ORIGINAL ARTICLE

# Virtual Reality Relaxation for Mental Health Service Users with Complex Care Needs: a Pilot Study in Residential Care Homes and Supported Accommodation

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**Abstract**  Virtual reality (VR) relaxation is a promising, novel intervention for service users with a range of mental health conditions and has potential wellbeing benefits such as promoting relaxation and reducing stress and anxiety. Less is known about the implementation of VR relaxation for service users in complex care mental health services. This study aimed to investigate implementation of a single session of VR relaxation for service users in residential care homes and supported accommodation, who were supported by a South London community team. Participants could explore relaxing, natural environments in VR. Pre- and post-VR visual analogue scales of mood, immersiveness, helpfulness, narrative feedback and clinician reflections were recorded. Participants (N = 20) had psychotic disorders and other serious mental health conditions. Post-VR, there were significant increases in relaxation (large effect), happiness and connectedness to nature (both medium effects), and decreases in anxiety and sadness (both medium effects). Stress was low at baseline and there was no significant effect post-VR. Helpfulness and immersion scores were high (both > 8). Participants reported the intervention was very relaxing, exciting, uplifting and were enthusiastic about engaging in more VR relaxation and further psychological interventions, including therapy and other digital interventions. Participants reported finding a session facilitator helpful. Technical issues were minor and resolved by the facilitator. Findings indicate scope to widen access to VR relaxation within complex care services. More facilitators could offer multiple sessions to larger, more diverse groups of service users. Future research with more robust methodologies is needed to test effectiveness and longer-term impact.

**Keywords**  Digital mental health · VR · Psychotic disorders · Schizophrenia · Severe mental illness · Psychological treatments

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## Introduction

Use of virtual reality (VR) in mental health is an exciting innovation with the potential to enhance

psychological treatments (Bell et al., 2020). VR involves accessing three-dimensional, interactive, and immersive virtual environments using a head-mounted display (HMD) (Bell et al., 2020; Riches et al., 2023b). Research indicates that VR can be used effectively and safely in therapeutic settings for people with severe psychiatric disorders (Eshuis et al., 2021; Freeman et al., 2017; Monaghesh et al., 2022; Riches et al., 2023b). VR relaxation programmes have been developed where individuals can experience relaxing, natural, virtual environments, such as swimming with dolphins, beach scenes and forest walks, with guidance from a facilitator (Riches et al., 2021a). Research indicates that VR relaxation is a useful tool to improve wellbeing for service users and is feasible and acceptable for a range of mental health conditions including severe mental illnesses, such as schizophrenia (Riches et al., 2023b). Despite common concerns regarding the use of VR in service users with psychosis and their ability to distinguish between virtual and real worlds, research indicates that VR relaxation is a safe intervention for these service users, including those who experience delusions, hallucinations, and other psychotic symptoms (Freeman et al., 2017; Riches et al., 2021b). Exploratory research indicates that service users with severe mental health conditions experienced significantly lower stress, depression, and anxiety; and increased relaxation after VR relaxation sessions (Mark et al., 2021; Riches et al., 2023c; Shah et al., 2015; Tan et al., 2021). Qualitative research indicates that both service users and staff on psychiatric wards are enthusiastic for VR relaxation to be implemented, with the only significant barrier to implementation being physical space for this therapeutic intervention (Brown et al., 2020). Due to reduced costs, VR interventions can be more accessible in clinical settings (Watson et al., 2023).

Studies within care home settings, such as for people with dementia, have found positive therapeutic benefits of VR and indicate that the intervention is safe and improves quality of life (D'Cunha et al., 2019; Ferguson et al., 2020). Despite the benefits of VR relaxation found in these settings, there is limited research exploring this intervention to support adult service users with complex mental health needs, particularly those requiring long-term rehabilitation services, such as those living in supported accommodation and residential care homes (Rault et al., 2022; Riches et al., 2023b). Mental health service users with complex care needs often experience chronic and complex mental illnesses, such as psychotic disorders, and can have additional needs, including physical health and mobility issues (Wiker et al., 2019). They can struggle to live independently and require significant support and rehabilitation for their daily living, psychosocial, and functional needs (Chaturvedi & Jayarajan, 2017). The aim of this pilot study was to evaluate implementation of a single session of VR relaxation for adult mental health service users with complex care needs, living in residential care homes or supported accommodation settings.

