

Understanding public perceptions of virtual reality psychological therapy: development of the attitudes towards virtual reality therapy (AVRT) Scale

Aislinn D Gomez Bergin, Aoife M Allison, Cassie M Hazell

Submitted to: JMIR Mental Health
on: April 27, 2023

Disclaimer: © The authors. All rights reserved. This is a privileged document currently under peer-review/community review. Authors have provided JMIR Publications with an exclusive license to publish this preprint on its website for review purposes only. While the final peer-reviewed paper may be licensed under a CC BY license on publication, at this stage authors and publisher expressly prohibit redistribution of this draft paper other than for review purposes.

Table of Contents

Original Manuscript.....	5
Supplementary Files.....	28
Multimedia Appendixes	29
Multimedia Appendix 1.....	29

Preprint
JMIR Publications

Understanding public perceptions of virtual reality psychological therapy: development of the attitudes towards virtual reality therapy (AVRT) Scale

Aislinn D Gomez Bergin^{1, 2, 3, 4*} PhD; Aoife M Allison^{3*} MSc; Cassie M Hazell^{5*} PhD

¹National Institute of Health and Care Research MindTech MedTech Co-operative Institute of Mental Health University of Nottingham Nottingham GB

²National Institute of Health and Care Research Nottingham Biomedical Research Centre University of Nottingham Nottingham GB

³Mental Health and Clinical Neurosciences School of Medicine University of Nottingham Nottingham GB

⁴School of Computer Science University of Nottingham Nottingham GB

⁵Department of Psychological Interventions School of Psychology University of Surrey Guilford GB

*these authors contributed equally

Corresponding Author:

Aislinn D Gomez Bergin PhD

National Institute of Health and Care Research MindTech MedTech Co-operative

Institute of Mental Health

University of Nottingham

Jubilee Campus

Triumph Rd

Nottingham

GB

Abstract

Background: Virtual reality (VR) psychological therapy has the potential to increase access to evidence-based mental health interventions by automating their delivery while maintaining outcomes. However, it is unclear whether these more automated therapies are acceptable to potential users of mental health services.

Objective: The main aim of this study was to develop a new, validated questionnaire to measure public perceptions of virtual reality therapy including those guided by a virtual coach. We also aimed to explore these perceptions in greater depth and test how aspects such as familiarity with VR and mental health are associated using both quantitative and qualitative approaches.

Methods: We used a cross-sectional mixed-methods design and conducted an exploratory factor analysis of a questionnaire that we developed, the attitudes towards virtual reality therapy (AVRT) Scale, and a qualitative content analysis of data collected during completion.

Results: We received a total of 295 responses and identified four factors within the AVRT Scale. The four factors are: (1) attitudes towards VRT, (2) expectation of presence, (3) preference for VRT, and (4) cost-effectiveness. We found that being more familiar with VR was correlated with more positive attitudes towards VRT (factor 1), a higher expectation of presence (factor 2), preference for VRT over face-to-face therapy (factor 3), and believing that VRT is cost-effective (factor 4). Qualitative data supported our factors and indicated that VRT is acceptable when delivered at home and when guided by a virtual coach.

Conclusions: This study is the first validated scale to explore attitudes towards VRT, including VRT guided by a virtual coach, within the general population. Our findings indicate that people are willing to try VRT, particularly as it offers increased access and choice, and that as VR becomes more ubiquitous, so too will positive attitudes towards VRT.

(JMIR Preprints 27/04/2023:48537)

DOI: <https://doi.org/10.2196/preprints.48537>

Preprint Settings

1) Would you like to publish your submitted manuscript as preprint?

Please make my preprint PDF available to anyone at any time (recommended).

✓ Please make my preprint PDF available only to logged-in users; I understand that my title and abstract will remain visible to all users

Only make the preprint title and abstract visible.

No, I do not wish to publish my submitted manuscript as a preprint.

2) If accepted for publication in a JMIR journal, would you like the PDF to be visible to the public?

✓ **Yes, please make my accepted manuscript PDF available to anyone at any time (Recommended).**

Yes, but please make my accepted manuscript PDF available only to logged-in users; I understand that the title and abstract will remain visible.

Yes, but only make the title and abstract visible (see Important note, above). I understand that if I later pay to participate in <http://www.jmir.org>, I will be able to access the full text of my manuscript.



