

Virtual reality and social avoidance: an exploratory study of acceptance, and feasibility in an inpatient secure environment

Virtual reality
and social
avoidance

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Abstract

Purpose – Social avoidance disorders can be disruptive to the individual as they begin to over-manage their lives, at times avoiding social and work commitments. A potential therapeutic approach is exposure therapy and a virtual reality (VR) treatment approach, gameChange VR, has been developed. This provides an opportunity to test their fears in virtual environments. This study aims to investigate the feasibility of using this VR approach to treat people with social avoidance problems within a secure mental health setting.

Design/methodology/approach – Nine participants completed the gameChange VR sessions. Participants received 30-minute VR sessions for up to six weeks using selected scenarios at five levels of difficulty. Patients' comments and behaviours were noted and clinical staff also provided feedback on their observations of patients' use and experience with VR.

Findings – Overall, patients felt that the gameChange VR helped them to build their confidence and reduce their overall anxiety as they became more comfortable with the equipment. Both patients and staff generally found the intervention easy to use and the staff reported an overall high level of engagement among the participants. The key issues raised largely related to technical and safety issues.

Originality/value – While a previous study was carried out using gameChange VR with an outpatient cohort, this was the first using an inpatient group in a secure mental health setting. It has demonstrated that the intervention is viable in this setting, although further studies are required to identify the specific patient population that would benefit optimally from the therapy.

Keywords Secure hospital, Virtual reality, Healthcare, Mental health, Social avoidance

Paper type Research paper

1. Introduction

The therapeutic use of virtual reality (VR) is increasing and includes the treatment of brain injury (Aida *et al.*, 2018; Rose *et al.*, 2005), cognitive rehabilitation (Maggio *et al.*, 2019), communication disabilities (Bryant *et al.*, 2019) and neuropathic pain (Chi *et al.*, 2019). There are different types of VR rehabilitation strategies available including: “video game-like” approaches with clear goals, progressions and rewards, “exposure therapy” that opens the user to specific simulated environments, and “teaching by example” with step-by-step instructions. VR exposure therapy has been reported to have similar efficacy to that of cognitive behavioural methods in reducing anxiety associated with phobias, such as the fear of flying, panic disorder, social phobia and arachnophobia (Freeman *et al.*, 2018).

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Anxiety disorders (ICD 10 –F41) constitute a group of illnesses that are defined by “anxiety” being the major symptom and are not restricted to any particular environmental situation. They are characterised by a variety of symptoms including excessive fear and worry. An individual can experience physical symptoms such as nausea, shortness of breath, hot flashes, chills and dizziness as well as sleep-related problems (Mossman *et al.*, 2017). A maladaptive coping strategy includes the avoidance of situations that have the potential to exacerbate their anxiety (Wadsworth, 2015), and may occur when a particular situation or social interaction causes an increase in a person’s anxiety. This may be built upon by a belief that there will be a negative consequence as a result of this situation or interaction and in turn cause them to avoid, even unintentionally, the situation to minimise the feelings of anxiety. This is evidenced by Rinck *et al.* (2010) who observed individuals with social anxiety and social phobia. Using a simulation of a social situation, he reported that there was a significant correlation between the level of anxiety and the distance they kept from scenario-associated avatars. Furthermore, as anxiety causes excessive fear and worry, it can also contribute to a heightened risk appraisal, whereby the individual perceives an increased likelihood and severity of a negative outcome (Maner and Schmidt, 2006). Resulting from this avoidance, individuals may employ safety seeking behaviours (SSB) which they feel will protect them from the negative ramifications they perceive to associate with fear-inducing stimuli. Safety behaviours can be present in anxiety related disorders such as obsessive-compulsive disorder (OCD), posttraumatic stress disorder (PTSD), social phobia as well as in psychosis and autism (Van Uijen, 2018; Spain *et al.*, 2018). An example of SSB occurs within social phobia whereby the individual believes that they will be negatively judged and their SSB serves to avoid adverse social situations (Thwaites and Freeston, 2005; McManus *et al.*, 2008). Social phobia is defined in ICD-10 as “a fear of scrutiny by other people leading to avoidance of social situations”. However, this behavioural approach further reinforces the negative and maladaptive anxious belief that they will be judged in social situations. This leads to increased anxiety with a drastic impact on their daily life where they feel they must avoid certain situations and limit their experiences in order to prevent the negative event from occurring (Villanueva *et al.*, 2020).

To address this maladaptive response, approaches such as exposure therapy aimed at social phobia have been developed. This approach gradually exposes the individual to the feared stimulus with the intention of overcoming their maladaptive thinking patterns (Craske *et al.*, 2014). Exposure therapy can be embedded into Cognitive Behavioural Therapy (CBT) in order to challenge the maladaptive thoughts whilst encouraging exposure to the feared stimulus. The therapist will work with the patient to discuss thoughts that arise in each exposure increment and use the outcomes from each exposure to overcome their negative beliefs (Kaczurkin and Foa, 2015).

While exposure therapy has become highly effective in reducing anxiety, its use is limited as not every fear is appropriate for exposure from the therapist’s office or in the local area. Other limitations include conducting therapy in the community, where there are challenges with confidentiality and treatment adherence (Lognoul *et al.*, 2020), and the patient may be reluctant to drop their SSB which in turn decreases the effectiveness of the treatment (Palmqvist *et al.*, 2007).

