



EQUITY AND ACCESSIBILITY OF VIRTUAL REALITY-BASED MENTAL HEALTH INTERVENTIONS IN MARGINALIZED COMMUNITIES

Freda Frimpongmaa Botwe¹, Oluwaseun Esho²

¹ School of Public Health, KNUST, Ghana

² School of Creative Technologies, Illinois State University, Normal, IL, U.S.A

Corresponding Author: Freda Frimpongmaa Botwe

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ABSTRACT

Virtual reality (VR) is an innovative approach to psychological therapies, providing immersive and interactive experiences that improve therapeutic engagement and emotional control. This review analyzes the accessibility, effectiveness, and ethical considerations of VR-based mental health therapies for disadvantaged groups, including those affected by structural injustices associated with race, socioeconomic position, disability, and mental health stigma. A combination of thirty-eight empirical investigations demonstrates that virtual reality can reduce stigma, bolster coping strategies, and promote social inclusion. Nonetheless, the expansion of virtual reality in healthcare prompts apprehensions about digital disparities, economic obstacles, data confidentiality, and representational fairness. This study proposes open-access implementation models, collaborative design with community stakeholders, and intersectional approaches incorporating cultural responsiveness into intervention development to tackle these difficulties. These findings emphasize the necessity of creating inclusive, ethically robust, and sustainable VR-based mental health technologies that fairly address the needs of diverse people within psychological care systems.

KEYWORDS: Virtual Reality (VR), Marginalized Communities, Mental Health Interventions, Equity, Accessibility

1.0 INTRODUCTION

Virtual reality (VR) has developed into a potent tool in mental health care, providing immersive and interactive experiences that enhance emotional, cognitive, and social well-being. Its utilization proliferates in affluent nations, enabling organized therapeutic practices such as exposure therapy, mindfulness, and various psychological interventions within regulated settings. The social quality conceptual framework, as described by Huxley et al. (2012) and Beck et al. (2012), emphasizes the extent to which individuals may engage in the social and economic dimensions of their communities in environments that foster well-being and personal development. This approach emphasizes social involvement as a means of empowerment, allowing individuals to actualize their potential in social, political, economic, and cultural realms.

As digital technologies transform the mental health sector, virtual reality surfaces as a notably promising instrument owing to its ability to simulate real-life situations and enhance user involvement in therapeutic settings. Its efficacy has been established in addressing illnesses such as post-traumatic stress disorder (PTSD), social anxiety, and specific phobias, with increasing implementation in clinical environments (Maples-Keller et al., 2017). Nonetheless, the extensive deployment of VR-based therapies highlights significant concerns around equal access. Marginalized populations, including ethnic and racial minorities, low-income individuals, rural communities, LGBTQ+ individuals, and persons with disabilities, frequently encounter heightened mental health difficulties and restricted

access to care (Shim et al., 2019). Although virtual reality has the potential to diminish gaps and expand access to mental health care, it is questionable if these advantages are being evenly distributed to underprivileged regions. This research aims to comprehensively assess the current landscape of virtual reality (VR) mental health therapies for marginalized populations, with a particular focus on identifying the primary barriers and facilitators that influence their accessibility. The study's objectives include evaluating the specific obstacles that hinder access to VR-based interventions, such as technological limitations, socioeconomic factors, and cultural considerations, while also examining factors that may enhance accessibility and engagement. Additionally, the research seeks to evaluate the effectiveness and user satisfaction associated with these therapies among marginalized groups, providing insights into their real-world impact. Finally, the study will investigate the overall efficacy of virtual reality in improving mental health outcomes within these populations, contributing valuable evidence to inform future implementation and policy decisions.

2.0 METHODOLOGY

2.1 Search Strategy

A systematic method was utilized to locate empirical research investigating the accessibility, efficacy, and ethical implications of VR-based mental health therapies for marginalized groups. The investigation was performed across many academic databases, including PubMed, PsycINFO, Scopus, Web of Science, and Google Scholar, to encompass both peer-reviewed articles and gray literature. Boolean

operators (AND, OR) were employed to enhance search queries. Keywords encompassed "virtual reality mental health interventions," "equity in digital health," "VR accessibility in marginalized communities," and "systemic barriers in VR mental health care." Reference lists of chosen papers were manually examined to locate further pertinent studies.