Original Manuscript

Understanding public perceptions of virtual reality psychological therapy: development of the attitudes towards virtual reality therapy (AVRT) Scale

Authorship line:

Aislinn D Gómez Bergin (*PhD*)^{1,2,3}, Aoife M Allison (*MSc*)³, Cassie M Hazell (*PhD*)⁴

Affiliations:

¹ NIHR MindTech MedTech Co-operative, Institute of Mental Health, School of Medicine, University of Nottingham, Innovation Park, Triumph Road, Nottingham, UK

²NIHR Nottingham Biomedical Research Centre, Institute of Mental Health, University of Nottingham, Innovation Park, Triumph Road, Nottingham, UK

³Mental Health and Clinical Neurosciences, School of Medicine, University of Nottingham, Queen's Medical Centre, Nottingham, UK

⁴Department of Psychological Interventions, School of Psychology, University of Surrey, Guilford, UK

Corresponding author:

Aislinn D Gómez Bergin aislinn.bergin@nottingham.ac.uk

Institute of Mental Health, Mental Health and Clinical Neurosciences, University of Nottingham, Innovation Park, Triumph Road, Nottingham, NG7 2TU, UK

Abstract

Background: Virtual reality (VR) psychological therapy has the potential to increase access to evidence-based mental health interventions by automating their delivery while maintaining outcomes. However, it is unclear whether these more automated therapies are acceptable to potential users of mental health services.

Objective: The main aim of this study was to develop a new, validated questionnaire to measure public perceptions of virtual reality therapy guided by a virtual coach. We also aimed to explore these perceptions in greater depth and test how aspects such as familiarity with VR and mental health are associated using both quantitative and qualitative approaches.

Methods: We used a cross-sectional mixed-methods design and conducted an exploratory factor analysis of a questionnaire that we developed, the attitudes towards virtual reality therapy (AVRT) Scale, and a qualitative content analysis of data collected through free-text responses during completion of the questionnaire.

Results: We received a total of 295 responses and identified four factors within the AVRT Scale. The four factors are: (1) attitudes towards VRT, (2) expectation of presence, (3) preference for VRT, and (4) cost-effectiveness. We found that being more familiar with VR was correlated with more positive attitudes towards VRT (factor 1), a higher expectation of presence (factor 2), preference for VRT

over face-to-face therapy (factor 3), and believing that VRT is cost-effective (factor 4). Qualitative data supported our factors and indicated that VRT is acceptable when delivered at home and when guided by a virtual coach.

Conclusion: This study is the first validated scale to explore attitudes towards VRT guided by a virtual coach, within the general population. Our findings indicate that people are willing to try VRT, particularly as it offers increased access and choice, and that as VR becomes more ubiquitous, so too will positive attitudes towards VRT. Future research should seek to further validate the AVRT Scale.

Keywords: psychological interventions; digital; virtual reality; virtual agent; mental health; presence

Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Introduction

Virtual reality (VR) relates to an immersive environment within which people can interact using either computer equipment such as a screen and mouse or through VR-enabled headsets and controllers, where additional sensors can track the users' actions in real time. This latter application provides people with a greater sense of presence, a term used to describe how closely a virtual environment is interpreted as real [1]. VR has, in recent years, been used successfully in a range of healthcare settings to improve and increase access to treatment [2]. In particular, VR has been used in the delivery of psychological therapies for a range of mental health problems, with several decades of evidence demonstrating its clinical efficacy in the treatment of psychosis, depression, anxiety, and eating disorders [3]–[8].

VR therapies (VRTs) were initially developed to be used by therapists as an adjunct or tool in their delivery of therapy. However, the need for a real-world therapist to deliver VRTs presents a key challenge to their widespread implementation [9]. Researchers have shown that the automation of some therapeutic elements may overcome this barrier to meet the increase in demand for treatment globally [10], [11]. Emerging evidence demonstrates that VRTs can be successfully delivered with little to no therapist involvement, with virtual coaches instead supporting people in receipt of therapy for fear of heights and agoraphobia in the context of psychosis [10], [11]. Virtual coaches are also known as virtual agents [12]. These characters are not under human control and therefore offer automation of therapies, where dialogue and responses are scripted, instead of the formulation that is offered by real-world therapists.

There are financial and resource incentives for mental health services to offer more automated therapies [13]. Clinicians also appear to generally be in support of VRTs. For example, cognitive behaviour therapists [14] and psychiatric healthcare staff [15] reported positive attitudes towards VRT, particularly when they were more familiar with VR. But these studies do not consider how staff feel about VRT guided by a virtual coach, and, arguably more importantly, do not explore patient and public perceptions of VRT. VRT drop-out rates have been used as a proxy measure of patient experience and these figures show similar dropout rates to therapies delivered without VR [16]. However, dropout rates from research do not provide us with a clear picture of whether people will be more or less likely to take up therapies that are delivered using VR, including those guided by a virtual coach. A content analysis of Facebook posts by the general public appears to suggest at a minimum an interest in VR's application within mental healthcare [17]. Staff and service users also have positive views towards their use in mental health inpatient facilities [18]. Yet, these studies still do not directly ask potential users of mental health services whether they would be willing to try VRT guided by a virtual coach or factors that relate to this willingness.

Healthcare staff, when asked for their views on what they thought service users would think of VRT, had concerns as to whether patients would be willing to accept their use as part of their mental health care package [19]. The literature has also highlighted a lack of personalisation as a barrier to engagement with digital mental health interventions more broadly [20]. It is unclear whether this

indicates automated VRTs can be sufficient when scripts are relevant to the experience of the individual. It is possible that the presence of a virtual coach will encourage more positive attitudes and a willingness to try VRTs. There is a need to understand service user and public perspectives on the use and delivery of VRTs and those guided by a virtual coach, and how different factors may impact on the uptake of such interventions.

