Dreadphobia: Evaluating the Usability of a Virtual Reality Application in Support of Mental Health

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Abstract. Mental health disparities within African American communities are a significant concern, as research shows that they often receive poor quality care and lack access to culturally competent mental health services due to various barriers. Culturally responsive care can be facilitated through the integration of virtual reality (VR) technology, which has become more accessible and affordable in recent years. This research aims to design, develop, and evaluate the usability of Dreadphobia, a VR application built in Unity cross-platform engine, that provides evidence-based information and resources about mental and behavioral issues in African American communities in an engaging way. The Meta Quest 2 headset was used to create a VR escape room environment that allows individuals to explore and find hidden facts about different mental health illnesses surrounding Black communities. The application has gamification features such as music, sound effects, teleportation, and scoring. The goal is to bring awareness to mental health disparities within African American communities and help individuals with mental illnesses seek treatment. This study aimed to test the functionality of Dreadphobia and identify areas of confusion in the user experience, as well as uncover opportunities for improvement. Out of a total of nine participants who evaluated the system, two of them rated it poorly, indicating that there were issues with its performance. However, despite this negative feedback, the average SUS score given by all participants was 74.44, which is above average and falls between a good and excellent rating. Although there are areas for improvement, the pilot study had promising results, and this research is a positive step toward creating a more equitable and comprehensive mental health learning tool accessible to everyone.

Keywords: Mental Health · Disparities · African-American Communities · Virtual Reality · Usability Testing

1 Introduction

According to the Centers for Disease Control and Prevention (CDC), mental health refers to a person's psychological and emotional well-being, which affects their thoughts, feelings, and behaviors [3]. Good mental health enables individuals to manage daily life stressors, work efficiently, and contribute meaningfully to

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their communities [8]. Conversely, poor mental health can lead to various mental illnesses such as depression, anxiety, bipolar disorder, and schizophrenia [6]. There are inequalities in mental health outcomes among African Americans in the US. Due to a range of social and environmental factors, African Americans are more likely to experience mental health problems and less likely to receive culturally responsive appropriate care and treatment compared to other racial counterparts [2].

A significant factor contributing to mental health disparities in African American communities is discrimination and racism [9]. Discrimination can cause chronic stress and lead to feelings of anxiety and depression. Additionally, African Americans are more likely to face systemic racism and experience trauma from police brutality and other forms of violence, which can have long-term effects on mental health. Additionally, African Americans are more likely to face socioeconomic challenges, such as poverty, unemployment, and inadequate access to health care services. These issues can lead to higher levels of stress and affect mental health. African Americans are also more likely to lack health insurance coverage, which can limit their access to mental health services.

Furthermore, cultural factors may influence mental health disparities in African American communities. The stigma and shame associated with mental health problems can discourage people from seeking help. African Americans are also more likely to rely on religious and spiritual beliefs to help deal with mental health issues, which can be a barrier to seeking professional care. Finally, the shortage of culturally competent mental health professionals may also contribute to mental health disparities in African American communities. Many mental health professionals may not understand the cultural experiences and perspectives of African Americans, which can make it difficult to provide effective treatment. To address mental health disparities in African-American communities, it is essential to provide appropriate and culturally responsive care, increase access to mental health services, and reduce the stigma surrounding mental health. Additionally, efforts need to be made to address systemic racism and socioeconomic factors that contribute to mental health disparities. By recognizing and addressing these issues, we can work to improve mental health outcomes in African-American communities.

Virtual Reality (VR) has been the focus of several research studies examining its effectiveness in treating different mental health conditions such as phobias, eating disorders, PTSD, and psychosis [5]. Lucia Valmaggia has recently reviewed the growing interest and popularity of VR [7]. VR is an immersive technology where a person wears a head-mounted display, and the computer generates images/sounds that are synchronized with their movements, aiming to simulate real-life experiences. Researchers and certified clinicians can use VR to bring real-life experiences to a laboratory setting, making it an effective therapeutic, educational, and exciting tool to support various mental health conditions [4]. This paper aims to evaluate the use of VR and its potential for supporting mental health in African American communities.

2 System Overview

Dreadphobia is a VR application built in Unity cross-platform engine that provides evidence-based information and resources about mental and behavioral issues in African American communities. It is designed to raise awareness about mental health disparities within African American communities and help individuals with mental illnesses seek treatment. The application takes the form of a VR escape room environment where users can explore and find hidden facts about different mental health illnesses surrounding Black communities. It includes gamification features such as music, sound effects, teleportation, and scoring to engage users and make learning about mental health issues more fun and interactive. The goal of Dreadphobia is to address the persistent and complex issues of mental health within African American communities by providing culturally responsive care through the use of VR technology.

3 Study Design

The purpose of this study was to test the functionality of Dreadphobia by observing real users as they attempted to complete the designated tasks. The goal was to identify any areas of confusion and discover opportunities to improve the overall user experience.

3.1 Participants

The study was completed by 9 participants in its entirety. All participants (100%) identified as African-American or Black. Among the participants, 7 (77.8%) were male and 2 (22.2%) were female. In terms of age, 5 (55.6%) were between 18–20 years old, and 4 (44.4%) were between 21–25 years old. Additionally, 6 (66.7%) of the participants had used VR before the study, while 3 (33.3%) had never used VR before.