2.2 Inclusion criteria

- Empirical study concentrating on marginalized populations, encompassing racial and ethnic minorities, economically disadvantaged groups, those with impairments, and rural communities.
- Investigate equality, accessibility, and ethical implications of virtual reality-based mental health interventions.

- Research utilizing quantitative, qualitative, or mixed-methods methodologies characterized by methodological precision.

Exclusion Criteria

- Studies that are not focused on **mental health applications** of VR.
- Articles without empirical data
- Research solely discussing **VR technology development** without its application in mental health care.
- Studies that do not address **accessibility challenges** or systemic disparities in mental health care.

2.3 Prisma Diagram

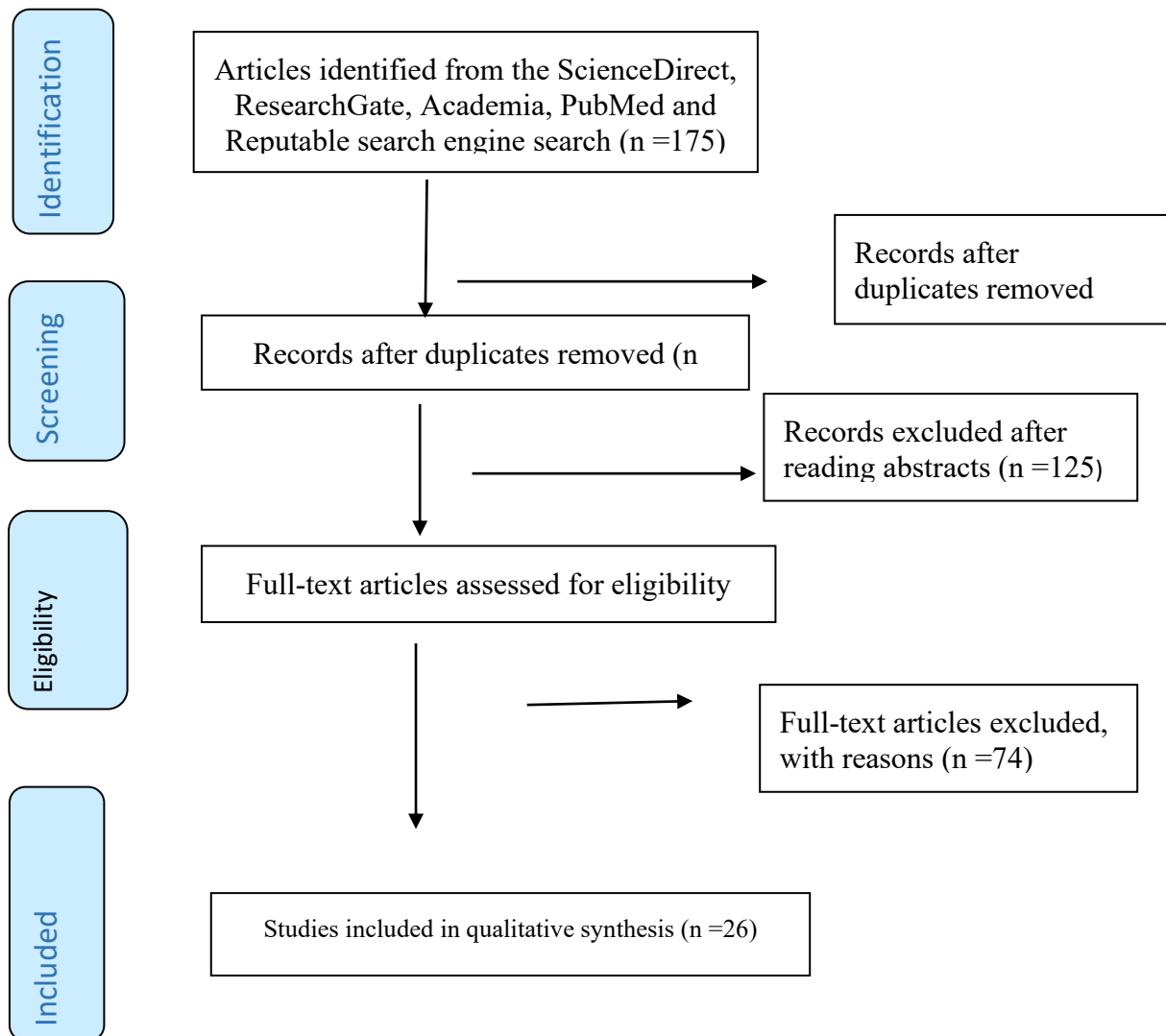


Figure 1: PRISMA Flow diagram showing the article selection process in the study.