It has been proposed that a VR approach can be used as a means to deliver exposure therapy (Wechsler *et al.*, 2019). The VR is administered using a headset which allows the participant to observe the relevant scenarios, thereby allowing the automated delivery of therapeutic interventions. The headset permits a 3D immersive experience into simulations of environments (Diemer *et al.*, 2015). Immersion into VR scenarios was described by Powers and Emmelkamp (2008) to produce a similar emotional and cognitive response to real world

experiences. Rothbaum *et al.* (2006) found no difference between real life exposure compared with VR, suggesting the two to be equivalent. The patient may select a challenging VR environment and enter the simulation under the guidance of a therapist. However, unlike real world exposure therapy, the VR provides a platform to allow a patient to test their fears in a safe environment while reducing the need for SSB as they are not in any “real life” danger. The participants may therefore be more willing to enter the challenging situations and experiment (Garcia-Palacios *et al.*, 2007). This may be due to patients feeling safe because they fundamentally understand the induced fear is not real and is a simulation (Powers and Emmelkamp, 2008). They can also repeat the same scenario until they feel comfortable and happy to continue (Diemer *et al.*, 2015). Furthermore, knowing that the VR is not “real” may encourage the participants to seek help, where they may otherwise avoid addressing their phobias (Geraets *et al.*, 2019). The feasibility of the VR approach has been assessed using a meta-analysis of 30 randomised controlled trials that found large effect sizes for VR therapy treating anxiety, when compared to waitlist controls or *in vivo* exposure (Carl *et al.*, 2019).

The gameChange VR-based intervention was developed by OxfordVR (Lambe *et al.*, 2020) and was designed to allow people to feel safe in the real world environment and have opportunity to test their fears in different virtual social situations and environments. The social interactions can sequentially increase in intensity and expose the individual to novel environments at a pace with which they are comfortable. The technology allows the individuals to access various scenarios of which they are fearful, to test their beliefs and learn what the consequence of staying within their feared situations may be.

The effectiveness of gameCharge VR has recently been assessed in a multi-centre clinical trial within an outpatient setting (Freeman *et al.*, 2022a, 2022b). The study sought to assess the effectiveness of the VR intervention in reducing agoraphobic avoidance and distress in patients with psychosis. Participants were assigned to either the VR therapy plus treatment as usual (TAU), or TAU alone. The sessions were administered via six, thirty-minute sessions across a six-week period. Of the 346 individuals who were enrolled, 174 were randomly assigned to the gameChange VR group. Compared to the TAU group, the VR group had significant reductions in agoraphobic avoidance and distress at six weeks (Freeman *et al.*, 2022a). Furthermore, the researchers concluded that those with a greater severity of anxiety and avoidance demonstrated a superior treatment benefit which lasted for up to six months. Overall, the VR therapy led to a significant fear reduction in everyday situations compared with the TAU group and this was particularly observed in those who had severe symptoms of agoraphobia (Freeman *et al.*, 2022b). Feedback from a limited number of participants who completed the course of therapy was largely positive and they felt that the balance between the virtual environment and the reality was appropriate to allow them to overcome their social challenges (Bond *et al.*, 2023).

While the gameChange VR clinical trial had been carried out in an outpatient setting, this therapeutic approach may also have the potential to benefit patients within a secure mental health setting, and especially those with complex mental health disorders. These patients are likely to have a limited opportunity to explore their feared environments and test their negative beliefs due to restrictions in place due to specific risk assessments or the mandatory conditions of their court sentence for those in a forensic setting.

The aim of this preliminary study was to qualitatively explore the feasibility, acceptance and experience of the gameChange VR programme with patients and clinical staff in a secure mental health setting in order to determine the potential of carrying out a future larger scale trial within this community.

2. Method

The study was carried out at St Andrew's Healthcare, a low and medium secure UK mental health Charity in the UK. This study was approved by the institution's Research Peer Review Committee and ethics approval was provided by the Reading Independent Ethics Committee (RIEC REF.101219-1).

2.1 Intervention

GameChange VR is a virtual reality-based social engagement programme developed by OxfordVR which was designed to allow people to feel safe within the virtual environment to test different social situations and environments (Lambe *et al.*, 2020; Freeman *et al.*, 2022a, 2022b). The license to use the gameChange VR intervention was purchased by St Andrew's Healthcare from Oxford VR for the duration of the study. The programme is administered to the patient via a HTC Vive Pro OR Oculus Rift™ virtual reality headset connected via a cable to a laptop which also includes hand controllers and sensors. The series consists of six scenarios; a street, a bus, a café, a pub, a doctor's waiting room and a shop. When they enter into each scenario, the participants are met by a virtual coach who instructs them to complete a series of tasks such as purchasing something at the shop or waiting in a queue. These scenarios can increase over five levels of difficulty, such as an increase in the number of avatars present or experiencing a noisier environment in the shop or waiting room. Each scenario lasts approximately 30 min.

For the current study, the sessions were administered by assistant psychologists through six weekly sessions. The sessions began with psycho-education about anxiety, delivered by the virtual coach. Following this, participants were asked which scenarios they may like to explore, however, while this was taken into account, the scenario selection was also informed by the clinical team who identified which scenarios would meet the patients' needs and maximise the potential benefits.

2.2 Participants

Patients were recruited from the medium and low secure, and learning disability and autism (LDA) divisions. Clinical psychologists identified patients who displayed social avoidance problems. Patients who met the following inclusion criteria were chosen to participate:

- capacity to provide consent as advised by the clinician in charge of the individuals care responsible clinician (RC).
- clearly displayed avoidance of social situations for at least 6 months.
- exposure to a specific VR-associated social setting deemed to be beneficial by their ward clinical psychologist and the wider multi-disciplinary team (MDT).