Aim

The main aim of this study is to establish a new, validated questionnaire to measure perceptions of VRT guided by a virtual coach. Secondary to this, we aimed to explore how these perceptions are associated with familiarity with VR and mental health using both quantitative and qualitative approaches.

Methods

Study Design

The present study used mixed methods with a cross-sectional design. Data were collected using an online questionnaire, using Jisc software [21].

Participants

Participants were recruited via social media to complete the online questionnaire. We aimed to recruit a minimum of 200 participants in line with sample size recommendations for exploratory factor analysis (EFA) [22]. To be eligible to participate, persons were required to be: a resident of the UK or Ireland, and aged 18 years or over. A link to the online survey was included in all promotional materials.

Measures

Demographics

Participants were asked to provide basic demographic information, including their age and gender identity, as well as whether they identified as having a mental health condition, had ever experienced therapy, or had supported anyone with a mental health condition. They were also asked their experience of VR (from never to ten or more times), as well as their familiarity with VR, VRT and mental health conditions.

The AVRT Scale

The attitudes towards virtual reality therapy (AVRT) Scale was developed by AA and AGB. Items were based on themes identified in previous literature that contribute towards perceptions of VRT and digital mental health interventions [14], [23]–[29]. Items surrounding the virtual coach drew on the literature related to therapeutic alliance and focused on trust, comfort, and need [30].

We designed 54 items all assessing different aspects of attitudes towards VRT, including nine related to attitudes about VRT delivered by a virtual coach. Each item used a seven-point Likert-scale where participants rated their agreement from ‘strongly agree’ to ‘strongly disagree’. Strong agreement or disagreement on 16 of these items triggered a free-text question for participants to provide context using free-text responses. Responses were scored from 1 (strongly disagree) to 7 (strongly agree). A higher score indicates more positive perceptions of VRT. A total of 27 items were reverse-worded and therefore reverse coded.

Participants were also invited to respond to three additional free-text questions asking what they would like to know more about, how they think their level of VR experience has influenced their

perceptions, and what they think the best setting for VRT would be.

Procedure

Upon opening the questionnaire, participants were first shown the information sheet followed by a consent statement. After consenting, participants were asked to enter a unique identification code so that their anonymised responses could be identified later. Participants were then asked to provide basic demographic information followed by an explanatory paragraph (see Multimedia Appendix 1: Supplementary Material) about VRT and the virtual coach, which was described as “a computer-generated avatar” that “guides the patients through the scenarios and offers advice and encouragement”. This was followed by items on experience with VR and mental health, the AVRT Scale, and the three free-text questions. After completing these questionnaires, participants were presented with a debrief statement.

Ethics

Ethical approval was granted by The Division of Psychiatry and Applied Psychology ethics sub-committee at the University of Nottingham (Project ID 1534).

Statistical Analysis

Raw data were downloaded from Jisc [21] into IBM SPSS Statistics 25 [31]. We removed responses from participants that did not meet the inclusion/exclusion criteria, provide consent and/or had missing data. The sample characteristics were summarised using descriptive statistics.

To validate our new questionnaire, we conducted an exploratory factor analysis using principal component analysis with a varimax rotation. We assessed the suitability of the data for factor analysis using Bartlett's test of sphericity and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (acceptable adequacy $\geq .6$). All 54 items with Likert scales were included in the EFA. Items were firstly screened to check for multicollinearity and poor correlations with the other items. We operationalised this screening by assessing the determinant and searching for any inter-item correlations of $\geq .7$ or where the majority of coefficients were non-significant and/or $< .4$. Any items that failed this initial screening were removed and the EFA was re-run. Factors were derived by Eigenvalues ≥ 1 where Kaiser's criterion [32] were met, and in combination with the point of inflexion on the Scree Plot where they were not. For factors to be retained they must be comprised of at least three items. Where items loaded onto more than one factor, the item was assigned to the factor with which it made most thematic sense.

The questionnaire included both positively and negatively worded items. Once factors were established, we reverse-scored negatively worded items so that a higher score indicated a more favourable attitude. We then assessed the internal consistency of the final factor structure using Cronbach's alpha, with acceptable internal consistency considered to be ≥ 0.7 [33]. Further items may be removed at this point where the scale reliability can be substantially improved if the item was removed. The factor scores were computed using the mean and standard deviation of the scale sum.

To assess whether there was a relationship between the scale totals of the derived factors and lived experience of VR, VRT, and mental health problems we conducted a series of Pearson's r correlations.

