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Feasibility of Virtual Reality for Mental Health in Long-Term Care in Rural Populations

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ABSTRACT

Throughout the COVID-19 pandemic, long-term care residents have been disproportionately affected both physically and mentally. Increased restrictions have worsened long-term care residents' mental health and have increased feelings of isolation and loneliness. This pilot study explores the feasibility of virtual reality (VR) technology used by long-term care residents for mental health in a rural area of southern Illinois. We captured long-term care residents' thoughts, feelings, and knowledge of VR using a pre-test and post-test design following an educational session introducing VR. Participants were then offered the opportunity to use the technology, with 9 out of the 11 participants watching a 360^0 video using the VR headset. All participants who tried the VR headset noted that they were more willing to try VR in the future. While no statistically significant changes in mood from before and after the session were found, the results suggest that the use of VR for mental health in long-term care populations is more feasible when paired with an educational session before intervention.

KEYWORDS: Virtual Reality; Long-Term Care; Mood; Mental Health; Feasibility.

KEY PRACTITIONER MESSAGE

1. The COVID-19 pandemic has disproportionately impacted residents of long-term care facilities through increased risk of infection, restrictions, and feelings of loneliness.
2. VR technology can improve the mental health of those long-term care residents during and after the COVID-19 pandemic to combat feelings of isolation.
3. Long-term care residents positively received the VR technology when paired with an educational session to introduce the technology.

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INTRODUCTION

Virtual reality (VR) is an advanced type of human-computer interaction that allows users to interact with an environment that simulates reality (Schulthesis & Rizzo, 2001). Advances in VR technology now allow for more immersive experiences, creating an increased sense of presence in the virtual environment for the user (North & North, 2016), which has the potential to enhance the effects of VR use in healthcare. VR has been used in a variety of ways with the aging population, including cognitive training, balance training, and activities of daily living assessment. (de Vries et al., 2018; Gamito et al., 2019; Optale et al., 2010). Appel and colleagues (2020) recognized the potential for VR to simulate outdoor experiences among those with physical and/or cognitive impairments and assessed the acceptance of VR therapy using a head-mounted display. The authors found high acceptance of the technology, with 76% of participants wanting to try VR again and few reporting adverse side effects.

Yu and colleagues (2020) found that middle-aged and older adults who viewed virtual nature settings using a head-mounted display experienced greater psychologically restorative effects compared to those who viewed urban settings. Liu et al. (2020) found that older adults reported a stronger sense of presence and more robust emotional responses to viewing immersive VR videos. Pairing these findings with evidence that nature-based interventions enhance health and well-being for the aging population (Moeller et al., 2018), there is strong evidence to suggest that nature-based immersive VR technology can positively impact morale, mental health, and quality of life for those in long-term care settings.

The COVID-19 pandemic has disproportionately impacted residents of long-term care facilities. The older population, especially those with comorbidities, is at a higher risk of contracting COVID-19 and severe infections (LeVasseur, 2021). Therefore, the higher risk of COVID-19 contraction for long-term care residents means increased restrictions are necessary. However, these increased safeguards, such as restricting visitors, have increased feelings of isolation for long-term care residents. Another article highlighted eight mental health considerations for long-term care communities (Checkland et al., 2021). Some factors that have possibly worsened long-term care residents' mental health during the COVID-19 pandemic include ageism, chronic staff shortages, poor access to mental health services, and limited education and training for staff on mental health (Checkland et al., 2021). Eghtesadi (2020) noted that the extreme loneliness experienced by older adults as part of the pandemic is a cause for concern as it increases the risk of poor health outcomes. One suggestion presented included using virtual reality headsets in residents' homes so that those individuals could have immersive experiences that would connect them to the outside world (Eghtesadi, 2020).

Other literature shows that mental health in long-term care settings has been negatively affected. Therefore, VR technology may impact the mental health of those long-term care residents during and after the COVID-19 pandemic to combat feelings of isolation and low morale. Previous literature does not account for possible difficulties when introducing the technology to rural populations such as the southern Illinois long-term care population. Furthermore, earlier articles do not include the mental health of residents during a pandemic, where even greater negative emotions are taking place. Therefore, this study explores the feasibility of virtual reality technology used by long-term care residents for mental health in a rural area of southern Illinois.

METHOD

The original study proposal was centered on exploring the possibility of virtual reality technology to improve the mental health of long-term care residents. This pilot study employed a one-group pre-test and post-test design. The study included residents completing a demographic questionnaire as well as a mood scale prior to virtual health intervention. After a 10-minute intervention of watching a nature-based video, participants would have completed the mood scale again immediately following the video, one hour after the video, and four hours after the video to assess the time effect of the intervention. Based on some feedback from long-term care residents, they did not feel comfortable trying the virtual reality headset. Some residents noted feelings of anxiety surrounding the technology and overall felt unsure.

Research Design

The new approach introduced an educational component to capture data regardless of the resident trying the virtual reality technology and continued with the one-group pre-test and post-test study design. Participants were assigned to complete a demographic questionnaire. Next, participants completed a questionnaire regarding their current

knowledge, experience, and feelings on virtual reality technology. Participants then finished a mood scale where they ranked their current mood between various emotions. Then, participants listened to a short presentation on the basics of virtual reality technology. The presentation included the uses for virtual reality, its appearance, and possible side effects of the technology. Following the educational presentation, participants again completed an assessment of their feelings, opinions, and knowledge of virtual reality. Participants were then provided with the opportunity to try the headset on with or without an immersive video, whereas participants were also able to choose the video to fit their interests. If participants decided not to try the virtual reality headset, they still completed the mood scale once again following their knowledge questionnaire. Participants that decided to use the virtual reality headset would complete the mood scale following their virtual reality experience.

