Dementia focused immersive virtual reality: An innovative tool in Occupational Therapy education

C. Spellman, A. Thinnes, E. Young, L. Smith

Creighton University (Omaha, Nebraska)

INTRODUCTION

Simulated environments emerged in the 1950s in the motion picture industry to create immersive, multi-sensory experiences for audiences. Over time, these environments evolved into advanced virtual reality (VR) technologies, such as head-mounted displays (HMDs), which combine 360-degree visuals with audio and tactile feedback, making users feel physically present in a virtual world.

In recent years, HMD VR devices have become accessible across fields like military simulation, product design, medical training, exergaming, therapy, and meditation [2]. In medical education, VR enhances learning by making anatomical structures interactive, improving engagement, self-confidence, and motivation [4, 8]. Despite VR's growing use in health sciences, limited research exists on its application in occupational therapy (OT) education [3].

This qualitative study explores OT students' perceptions of immersive VR as a teaching tool, focusing on dementia education. Fourth-semester OT doctoral students at a Midwest university used *A Walk Through Dementia* (AWTD), a free VR app, to experience daily life with dementia through activities like shopping, walking home, and navigating within a house. Using Google Cardboard and smartphones, students engaged in this simulation as part of an older adults course. Previously, the program employed a 2D, non-immersive version of AWTD, but its discontinuation led instructors to adopt immersive VR for a more realistic and impactful learning experience.

Immersive VR offers students a low-risk environment to understand dementia's impact, fostering empathy and improving interaction skills while safeguarding the dignity of those with dementia. The authors hypothesized that students would prefer immersive VR for its novelty and effectiveness in enhancing empathy and understanding. However, potential drawbacks, such as cybersickness [7], could hinder the experience. This study aimed to determine whether immersive VR via HMD is more effective and preferred compared to non-immersive simulations for dementia education in OT programs.

METHODS

A prospective, within-subjects experimental design study was initiated at a Midwestern university to gain qualitative data to determine student perceptions of using VR HMD in occupational therapy education. A convenience sample of entry level doctoral occupational therapy students in the fifth semester of their OTD program who had recently completed the 2D, non-immersive dementia simulation experience during their fourth semester was used in this study. The Institutional Review board determined the study to be exempt; demographic and participant identifiers were not collected. Each participant was compensated with a twenty-five-dollar gift card in exchange for their participation in the study.

Recruitment of students occurred via an emailed interest survey. Investigators determined the ability to accommodate up to fifteen student participants due to limited HMDs, time slots, and intern technology support in the institution’s virtual reality lab. All fifteen student participant positions were filled. Students were scheduled for a time to participate in the experience in the institution’s virtual reality lab.

On the date of the pilot study, students were asked to complete a pre-experience survey based on their previous 2D, non-immersive simulation experience that occurred during the fourth semester of their OT program. Following their completion of the pre-experience survey, student participants were oriented to the immersive VR experience and fit with an HMD. They were then educated on potential side effects, such as virtual sickness, and instructed on alternative delivery methods of the simulation if they were unable to tolerate the immersive HMD simulation. Next, students were instructed on how to complete the three *AWTD* components of daily life using the HMDs and handheld controllers. After the immersive *AWTD* simulation experience, the students completed a post- experience survey.

The pre/post- experience surveys were completed by all students using the online survey platform, Qualtrics. Pre- experience survey questions asked information about students' experience with *AWTD* using Google Cardboard during their fourth semester (see Table 1). Post- experience survey questions asked key questions pertaining to their experience with the use of the VR HMD as a medium to complete the simulation application. (see Table 2).

A qualitative comparative analysis was utilized to compare immersive VR with the use of HMD versus the use of Google Cardboard and the student's personal smartphone [1].

Qualtrics was used to categorize responses from the pre- and post- experience survey questions. The research team employed a coding response guide to determine themes, mark data points, and ensure interrater reliability [5]. Collective themes of the data collected were agreed upon from thematic discussion. Results were tabulated and expanded on from the qualitative data reviewed.

Table 1

Pre-Experience Survey Questions	
Selecting "Yes" to this statement indicates your consent to participating in this research. Yes/No	
1.	Did you participate in the simulation "A Walk Through Dementia" in OTD 423 Occupational Therapy with Older adults?
2.	What did you use to experience this simulation? (Type/brand of smartphone? Type of headphones?)
3.	Did you feel that how you experienced this simulation (watching on your smartphone with headphones) helped you understand dementia through the perspective of a person with the disease? Explain.
4.	What, if anything, stood out in that experience?
5.	Did you feel motion sickness as you experienced the simulation on your smartphone?

Table 2

Post-Experience Survey Questions	
1.	Did you participate in the simulation "A Walk Through Dementia" in The IdeaHub?
2.	Have you used a VR device before?
3.	What device did you use to experience this simulation?
4.	Did experiencing the "A Walk though Dementia" with use of a VR device enhance your understanding of dementia through the perceptive of a person with the disease? Explain.
5.	Was anything perceived differently in this experience using a VR device? Explain.
6.	Did you feel motion sickness as you experienced the simulation with the VR device?
7.	Was the VR device comfortable to use? Explain.
8.	Did you note any other side effects from use of the VR device?
9.	Share your preference. Would you prefer to experience this simulation through use of your smartphone or through use of the VR device? Why?