Qualitative Analysis

All responses to the free-text response questions (i.e. 16 free-text boxes triggered by extreme responses to survey questions, and three additional free-text questions) were uploaded onto NVivo (version 12 for Mac). Qualitative content analysis [34] was used to quantify and summarise the qualitative data, within the broader context of the AVRT Scale. All data was coded inductively by a

qualitative researcher (AGB) where several codes could be applied to a single response. Codes were collated by question or item. The study team met to review and revise any discrepancies or discuss any questions that arose. Findings were then summarised according to each question or item and are presented within the factors of the AVRT Scale.

Results

Sample characteristics

We collected 295 responses to the survey. Our sample reflected a range of ages. The majority were female, had used VR at least once, and had no personal or professional experience of mental health problems. However, most had supported a friend or family member with poor mental health. See Table 1.

		n(%) or M(SD)
What is your age (in years)?		
	18-24	89(30.2)
	25-29	39(13.2)
	30-39	45(15.3)
	40-49	49(16.6)
	50-64	64(21.7)
	65+	9(3.1)
What is your gender identity?		
	Male	83(28.1)
	Female	209(70.8)
	Prefer not to say	3(1.0)
How many times have you experienced virtual reality?		
	Never	112(38.0)
	Once	48(16.3)
	Less than 5 times	88(29.8)
	5-9 times	20(6.8)
	10 times or more	27(9.2)
Do you identify as having a mental health condition?		
	Yes	102(34.6)
	No	181(61.4)
	Prefer not to say	12(4.1)
Have you ever experienced therapy for a mental health condition?		
	Yes	131(44.4)
	No	160(54.2)
	Prefer not to say	4(1.4)
Have you ever supported a friend/family member/colleague with a mental health condition?		
	Yes	253(85.8)
	No	39(13.2)
	Prefer not to say	3(1.0)
Have you ever worked in a caring role for people with mental health conditions?		
	Yes	108(36.6)
	No	186(63.1)
	Prefer not to say	1(0.3)

How familiar are you with virtual reality?		2.33(1.02)
How familiar are you with virtual reality therapy?		1.35(0.75)
How familiar are you with mental health conditions?		3.65(0.96)

Table 1. Sample characteristics. *Note:* VR = virtual reality.

Quantitative Analysis

Item screening

The data were found to be appropriate for EFA ($KMO = .93$; $X^2(1431) = 10205.48$, $p < .001$). The determinant suggested there is multicollinearity and inspection of the correlation coefficients revealed two pairs of items that were highly correlated (items 7 and 8 = .83; items 36 and 37 = .87) – we therefore removed one item from each pair of correlations (items 8 and 36). Items 13, 32, and 33 were removed as the majority of inter-item correlations were non-significant. We also removed items 6, 19, 25, 26, 28, 31, and 47 as either all or all but one of the correlation coefficients were below .4. In total we removed 12 items, and then re-ran the EFA on the remaining 42 items.

The determinant again indicated that multicollinearity was still an issue. We identified three pairs of correlations with coefficients greater than .7 (items 10 and 11 = .76; items 29 and 49 = .76; items 35 and 37 = .71) – we therefore removed one item from each pair (items 10, 29, and 35) and re-ran the EFA on the remaining 39 items.

Exploratory Factor Analysis

Kaiser's criterion were met ($n = 295$; average communalities = .64) [32]. The factor structure was therefore determined based on Eigenvalues greater than 1. The rotated factor solution suggested 7 factors explaining 63.64% of the variance. However, 3 factors were not retained as the factors contained less than 3 items. The removal of these factors resulted in items 7, 23, 24, 27, 48, and 49 being removed. The resultant 33 items were entered into a final EFA. A four-factor solution was suggested based on both the Eigenvalues and the Scree plot, explaining 58.61% of the variance.

Factor 1 had 13 items that assessed respondents' support for VRT, including 6 reverse worded items (factor 1: attitude towards VRT). Factor 2 had 9 items. The items, including 7 reverse-worded items assessed the extent to which respondents had expected VRT to be immersive (factor 2: expectation of presence). Factor 3 had 7 items asking respondents to compare VRT to aspects of face-to-face therapies (factor 3: preference for VRT). Factor 4 had 4 items each assessing different aspects of the cost-effectiveness of VRT (factor 4: cost-effectiveness). See Multimedia Appendix 1: Supplementary Material for the final factor structure.

Scale reliability

After reverse-scoring those items that were reverse-worded we computed the Cronbach's alpha values for each scale. All scales had strong internal consistency (Cronbach's $\alpha \geq .82$). The scale reliabilities could not be improved by removing any of the items. A higher score on each of the subscales suggests a more favourable attitude (factor 1), increased perceived presence (factor 2), a preference for VRT over traditional therapies (factor 3), and agreement that VRT is cost-effective (factor 4). The desired direction for each subscale to demonstrate support for VRT is high for factors 1, 3 and 4, and low for factor 2.

Relationship between scales and lived experience

There was a significant relationship between how familiar participants were with VR and their scores on all factors. Familiarity with VR was positively associated with a more favourable attitude towards VRT (Factor 1), higher expectations of presence (Factor 2), a preference when compared with face-to-face therapy (Factor 3), and belief that VRT is cost-effective (Factor 4). We also found significant

positive correlations between factors 1, 2, and 3, but not factor 4, and familiarity with VRT. There was no significant correlation between mental health familiarity and scores on any of the factors. See Table 2 for correlation coefficients and associated significance scores.