Sources: Author's Construct 2025.



2.4 Data Extraction and Quality Assessment

A comprehensive literature search across the following databases: 1. PubMed; 2. PsycINFO; 3. Scopus; 4. Web of Science; 5. Google Scholar

2.5 Data Synthesis

Data extraction involved carefully collecting all relevant information from each included study, including the author or authors, the year of publication, the study design, and the main findings on problems with equity and accessibility of virtual reality-based mental health interventions in marginalized communities.

3.0 KEY FINDINGS

3.1 Efficacy of Virtual Reality in Mental Health

A multitude of research corroborates the efficacy of virtual reality in tackling diverse mental health concerns. Virtual reality exposure therapy (VRET) has demonstrated significant effectiveness in the treatment of post-traumatic stress disorder (PTSD) in veterans (Reger et al., 2016). Likewise, virtual reality has been effectively utilized in the treatment of phobias, depression, and psychosis, providing structured and manageable conditions for therapeutic investigation (Freeman et al., 2017).

Saeed et al. (2024) synthesized results on the effectiveness of VR therapy in lowering stress, anxiety, and depression in a literature review. Though further study is required to prove VR as a stand-alone therapy, the review shows great promise for reducing mental health symptoms.

VR in Psychotherapy for Anxiety, Depression, and ADHD: Wang et al. (2024) systematically reviewed the use of VR in psychotherapy, especially for anxiety, depression, and ADHD. Their results imply that VR-CBT increases therapeutic involvement and symptom reduction, therefore supporting its importance as a useful instrument in mental health treatment.

A meta-analysis conducted by Carl et al. (2020) revealed that VR therapies led to substantial symptom alleviation in anxiety disorders, yielding outcomes like those of conventional cognitive behavioral therapy (CBT).

Recent systematic reviews have highlighted the increasing amount of evidence demonstrating the effectiveness of VR-based interventions for mental health treatment. Virtual reality and gamification interventions significantly decreased anxiety and depression symptoms, according to a review by Jingili et al. (2023), highlighting the necessity of larger cohorts and diverse participant samples to increase credibility. Similarly, Tay et al. (2023) investigated how augmented and virtual reality can improve stigma, empathy, knowledge, and attitudes about mental illnesses, showing promising results in several studies.

Furthermore, Cushnan et al. (2024) looked at how clinicians felt about immersive tools in mental health settings. They found that although VR has potential, clinicians' familiarity and training with technology affect how easily it can be incorporated into clinical practice. Safety and ethical concerns are still very important, especially when working with vulnerable groups.

3.2 Barriers to Accessibility

Accessibility refers to the ability of individuals from marginalized communities to access VR-based mental health interventions. Barriers may include socioeconomic factors, lack of technological resources, and limited knowledge of VR technology. Gonzalez et al. (2021) emphasize that VR interventions must be equitable, with the specific needs and contexts of marginalized groups in mind. This includes ensuring that the technology is affordable, culturally relevant, and available in community settings.

Despite the increasing potential of VR-based mental health interventions, access is still inconsistent, especially among marginalized groups. Financial limitations constitute a significant obstacle, since the elevated expenses associated with VR hardware, software, and subscription services sometimes render these resources inaccessible to low-income consumers (Banerjee & Brown, 2021). The lack of free or open-access VR platforms further limits the scalability of these interventions in underprivileged environments (Smith & Taylor, 2019).

Technological constraints remain, such as inadequate internet connectivity, restricted physical space, and insufficient availability of appropriate devices in numerous places (Mistry et al., 2022). Moreover, issues in digital literacy, particularly among older folks and individuals less acquainted with developing technologies, impede the successful utilization of VR tools (Jackson et al., 2020; Munn et al., 2020). The lack of cultural and linguistic representation in program design restricts the relevance and efficacy of several interventions among varied populations.