RESULTS

This study investigated OT student perceptions of immersive virtual reality as a teaching modality; as well as providing OT students with exposure to individuals with dementia in a safe, controlled virtual environment. The authors hypothesized that students would prefer the immersive VR experience of the AWTD app over a 2D, non-immersive experience due to the novelty of the experience. They also believed it would improve understanding of dementia symptoms and increase empathy toward clients with dementia and their caregivers. 15 students completed the voluntary immersive VR experience, pre-survey, and post-survey, for a response rate of 100%. The students' perception of the initial dementia simulation was positive. Students reported it was an engaging and educational experience. Students also noted that

learning didactic material in an interactive way increased understanding and empathy about and for individuals with dementia. Fifty-three percent of students felt they were able to be fully immersed in the simulated experience of having dementia. Twenty percent said they had some difficulty maneuvering in the simulation and found its technical aspects challenging to the overall learning experience. Thirteen percent of students made note of the simulation space, a standard classroom, was a distraction when using the smartphone for the simulation as one could still see and hear the surrounding sights and sounds of peers and the classroom environment.

All students completed the simulation in its entirety using the HMD VR headset. Students were guided through the simulation, and no modifications to the simulation experience were required. Of the 15 students, 100% attended the pre-brief where the ground rules and expectations of the experience were shared. 12 had some type of previous immersive VR experience, and 3 had no experience in immersive VR. Students were instructed to complete the simulation in a seated position if they had any issues with motion sickness. 6 of 15 Students reported feeling motion sickness during the immersive VR experience, while 9 students reported no feelings of motion sickness. Students noted that any feeling of motion sickness was mild, and not strong enough to stop the simulation experience. Other side effects that were noted were feelings of a racing heart, anxiousness, and mild dizziness, and the need to readjust vision once the simulation was complete due to the blurry vision perspective within the simulation. 1 student noted the weight of the headset feeling heavy and tight around their head.

When asked if the use of a VR headset enhanced understanding of dementia, 100% of students reported a strong sense of increased intellectual understanding, increased emotional awareness, and increased empathy for and with individuals living with dementia. Students believe the VR simulation supported a deeper level of understanding by allowing a person to feel immersed in the context and experience of a person with dementia. 100% of the students strongly agreed that VR should be retained as a learning modality for teaching.

Students were asked to explain if the VR headset and immersive experience had any effect on their perception of the simulation experience versus when they participated in the simulation on a smartphone device previously. Students reported that the entire experience was enhanced and more realistic, lifelike. Students remarked on noticing more details within the three environments in the experience, feeling fully immersed and more control over where and what I was looking at. 14 out of 15 students agreed that the VR headset provided a richer learning environment, while 1 student felt they had a similar learning experience with either a smartphone or a VR headset. As far as comfortability and wearability of the VR headset, 13% of students noted the headset felt heavy to wear and caused mild motion sickness. 87% reported that the headset did not cause any discomfort and was their preferred method of experiencing the dementia simulation.

DISCUSSION

First, this study highlights the impact of virtual reality simulation on enhancing occupational therapy student's levels of empathy toward individuals with dementia as well as their caregivers. The results indicate that, when students engage with material in an interactive way, they perceive an increased understanding of and empathy toward individuals with dementia.

While increased use of technology in learning environments has brought about many new opportunities, it has also presented gaps in healthcare education including equipping students with strong skills in communication, empathy and the development of emotional intelligence [6]. Providing experiential learning opportunities, such as dementia simulations, can leverage technology while helping to address educational gaps and foster the development of soft skills. These soft skills are essential for delivering high-quality patient care and optimizing clinical outcomes. By engaging in this type of "low stakes" exposure to individuals with dementia early on in their academic careers, occupational therapy students may be able to enter into fieldwork experiences and future clinical practice with less anxiety and more empathy when serving individuals with dementia.

Second, although simulated teaching methods may not fully replicate real-world experiences encountered in the field, they provide students with foundational skills essential for developing empathetic behaviors and responses applicable in practice. The use of high-quality virtual reality simulations within occupational therapy education allows for repeatable experiences with clearly defined learning objectives at a relatively low cost. This ensures that occupational therapy educational programs offering hybrid models can ensure parity among their hybrid pathways so that all students have equitable learning opportunities.

CONCLUSION

While the use and benefit of simulation learning in occupational therapy educational programs exists, there is minimal research on the topic of immersive virtual reality in occupational therapy education. In this study, OT student participants reported an enhanced understanding of dementia due to the immersive virtual reality experience. The results of this study contribute to the existing body of knowledge on the use of virtual reality in healthcare education as an innovative teaching tool to enhance OT student learning outcomes. Exposure to complex conditions through immersive virtual reality can not only increase future practitioner's empathy but does so in a manner that considers the safety of both the learner and client to best serve vulnerable patient populations.

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