		Factor loading							VR familiarity		VRT familiarity		Mental health familiarity	
	Item	1	2	3	4	Scale M(SD)	Variance explained (%)	Cronbach's α	r	p	r	p	r	p
Factor 1: Attitude toward VRT						69.68(11.95)	18.93	.92	.35	<.001	.21	<.001	.11	.06
41	If the virtual coach encouraged me to do something between sessions, I would try to do it.	.74												
51	I would never be willing to try virtual reality therapy.*	.68												
50	I would be willing to try virtual reality therapy if I had more information about it.	.67												
52	I would encourage the people I care about to try virtual reality therapy, if it was offered to them.	.67												
53	I would discourage the people I care about to try virtual reality therapy, if it was offered to them.*	.65												

5	I would listen to the virtual coach.	.65												
3 4	No amount of practice would make me want to use virtual reality therapy.*	.63												
5 4	I cannot imagine virtual reality therapy being useful for someone with mental health problems.*	.62												
3 7	I am optimistic about virtual reality therapy being used in clinical settings.	.61												
4 2	I would feel comfortable interacting with the virtual coach.	.57												
3 8	I have a negative attitude towards virtual reality therapy.*	.55	[.50]											
2 2	I think that using technology for therapy is positive.	.53												
4	I would not trust a virtual coach.*	.42												
Factor 2: Expectation of presence						38.85(10.00)	16.15	.89	.40	<.001	.28	<.001	-.04	.55

14	I would feel like I was acting during virtual reality therapy.*		.69											
11	Virtual reality therapy would not be effective for me because I would be mindful that it is not real-life.*		.67	[.42]										
9	I do not think the virtual environment would feel real.*		.66											
43	I would find the characters in the virtual reality therapy unsettling.*		.65											
30	Potential side effects of virtual reality therapy would put me off using it.*		.63											
45	I am sceptical about the effectiveness of virtual reality therapy.*		.56	[.42]										
44	I think that the virtual reality therapy would make me feel present enough to be effective.		.56											
2	I would decline virtual reality therapy because I would prefer		.54											

	face-to-face therapy.*													
1 2	I think that the virtual environment would feel real.		.48	[.45]										
Factor 3: Preference for VRT					23.59(6.81)	14.86	.87	.25	<.001	.14	.02	-.06	.27	
3 9	I think virtual reality therapy would be better than face-to-face therapy.			.76										
3	I would trust a virtual coach more than a real therapist.			.73										
1 6	I believe that virtual reality therapy is more effective than face-to-face therapy.			.72										
1 7	I believe that virtual reality therapy is equally effective as face-to-face therapy.			.69										
4 0	I would trust a virtual coach the same amount as a real therapist.			.59										
1 5	I believe that virtual reality therapy is less effective than face-to-face therapy.*		[.47]	.59										
1	I would choose face-		[.45]	.54										

	to-face therapy over virtual reality therapy.*													
Factor 4: Cost-effectiveness						20.39(4.18)	8.67	.82	.15	.01	.10	.08	.01	.89
20	I think that using virtual reality therapy would save the NHS money in the long-term.				.87									
18	I think virtual reality therapy would be more cost-effective than face-to-face therapy.				.77									
21	I think that using virtual reality therapy would cost the NHS more money in the long-term.*				.76									
46	I think virtual reality therapy will be worth the cost.	[.40]			.60									

Table 2. Factor structure and loadings. *Note:* * = reverse-worded items; M = mean; SD = standard deviation; *r* = Pearson’s *r*; secondary loadings are given in brackets.

Qualitative Results

Table 3 presents the number of responses for both the questions and those items where either strong agreement or disagreement elicited a qualitative response.

Type of Data	Question	Responses	
Qualitative Questions			
Qualitative Question 1	Which aspects of virtual reality therapy guided by a virtual coach would you like to know more about?	226	
Qualitative Question 2	How has your previous experience of virtual reality (minimal or extensive) influenced your perceptions of virtual reality therapy guided by a virtual coach?	236	
Qualitative Question 3	If you were offered virtual reality therapy guided by a virtual coach, where do you think the best place to do the therapy would be?	245	
Factor 1: Attitudes towards VRT (42, 43)		Strongly Agree	Strongly Disagree
Item 41	If the virtual coach encouraged me to do something between sessions, I would try to do it.	18	1
Item 51	I would never be willing to try virtual reality therapy.	3	60
Item 50	I would be willing to try virtual reality therapy if I had more information about it.	21	3
Item 52	I would encourage the people I care about to try virtual reality therapy, if it was offered to them.	14	2
Item 53	I would discourage the people I care about to try virtual reality therapy, if it was offered to them.	1	24
Item 54	I cannot imagine virtual reality therapy being useful for someone with mental health problems.	2	22
Item 42	I would feel comfortable interacting with the virtual coach	10	4
Factor 2: Expectation of presence (47, 49, 50, 52, 40)		Strongly Agree	Strongly Disagree
Item 43	I would find the characters in the virtual reality therapy unsettling.	1	5
Item 45	I am sceptical about the effectiveness of virtual reality therapy.	6	7
Item 44	I think that the virtual reality therapy would make me feel present enough to be effective.	3	4
Factor 3: Preference for VRT (54, 39, 53, 41)		Strongly Agree	Strongly Disagree
Item 39	I think virtual reality therapy would be better than face-to-face therapy.	2	27
Item 40	I would trust a virtual coach the same amount as a real therapist.	4	16

