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Virtual Reality as a Window into Dementia: Undergraduates' Embodiment of a Latina Woman with Alzheimer's Disease

Linton, Hytrek, and Ortiz

Abstract

This study explores the effects of a VR simulation on 45 undergraduates' empathy and comprehension of Alzheimer's disease (AD) through embodying a Latina with AD. At a Hispanic Serving Institution, social work and health students navigated through AD's stages as Beatriz. Pre- and post-intervention surveys showed a notable rise in confidence in aiding AD individuals, although symptom identification did not significantly improve. Qualitative insights revealed a deeper appreciation of AD's lived experiences, underscoring VR's capacity to enhance empathy and understanding of health conditions in educational settings.

Introduction

Virtual reality (VR) is increasingly recognized as a pivotal tool in the realm of social work education, offering immersive learning experiences that can significantly enhance both theoretical knowledge and practical skills (Hsiao, 2021; Lanzieri, 2021; Linton, 2022; Huttar & BrintzenhofeSzoc, 2020). This technological advancement has opened new avenues for educational strategies, particularly in the context of social work, where understanding diverse social contexts and developing empathy are crucial. The broader implications of VR in healthcare professions, especially its effects on confidence and knowledge development in the context of dementia care, are notable in considering VR's multifaceted role in social work and health education (Campbell et al., 2021; Hicks et al., 2023; Hirt & Beer, 2020; Jones et al., 2021).

Virtual Reality & Simulation Based Social Work Education

Virtual reality is one type of simulation-based form of social work education. Incorporating simulation-based education into social work training enhances key professional skills. For instance, Blakely and Biehle (2021) demonstrated how virtual reality simulations improve empathy and understanding in child welfare cases. Kourgiantakis et al. (2020) focused on role-play simulations to bolster family intervention techniques, highlighting the importance of real-life practice scenarios. Egonsdotter and Bengtsson (2023) examined the integration of digital platforms to facilitate collaborative learning among students, emphasizing technology's role in simulating complex social issues. Lee et al. (2021) and Sollars and Xenakis (2021) both emphasized the development of communication skills and decision-making through structured simulation activities, highlighting their effectiveness in preparing students for interdisciplinary collaboration. These studies collectively advocate for simulation-based methodologies as vital components of social work education, offering diverse approaches to enhancing practical competencies.

Virtual Reality and Social Work

Virtual reality (VR) has emerged as a transformative tool in social work education, offering unique opportunities for immersive learning experiences. Due to more recent developments in improving its capabilities and the newer, more realistic nature of VR technology, five studies published since 2020 have identified common themes and insights

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into VR's effectiveness, challenges, and future directions in social work, such as enhancing empathy, diversity, efficacy, and technology developments (Hsiao, 2021; Jenney et al., 2023; Lanzieri, 2021; Linton, 2022; Huttar & BrintzenhofeSzoc, 2020).

Empathy and Diversity

A consistent theme across the studies is VR's role in deepening empathy and understanding of diverse social contexts. Lanzieri's (2021) research with 30 social work students demonstrated how VR experiential learning enhanced comprehension of community dynamics and individual client experiences. Lanzieri's study included immersing students into the Lower East Side of New York City using VR. Students explored the community physically and saw community residents and community organizations in the Lower East Side; after VR students reflected on whether what statistics say about poverty and resources in the community reflect what they experienced in VR. Similarly, Linton's (2022) pilot study of the effects of several VR scenarios in which 18 undergraduate students embody people with various chronic health conditions found that students reported more empathy and compassion towards people with the health conditions. This indicates that VR fosters empathy towards patients with various health conditions, highlighting its capability to create emotionally resonant experiences essential for social work.

Learning Outcomes and Self-Efficacy

VR's positive impact on learning outcomes and self-efficacy is inconsistent across the studies. Hsiao (2021) found significant improvements among 227 social workers who used VR in self-efficacy and learning motivation. However, BrintzenhfeScoc's (2020) systematic review of research in social work on VR as a teaching method prior to 2020 found only one of seven studies that showed an improvement in self-efficacy among participants (Levine and Adams, 2013). Jenney et al.'s (2023) assessment of the feasibility and usability of a new VR scenario on intimate-partner violence that participants enjoyed the opportunity to learn and build confidence through a VR game. More research is needed on VR's potential in building competence and confidence in social work practices.

Challenges and Considerations in VR Technology

The integration of VR into social work education presents certain technological challenges. Huttar & BrintzenhofeSzoc (2020) identify a lack of standardized training for VR users, and Lanzieri's study addresses technological limitations in VR design, such as the need for clearer imagery (Lanzieri, 2021). These challenges emphasize the importance of addressing technical and pedagogical aspects to maximize VR's educational benefits.

