotionally experience their surroundings in a safe manner.[5] A study by Gutiérrez et al. has shown that medical students have higher knowledge gain with immersive environments using head-mounted displays (HMDs) than by screen-based learning.[6] Haerling et al. have demonstrated that learning transfer is similar in nurses receiving virtual or physical simulation, but the simulation was significantly cheaper in the VR group.[7]

Objective

Using VR-360 videos as a form of educational exposure therapy for PPE donning in both high- and low-stress environments.

Methods

Given physical distancing, resource, and time constraints, in our context we had limited access to manikin-based simulation. We thus chose to use VR based 360 videos to demonstrate our institution's PPE donning protocol. We created two immersive VR-360 films of 1) a HCW donning PPE under normal circumstances and 2) while in the delivery suite for a critically ill (simulated) newborn requiring resuscitation. Cognitive stress in the latter video was simulated using loud alarms (via in situ simulation software)[8] and emotional team members yelling for help in the background. This allowed them to experience the stress of such a scenario without sacrificing personal safety during donning. The participants then completed an adapted post video Likert scale-based questionnaire. It was composed of questions related to subjective 'realism' and usefulness of these videos as well as the equipment, its side effects and satisfaction with the overall experience (Appendix A).[9,10] As this was created as a tool to educate on the standard use of PPE donning, a formal ethics approval was not required. Thus far, ten anesthesiologists have viewed these videos using the Oculus Go headset.

Preliminary feedback

Our preliminary feedback (Figure 1) has been that the videos seemed realistic, enjoyable, practical and provoked a self-reported stressful response (when intended). Half of the participants concurred that they gained knowledge which they could extend to clinical practice, whereas the other half were undecided. The majority agreed that the entire system was easy to use without side effects and were satisfied with the experience. This was the first phase of a larger project in which we plan to compare VR videos to manikin-based simulation (the current 'gold-standard' for education).

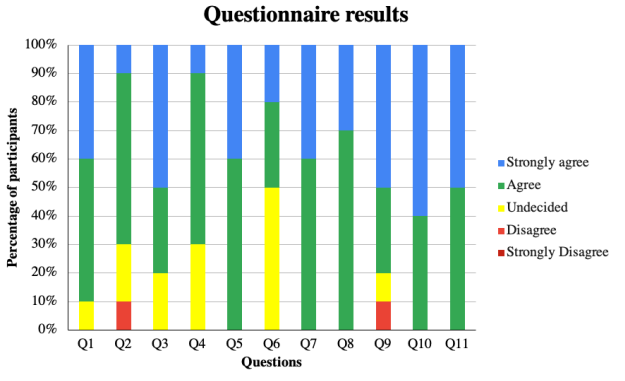

Figure 1. Preliminary participant feedback regarding VR educational video. No participants replied "Strongly Disagree" to any of the questions.

Summary

This initiative was created as a response to the pandemic to ensure that HCW adhered to proper PPE donning procedures in both high- and low-stress environments. Our preliminary evidence suggests VR videos serving as educational exposure therapy for HCW may be a cost-effective, globally accessible and sustainable resource. We plan to expand the content of these videos to increase safety and decrease the emotional strain on our HCW in a variety of settings during this pandemic, while also conserving valuable resources.

Conflicts of Interest: The authors have no conflicts of interest to declare.

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Appendix A.

Questionnaire

Rate on a scale of 1-5.

1- Strongly disagree

2- Disagree

3- Neither agree or disagree/Undecided

4- Agree

5- Strongly agree

Q1. The virtual environment seemed natural/real to me.	
Q2. I became so involved in the virtual environment that I was not aware of the real things happening around me.	
Q3. I enjoyed being in this virtual environment.	
Q4. I felt that donning under stress made me feel stressed.	
Q5. The information provided by the virtual environment was clear.	
Q6. I feel I gained knowledge from this experience that I will be able to apply to clinical practice.	
Q7. Personally, I would say that this virtual environment is practical.	
Q8. I found the HMDs/entire system easy to use.	
Q9. I did not experience any fatigue/headache/eyestrain/nausea/any other discomfort during interaction with the virtual environment.	
Q10. I would like to learn more using the virtual environment and HMD's.	
Q11. Overall, it was a satisfying experience.	