Factor 4: Cost-Effectiveness (46)		Strongly Agree	Strongly Disagree
Item 46	<i>I think virtual reality therapy will be worth the cost.</i>	6	3
Non-Factor Answers (45, 48, 44, 51)		Strongly Agree	Strongly Disagree
Item 47	<i>I think I would be able to use the virtual reality equipment easily.</i>	24	2
Item 49	<i>I think that virtual reality equipment could spread diseases.</i>	0	19
Item 48	<i>If my skills with technology were poor, I would feel confident using virtual reality therapy if the healthcare professional accompanying me was trained to a high standard.</i>	17	2

Table 3. Qualitative responses to questions and answers.

Qualitative Questions

Which aspects of VRT guided by a virtual coach would you like to know more about?

Nineteen indicated they did not want to know anything more. Those who provided reasons indicated that they did not want to try it or did not know enough. Twenty-two indicated that as they did not know enough, they would like to find out more. Five indicated that they would like to try out the VRT and nine asked about how much it would cost. Thirteen were curious about the conditions that could be targeted with the VRT, specifically asking about its use for anxiety disorders, depression, and emotion regulation.

Many asked how it could be tailored or personalised to them individually (n=29/226; 12.83%). For several this meant thinking also about their own position within the interaction, asking about safety or how much control they would have, whether the VRT might have a negative effect and how this would be monitored. They asked about the virtual coach (n=47/226; 20.80%), wanting to know how real it would be, how much of the language would be generic or responsive to them, and how they could build a relationship with a virtual coach. They wanted more information about whether there was a real therapist involved and how involved they would be (n=11/47; 23.40%) – if they would be able to meet them in person, if they would deliver the therapy live or preprogramme the coach, or if the virtual coach would be fully AI. The realness of the virtual coach, as well as the VRT (n=16/226; 7.08%), were also important questions posed by participants – including asking whether it would be realistic enough and comparing it to “real” or face-to-face therapy.

Most additional responses indicated that they would like to know more about the process (n=67/226; 29.65%). This included practical questions around the frequency of use, the length of sessions, and how it would be delivered (e.g. in what location). Many also asked about the content (n=26/226; 11.50%), particularly the scenarios that could be represented but also other aspects including the appearance, the script, and how the content could link with face-to-face therapy. Eleven asked about the technical aspects including the development of the coach (e.g. whether an algorithm or artificial intelligence was used) and what equipment would be used to deliver the VRT.

How has your previous experience of virtual reality (minimal or extensive) influenced your perceptions of VRT guided by a virtual coach?

The largest group of those answering this question indicated that they had no previous experience (n=79/236; 33.48%). Some of those without experience were positive or curious (n=19) whilst others expressed more negative perceptions about its effectiveness as a therapeutic tool, anticipating that it would not feel real or tailored enough to the individual (n=8). The second largest group felt that their previous experience had helped them to be more positive (n=59). Although several mentioned using VR for gaming, they felt that it was effective at producing a level of presence that would be conducive to therapy and help to invoke real emotions and responses. They felt it was easy to use, could potentially lower costs, and make therapy more accessible. Some had already used VRTs and felt that it had been a positive experience or linked it to their own experience of mental health and how it could be used for treatment. Several also felt that despite negative experiences such as motion sickness or technical difficulties that they still had a positive perception of VRT.

However, those with a more negative perception (n=34) also mentioned nausea or dizzy, whilst others perceived VR as more suited to games. Others also had problems with the quality of the experience, feeling that it had not offered enough presence. However, those with a negative experience were the smallest group. Finally, the third largest group felt that their previous experience would not influence how they felt about VRTs guided by a virtual coach (n=40). For some their previous experience could not inform their perception about VRTs as it had been for entertainment purposes, or they had too little experience to be able to make a judgement (n=13).

If you were offered virtual reality therapy guided by a virtual coach, where do you think the best place to do the therapy would be?