Future Directions and Potential for Growth

To evaluate the effectiveness of the WARM program, we assessed aspects of physical health (grip strength and body mass index [BMI]) and nutrition (Mini-Nutritional Assessment-SF (MNA®; Cereda, 2012). A trained agency staff member and university student visited each participants' home at baseline and at the end of the 26-week study. Each of the following outcomes were assessed. The studies collectively point towards significant potential for VR in both undergraduate and postgraduate education. Linton's (2022) focus on undergraduate students suggests VR's applicability across different educational levels. However, Huttar and BrintzenhofeSzoc (2020) identify a gap in literature concerning VR in postgraduate training and distance learning, indicating are-

as for future exploration.

Previous research presents a compelling case for the integration of VR in social work education. By enhancing empathy, understanding, and self-efficacy, and providing immersive experiences in diverse social contexts, VR emerges as a valuable educational tool. However, the need for improved implementation and standardization is clear. Future research should focus on expanding VR's application, improving technological aspects, and developing standardized training protocols.

Health Care Professionals, VR and Confidence

Research in other disciplines outside of social work has demonstrated effects of virtual reality on confidence and knowledge development. Across research on preparing caregivers, students, and health care professionals, VR consistently enhanced self-efficacy and confidence among participants, regardless of their specific roles in healthcare. Wijma et al. (2018) demonstrated improvements in empathy and perceived competence among informal caregivers of people with dementia. These findings align with those of Hsiao (2021), where social workers experienced increased self-efficacy and motivation following VR-based experiential education. Similarly, Simpson et al. (2023) also reported improved confidence and preparedness in practitioners trained in risk assessment and management through VR. These similarities suggest a universal benefit of VR in enhancing confidence and self-efficacy across various healthcare roles.

Health Care Professionals, VR, Knowledge Development

Previous research has provided varied insights into the impact of VR on dementia knowledge development among healthcare professionals and students (Campbell et al., 2021; Hicks et al., 2023; Hirt & Beer, 2020; Jones et al., 2021). For instance, Campbell et al. (2021) noted substantial changes in nursing students' perceptions of awareness and sensitivity concerning Alzheimer's Disease patients, although no notable improvement in knowledge about memory loss and care was observed. This trend of enhanced empathy and sensitivity was also echoed in the findings of Jones et al. (2021), where immersive VR learning experiences led to significantly enhanced empathy in participants. However, the results pertaining to the improvement in knowledge and symptom identification were more mixed. Hirt and Beer (2020) observed improvements in caregivers' and students' empathy and competencies, suggesting a potential benefit of VR in training for effective dementia care. Conversely, Jones et al. (2021) reported mixed outcomes regarding the enhancement of dementia knowledge. While some interventions showed significant improvement in participants' knowledge of dementia, other studies did not find any marked improvement (Jones et al., 2021).

The study by Hicks et al. (2023) focused on care home practitioners and their qualitative experiences with VR. This study provided valuable insights into the potential of VR as a tool for enhancing dementia awareness. The practitioners reported the VR experience as insightful and evocative, offering them a deeper understanding of the challenges faced by individuals living with dementia reporting specific symptoms, such as disorientation or challenges in perception (Hicks et al., 2023). This experiential learning was particularly noted for its capacity to generate feelings of immersion, helping practitioners to understand and even feel the emotional and cognitive challenges of dementia.

Study Purpose

While there is a consensus among these studies on the efficacy of VR in enhancing empathy and sensitivity towards dementia

patients, the impact on knowledge and symptom identification shows variability. The immersive nature of VR seems particularly effective in fostering a deeper emotional and psychological understanding of dementia, which is crucial for empathetic care. However, the effectiveness of VR in improving objective knowledge and skill development in dementia care and symptom identification remains an area requiring further exploration. The purpose of this study was to assess the impact of an immersive, interactive virtual reality scenario in which undergraduate social work and health students ($N = 45$) embodied Beatriz, a Latina woman with Alzheimer's disease.. The author hypothesized that undergraduate students would statistically significantly improve their confidence to support people with Alzheimer's disease in early, middle, and late stages. Secondly, the author hypothesized that participants would statistically significantly increase their knowledge of Alzheimer's disease symptoms.

Methods

Sampling

Participants were recruited from a Hispanic Serving Institution located in Southern California (Table 1). A power analysis was conducted to assess the appropriate sample size. Based on the parameters (medium effect size, alpha level of 0.05, power of 0.80, and a moderate correlation between paired samples of 0.5), the calculated sample size required for a paired samples t-test was approximately 34 participants. Furthermore, the study required 34 paired observations (e.g., preintervention and postintervention scores for each participant) to have a good chance of detecting a medium-sized effect with the specified levels of alpha and power.