The following exclusion criteria were applied:

- patients deemed to lack adequate social skills (e.g. patients whose behaviour in a social context is likely to lead to negative consequences or isolation);
- patients who engaged in risky behaviours requiring restraint, seclusion or tranquilisation in the 24 hours prior to the VR session;
- specific non-social, environmental phobia such as fear of objects, heights, animals etc;
- receiving intensive psychological treatment for the treatment of social avoidance;
- primary diagnosis of substance abuse;

- acute depression;
- manic phase of bi-polar disorder;
- dementia, where predominant features are inability to learn or significant problems in orientation to time, place or person;
- psychosis to the degree where the patients are unable to engage effectively;
- impaired ability to understand, follow and recall instructions as assessed by the clinical team; and
- photosensitive epilepsy, significant visual, auditory, or balance impairment.

Information on participant's gender, age and ICD-10 diagnosis were also collected to provide contextual information on the participants involved in the study.

2.3 Qualitative evaluation

Patients were asked to provide feedback on their experience after each VR session using five open-ended questions in order to understand their overall treatment satisfaction, the relevance of the scenario, the intervention delivery and its perceived benefit.

2.4 Measures

The accompanying staff members were interviewed about the usability of the VR at the end of the intervention using completed the System Usability Scale (SUS) (Bangor *et al.*, 2008) which is a 10-item questionnaire used to assess the usability of a system (e.g. technology, websites). The questionnaire measures a variety of factors such as efficiency, intuitiveness, ease of use and satisfaction. The participants were asked to rate how strongly they agree or disagree in reference to the usability of the product in reference to the aforementioned factors on a scale of 1 to 5. The answers were converted to a final rating scale with a maximum score of 100 (Bangor *et al.*, 2009).

System usability scale (SUS):

- (1) I think that I would like to use this system frequently.
- (2) I found the system unnecessarily complex.
- (3) I thought the system was easy to use.
- (4) I think that I would need the support of a technical person to be able to use this system.
- (5) I found the various functions in this system were well integrated.
- (6) I thought there were too many inconsistency in this system.
- (7) I would imagine that most people would learn to use this system very quickly.
- (8) I found the system quite cumbersome to use.
- (9) I felt very confident using the system.
- (10) I needed to learn a lot of things before I could get going with this system.

Five patients completed the Simulator Sickness Questionnaire (SSQ) which was administered before and after the first session in order to determine whether the VR equipment caused any sickness (Kennedy *et al.*, 1993). The questionnaire consists of 16 items rated on a 4 point/rating scale, and it is used to evaluate the degree of cyber sickness felt when using the virtual reality systems. The SSQ is divided into three items, Nausea, Oculomotor and Disorientation, the total question score assigned to each item is summed

and multiplied as follows: Nausea sum is multiplied by 9.54, Oculomotor by 7.58 and Disorientation by 13.92. Finally, the total score of each is combined and divided by 3.74. Ultimately, the higher the score, the higher the sickness level (Walter *et al.*, 2019).

2.5 Procedure

Potential participants were approached by an experienced clinical psychologist who explained the gameChange VR intervention to them. Those who were interested to learn more about the VR programme were scheduled for an enrolment session with an assistant psychologist. During this first session, the participants were offered the opportunity to practice immersive VR and experience neutral scenarios (e.g. a forest, the countryside, a sandy beach, a rocky beach, a church) delivered with an Oculus Rift™ headset and a Samsung S8 mobile phone (Rose *et al.*, 2021). The first VR sessions was scheduled for those patients who provided their consent to participate.

In the first gameChange VR session, a virtual coach provided a psycho-education session about anxiety. The participants then received weekly 30-minute VR training sessions for up to six weeks. At each session the participants started with a selected scenario and progressed through the five levels of difficulty. Any comments or behaviours during each session were noted down by the researcher. Participants were encouraged to provide feedback following each session. Finally, the clinical staff also provided feedback about their observations of patients' use and experience with VR.

2.6 Analysis

Patient's feedback and staff interviews were analysed using a six-step thematic analysis (Braun and Clarke, 2006). This process involves identifying topics from which a series of codes may be generated. Statements were coded and used to identify and define themes occurring in the procured data set.

3. Results

3.1 Patient's characteristics

Eleven patients were initially enrolled in the study although two dropped out at an early stage due to the discomfort of using the VR equipment. One of these patients, a female aged 36 declined to participate after the first session stating that the headset was uncomfortable and made her feel claustrophobic. The second, a female aged 35 disengaged after three sessions stating that the visual display was blurry causing her discomfort. There was no obvious correlation between the patient's clinical symptoms and/or diagnosis and their withdrawal from the study. All except one of the remaining participants who completed the study were male with ages ranging between 25 and 65 years. The patients had a primary diagnosis of schizophrenia (42.9%), Asperger's Syndrome (28.6%), emotional unstable personality disorder and unspecified dementia (14.3%). Three patients had multiple comorbidities (mental/behavioural disorders from multiple/psychoactive drug use, bipolar affective disorder, moderate depressive episode and OCD). Although dementia had been considered as an exclusion criterion, one participant was deemed to have capacity to give consent to participate and was considered to benefit clinically and was subsequently included within the study.

There was some indication of minor simulator-associated sickness among a number of patients which dissipated after session 1 indicating that the patients adapted to the technology (Table 1). These were primarily in the oculomotor and disorientation domains, although there were no specific common trends observed. These scores are considered as being low (Kennedy *et al.*, 1993).

Table 1
Sickness simulator
questionnaire

Participant	Total SSQ score (before)	Total SSQ score (after)
1	0	0
2	33.66	11.22
3	44.88	33.66
4	3.74	3.74
5	7.48	0
6	86.02	33.66
7	67.32	41.14
8	41.14	22.44
9	93.5	74.8

Source: Created by author

All of the participants who completed the study undertook a minimum of five out of six interventional sessions.