## Materials and Methods

### Approval

This study was ethically approved as a service evaluation by the South London and Maudsley NHS Foundation Trust. The intervention was delivered in residential care homes or supported accommodation settings as part of routine clinical practice.

### Participants

Participants were recruited from a South London NHS complex care service which aims to rehabilitate service users with severe mental health conditions who live in care homes and supported accommodation. This team provides input to an inpatient rehabilitation unit, 45 care homes, and supported accommodation in South London. These residential care homes typically offered 24h support to service users from mental health professionals. Supported accommodation typically offered part-time support for service users who were able to live more independently.

An assistant psychologist (GW), who worked in that team, facilitated the VR relaxation sessions with service users. Service users were referred to the VR intervention as part of their rehabilitation programme by the team consultant or care coordinators. Care coordinators were identified as useful staff to liaise with and to recruit participants (Robotham et al., 2015). Service users with a history of epilepsy or seizures were excluded from participating due to a risk of seizures being triggered by VR (Tychsen & Thio 2020).

Face-to-face training in facilitating VR relaxation sessions was provided by a clinical psychologist with expertise in VR-based psychological interventions (SR). This was crucial for the facilitator to be able to support service users to navigate through the virtual environments. The facilitator received weekly supervision from a counselling psychologist who was their clinical supervisor (ED), and monthly supervision on VR-related clinical issues from the same clinical psychologist who provided the VR training (SR).

## Procedure

The intervention and protocol for the session were based on previous research (Riches et al., 2023c). Participants provided verbal informed consent, which was recorded within clinical notes as standard practice. Sessions lasted up to one hour and were held in quiet, private rooms in the supported accommodation or care homes, or in a private consultation room in the outpatient unit of a psychiatric hospital that was associated with the complex care service. During the session, participants were first introduced to the concept of VR relaxation and were provided with a description of the natural environments available on the VRelax program (V1, https://vrelax.com/en/), such as swimming with dolphins, beaches, and mountain scenes. Some environments had interactive elements, such as guided meditation on the beach. Participants were provided with an opportunity to ask any questions. The facilitator then explained the VR equipment consisting of a wireless Oculus Go HMD and controller and supported the service user to use the controller buttons, such as clicking the trigger button to navigate new environments. The facilitator also demonstrated how to wear the HMD and adjust the straps, so it was comfortable. Participants were reminded that they could end the VR relaxation at any stage by removing the HMD.

The facilitator guided participants through the homepage to the VR program. Participants were invited to explore the environments at their own, relaxed pace without rushing. To know where participants were located in the VR environment, the facilitator could follow the VR audio and a map containing the layout of the environments. The facilitator occasionally asked the participant to describe what they were seeing, which aimed to increase participant engagement and attention to the VR, but

also allowed the facilitator to know which environments were accessed. The participants were allowed to explore the environments for as long as they wanted within the one-hour session time. If technical issues arose during a session, this was recorded and logged for each HMD and the participant was reassured that these were a normal part of working with technology. At the end of the session, the HMD and controller were removed and sanitised. In addition to dealing with these technical issues, the facilitator recorded in their clinical journal any other reflections or practical issues that arose during the session, or that were raised by the participant. Following sessions, the facilitator brought any clinical reflections from the clinical journal to VR supervision for further discussion.

## Measures

Demographic information on sex, age, and diagnosis were recorded from clinical records. Diagnosis was recorded by the clinical team according to the *International Statistical Classification of Diseases and Related Health Problems* 10th Revision (ICD-10) (https://icd.who.int/browse10/2016/en#!/IX). Session data was collected using online surveys designed on Qualtrics. This comprised pre- and post-VR visual analogue scales (VAS), from 0 (not at all) to 10 (very), which assessed stress, anxiety, happiness, relaxation, sadness, and connectedness to nature. On the same scale, participants also rated how immersive and helpful they found the VR experience. Narrative feedback was gathered through open questions post-VR comprising 'How did the virtual reality experience make you feel?', Do you have any other feedback? What did you like? What did you dislike? Was there anything that you would have liked to be different?', and 'Was there anything about the virtual reality experience that might help your wellbeing in future?'. Clinical reflections were recorded during and after each session by the facilitator in a clinical journal. The clinical journal was typed and stored, in a password-protected form, on the facilitator's computer.