The largest group of respondents who identified a single location felt it would be best delivered within the home (n=84/245; 34.29%) whilst the second largest group felt it would be best delivered in a more professional location (n=43). Several felt it could be offered in both settings (n=38) whilst others suggested access first either through a clinic (n=12), where they could access technical or therapeutic support, or from home (n=4), where they would feel more comfortable. When respondents highlighted delivery from home, they described it as safe, comfortable, and familiar. They felt they might feel vulnerable or disorientated when coming out of a VRT session and that being at home would be preferable. Similarly, more professional locations like doctor surgeries or clinics were also described as safe and familiar, although by fewer people. Professional or clinical settings were often viewed as a better location due to the presence of support. Other reasons included the level of cleanliness offered and that there would be fewer distractions.

For those without a preference, they identified elements of the location that were necessary to optimise the experience. These included having space to move, feeling safe and secure (for instance in an enclosed space), having privacy and quiet, feeling safe, and having few distractions. They also felt it would need to take into consideration the condition being treated (including severity) and the individual's preferences.

Factors with Item Responses

Factor 1: Attitude towards VRT

Individuals who scored highly on this factor had a positive attitude towards VRTs and VRTs delivered by a virtual coach, whilst those who scored low had a negative attitude. Within the

items where strong agreement or disagreement elicited a text response (items 41, 51, 50, 52, 53, 54, 42) those who had positive attitudes highlighted the value of having choice in mental health therapies. They emphasised the need to be willing to try different treatments to find one that works, reflecting on how more automated and digital options can help to increase access. Those with more negative attitudes were those who indicated that it would be a type of therapy they would not choose.

Factor 2: Expectation of presence

Individuals who scored highly on this factor felt that VR would not be real enough, i.e. low presence. Individuals who scored low felt that VR was immersive. Within the items where strong agreement or disagreement elicited a text response (items 43, 45, 44) the respondents indicated several factors that impacted on their expectation that the VR would be 'real enough'. Previous experience appeared linked to the expectation of presence. People that had enjoyed their experiences had a greater expectation of presence. Those with a lower expectation felt that the VRT would be too much like a game, whilst others indicated that experiencing cybersickness meant they had not felt present.

Factor 3: Preference for VRT

Individuals who scored highly on this factor showed a preference for VRT whilst those who scored low showed a preference for face-to-face therapy. Within the items where strong agreement or disagreement elicited a text response (39, 40) there was a strong sense that those who preferred face-to-face therapy would feel the loss of the human interaction most and they felt that a real person was needed to build a relationship and trust. Those who were more in favour of a VRT and the virtual coach felt that it would be more convenient and potentially enable more disclosures related to their mental health.

Factor 4: Cost-effectiveness

Individuals who scored high on this factor felt that VRT was cost-effective, whilst those who scored low did not. Within the item where strong agreement or disagreement elicited a text response (46) those who felt it was more cost-effective highlighted the decreasing costs of equipment and benefits that this could bring to mental health services. For those who felt VR was still too expensive there was also recognition of the difficulties that services might have in adopting VR.

Discussion

Overview

The current study aimed to develop a new instrument for assessing the perception of VRT delivered by a virtual coach within the general public. We received a total of 295 responses. We found a four-factor solution was the best fit for the AVRT Scale, with all subscales found to have excellent internal consistency. The four factors are: (1) attitudes towards VRT, (2) expectation of presence, (3) preference for VRT, and (4) cost-effectiveness. We found that being more familiar with VR was correlated with more positive attitudes towards VRT (factor 1), a higher expectation of presence (factor 2), preference for VRT over face-to-face therapy (factor 3), and believing that VRT is cost-effective (factor 4). Familiarity with mental health was not associated with any factor. The qualitative data supported the quantitative findings with many respondents echoing that their previous experience with VR may impact their perception of VRT. Respondents identified their home and spaces that felt safe and quiet as the best locations for delivering VRT. The virtual coach was a salient concept throughout the

qualitative responses, with participants wanting to better understand it and the relationship that could be facilitated.

Key Findings

Previous literature has indicated a correlation between VR familiarity and more positive attitudes towards VRTs [14], however this is the first study to demonstrate this in a survey of the general public. Although we do not know the direction of this association the qualitative findings suggest that as the reach of VR headsets increases, VRTs will likely be viewed more positively. The perceptions of potential patients are important in determining the efficacy of VRT as positive expectations of any psychological therapy are associated with better treatment outcomes [35], [36]. The increase in the popularity of VR kits may therefore indirectly improve the efficacy of VRTs.

This study is the first to explore peoples' perceptions of VRTs guided by a virtual coach. Although the majority of participants had no personal or professional experience of mental health therapy, many mentioned aspects relating to the virtual coach that draw parallels with 'therapeutic alliance'; within psychotherapy this denotes the importance of the relationship between the therapist and service user. In psychotherapy research more broadly, a strong therapeutic alliance is associated with better treatment outcomes [37]. The concept of therapeutic alliance has been studied in relation to VR-assisted therapies [30] and digital mental health more broadly [38]. The effects are similar but may be predictive of treatment outcomes to a lesser extent and more so predict engagement.