3.2 Clinical staff results

Six members of the clinical team administered the intervention and three staff members completed the Staff System Usability Scale (SUS) with an average score of 87.5, which illustrates that they found the product to be highly usable.

In general, the staff reported an overall positive experience of the gameChange VR intervention for both staff and patients (Table 2). They commented upon the novelty of trying a new therapeutic approach that may have contributed to the overall patient experience. Furthermore, the ease of use of the VR kit facilitated the general enjoyment.

Generally, the gameChange VR was considered to be relatively easy and straightforward to use:

“Pretty straightforward - it was really easy for me to navigate as a member of staff and then explaining it to the patients, they seemed to understand it quite clearly”. (S2)

“Yeah it’s as easy as it could be. JS (patient): [. . .] found it completely easy” (S5)

However, specific individual issues were highlighted by staff members. Programme freezing and software glitches were encountered, but these were generally easy to resolve:

“There was sometimes some issues with freezing and glitches but that was able to be resolved pretty quickly”. (S1)

User	Staff comments
Patients’ experience according to staff	He really enjoyed it [. . .] is what he said [. . .] it felt real to him is what he said (S2)
	A lot of them were very engaged, they really enjoyed it (S3)
	Yeah it’s as easy as it could be. JS (patient): erm yeah he found it completely easy (S5)
Staff experience	I found it quite easy, too easy to use, and it was enjoyable. (S3)
	Overall I’d say it was really good (S1)
	I thought it was positive I thought it was good (S5)

Note: S = staff member

Source: Created by author

Table 2.
Overall staff
feedback of both
patient and staff
experience of
gameChange VR

The staff training provision was considered to be important and a team approach with one-to-one initial support would be particularly beneficial if the therapy were to be introduced into routine clinical use:

“There was a lot of training beforehand but once I got started with the sessions it was easy to use”: It would have been easier if as a team collectively, ourselves and yourselves, all together, I think that might have helped to help with any confusions. I preferred the one to one training [...] that made it easier [...] to [...] work out the VR”. (S6)

Staff also highlighted some difficulties associated with technical aspects of the kit and the setting up procedures including calibration of the equipment prior to each session. These were included in the standard operating procedures. It was suggested that the process of setting up and running the sessions was quite time consuming. However, these issues did not hinder the overall intervention sessions and the problems could be overcome (Table 3).

A key area of concern related to the programme having to be re-launched periodically. Furthermore, it was difficult at times to determine whether some of the perceived technical issues were actually associated with the programme itself or whether patients were not interacting with the device in the appropriate manner. Staff also expressed safety concerns and highlighted technical difficulties about using the interact with the VR environment for patients with reduced physical mobility.

3.2.1 Scenarios and personalization. While the VR scenarios were considered to be clinically relevant *“They were relevant [...] in terms of his anxiety when he goes in the street the VR didn’t meet that “cause for him it”s about the noise [...] for example [...] like a child crying [...] that kind of stuff wasn’t in the VR so it didn’t really [...] meet his needs”* (S2), they didn’t always match the concepts that would address the patient’s anxieties (Table 4). Therefore, some improvements were proposed which included personalised scenarios that would target the patients’ individual goals.

3.2.2 Patients’ experience and progress observed by staff. Overall, staff suggested that the patients were able to use the VR system with ease and that they experienced relatively few problems, although this may have been due to the “tech savviness” of some of the participants (Table 5).

3.2.3 Engagement and drop out. The patients exhibited increased confidence as they progressed through the levels of the scenarios and their increased engagement was reflected by observable improved changes in behaviour. However, this level of interest appeared to attenuate over time following further experience with the scenarios as the novelty of the VR intervention wore off and another key theme that arose was repetition which led to patients becoming disengaged over time (Table 6). Staff also reported various reasons for participants dropping out of the study. In one case, a feeling of claustrophobia led to a participant feeling distressed and dizzy, subsequently causing them to drop out of one of the training sessions. In another case, they felt that the intervention was not appropriate for them at that particular time in their treatment journey.

3.2.4 Observed mood and behaviour changes. Finally, staff commented upon the patients’ mood during the sessions or any improvements in behaviour including social interactions on the wards (Table 7). Although the participants exhibited anxiety prior to the VR therapy, as they were placed in close proximity to avatars at the start of the sessions, this tended to subside as the participants subsequently became familiar with the VR environment. However, in some cases, this increased during the therapy session. This may have been due to the exposure to stressful stimuli within the scenario or the potential

Table 3.
Technical and set up
experience reported
by members of the
clinical team