Convenience sampling was used. Participants (N = 45) were identified in three sections of upper-division, undergraduate, interdisciplinary health, and social work courses in 2022 and 2023. Most participants were female (71.11%) and Hispanic (68.89), which was representative of the interdisciplinary health and social work major at the University.

Virtual Reality Intervention

Participants put on an Oculus VR headset covering their eyes and ears. They were assisted in fitting the headset by their instructor and two Instructional Designers. The participants then completed an immersive, interactive virtual reality scenario in which they embodied a Latina woman, Beatriz, with Alzheimer's disease. This scenario was developed by EmbodiedLabs. The scenario included three sections. Each one represented one of the following stages of Alzheimer's disease: early, middle, and late.

In the multiple scenario scenes, the participant experienced common symptoms of Alzheimer's disease, such as memory loss, confusion, and hallucinations. The person the participant embodies also interacted with her family. Primarily, she interacted with her daughter (who is her primary caregiver) and grandson. She also met with healthcare professionals in the scenes. Participants can physically interact in most scenes using their hands as well as always look around them 360 degrees. For example, in one scene, the participant was dazed and confused as she was chopping up food in the kitchen. Participants lifted their hand and "grabbed" the knife. They "saw" their hand holding the knife in the scenario, and, as they lifted their hand and moved it down, they saw the knife chop a potato. Beatriz's family was trying to speak to her in that scene, but she did not respond right away. She responded to them with a written note that her daughter read stating, "my brain isn't working right." Her family members stare at her looking confused. In another scene, Beatriz was grocery shopping. On her list, she had written, "flour," but she placed flowers in her cart instead.

The full scenario took about 25 minutes to complete for each participant. They received short breaks between each of the three sections of the scenario and received a "check in" by the authors to ensure the participant's well-being before proceeding. All participants completed the full scenario.

Data Collection

An online survey was administered with participants one week prior to VR and one week after VR. The survey asked participants about (a) their demographics, (b) to select if 11 symptoms were symptoms of Alzheimer's disease, and (c) to rate their level of confidence in supporting people with Alzheimer's disease in early, middle, and late stages of the disease (rating from 1 = not at all confident to 5 = very confident). The 11 listed symptoms were all indeed symptoms of Alzheimer's disease. On the pre- and post- surveys, participants were also asked to "describe an example of an experience that you would anticipate when caring or interacting with a patient in early stages of Alzheimer's disease" prior to participating in VR and after the experience.

Data Analysis

Descriptive statistics were used to describe the sample and primary outcomes. Paired samples t-tests were used to assess statistically significant differences between pre- and post-survey responses.

The first author reviewed all qualitative data to identify themes. The themes were entered into the GPT software, which helped to narrow initial themes found from the pre- and post-responses to the prompt "describe an example of an experience that you would anticipate when caring or interacting with a patient in early stages of Alzheimer's disease." The first author reviewed the themes, combined themes and subthemes that were related, and developed a codebook defining the theme and a quote for each theme.

Results

The survey results found statistically significant improvements in confidence in supporting individuals with Alzheimer's disease in each stage (Table 2). Using the parameters in Table 2, effect sizes (Cohen's d) were calculated for each outcome, confidence supporting people with Alzheimer's disease in early ($d = 1.02$, large effect), middle ($d = .54$, medium effect) and late stages ($d = 0.68$, medium effect). Based on the effect sizes, a significant effect was found on the impact of VR on confidence supporting people with early stages of Alzheimer's disease. No other statistically significant differences were found in symptom identification from the survey data.

Common qualitative themes in response to the prompt "describe an example of an experience that you would anticipate when caring or interacting with a patient in early stages of Alzheimer's disease" found in pre- and post-data included memory loss, communication challenges, mood changes, activities of daily living challenges, and family experiences. New themes arose for students after they embodied Beatriz. While students described family experiences generally changing as a loved one experiences Alzheimer's disease prior to virtual reality, students' responses after VR focused on family members' need for patience for their loved one, demonstrating more depth of understanding on the family experience. One participant reported, "They will forget where they are at, what they were even doing, or sometimes forget relatives and themselves. As a family member it is important to notice any type of different behavior going on. As well as have some patience." Four symptoms that participants described were new after VR: confusion, anxiety, repetitiveness, and hallucinations. One participant described that people with AD may "hallucinate…and not be fully conscious." While statistically significant improvements were not found in students'

ability to identify symptoms of Alzheimer's disease, their description of these common experiences among people with AD after VR demonstrated new knowledge gained. Participants also described the need for legal, financial, and long-term planning among people with Alzheimer's disease and their families after VR even though they did not do so prior. These practical planning skills are needed to support people with Alzheimer's disease.