## Analysis

Quantitative data was cleaned and analysed using R Studio. Demographic characteristics were reported in

means, frequencies, and percentages. Tests of normal distribution were completed using the Shapiro-Wilkins test for each outcome measure. Paired sample t-tests were employed to compare VAS scores pre- and post-VR for normally distributed data; otherwise, paired Wilcoxon tests were used. 95% confidence intervals and Cohen's d effect sizes were calculated (Lakens, 2013). Means for helpfulness, immersiveness, and length of time in VR were calculated, and total number of virtual environments visited was reported. Thematic analysis was used to explore qualitative feedback from participants and identify key themes from their experience of the VR relaxation session (Clarke & Braun, 2017). This data was coded by two researchers (GW, SR) and was thoroughly discussed within the research team to explore alternative ways of interpreting the data and identification of key themes, while considering the potential for bias and subjectivity within this approach. The facilitator's (GW) written clinical reflections on the experience of delivering the intervention were collated from each session, through written self-report and through discussing VR-related clinical issues with other psychological professionals (SR, ED). The clinical reflections from the single facilitator were summarised into a set of paragraphs which were organised by topic.

## Results

### Sample

Participants (N = 20) were recruited from 16 of the residential care homes and supported accommodation facilities to which the service provided input. Participants were an even mix of male and female, and people of Black and White ethnicities. On average, participants were in their mid-fifties, but ages ranged from participants in their late-twenties to their early-seventies. Most participants had a psychotic disorder. Table 1 reports demographic characteristics.

### Quantitative Findings

All service users completed the session successfully and all measures were administered as intended. On average, participants spent just over twenty minutes in the VR (mean = 22.5 min) and accessed four environments, with time spent in VR ranging from eight

**Table 1** Demographic characteristics of participants and virtual reality relaxation session information

| Demographics | N (%) |
| --- | --- |
| Mean age (SD, range) | 53.95 (9.63, 28–71) |
| Sex | |
|   Male | 9 (45) |
|   Female | 11 (65) |
| Ethnicity | |
|   Black | 9 (45) |
|   White | 11 (65) |
| Diagnosis (ICD-10) | |
|   Paranoid schizophrenia (F:20) | 10 (50) |
|   Schizoaffective disorder (F:25) | 5 (25) |
|   Bipolar affective disorder (F:31) | 3 (15) |
|   Paranoid personality disorder (F:60) | 1 (5) |
|   Cyclothymic mood disorder (F:34) | 1 (5) |
| Virtual reality environments visited | |
|   Quiet beach start position | 20 |
|   Beach with interactive exercises | 7 |
|   Scuba diving with dolphins | 12 |
|   Sea view with interactive music | 4 |
|   Coral reef with interactive bubbles | 9 |
|   Tibetan sound therapy | 4 |
|   Rocky beach | 7 |
|   Mountains with no animals | 5 |
|   Mountains with cows | 3 |
| Mean duration in virtual reality (SD, range) | 22.5 (9.80, 8–41) |

SD, standard deviation; ICD-10, International Statistical Classification of Diseases and Related Health Problems 10th Revision

to 41 min across all participants. The most frequently accessed environments were the quiet beach (N = 20), scuba diving with dolphins (N = 12), the coral reef (N = 9), and the rocky beach (N = 7). Post-VR there were significant increases in relaxation (large effect), happiness, and connectedness to nature (both medium effects); and significant decreases in anxiety and sadness (both medium effects). Changes in stress levels were not significant although stress was relatively low at baseline. Immersion and helpfulness scores were both > 8. Table 2 reports all VAS data.