Experience	Staff comments
Technical difficulties	<p>A bit confused about how, for example, in the shop situation when you were [...] picking out things on [...] a sort of a stand or something, the patients couldn't really grab the objects, they had to try multiple times to then grab the object. And I'm not sure if that was just them not really pressing the button or they weren't near enough at first (S3)</p> <p>It was quite time consuming to set up and pack up/transit (S4)</p> <p>A wireless headset would feel safer, easier as it was connected to a large heavy weight laptop (S4)</p> <p>There were a few complaints, though, regarding like the volume of the VR and how it couldn't be turned up (S3)</p> <p>That was an issue with sound. So some of the patients in some of the situations, they didn't really know what to do, and they had to sort of either, they said verbally what do I do, and then I say it for them, or had to just sort of wait and see if they figured it out on their own (S3)</p> <p>It was quite easy, for one of them, she had quite a bad back problem, so, instead of standing up and doing the VR, she chose to sit down. And that sort of made it difficult for when in the VR you have to stand on a specific part to start the VR. (S6)</p> <p>It's remarkable how aware you are of the wire, although you're immersed in this environment. And that was always a worry of like, oh, my word, they're going to trip, but they never did (S6)</p> <p>It was quite easy, for one of them, she had quite a bad back problem, so, instead of standing up and doing the VR, she chose to sit down. And that sort of made it difficult for when in the VR you have to stand on a specific part to start the VR. (S3)</p> <p>I think for me. . . . doing all that set up and everything for the patient to stay in there for ten minutes. . . . that was really frustrating (S2)</p>
Safety concerns	<p>It did take quite a big chunk of my time. . . . and I think maybe that's what made it more frustrating (S2)</p> <p>Sometimes the set up. . . . took a bit of a while. . . all in all I think it was. . . . you know it was still practical enough like it wasn't wholly impractical . . . erm . . . it was just a bit of a faff sometimes (S5)</p> <p>Setting up, like guardian set up that sort of thing, at first it was a little bit tricky. . . On one of my first sessions, I had a patient who was about six foot. . . When it came to the next session, the female patient was. . . about a foot shorter, and I'd forgotten to go into guardian set up first. . . So with that, it was just a bit of a struggle. . . And so we had to exit it and then do it. But I think that was maybe more on my part, just not really understanding how to properly set up. But then after that, it was absolutely fine (S3)</p>

Note: S = staff member
Source: Created by author

anticipation of such an exposure. Moreover, for one of those who exhibited a physiological response to anxiety, a staff member reported this led to the VR goggles fogging up which meant it had to be removed and wiped for continued use.

Staff acknowledged that their progress improved as the patients became more comfortable with the equipment “*He definitely did seem to make some progress and become more comfortable with using the equipment*” (S5). They suggested that regular weekly sessions over a longer course of several months would be beneficial as the progress was relatively slow in the initial phases “*If he was able to say [...] engage in the intervention or use the equipment once a week for [...] several months [...] would have been better for him because although he was making good progress [...] the progress was slow*” (S5)

VR scenarios	Staff comments
Relevance	<p>Due to his specific case . . . being in community environments are less relevant for him . . . he's not . . . immediately going to be able to access the community . . . due to the stage of the case . . . was less relevant to him just because he's . . . he's not currently got access to . . . erm the community (S5)</p> <p>They were definitely relevant . . . only thing is . . . they're situations which he wouldn't be able to try in real life for a very long timeso i think it's something that they'd have to go through again . . . like . . . as they get closer to discharge (S1)</p> <p>With my second patient . . . I don't think it was very practical in terms of his needs . . . erm . . . I personally didn't think he had . . . the type of social anxiety that the VR was . . . was measuring I think that was more to do with his autism than what you really get in the VR so from the start to the end of the intervention I didn't see much change (S2)</p> <p>They would be in the scenario fine but as soon as they were asked a question or spoken to you could see them getting more anxious . . . so yeah . . . i think perhaps getting the patient to engage in more conversation would be beneficial (S1)</p>
Personalisation	<p>For young people - maybe a theme park, park, cinema, clothes shopping, restaurant etc. (S4)</p> <p>Communal . . . ward-like . . . environment . . . with this . . . erm . . . patient specifically . . . he will isolate himself in his room . . . he's just not very confident being in a communal area even if it's just like a lounge . . . so I think if there was . . . erm . . . a more . . . ward-like environment . . . like a lounge with a TV in a corner maybe a member of staff sat on one sofa and a couple of patients or just other people sat around that may be more of a familiar environment to him (S5)</p> <p>Some more like outdoorsy settings . . . they do utilise their leave and go out around the parks and it is quite busy. So I think, yeah, a park or maybe like a duck pond or something, that sort of situation where there's a lot of people will be quite beneficial. And maybe like a restaurant or something, a little bit more practical. I don't know, like a takeaway or a bank or something, like something that they sort of use more or less every day (S3)</p> <p>A lot of them struggle with groups . . . so . . . maybe being in a community meeting or in their meeting with a group maybe something loud that kind of stuff cause that's . . . more practical . . . they have group sessions so that would've been . . . I think that would've been . . . really really practical (S2)</p>

Table 4.
Staff views on the
relevance of the VR
scenarios

Note: S = staff member
Source: Created by author

Experience	Comments
Positive interaction	<p>I think it was really appropriate, I think, because each level is about two minutes, isn't it, really? And I think that was just enough time for them to get comfortable in the surroundings and have either a little activity in that or to just wait around, I think any longer they would get bored (S3)</p> <p>They interacted with the equipment really, really well it was quite straightforward (S2)</p> <p>He really didn't have any problems with it all . . . you know he's quite tech savvy anyway . . . so . . . there weren't any like . . . erm . . . I don't know physical . . . erm . . . impairments or anything (S5)</p>

Table 5.
Staff perspective on
patients' experience
and practice

Note: S = staff member
Source: Created by author

Experience	Comments
Session engagement	<p>really engaged . . . yeah they've both said how realistic it is . . . and they've stayed in the virtual environment for the whole time in each of the sessions (S1)</p> <p>For one of my patient who ended up dropping out of the sessions I think it was so practical like he really engaged with it (S2)</p> <p>Initially fully engaged but this decreased as time went on. I think this was due to it no longer being novel and the scene having been fully explored (S4)</p> <p>behaviour didn't always match up to kind of their ratings, which was also hard, so observed one of the guys heavily sweating and appeared really anxious, but when it came to scoring stress, it was zero and talking to staff, it was very much as its seen as a sign of weakness, of male pride. . . . I think he just didn't want to ever admit anything, however, he was sweating and physiologically appeared anxious - (S6)</p> <p>young person became tiresome two thirds of the way through the intervention, finding it repetitive (S4)</p> <p>Was going to decline and withdraw from the study, and I think that was mainly because of . . . the difficulties that I mentioned earlier; about the height and sort of going in and it being really strange. And I think that was more on my part than anything. But then as we sort of got through that and we went, we had another session and it was absolutely fine and the height was normal, and she went through some of the levels, she started to really enjoy it (S3)</p>
Drop out	<p>I think it really actually depended on their mood, like their mental state at the start, and the ones when they were in a session and they decided to leave the session early, it wasn't more of a, oh, I'm getting really frustrated at the game. It was more of, oh, I just feel really low in mood, like something happened on the ward earlier, so I just don't really feel up to it (S3)</p> <p>One of them dropped out because she felt quite claustrophobic with the headsets on, and she felt quite dizzy, I think from the visuals. So in a practical element, that wasn't great for her (S3)</p>

