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Commentary   **Open Access**

Increasing Diversity and Inclusion in Research on Virtual Reality Relaxation: Commentary on 'Virtual Reality Relaxation for People with Mental Health Conditions: A Systematic Review'

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Article Info

Introduction

Virtual reality (VR) relaxation is a novel mental health and wellbeing intervention for stress reduction. It typically involves an immersive three-dimensional visualisation of calming natural environments using a head-mounted display. Research indicates that VR relaxation is feasible, acceptable, and effective in promoting short-term stress reduction for the general population and in improving wellbeing in the workplace[1-3].

Although traditional stress management interventions, such as mindfulness, are effective, they can be challenging for mental health service users as they require concentration, sustained attention, and visualisation[4,5]. A recent systematic review provides evidence for the clinical application of VR relaxation for people with mental health conditions, such as anxiety and stress-related conditions, psychotic disorders, mood disorders, eating disorders, and neurodevelopmental conditions[3]. Studies have also been carried out for inpatients in psychiatric wards, including for people with eating disorders, psychotic disorders, and mood disorders. This systematic review is the first major review on this topic identifying the broad range of mental health conditions that have been studied and assessing the feasibility, acceptability, and effectiveness of VR relaxation in clinical samples. Despite providing a comprehensive narrative synthesis of the existing literature, one methodological limitation of the review is that it did not analyse the demographics of the study samples in detail to understand which groups of people may have benefited from the intervention in contrast with groups that may have been overlooked by this research. Nor did it analyse instances of service user involvement and co-production in the design of interventions and studies. This commentary article aims to place a greater emphasis on these important issues and highlights the value of diversity and inclusion in research on VR relaxation for people with mental health conditions, including service user involvement in the design of the intervention. In the context of these diversity and inclusion issues, the article highlights differences within demographic characteristics of user experience of VR and relaxation practices and argues that VR relaxation research should focus on testing this intervention on people of a wider range of characteristics.

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Lack of diversity in research can have important methodological and ethical consequences, including poor generalisability of findings, lack of demographic contextualisation of interventions, and preventing some populations from experiencing the benefits of potentially novel and effective treatments. Given that participants' reactions to interventions can vary depending on characteristics such as age, gender, and ethnic group, appropriate consideration of diversity and inclusion issues is essential to understand whether an intervention is effective for different populations. Therefore, it is important for studies to implement strategies to increase participation of underrepresented and potentially marginalised groups. Although diversity and inclusion are a general issue for all psychological interventions, every intervention, including VR relaxation, needs to address this issue for itself. This commentary article analyses the VR studies included in the systematic review in terms of the age, gender, ethnic group, and service user involvement included within the samples. See Table 1 for a full analysis of the demographic breakdowns of these studies.

Age Diversity

The analysis of sample demographics indicates that research with younger people and older adults is rare. Most VR relaxation studies tested adults with mean ages largely falling within the 30-50 range[6-14], with only one study evaluating VR relaxation in adolescents[15].

In VR research, there appear to be age-related differences in user experience[16,17]. These age-related factors and their impact on VR relaxation are not fully understood, in part due to small sample sizes, and require further investigation in future research. In particular, there needs to be more research testing VR relaxation on younger people and older adults.

Gender Diversity

Most studies included in the systematic review appear to test more cisgender female participants than cisgender male participants[6,8,10-14,18-22]. Only one study reported testing non-binary people, but the non-binary sample was very small[18]. In general, there was a lack of reporting on other gender identities e.g., transgender, which means it is possible that participation from people with other gender identities was underreported, although this cannot be verified.

A possible reason for the high female representation could be that females tend to be more likely to seek help when experiencing mental health problems[23]. There are also gender differences in user experience with VR, such as differences in spatial immersion, feeling of involvement, and cybersickness[24,25]. Stress management also varies across genders. Females are more likely than males to use meditation, and although both males and females use it for stress reduction and wellbeing, males perceive meditation to be less helpful[26]. Given these gender differences, high representation of cisgender females in VR relaxation research could potentially bias the findings.

Transgender and non-binary people are often predisposed to higher levels of stress and anxiety due to discrimination and lack of support and are shown to respond well to mindfulness therapies that include sensory stimulation, a pressure-free environment, and a transgender instructor[27,28]. Despite the need to improve the mental health and wellbeing of transgender people, VR relaxation has not been tested in a sample from this population. Diversity and inclusion of other gender identities in VR relaxation beyond cisgender participants is needed.