### Qualitative Findings

Seven themes were identified. Participants reported that they felt *More relaxed, calm, and at ease* after

**Table 2** Pre- and post-virtual reality relaxation visual analogue scales and analyses

| Visual Analogue Scale ("Please mark on the line…") | Pre-VR | Post-VR | Pre-VR versus post-VR | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| | M (SD) | M (SD) | 95% CI | Test | df | Effect size | P |
| "…how STRESSED you feel right now." | 3.72 (2.90) | 3.29 (3.16) | 0.79–0.50 | 0.51 | 19 | 0.14 | 0.62 |
| "…how ANXIOUS you feel right now." | 4.53 (3.65) | 2.45 (3.43) | −1.24–0.07 | 2.71 | 19 | 0.62 | 0.01* |
| "…how HAPPY you feel right now." | 5.88 (3.08) | 7.79 (2.64) | 0.01–1.32 | 2.70 | 19 | 0.67 | 0.01* |
| "… how RELAXED you feel right now." | 5.66 (2.97) | 8.35 (2.24) | 0.34–1.70 | 7 | 19 | 1.00 | 0.00** |
| "… how SAD you feel right now." | 3.94 (4.05) | 1.85 (2.86) | −1.24–0.06 | 8 | 19 | 0.60 | 0.02* |
| "… how connected you feel to NATURE right now." | 6.09 (2.98) | 8.06 (2.41) | 0.07–1.34 | 2.77 | 19 | 0.73 | 0.01* |
| "… how HELPFUL you found the virtual reality experience." | – | 8.75 (1.71) | – | – | – | – | – |
| "…to what extent you FELT YOU WERE ACTUALLY IN THE RELAXING ENVIRONMENTS." | – | 8.25 (2.31) | – | – | – | – | – |

T-tests were conducted on stress, anxiety, happiness, and connectedness to nature. Wilcoxon tests were conducted on relaxation and sadness. Effect sizes were calculated using Cohen's d for t-tests and Z score for Wilcoxon tests

VR, virtual reality; M, mean; SD, standard Deviation; CI, confidence intervals; df, degrees of freedom; *p*, probability

*, $p < 0.05$; **, $p < 0.00$

engaging in the VR relaxation, which enabled them to access a safe space, while increasing their *Enjoyment and happiness.* Participants reported the VR experience was *Immersive, realistic, and believable,* which helped them to escape from their stress and increased their imagination. A small minority of participants reported *Difficulties with equipment,* which included finding the headset heavy and uncomfortable in some cases. Participants reported *Applications for future relaxation* which included doing guided meditation and remembering images of the natural scenes in the VR session when they are feeling stressed. Some participants expressed *Enthusiasm for future VR experiences* and wanted to buy their own VR headset so that they could engage with more VR relaxation in their own time. Others expressed *Curiosity about other psychological interventions* and reported that engaging in the VR relaxation session had led them to be interested in arranging talking therapy or other psychology sessions. Table 3 reports key themes and supporting quotes from the thematic analysis.

Clinical Reflections of Facilitator

The VR sessions were highly popular with service users and most participants requested additional sessions. Given that there was only one facilitator, this demand exceeded capacity and it was not possible to offer multiple sessions to service users. The facilitator reflected that this was a disappointing aspect of what

was otherwise an exciting and novel intervention to deliver. Nevertheless, many of the service users who had the VR session requested to have further psychological input. The facilitator and supervisors reflected on the potential of VR to increase engagement in talking therapies for otherwise 'difficult to reach' service users.

Some participants were hesitant to engage in VR with a facilitator that they had not met before. To overcome this, the facilitator was flexible and could offer the sessions while the keyworker or care coordinator was in the room to elicit engagement and support the service user if requested. This collaboration with the care team, who had established therapeutic rapport with the service users, worked effectively to encourage engagement (Robotham et al., 2015).

Occasionally, technical issues arose, such as the headset freezing or the controller becoming disconnected. However, these could always be problem-solved during the session and did not impact the delivery significantly. Working with a client group with complex needs sometimes required additional support to be given to participants in handling the controllers or headsets, but these needs could always be met during the session and did not interfere with the delivery. The facilitator was able to guide individuals who had never used VR before to engage, as the time slot allowed for detailed explanation about the VR within the hour. This support may have allowed service users who were known by the clinical team to