Note: S = staff member

Source: Created by author

Table 6.
Engagement and
drop-out rates

3.3 Patient feedback on game change VR

The patients completed post-session interviews and an end of intervention interview; a thematic analysis of the results generated two primary themes – impact (Table 8) and functionality (Table 9).

Overall, the patients reported the gameChange VR experience to be realistic and they found working through the different levels helped them to reduce their anxiety, with this becoming easier with practice. Furthermore, although there was some initial anxiety at the start of the session, this appeared to stabilise once they began progressing through the scenarios and levels (Table 8).

While the feedback was largely positive, a common theme that arose was although the scenarios were realistic, they weren't always sufficiently challenging which led to the novelty of the intervention wearing off and the participants did not experience a subsequent progression in their fear reduction. Moreover, the patients commented that there was a need to improve the level of interaction within the scenarios as this would enhance how realistic the VR was, whilst also adding to the levels of difficulty that were relevant to addressing the individuals' phobia.

4. Discussion

The current study was developed to explore the acceptance and feasibility of gameChange VR as a tool to treat social avoidance in a group of patients within an inpatient secure

Table 7.
Staff perspective on
observed patients'
mood behavioural
changes

Experience	Comments
Observed behavioural changes during VR exposure	<p>as the sessions went on . . . and he would do it multiple times . . . it got to a stage whereby the . . . last couple of sessions that we had he was able to request for a drink and . . . to point people towards the toilets and what have you so yeah he was getting better at that (S4)</p> <p>Tended to start each scene with anxiety, this lowered with increased time of exposure and then they explored the scene excitably. Interactive scenes provided helpful distractions (S4)</p> <p>Anxiety increased when phasing in of a scene was about to begin or individuals were 'immediately' close in proximity but this decreased once it became familiar. (S4)</p> <p>Distress was usually higher after the patient had done the session (S1)</p> <p>Mood generally remained stable . . . i mean . . . they're both usually pretty stable anyway . . . erm . . . with one of the patients especially . . . their distress was quite high and you could see them getting really anxious and tense as they tried the harder levels. . . after the session as well both of them had quite high distress . . . probably because they've just done the session and haven't just come back from a walk or something like that . . . (S1)</p>
Observed behavioural changes after VR sessions	<p>The patients have definitely been more sociable . . . like . . . just thinking about one of the patients . . . before the VR he would have just stood by the door to the nurses station . . . and waited for someone to come and ask him a question . . . whereas now . . . he will actually go up and ask things himself . . . so there's definitely been a positive change in their behaviour (S1)</p> <p>They've made comments about how the patients been a lot more talkative with his peers and coming up to them and asking questions (S1)</p> <p>It was positive. It's hard because we ask the questions at the end and they're very yeah it was good, fine. It's quite hard to get them to sort of articulate their experience but yeah their sort of body language was positive. (S6)</p> <p>He went from being, yeah, not really interested to actually being early for the sessions being there ready. . . . And the staff would they'd be like, he's been talking about it, this is just not the guy we know. it was really good to see that he was he was getting a bit of meaning from his day and actually enjoyed it. (S6)</p>

Note: S = staff member
Source: Created by author

mental health setting. A previous discussion group established by the developer, carried out at the same time as the current study, indicated that gameChange VR may help to build confidence, reduce anxiety, and "bridge that gap" between the differences of being in hospital and being discharged to the community. However, it did highlight that it may not be suitable for all patient groups (Brown *et al.*, 2022). The gameChange VR intervention has only previously been used for patients attending an outpatient clinic who have quite different needs within a specialised setting (Freeman *et al.*, 2022a, 2022b) so the current study was the first to actually use the intervention in an in-patient population. The sample size in the current study was small, which limited it to being qualitative in nature, and although the overall feedback from patients and staff was generally positive in nature, differences between the two settings were highlighted.

The feedback from both patients and staff demonstrates a high level of engagement, suggesting the gameChange VR is an acceptable intervention and that the intervention is

Table 8.
Patients' views on
the impact of
gameChange VR

Topics	Comments
Benefits of VR	<p>It was a lot more realistic and useful than I expected. Felt like a game for 2 minutes at the start but then I got into it and it felt so real. Rediscovered myself (P1)</p> <p>All good, I worked independently. It helps to reduce challenging problems and the stress (P2)</p> <p>I think I would be more willing to try it out with somebody with me, not on my own yet. . . but I think I'd be more willing to try and get a bus or, I mean not that willing but. . . just a little bit more (P1)</p> <p>It was more intense as I went to the higher levels. People were right on top of me and I was crowded in. It was good though (P1)</p> <p>Very good- all good. How to order well and how to order appropriately in the manner of relax (P2)</p> <p>If it's quiet going to the café, it has to be in the morning. If it's late afternoon, it would be crowded so I don't go. I have to overcome it in the next level. (P2)</p> <p>Easier than it was before. I wasn't as hot and sweaty, not like I used to be. (session 6) (P1)</p> <p>Half - I'm a little bit confident. Children scares me (them being noisy) (P2)</p> <p>Very good. So I can travel well without problems (P2)</p> <p>I was anxious when in it but it was realistic that's why (P1)</p> <p>It was ok there was clear progression but not too steep. Anxious at the start being in the room with headset on but then it went into being anxious about the activity and being on that street (P1)</p> <p>Felt a bit agitated but not as much, The different levels worked well (P2)</p>
Anxiety due to VR	<p>It was intense on the bus when they were all staring at me and it felt like they were on top of me. Awkward to be standing around as I usually scroll on my phone or something but I could not. Discussed and explained safety behaviours (P1)</p> <p>Fairly spaced levels, gradual progression, and anxiety increased as I went through it but at some point, it plateaued (P1)</p>