Measures

The demographic questionnaire included age, marital status, medical conditions, number of family members near the facility, and the number of times residents had left the facility in the previous week. The mood scale was adopted from Nahum et al. (2017) Immediate Mood Scaler to capture data regarding the current emotions of the participants. The scale ranged from very negative emotions and very positive emotions. An example question asked participants to choose between feeling very depressed, somewhat depressed, neither depressed nor happy, somewhat happy, and very happy. The pre-test measurements included participants self-ranking their current knowledge, perceptions, and feelings toward virtual reality technology. For example, participants were asked, *"How willing are you to try virtual reality?"* and *"Have you heard of virtual reality before?"* Lastly, the post-test measurements explored if the participants' knowledge, perceptions, and feelings towards virtual reality technology had changed following the education component of the study. An example question included, *"Please rate how much your knowledge about virtual reality has increased or decreased."*

Research Aim and Study Sample

The research design first proposed aimed to explore if nature-based virtual reality technology can improve the mental health of long-term care residents. The new research design aimed to explore the feasibility of introducing virtual reality technology to long-term care residents. The study sample consisted of residents of a long-term care facility in the southern Illinois region.

Statistical Analysis

Using Microsoft Excel, the Wilcoxon signed-rank was used to compare the mood of participants before and after the informational session. Summary statistics were also calculated for the participants' demographics and self-ranking of knowledge, perceptions, and feelings toward VR.

RESULTS

Demographics

Of the sample (n= 11), all participants were female with an average age of 80 years. Five were divorced, four were widowed, and two were single. Participants left the facility an average of 2.09 times in the previous week. Furthermore, participants had an average of six family members within an hour's distance of the facility; three had no family members within an hour's drive distance. Lastly, the most commonly noted medical categories were musculoskeletal and cardiovascular, with 9 participants responding with those conditions. Five participants noted psychological conditions.

Nine participants were willing to try the VR headset following the education session. Of the two participants who did not try the headset, one participant noted she had vertigo and was concerned about potential side effects. The other participant noted anxiety surrounding the possible side effects, such as motion sickness, headaches, blurry vision, eye strain, and nausea.

Mood Scale Summary

The Wilcoxon signed-rank test found no statistically significant changes in mood from before and after the informational session on virtual reality. However, among participants who tried the VR headset, several noted increases in mood following the VR video, as shown in Table-1. Increases in the mood scale signify a more positioned emotion being felt following the intervention. Additionally, of those that completed the virtual reality experience, zero reported possible side effects. All comments recorded during the virtual reality experience were positive, with quotes such as "*I want one of these! This is so relaxing and too awesome for words."*

Informational Session Results

All participants noted an increase in knowledge of VR following the educational presentation. Furthermore, all participants reported that their interest in virtual reality increased or stayed the same following the session. Seven out of the eleven participants had heard of virtual reality prior to the educational session, with three participants having seen a virtual reality headset before the presentation. All participants who tried the VR headset noted that they were more willing to try VR in the future. The two participants who did not try the headset reported they were less likely to try VR in the future.

Table-1. Change in Mood Among Those Who Tried the VR Headset

Depressed / Happy	Lonely / Engaged	Pessimistic / Optimistic	Frustrated / Peaceful	Tense / Relaxed
4	4	4	8	4
Increased	Increased	Increased	Increased	Increased
5	4	4	1	5
Same	Same	Same	Same	Same
0	0	1	1	0
Decreased	Decreased	Decreased	Decreased	Decreased

DISCUSSION

This study aimed to determine if virtual reality technology for the mental health of long-term care residents is feasible. We found that virtual reality for mental health in long-term care populations is more feasible when paired with an educational session before intervention. Previous research findings by Appel and colleagues (2020) found that the majority of participants were willing to use virtual reality again, and few reported adverse side effects, and similar results were found as a part of this study. However, this study found difficulties experienced when exposing a rural southern Illinois long-term care population, notably around anxiety with using the VR headset initially. It is important to note that those who attended the educational session expressed willingness beforehand; thus, the participants in this study may have been more willing to try VR compared to the rest of the population in the facility.

Our study had other limitations. First, the study sample was small, and there were no male participants. The facility's activity director noted that attendance for activities was higher for women. Second, the exposure to new technology for the population required innovative thinking to overcome the challenge of anxiety of long-term care residents regarding virtual reality and its possible side effects. Furthermore, conducting the study during the COVID-19 pandemic resulted in more significant time restraints due to facility outbreaks. We had to reschedule visits due to facility shutdowns, which may have also decreased participation in the study.

Conclusion

Virtual reality technology intervention is more feasible with educational sessions. Increased feasibility means virtual reality technology research for mental health in long-term care settings is viable to pursue, especially as mental health awareness is increasing. This study addressed gaps in current literature as it explored the feasibility within a more rural population that often has decreased access to newer technology. While the Wilcoxon Sign-Rank test produced a not statistically significant result, the qualitative data, quotes of participants, zero adverse side effect reports, and the use of the technology resulted in positive comments noted by patients support our conclusion that virtual reality for mental health in long-term care populations is more feasible when paired with an educational session before intervention.

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