3.2 Procedure

At the beginning of the study, the informed consent was explained to the participants by the researchers. After obtaining consent, a pre-survey was administered to collect demographic information. Participants were then instructed to complete five tasks using a headset that had Dreadphobia preloaded onto the screen. These tasks included reading instructions, exploring the entire virtual environment, teleporting to a claw machine, resetting their position in the environment, and finding five hidden facts. The System Usability Scale (SUS) was used to ask participants 10 questions to evaluate the app's usability. Lastly, a post-interview was conducted where participants were asked to share their likes, dislikes, and suggested changes for the system.

4 Results

4.1 Usability

Out of a total of nine participants who evaluated the system, two of them rated it poorly, indicating that there were issues with its performance. However, despite this negative feedback, the average SUS score given by all participants was 74.44, which is above average and falls between a good and excellent rating according to Bangdor's [1] scale. While the overall score suggests that the system performed well, the fact that some of the participants had negative experiences highlights the importance of considering individual user feedback when evaluating a system's effectiveness. It is also worth noting that the context and specific tasks involved in the evaluation may have played a role in shaping the overall score, so further investigation and refinement may be necessary to fully optimize the system's performance.

4.2 Task Completion

All participants completed Tasks 1 through 3. Task 4 (Reset Yourself) and Task 5 (Find 5 hidden facts) had the highest rates of incompleteness among the five tasks, and the usability scores were negatively impacted by unanticipated technical and design issues. One participant encountered a design flaw that caused them to be outside of the virtual environment's boundaries, while two others experienced headset malfunctions while performing the task. Additionally, some participants may not have adequately read instructions for resetting themselves due to eagerness to explore the virtual environment. The resulting frustration from these unaccounted issues likely contributed to the lower usability scores.

4.3 Post-interviews

During the post-interview, participants provided feedback on what they liked, disliked, and would change about the system. They generally liked the overall idea of Dreadphobia, the look of the map, and the fact that it uses virtual reality. However, participants also expressed several dislikes, including the controls for moving around, the fact that the system only displayed information in one eye of the Oculus lens at times, the inability to use any of the arcade machines, and the music selection. In terms of changes, participants suggested that Dreadphobia should have continuous movement instead of teleportation, allow users to play games on some of the machines for entertainment, display the facts in both lenses of the Oculus simultaneously, make the lighting dimmer to create a feeling of dread, allow users to pause music, and add a tutorial or training session to teach users how to toggle the controller. Overall, these suggestions could improve the user experience and make Dreadphobia more engaging and effective for its intended purpose.

5 Future Work

Based on post-interview feedback from participants, the team has decided to make some modifications to the Dreadphobia system. One major suggestion was to add more features and playing levels to enhance the overall experience and increase engagement. Additionally, the system will be made cross-platform by optimizing it for use on mobile devices, allowing users to access the system on-the-go. Another area of focus is investigating the ease of use and satisfaction of the modified user interface. User testing will be conducted, and feedback will be gathered to ensure that the interface is intuitive and user-friendly.

An investigation will also be conducted into the effectiveness of the system, including its impact on knowledge acquisition, attitude change, and behavioral intentions related to mental health. This will involve collecting data from users before and after interacting with the system and analyzing the results to determine its effectiveness. Finally, a comparison will be made between Dreadphobia and traditional methods for teaching about mental health, such as textbooks, lectures, and workshops. This will allow for an assessment of the unique strengths and weaknesses of the system and identify areas for improvement. Overall, these modifications and investigations will help to further enhance the effectiveness and impact of Dreadphobia.

6 Conclusion

The hypothesis that Dreadphobia would have below-average usability was disproven since the system was found to be usable and well-received by undergraduate students, as demonstrated by the high SUS score and positive feedback. However, it's crucial to recognize that the conclusion is based on limited data, and further research may be required to fully evaluate the system's usability and likability. A significant proportion of participants also learned at least one piece of information inadvertently, highlighting the potential of Dreadphobia as a mental health learning tool. Although there are areas for improvement, the pilot study had promising results, and this research is a positive step toward creating a more equitable and comprehensive mental health learning tool accessible to everyone.

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References

1. Bangor, A., Kortum, P., Miller, J.: Determining what individual SUS scores mean: adding an adjective rating scale. J. Usability Stud. **4**(3), 114–123 (2009)
2. Bailey, R.K.: Racial and ethnic disparities in depression: current perspectives. Psychol. Res. Behav. Manag. **12**, 343–352 (2019)
3. Centers for Disease Control and Prevention: Mental health (2021). https://www.cdc.gov/mentalhealth/

4. Freeman, D., et al.: Virtual reality in the assessment, understanding, and treatment of mental health disorders. Psychol. Med. **47**, 2393–2400 (2017)
5. Valmaggia, L.R., Latif, L., Kempton, M.J., Rus-Calafell, M.: Virtual reality in the psychological treatment for mental health problems: an systematic review of recent evidence. Psychiat. Res. **236**, 189–195 (2016)
6. National Alliance on Mental Illness: Mental health conditions (2022). https://www.nami.org/About-Mental-Illness/Mental-Health-Conditions
7. Valmaggia, L.R.: The use of virtual reality in psychosis research and treatment. World Psychiat. **16**, 246–247 (2017)
8. World Health Organization: Mental health: Strengthening our response (2021). https://www.who.int/news-room/fact-sheets/detail/mental-health-strengthening-our-response
9. Zapolski, T.C., Beutlich, M.R., Fisher, S., Barnes-Najor, J.: Collective ethnic-racial identity and health outcomes among African American youth: Examination of promotive and protective effects. Cult. Div. Ethnic Minority Psychol. **25**(3), 388 (2019)