Note: P = patient

Source: Created by author

relatively easy to use, with staff commenting upon the high levels of engagement occurring as a result.

Patient improvement was also observed and staff acknowledged that the patients' progress improved as they became more comfortable with the equipment. They also suggested that regular weekly sessions over a longer course of several months may be more beneficial as the progress was relatively slow in the initial phases. This suggests that, for some patients, a personalised approach may be a more suitable than the standard therapy provided either in the outpatients clinic or remotely, which is not unusual for the complex mental health conditions that are encountered in an inpatient setting.

The patients felt the intervention was realistic, and that it became easier as they progressed through the different levels. VR was perceived as allowing them to be in situations they would otherwise not find themselves in. Patient 1 stated that it "*puts me in situations I would normally avoid and not be in* and then further commented "*Ok, manageable, felt harder as I progressed.* Overall, this provided support for gameChange VR as an exposure therapy intervention, as well as highlighting the success of the graded difficulty which is seemingly working as intended. This is in good agreement with the patient feedback from the outpatient study that reported gameChange VR as "a safe place to learn" (Bond *et al.*, 2023).

While the overall clinical experience of gameChange VR was well received, the key issues raised were primarily of a technical and safety nature, the improvement of which may enhance the overall experience. A key issue was glitches relating to sound and vision which meant that

Experience	Comments
Real world transferability	Different in real life - harder in community. Feel it would be useful for those institutionalised (P4) Not really - not in the real world. It would be quite tough to go through a similar situation in the real world (P3) Yes, relevant to me as I don't go out on the street alone. It has been years since I last did that as I normally go with my mum, sister and sister in law and they usually stay with me. The more I do it the more helpful it will be I think (P1)
Improvements for VR	Bus would be harder - stressful finding somewhere to sit. Doctors would be easier - more in control. In the VR you could pick up pens and leaflets, just waiting (P4) First session found it more difficult because I didn't know what to expect. Going into town (community) would be more challenging (P3) I don't know how it would help me overcome my fears/anxiety but the scenario was okay (P4) Slightly more than before but I think you do have to experience it in reality as well. (P1) Too easy, no stressors (for me). Comfortable with the experience. Not challenging, option to pick level would be helpful (P3) Boring, because it's too easy. Long wait. There should be more things to do (P3) The equipment is good, could be more realistic, such as speaking to people in the shop, e.g. asking for something. Would feel more relevant if more interaction (P2) Boring, apart from street Level 4 because of cleaning the wall. Doing something instead of standing around (P3) Ok, I don't know if it will have any effect doing it all again now, because I know what is going to happen. Maybe different scenarios if intensity would help, as I know what will happen (P1)

Note: P = patient
Source: Created by author

Table 9.
Patients' views on
the functionality of
gameChange VR

meant participants were not experiencing a consistently high standard product. This demonstrated a need to review specific technical issues to ensure that all participants benefit from a well-functioning system. A number of other opportunities for improvement were identified. For example, the therapy sessions had to be disrupted if an incorrect scenario was selected, therefore the course of the session could be improved by including an “exit” option that would allow the session to be terminated prematurely, thus avoiding having to completely restart the programme from the beginning, which included having to go through the introduction again.

Staff also highlighted the cumbersome set up process, which entailed a lengthy set up that used up clinical time, only for the participants ultimately to interact minimally with the intervention. Therefore, reducing the set-up time may increase staff motivation to use the intervention. Timing issues were also raised in the consultations with inpatient staff (Brown *et al.*, 2022). Moreover, staff commented on the safety concerns they had relating to the wires when the patient was wearing the headset. This highlights the need for a wireless headset that may mitigate this concern and thus enhance the overall suitability and safety of the interventions use for a wider range of individuals. Interestingly, this was not mentioned in the consultation group (Brown *et al.*, 2022) and demonstrates that there are certain issues that can only be identified when they are actually trialled in the clinical setting. Previous studies using VR headsets in an inpatient setting have employed a wireless remote headset that minimised any potential danger associated with wire connections (Rose *et al.*, 2021). Further, the sensitivity of the gameChange VR intervention that allows participants to interact with the avatars and objects within the scenarios was considered to require

improvement. Some patients reported that they had difficulty in picking up objects in the shop. Therefore, a review of the headset interaction capabilities would be required as this is a key component to exposure therapy, ensuring that the participants are able to interact with the virtual environment.

These issues highlight some of the key differences that exist between an outpatient clinic and a secure inpatient setting. In the former, the gameChange VR setup is static and the patients enter into the room and participate in the therapy. However, in an inpatient facility, the setup has usually to be brought to the patient's ward area set up in advance of the session, which can take time. The therapy room may not be ideally suited for use for gameChange VR (size, room to move), and the challenges with leads and connections have been highlighted by the staff. There is also the additional set-up time that has to be factored into the overall therapy time. Some staff commented upon the frustrations that arose due to the time-consuming nature of setting up the intervention, which would then detract from their clinical time. Therefore, a consideration for future implementation of the intervention would be to ensure that adequate provision is in place for the sessions to be set up (Chung *et al.*, 2022). Appropriate staff training should also be provided to equip staff with the knowledge on how to manage any problems that could arise including having to reboot the system, which could detract from therapeutic time or even leading to cancellations (Brown *et al.*, 2022).