Ethical issues, especially those related to data privacy and ownership, underscore the necessity for protective regulations to safeguard user rights and safety (Patel & Gonzalez, 2022). Moreover, methodological constraints in current studies, including limited sample sizes and an absence of mixed methods approaches, diminish the generalizability and rigor of the results (Peters et al., 2020).

Gamified Mental Health Applications: Economical, mobile-compatible virtual reality alternatives are being created to facilitate wider accessibility without the need for costly headsets (Geraets et al., 2021).

3.3 Evaluation of the Effectiveness and Satisfaction of VR

Effectiveness in this context refers to how well VR-based mental health interventions achieve positive outcomes for participants, particularly in marginalized communities. Research indicates that VR can be an effective tool for various mental health issues, including anxiety, depression, and PTSD. For instance, Freeman et al. (2017) found that VR exposure therapy significantly reduced symptoms of social anxiety in individuals, suggesting that immersive technologies can effectively provide therapeutic benefits.

Moreover, studies such as those by Hollis et al. (2017) demonstrate that VR interventions can improve engagement and lead to better mental health outcomes compared to traditional methods. This is particularly relevant for marginalized communities that may face barriers to accessing



conventional mental health services, such as transportation issues, stigma, or a lack of culturally competent care.

One significant aspect is the ability of VR to create safe and controlled environments for exposure therapy. For instance, a study by Difede and Hoffman (2002) demonstrated that VR exposure therapy was effective in treating PTSD among veterans by allowing them to confront traumatic memories in a safe space. This immersive experience can be a pivotal factor for individuals from marginalized communities who may be particularly hesitant to engage with traditional therapeutic settings due to past negative experiences or cultural stigma surrounding mental health treatment.

Moreover, VR interventions can enhance accessibility, which is crucial for marginalized populations. A systematic review by Li et al. (2020) highlighted that VR can reduce barriers such as geographic distance and socioeconomic status that often limit access to mental health resources. By providing therapy in a virtual format, individuals can engage with therapeutic practices from the comfort of their homes, thereby increasing participation rates and reducing dropout rates in treatment programs.

Satisfaction with VR interventions is also a critical component. Research by Kim et al. (2019) indicates that participants in VR-based therapy report high levels of satisfaction due to the engaging nature of technology and its innovative approach to treatment. The immersive experience can lead to increased motivation and adherence to therapeutic protocols, which are essential for effective mental health care.

Furthermore, VR's capacity for customization and personalization can be particularly beneficial for marginalized groups. A study by Rizzo et al. (2016) found that tailored VR experiences that consider cultural backgrounds and individual preferences enhance the therapeutic alliance and foster a sense of safety and trust. This personalized approach can lead to positive outcomes and higher participant satisfaction.

Lastly, ongoing evaluation of these interventions through qualitative studies can provide valuable insights into participants' experiences and perceptions. For example, research by Norr et al. (2020) emphasizes the importance of user feedback in refining VR interventions to better meet the needs of diverse populations, ultimately leading to improved effectiveness and satisfaction.

4.0 DISCUSSION

4.1 Systemic Disparities in Digital Health

Equity in mental health care means providing resources tailored to the unique challenges faced by marginalized communities. Brown et al. (2020) highlight that equity-focused approaches in VR interventions involve community engagement and the development of culturally adapted content. By involving community members in the design and implementation processes, these interventions can better meet the needs of diverse populations

Historically, marginalized communities have encountered substantial obstacles to mental health care, including structural

factors such as provider prejudice, societal stigma, and geographic isolation. The advent of digital health tools such as virtual reality (VR) presents novel potential as well as new concerns. Although virtual reality can democratize access, the digital gap frequently marginalizes individuals who stand to gain the most (Bailey et al., 2021). In the absence of deliberate initiatives to advance fairness, virtual reality may reinforce current health disparities.