**Table 3** Key themes from thematic analysis and supporting quotes

| Theme | Explanation | Supporting quotes |
|---|---|---|
| *More relaxed, calm, and at ease* | Most participants reported that the VR relaxation was 'the modern world of relaxation' as it reduced their anxiety and stress levels, created a safe space, and they were generally enthusiastic about the therapeutic benefits of VR | "It helped my mood" (P4), "very relaxed and calm, I've tried a lot of different relaxation things which didn't help me. The scenery was very graphic and very relaxing and therapeutic. It was very effective from start to finish" (P6), "I can understand why it worked. I was anxious before and now I'm not anxious at all." (P6), "It brought down my stress levels" (P8), and "I feel so much better. This is wonderful. I had just been shopping and it was stressful, but I am so relaxed" (P14), "I didn't dislike anything. I liked the guided meditation, the music, the scenery was very calming and relaxing. It was excellent" (P6), "It's so relaxing. It was the first time I've ever tried something like that" (P9), "It was very therapeutic and made me feel very relaxed and very confident" (P10), "It's like a safe space, where you feel free" (P17), "This is the modern world of relaxation. You're onto a good thing that will help lots of people, especially when it's hard to get to the real places" (P14) |
| *Enjoyment and happiness* | Many participants commented on the many aspects of the intervention that they enjoyed and made them feel happy and uplifted | "I like the mountains and the cows; I liked the beach, and I liked the snow on the mountains, and I liked the goldfish and the coral reef…there was nothing I would change" (P2), "I liked the music. I liked everything. I wouldn't change anything" (P3), "I liked the sound of the waves coming in and watching the water come in, the music was well played too in the Tibetan sound therapy" (P5), "I liked being in virtual reality. There was nothing I didn't like. I wouldn't change anything" (P9), "happy" (P3), "I found it uplifting and felt happier. I was very impressed indeed" (P8), "I can tell everybody that I've done virtual reality and I found it entertaining. I am hoping it will make me go away feeling much happier about myself" (P16) |
| *Immersive, realistic, and believable* | Most participants found the VR experience to be immersive, realistic, and believable, reporting that the VR increased their imagination and felt like they were able to escape from their stressors | "It got my imagination working, I really was convinced I was there, it was so incredible" (P8), "like you are in the scene itself, in the coral reef, seeing all the fishes there. It's like you're actually there" (P9), "I felt it was live and like 3D" (P11), "It looked real, and you could see the beach and the waves" (P12), "This just blows your mind, I feel like I am really on the beach and in the water" (P14), "I feel like I've been out for an excursion even though I haven't been out" (P17), "get away from the struggles of life in the city" (P2) |

**Table 3** (continued)

| Theme | Explanation | Supporting quotes |
|---|---|---|
| *Difficulties with equipment* | A few participants reported difficulties with the equipment, such as finding the headset uncomfortable and commented on some difficulties using the technology, which were easily resolved with support of the facilitator | They reported the "heavy headset was uncomfortable" (P1), "the equipment was a bit uncomfortable" (P4) and "I felt a bit uncomfortable with the goggles on, but not too uncomfortable" (P11), "found the controller quite difficult because I didn't know what to press but it wasn't bad. It was good to have the help" (P7), "It was very helpful to have the facilitator there who was trained and could help me because you knew everything I could see" (P13) |
| *Applications to future relaxation* | Many participants commented on how they might apply their VR relaxation experience to their future relaxation practices outside of the VR. For example, participants spoke about using their imagination, engaging with meditation, and going to real-life versions of the natural scenes they had seen in the virtual world | "I will play tapes of birds and water on YouTube and watch nature programmes on telly" (P1), "I will relax and think about the dolphins" (P3), "I won't forget this, if I have problems later tonight, I will remember the beach" (P5), "I would do the guided meditation again, the not judging and letting go and think of the scenery" (P6), "I would do more progressive muscle relaxation, it reminded me of when I did progressive muscle relaxation in hospital…I want to start doing this again at night" (P8), "it made me feel like I want to explore new sites and adventures. I would like to go to a safari park" (P9), "I will remember the sea, it made me think of my life when I lived [by the sea], and I was always down at the beach…maybe I can go" (P10), "It's brought it home to me that nature cures. I will go for a walk, in nature" (P14) |
| *Enthusiasm for future VR experiences* | Many participants were enthusiastic about trying VR again, either in another facilitator-led session or by purchasing their own headset, and would recommend VR relaxation for other service users | "it is something I would like to try again" (P11), "I would like to have a VR headset for myself" (P12), "I would like to try other types of virtual reality" (P13), "It made me want to do it again, it was absolutely amazing" (P15), "I would like to tell other service users about it and help them sign up." (P17) |
| *Curiosity about other psychological interventions* | Some participants were curious about other psychological interventions following the VR, and some requested to be seen by the psychologist for more psychological therapy | "I would like to try VR again and try therapy" (P2), "I would like to try it again and see other modern ideas in psychology" (P14), "I would like to see the psychologist more. I have problems hearing voices, and I don't see any reason why I shouldn't try the hearing voices group again." (P16) |