The study further shed light on considerations required to ensure the successful implementation for clinical practice. A key component required to ensure a smooth session is that clinical staff are appropriately trained to use the headset including manage any issues which may arise when the patient is in the session. While technical assistance was available during this trial as the researchers had purchased the programme from the manufacturers, this was only available during certain times.

Another key comment from staff was the suggestion to include more relevant scenarios bespoke to the individuals wearing the headset, highlighting the need to personalise the scenarios to the individuals' current situations, with the intention to build upon the challenging scenarios as they develop their fear response. While gameChange VR was aimed at an outpatient clinic and considered to be an automated therapy that can be successfully managed by the patients themselves (Bond *et al.*, 2023), its benefit in more complex inpatients may be limited. There are six scenarios, each with five different levels. However, these could be considered as being generic and may require to be nuanced to be able to address the needs of individual patients. However, for this particular patient group, VR could be considered as being only one part of an overall therapeutic journey.

While the VR was well received by staff and patients, with many highlighting a noticeable improvement, there were also suggestions that a gradual transition to real world scenarios would be required. Moreover, this can be achieved through a gradual exposure, through the use of more challenging scenarios with the final sessions leading to an ultimate real world exposure. Subsequently, there was a call for increasing the number of sessions over a longer period of time, to ensure there can be gradual exposure into more challenging circumstances. This highlights the requirement for gameChange VR to form part of a personalised recovery package which can be adapted according to an individual's needs rather than a standard six week block of VR therapy with a fixed number of levels of difficulty. Other VR therapeutic approaches, such as social cognition training (Nijman *et al.*, 2023), can be much more readily targeted towards the individual and may be more suited towards the complex inpatient population who participated in the current study. Indeed, staff commented upon certain aspects of the scenarios such as being able to converse with avatars not being possible, but which would be useful additions in order that the VR could emulate all aspects of the real life scenario through which the patient could then work. Indeed, personalisation was identified as a

potential topic in discussions with staff and inpatients by the Oxford group when they held preliminary consultations (Brown *et al.*, 2022). An active dialogue approach has been trialled successfully using VR in the DiScVR social cognition training where a trained qualified psychologist “acts out” the part of the avatar and can react according to how the patient is behaving in the scenario (Nijman *et al.*, 2023).

One potential cause of disengagement for patients in the current study may have stemmed from their perception of the VR therapy being a game and therefore any confidence that they may gain in the virtual scenario may not translate into the real life situation. However, participants in the gameChange VR clinical trial felt that the VR scenarios provided a “place to practice” and that it provided a safe place to “learn about their fears” that could be successfully managed by the patients themselves (Bond *et al.*, 2023). The differences may arise from the specific patient populations and their specific circumstances (inpatient versus community) and may again underline the different therapeutic requirements of the individual patient groups.

While the patient feedback from the outpatient study was largely positive (Bond *et al.*, 2023), it acknowledged that it only recruited those who successfully completed the full course of therapy. There was no feedback from those who dropped out from the study (34 out of 174 completed three or fewer of the six outpatient VR sessions), or the reasons for this. Furthermore, there were no discussions about extended therapy sessions or whether participants felt that they may benefit from future VR therapy in this area, considering that some of the participants in the current trial highlighted this as a particular issue.

Those who became disengaged or dropped out from the current study attributed this to the loss of novelty leading to boredom and the participants becoming disengaged. Therefore, for future studies, an improvement may be to enhance the number of levels of scenarios through which the participants have to progress. Moreover, staff felt that some of the patients who participated in the study were not all at the most appropriate stage in their treatment journey to benefit from the VR therapy. For example, improving a social phobia through a virtual park visit may not be feasible for real world transference if the patient is not then entitled to ground leave or pending discharge. Therefore, the benefits of VR may not be realised unless patients have the leave access which will allow them to implement the skills that which they have learned. Therefore, enhancing the level of personalisation within the VR may also hold increased success rates for participant retention.

Nevertheless, the current study had several limitations. The small sample size has meant that generalisability is limited and therefore further replication with a wider cohort is required to ascertain its true success. Furthermore, as the study was largely using qualitative feedback, the lack of confidence ratings and inability to gather PROs has meant there is limited information pertaining to a before/after exposure fear level, the gathering of which may allow for richer data and a clearer numerical demonstration of the VR’s success. However, such a study would require a large relatively narrow patient population.

Overall, the response from patients suggests that the therapy is acceptable and may be beneficial; feedback from staff also indicates that the technology is easy to use and implement and they observed some clinical benefit for their patients. However, both identified potential areas for improvement and the potential for translation into the real world setting.

While gameChange VR could be a very beneficial therapeutic tool for some patients, this study demonstrates numerous factors that may influence its impact. Overall, the study does demonstrate that a VR intervention targeting social avoidance is feasible and acceptable to patients in an inpatient secure mental health care setting. However, despite previous studies demonstrating its clinical effectiveness in outpatient facilities (Freeman *et al.*, 2022a, 2022b) which can be cost-effective in his environment (Altunkaya *et al.*, 2022), further research is

required to ascertain its usefulness in a specialist inpatient population. This will determine whether it will require adaptation for this dedicated population and particularly for which individual stage of their therapeutic journey it may be most beneficial.

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