Ethnic and Geographical Diversity

Ethnicity data was not reported by most studies. Of the five studies that reported ethnicity data, out of the 18 studies included in the review[12,15,20-22], most participants identified as of White or Asian ethnicity. Studies did not specify testing VR relaxation on people of Black ethnicity or other specific ethnic groups, although there is some lack of clarity on this issue due to some very broad labels that were used by studies to describe ethnic groups.

There is evidence that people from Black and Hispanic communities living in Western countries are less open to utilising mental health services due to fear of stigma and discrimination, mistrust in mental health services, and lack of culturally responsive services[29,30]. Ethnic groups can differ substantially in their beliefs and values, especially regarding spirituality and the mind and body connection, which can reflect in their relaxation practices[31]. There are also known cultural differences in attitudes to green natural environments[32], which are commonly used as virtual environments in VR relaxation research. Greater involvement of underrepresented ethnic groups should lead to meaningful cultural adaptations of VR relaxation[33].

Most studies were conducted in developed, affluent Western countries. Eleven of the 18 studies were conducted in Europe (Italy (N = 6), the Netherlands (N = 3), France (N = 1), United Kingdom (N = 1))[6-11,13-15,19,34]. Four studies were conducted in Asia (Singapore (N = 2), South Korea (N = 1), and Taiwan (N = 1))[21,22,35,36]. The remaining studies were conducted in North America and Australia[12,18,20]. These geographical factors may contribute to the existing 'digital divide' and suggest inequalities in accessing this intervention[37].

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Table 1: Characteristics of studies of virtual reality relaxation for people with mental health conditions

Study	Country	N	Mean Age (SD)	Gender	Ethnicity	Service user involvement
Bossenbroek et al. (2020)	The Netherlands	8	14.67 (1.83)	1 female, 7 male	8 Dutch (100%)	Not reported
Gorini et al. (2010)	Italy	20	Not reported	Not reported	Not reported	Not reported
Habak et al. (2021)	Australia	79	Most common age range: 25–34. Full Age Range: 18–65+	53 female, 23 male, 3 non-binary	Not reported	VR software development included consultation workshops with young men who experience suicidality
Kim et al. (2021)	South Korea	74	Median Age: 39, Range: 19–59	37 female, 37 male	Not reported	Not reported
Maarsingh et al. (2019)	The Netherlands	175	Patients: 40.6 (11.5). Healthy controls: 43.0 (10.5)	102 female, 73 male	Not reported	Not reported
Malbos et al. (2020)	France	27	48.40 (11.91)	13 female, 14 male	Not reported	Not reported
Manzoni et al. (2008)	Italy	60	VR Group: 42.80 (11.44), imaginative group: 48.55 (7.96), control group: 39.65 (14.52)	60 female	Not reported	Not reported
Manzoni et al. (2009)[a]	Italy	36	Not reported	36 female	Not reported	Not reported
Mark et al. (2021)	United Kingdom	17	35.8 (9.63)	17 male	Not reported	Not reported
Mistry et al. (2020)	Canada	96	Not reported	54 female, 42 male	39 Caucasian (40.6%), 24 Chinese (25%), 13 South Asian (13.5%), 5 multiple ethnic or racial groups (5.21%), 3 Southeast Asian (3.13%), 4 Middle Eastern (4.17%), and 4 "Other" (4.17%).	Not reported
Pallavicini et al. (2009)	Italy	12	VR/biofeedback group: 41.25 (13.24), VR without biofeedback group: 48.5 (12.662), controls: 51.25 (9.845)	9 female, 3 male	Not reported	Not reported
Repetto et al. (2013)	Italy	25	VR/biofeedback group: 45.25 (14.24), VR without biofeedback group: 48.5 (12.662), controls: 49.25 (9.845)	16 female, 9 male	Not reported	Not reported
Riva et al. (2008)	Italy	40	Not reported	40 female	Not reported	Not reported
Shah et al. (2015)	Singapore	22	Range: 21-60	16 female, 6 male	14 Chinese (63.64%), 5 Malay (22.73%), 3 Indian (13.64%)	Not reported
Tan et al. (2021)	Singapore	40	Not reported	24 female, 16 male	34 Singaporean (85%), 6 others (15%)	Not reported
Tarrant et al. (2018)	United States of America	26	VR Group: 46.21 (10.77), controls: 48.17 (20.11)	20 female, 6 male	12 Caucasian (46.15%), 1 Asian/ Pacific Islander (3.85%), 1 Multi-Racial (3.85%), 2 others (7.69%)	Not reported
Veling et al. (2021)	The Netherlands	50	41.6 (14.2)	33 female, 17 male	Not reported	Not reported
Wang et al. (2020)	Taiwan	77	Virtual nature Group: 58.43 (7.37), virtual abstract painting group: 59.87 (6.99)	38 female, 39 male	Not reported	Not reported
Total	-	884	-	552 female, 309 male, 3 non-binary	-	-