lack competency in digital technologies to effectively engage with a digital intervention.

## Discussion

This study aimed to pilot VR relaxation for mental health service users in an NHS complex care service in South London. Findings indicate that VR relaxation is feasible for service users with complex mental health needs and can be delivered in residential care and supported accommodation. They suggest that the intervention has the potential to improve psychological wellbeing within this population. Participants found the sessions relaxing, calming, and enjoyable, while technical issues were minor and resolved with the support of the facilitator. Participants found the intervention to be uplifting and exciting, and were enthusiastic about engaging in future relaxation, either through more VR relaxation, other relaxation techniques, or through further psychological support, such as therapy. Participants wished to engage with VR relaxation again, which indicates the potential for increasing access to VR relaxation for these service users. These positive findings are consistent with a growing body of research that indicates VR relaxation is feasible and acceptable to support the wellbeing of service users with serious and complex mental health conditions (Riches et al., 2023b). This study indicates that VR is a viable option even for those who lack competence and familiarity with digital interventions. It shows the potential of VR relaxation to give people access to the benefits of digital technology-based interventions, at a minimal cost. While it is important to be mindful of digital inequalities, this study highlights the fact that service users who are less technologically competent should not be excluded from accessing novel technological innovations, such as VR relaxation, even if they need additional support (Gann, 2019).

It is unclear how to interpret the findings on stress in this study, which contrasts with other research on VR relaxation for people with mental health conditions (Rault et al., 2022; Riches et al., 2023b; Veling et al., 2021). It is possible that the lack of a significant decrease in stress, as measured by the VAS, may be due to the sample self-reporting as low in stress at baseline. This may explain why the intervention did not have an impact on stress as assessed by the

quantitative measures. Despite this, in their narrative feedback, some service users reported that the VR relaxation had made them feel considerably less stressed, which is why the impact on stress can be interpreted as unclear. Nevertheless, given the VAS analysis and low baseline stress levels, it is possible that service users who were highly stressed may have been less likely to participate in the intervention due to general disengagement from services related to their mental health. This interpretation is supported by research that indicates that service users who experience more distressing symptoms in the context of psychosis may struggle to engage with therapeutic and psychological interventions, due to the nature of their illness, particularly interventions involving technology (Arnold et al., 2020; Evlat et al., 2021). Another possible interpretation is that there may be a positive effect on stress at baseline from meeting a researcher who is offering a novel intervention.

### Strengths and Limitations

This pilot study offers an exciting new intervention for service users in residential complex care settings, which has not been explored previously. Strengths of the study include the mixed-methods design; the evaluation of implementation across multiple care homes and supported accommodation, where psychological interventions may be overlooked; and the sample including service users with complex mental health conditions, many of whom struggle to engage with psychological interventions (Li & Zhang, 2020; Testad et al., 2014). Limitations of the study include the single facilitator, which meant a very limited number of sessions could be offered and some service users may have been overlooked; lack of formal standardised measures of wellbeing; lack of evaluation of longer-term impact; and lack of a control group to explore confounding variables. The involvement of only one facilitator also meant that the clinical reflections that they reported are highly likely to be impacted by bias and their individual, subjective experience. Despite this limitation, these clinical reflections were included to provide some insight into implementation issues that can arise when delivering these interventions, which may be helpful for future implementation within other clinical settings and may capture the experience of facilitating VR relaxation to guide future research. This may therefore constitute

a strength of the study because so little is known about facilitator experience to inform implementation. Further limitations include the fact that lack of standardised measures and the use of self-report visual analogue scales may limit the extent that conclusions can be drawn, as these measures are subject to bias. A potential sampling limitation in this study is that it is possible that participants who were more curious about digital technologies, such as VR, were more likely to engage and to be disposed to enjoy the intervention.