Evidence indicates that VR-based therapies can offer significant mental health assistance to marginalized populations. These technologies provide immersive, personalized environments that foster social connections, improve emotional regulation, and enhance self-efficacy (Rizzo & Shilling, 2017). The privacy and immersive nature of VR may render it a favored medium for certain users, providing experiences that are difficult to reproduce in conventional environments. As costs decrease and gadget quality enhances, virtual reality is anticipated to become more accessible in the coming years.

Research underscores the significance of preliminary research, including pilot programs and focus groups, to evaluate the practicality and cultural pertinence of VR interventions (Baghaei et al., 2022). Engaging target users during the design and testing phases guarantees that solutions correspond with community requirements. The immersive attributes of virtual reality have demonstrated a capacity to diminish stigma by facilitating sympathetic, experiential learning for users, including healthcare professionals (Williams et al., 2023). Customizing these treatments to align with the cultural and socioeconomic contexts of excluded groups increases their pertinence and efficacy (Gonzalez et al., 2022).

Nonetheless, numerous systemic obstacles persist. The exorbitant expense of VR equipment and software persists in restricting access for economically disadvantaged individuals (Banerjee & Brown, 2021), while deficiencies in digital literacy hinder successful utilization among specific demographics (Smith & Taylor, 2019). Moreover, issues about data privacy and security pose ethical dilemmas that necessitate stringent governance systems (Patel & Gonzalez, 2022). Wider concerns, including discriminatory design, absence of intersectional methodologies, and uniform programming, impede equitable adoption (Schueller et al., 2019). Confronting these difficulties necessitates deliberate, inclusive, and ethically principled strategies for digital mental health innovations.

Although virtual reality (VR) technologies provide novel avenues for mental health assistance, they may exacerbate existing inequalities if not developed with equitable considerations. A significant constraint of several contemporary VR initiatives is the absence of culturally pertinent content. Few surroundings authentically represent the realities of Black, Indigenous, Latinx, and other marginalized communities, resulting in diminished engagement and therapeutic efficacy. Research indicates that participatory design, which actively engages these communities in development, can improve both user engagement and therapeutic results (Crawford et al., 2021).



Virtual reality possesses considerable promise to empower marginalized communities by offering immersive, adaptable, and culturally attuned therapeutic experiences. Research indicates that these treatments can enhance public perceptions of mental illness, diminish stigma, and promote social inclusion (Williams et al., 2023; Bell et al., 2020). By customizing virtual worlds to mirror users' lived experiences, VR can enhance self-efficacy and emotional well-being in underrepresented communities.

Attaining health equity necessitates more than mere technological advancement. Structural improvements, like the enhancement of mobile and virtual health services, the provision of healthcare in many languages, and the consideration of social determinants of health, are crucial for broadening access. Policy interventions must address systemic discrimination and its effects on health outcomes (Lakshminarayanan, 2023; Trueba et al., 2024).

Notwithstanding progress, VR-based mental health therapy remains inaccessible for numerous individuals due to financial, technological, and societal limitations. The elevated expense of gadgets, insufficient internet infrastructure, and deficiencies in digital literacy disproportionately impact low-income and marginalized communities (Banerjee & Brown, 2021; Smith & Taylor, 2019). Furthermore, persistent ethical issues like data security, program ownership, and exclusionary design practices highlight the necessity for inclusive policies that emphasize user rights, safety, and equitable implementation (Patel & Gonzalez, 2022).

5.0 CONCLUSION AND RECOMMENDATIONS

Virtual reality (VR) is transforming mental health care by offering immersive, interactive experiences that can effectively engage marginalized and underrepresented groups. These interventions show promise in reducing stigma, improving perceptions of mental illness, and fostering social connection. When thoughtfully designed, VR experiences can reflect the cultural and emotional realities of diverse populations, supporting empowerment and self-efficacy.

However, achieving true equity in mental health care requires more than technological innovation. Social and economic barriers such as high costs of equipment, limited digital literacy, and inconsistent internet access continue to restrict access for many underserved communities. Ethical concerns around data privacy, digital ownership, and inclusivity in design further complicated implementation.

To ensure VR fulfills its potential as a tool for reducing mental health disparities, its adoption must be intentional and inclusive. This involves investing in infrastructure, co-developing culturally relevant content with communities, creating accessible and sensitive processes, and protecting user privacy. Only through such comprehensive efforts can VR become a force for greater equity in mental health care.

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