[a]Manzoni et al. (2009) used a sub-sample of Manzoni et al. (2008).

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Service user involvement

Academic studies emphasise the importance of service user involvement in research and design of interventions in such a way that they incorporate service users' views, values, and attitudes[38]. This is known to better inform the direction and delivery of these interventions, making them more responsive to service users' needs.

A key limitation in VR relaxation research is that service user involvement has rarely been part of the design of studies or interventions for people with mental health conditions. From the reviewed studies, only one study reported service user involvement in the development of the intervention, which comprised consultation workshops on VR software development with young men who experience suicidality[18]. Where pilot testing for a clinical intervention has occurred, it has been with healthy controls. For example, one study piloted-tested VR relaxation on five healthy individuals to test for any undesirable symptoms of cybersickness before using the intervention with inpatients presenting with mood disorders[21]. Given the wide variety of mental health conditions on which VR relaxation is tested, including severe mental health conditions like psychotic disorders, service user involvement in the development and design of the intervention is essential to address the specific needs of different service user groups.

Future directions

VR relaxation participants have typically been middle-aged White or Asian females, living in developed countries. Relaxation practices and VR experiences can vary across different age, gender, and ethnic groups[39-42] and disproportionate demographic representation can impact on the generalisability of VR relaxation research and its real-world applications. Overlooking these differences can lead to bias in intervention design and development, while failing to address the needs of underrepresented groups[43]. In addition, research articles should report more detailed information on the demographics of participants and any service user involvement, given that there appears to be inadequate reporting of these factors in the current research.

Testing VR relaxation across diverse samples of people will provide opportunities to contextualise the intervention in different demographic and cultural settings, allowing for better integration and popularisation. Therefore, age, gender, and ethnic group consideration in study design is necessary to ensure research is both ethical, by increasing diversity, inclusion and equal access to VR relaxation, as well as methodologically rigorous, by enhancing the validity of the findings.

There are several next steps for future research in VR relaxation. Future studies could include more age-specific samples, focusing on younger people and older adults, to identify and address any age-related preferences. For example, to enhance user experience across different age groups, VR relaxation may require multisensory input such as adding richer visual, auditory, and olfactory stimuli, especially for younger people and digital natives who may have higher expectations about cutting-edge technology[44-46]. Given the high representation of cisgender females in VR relaxation, future research could enhance sampling diversity by testing VR relaxation on service users of other gender identities; and strategies could be implemented to recruit more people beyond White and Asian ethnicities. Given that people from lower socioeconomic backgrounds are more likely to experience mental health problems, such as stress and anxiety, future research could focus on understanding and addressing barriers to accessing VR relaxation among this population.

To achieve demographic diversity, future studies could focus on increasing cultural awareness among researchers, designing culturally tailored materials and increasing trust in participants[47]. Future research could implement methodologies for collaborative or consultative work with service users by inviting them to be members of the project group, organising focus groups, or pilot testing. Service user involvement and demographic contextualisation of VR relaxation will provide an opportunity for greater personalisation in user experience that is tailored to individuals' needs, giving them more choice and control over the intervention[48].

Conclusion

VR relaxation is a promising intervention for stress reduction in mental health service users. However, there is a lack of diversity in study participants and our current understanding of this intervention is limited to biased samples in terms of age, gender, and ethnicity. There is also a lack of mental health service user involvement in the design and evaluation of such interventions. To enhance user-centred VR design practices and improve clinical outcomes across diverse populations, the next steps for future research are to prioritise diversity in their sampling beyond White or Asian, middle-aged, female or cisgender clinical populations, and increase collaboration with service users.

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