Clinical Implications

This study highlights the potential of training more staff to facilitate VR relaxation within mental health services. This study tested VR relaxation on service users with complex care needs, but to widen access further to a more diverse range of service users, facilitators could be trained to deliver the session flexibly and in a more personalised way. Future implementation could also include empowering and training wider members of the multidisciplinary staff team to use VR relaxation with service users as part of regular practice within services. Recent research allows individuals to tailor VR relaxation to their specific interests, such as through downloading their own apps to the HMD, which may make sessions more person-centred and accessible for those with additional needs or less experience engaging with technology (Riches et al., 2023a). Advances in these technologies may also service to make VR relaxation more interactive which could improve engagement (Kaleva & Riches, 2023). Future implementation of VR relaxation for people with severe and complex mental health conditions could include actively seeking service users who identify as being highly stressed or experiencing distressing symptoms. The VR intervention could then aim to actively target those symptoms.

The way VR relaxation was implemented in this study meant that service users only had access to the HMD when they had arranged a session with the facilitator (Repetto et al., 2013). It might be possible in future implementation projects to offer VR relaxation as a self-help intervention, which has known benefits (Pallavicini et al., 2009). However, this study highlights the important role of the facilitator in delivering the session, answering service user questions, and overcoming technical problems, indicating there would be a need for significant planning to redesign VR relaxation as a self-help intervention, especially in this clinical population.

Future implementation could explore delivering VR relaxation in the context of a cognitive behavioural framework. This has potential to benefit service users in complex mental health services who are chronically unwell to learn to notice what they find relaxing about certain experiences and to develop real-world application of what they learnt about their relaxation in the VR (Riches et al., 2023b).

Future Research

There remains a need for methodologically rigorous research into VR relaxation for mental health service users to increase the evidence, identify optimal methods of delivery, and evaluate longer-term impact. Due to the long-stay nature of participants within complex care residential services and rehabilitation units, this clinical group may be particularly appropriate for longer-term studies, such as randomised controlled trials, with longer-term follow-up periods and more objective measures. They may be a more suitable clinical group for these studies and to assess impact on ward culture compared to other service users who access acute inpatient services where the length of stay tends to be considerably shorter (Riches et al., 2023c). Future studies could actively recruit complex care service users with high self-reported stress, to evaluate whether VR relaxation can have an impact on stress in this clinical population. Future research might also consider exploring potential barriers to engaging with VR relaxation, which were not measured in this study, such as reasons for declining to engage. This has the potential to make the intervention more widely accessible to a larger, more diverse, group of service users (Riches et al., 2023a). Future research may also consider more thorough exploration of any potential adverse effects. For example, by using formal measures of cybersickness (Stauffert et al., 2020), and by asking specific questions that relate to preoccupations or delusions and whether these have been impacted by VR. Future research could further explore the experience of VR relaxation facilitators with a formal qualitative analysis that aims to understand their clinical experience in greater depth.

Future studies might also evaluate VR relaxation with mental health staff in complex care, given their own experience of stress (Williams et al., 2024; Williams & Riches 2023). Research indicates that VR relaxation is feasible to deliver in the workplace for staff working within mental health services, and future research could evaluate impact on staff well-being and team morale (Adhyaru & Kemp, 2022; Riches et al., 2021a; Riches et al., 2023a, under review; Riches et al., 2023d).

## Conclusions

This study indicates that VR relaxation has a beneficial impact on the wellbeing of service users with complex care needs living in residential care and supported accommodation. These positive findings and interest in VR relaxation indicate scope for increasing resources to clinical teams in complex care to increase the number of facilitators and sessions that it is possible to offer. More methodologically robust research in complex care, including with larger and more diverse samples, is required to explore the impact of VR relaxation and barriers to engagement.

**Declarations**

**Conflict of interest** None.

**Ethical Approval** This study was approved as a service evaluation by the South London and Maudsley NHS Foundation Trust.

**Consent to Participate** All participants provided informed consent to participate.

**Consent to Publication** Consent to publish has been confirmed. Participants were informed that no identifiable information would be included in the final report.

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