Discussion

The present study's methodology and results offer a unique perspective when compared to the nine previous studies (Campbell et al., 2021; Hicks et al., 2023; Hirt & Beer, 2020; Jones et al., 2021; Hsiao, 2021; Lanzieri, 2021; Linton, 2022; Huttar & BrintzenhofeSzoc, 2020; Wijma et al., 2018). This discussion will compare the methods and results, emphasizing the innovative approach of embodying a character with Alzheimer's disease and its impact on students' understanding and confidence.

Sampling and VR Intervention

The sampling approach and VR intervention differed in this study compared to others. The current study employed convenience sampling with 45 undergraduate students in interdisciplinary health and social work courses, like studies by Campbell et al. (2021) and Lanzieri (2021) which also targeted undergraduate students. This approach is common in educational research, allowing for direct access to the target demographic (Campbell et al., 2021; Lanzieri, 2021). Unlike other studies that generally used existing VR tools like the Virtual Dementia Tour (VDT; Jones et al., 2021), this study introduced an immersive scenario where participants embody "Beatriz," experiencing stages of Alzheimer's disease. This novel approach provided a more profound and personal experience compared to more general dementia awareness simulations reported in studies like those by Hicks et al. (2023) and Wijma et al. (2018).

Confidence and Depth of Knowledge

This study's focus on confidence suppor ing people with Alzheimer's disease and qualitative collection differed from previous research. Like findings by Hsiao (2021) and Linton (2022), the current study reported statistically significant improvements in confidence. However, this study's unique aspect was the focus on confidence in supporting Alzheimer's patients across different disease stages, offering a more nuanced understanding than the general empathy and sensitivity improvement found in other studies (Hsiao, 2021; Linton, 2022). Like Campbell et al. (2021), who observed no significant change in actual knowledge, the current study did not find statistically significant improvements in symptom identification; yet qualitative data indicated a deepened understanding of Alzheimer's experiences. This distinction is crucial as it highlights the difference between recognizing symptoms and empathetically understanding a patient's experience, a theme also echoed in the study by Jones et al. (2021). The current study's qualitative findings, particularly regarding the depth of understanding about family experiences and practical needs like legal and financial planning, are unique. Previous studies, like those by Hicks et al. (2023) and Hirt & Beer (2020), emphasized empathy and awareness but did not delve deeply into the practical aspects of caregiving and the comprehensive challenges faced by families.

The integration of virtual reality in social work education is enriched by contributions from diverse research, enhancing student confidence and understanding complex care scenarios. Bogo et al. (2017) explored the impact of simulation on skills development essential for practice confidence. Julien-Chinn and Lietz (2016) discussed the role of supervision in fostering self-efficacy, while

Taylor (2015) examined the balance between education discretion and critical practice. Others highlighted the benefits of group work and specific interventions in standards proficiency and dementia care understanding (Macgowan & Wong, 2017; Surr et al., 2020). This synthesis affirms VR's potential in social work education for developing empathetic, nuanced care strategies, particularly for Alzheimer's patients.

Conclusion

The methodology and results of the current study present a valuable addition to the body of research on VR in social work and healthcare education. While aligning with previous studies on enhancing empathy and confidence, it stands out in its approach of embodying a character with Alzheimer's disease, offering an immersive and deeply personal learning experience. This approach seems to foster a more profound understanding of the practical and emotional complexities of Alzheimer's care, bridging the gap between theoretical knowledge and empathetic understanding. Future research could explore this method further, possibly comparing it directly with more traditional VR or educational interventions to assess its unique contributions to social work education.

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Table 1.
Description of the sample ($N = 45$)

	M(*SD*)	Frequency(%)
Age	23.59(5.46)	
Biological Sex Female Male		 32(71.11) 13(28.89)
Ethnicity Hispanic White Asian Native American Pacific Islander		 31(68.89) 9(20.00) 3(6.67) 1(2.22) 1(2.22)

Table 2.
The impact of virtual reality on self-reported confidence and symptom identification

	Prescore	Postscore	*t*(*p*-value)
Confidence supporting individual with early-stage Alzheimer's disease	2.61 (1.08)	3.55(0.92)	-6.34 (.000)
Confidence supporting individual with middle-stage Alzheimer's disease	2.76 (0.95)	3.29(1.03)	-4.24 (.000)
Confidence supporting individual with late-stage Alzheimer's disease	2.51 (1.19)	3.27(1.05)	-4.40 (.000)
Identified 11 Alzheimer's disease symptoms	8.15	8.15(2.54)	.000(.50)