Understanding whether it is possible to foster 'therapeutic alliance' with a virtual coach and, if so, the nature of this relationship is something that the general public is concerned with and therefore requires further investigation. Our findings give some initial insights into how therapeutic alliance may operate in VRT with a virtual coach. Those respondents showing a preference for VRTs indicated that the presence of a virtual coach would aid disclosure. This may be because of the anonymity that this form of communication offers [39]. It is also interesting to note that many were curious about the level of automation and formulation offered by the virtual coach. Qualitative findings from a trial of VRT guided by a virtual coach found that the presence of a member of staff helped to reinforce learning which may suggest that certain elements of therapy require some level of formulation [40]. Our data suggests that the public view personalisation as an important component of therapy and that VRTs can be improved by offering some level of formulation.

Another point of novelty in the present study is the exploration of presence in relation to VRTs. Previous research has suggested that increasing presence can increase the effectiveness of VRT [41]. Newer VR-enabled headsets provide a greater level of presence as the quality of graphics, and functionality such as interactivity and sensitivity of sensors (e.g. eye tracking) have improved significantly. We sought to explore how important this sense of presence is to the general population. Our findings do indicate that those with a greater expectation of presence are more positive and more likely to show a preference for VRTs. Interestingly though, our findings indicate that even those who are very familiar with VR share concerns that there may be a lack of presence and immersion in VRTs. This suggests that developers and researchers must continue to develop and update their intervention designs to ensure that VRTs do not become stagnant and continue to elicit a sense of presence.

Most of those who viewed VRTs positively emphasised the need for choice to help increase access to mental health treatment. More automated VRTs have been designed in consideration of the pressure to deliver psychological therapies in mental health services and the lack of resource to meet this need [10], [11]. Our findings indicate that the general public are aware of this and view VRTs guided by a virtual coach as an acceptable solution. Our respondents also indicated that VRT guided by a virtual coach would be suitable to deliver at home,

further alleviating resource pressures. However, this was not the case for all participants, with a notable proportion wanting to access VRTs in a location that was safe, familiar, free of distractions, and large enough to use the VRT. The flexibility of location in delivering VRT is an important consideration for increasing access and meeting the needs of services users – especially when we consider the strong links between poor mental health and housing quality [42]. The location of delivery for VRT should be considered on a case-by-case basis.

A further consideration for implementation of VRT found in our study is the importance of information. Our qualitative findings indicated that people were keen to better understand what was involved in VRT and the virtual coach. Pre-intervention expectations are key in managing service users' expectations while also fostering hopefulness, which in turn improves engagement [43]. This information can also help to allay and create space for any concerns that service users might have about VRT. For example, a small number of participants were against the use of VRTs. Where this was expanded upon in our qualitative data collection, it appeared to indicate certain ethical and moral concerns about its use in mental healthcare. All of these views were valid, but some may be rooted in misconceptions about VR. Therefore potentially increasing the public's awareness and understanding of VR and VRT may help to appease these.

We found mixed findings with regard to the impact of cybersickness on willingness to engage in VRT. For some, cybersickness would dissuade people from using VRT. However, this finding was not ubiquitous with some saying that they were still interested in trying VRT even if they had experienced cybersickness. This contradicts previous research suggesting this is a considerable barrier [17]. It is possible that as the technology progresses, this might become less important. We also included a question around hygiene as our questionnaire was shared during the Covid-19 pandemic. However, this was excluded suggesting that it is not a significant concern for the general public.

Limitations

The questionnaire has only been validated using EFA. Further validation is required before we can confidently recommend its widespread use. Specifically, we need to confirm the factor structure in a new sample using confirmatory factor analysis, and also assess its concurrent and discriminant validity. If we are able to replicate the strong psychometric properties found in the present study then this questionnaire can be used to understand attitudes towards VR therapies delivered by virtual coaches. The scale will also need to be adapted to contexts outside the UK, for example by amending items and further validation.

The majority of our respondents were female and did not have previous experience of mental health conditions or therapy. It is possible that men and those with more experience of mental health may have different perceptions of VRTs. A recent review found that gender differences might impact on the use and acceptability of VR; specifically that women are more susceptible to cybersickness and therefore may be less willing to use VR [44]. Based on this, it may be that if we were to survey males, the attitudes towards VRT guided by a virtual coach could be even more positive. We do not have any available evidence to indicate whether those who are living with or have lived with mental health conditions are likely to be more or less accepting of VRTs. Purposive sampling should be used in future studies to ensure the view of these groups are included in future validation studies.

We also sought text responses for strong agreement or disagreement only on certain items. Potentially, those with more neutral views may have offered additional insights, but we weighed this against the additional burden for respondents. It may also have led some participants to neutralise their views to avoid triggering a free-text question. However, there were no instructions in the questionnaire that responding differently removed the free-text response. The range of scores also indicated that this did not deter participants from giving

extreme answers. The qualitative data we captured was sufficient for our analysis.

Finally, the analysis concerning the relationship between familiarity and attitudes towards VR and VRT was correlational. We cannot make any claims regarding the direction or causal nature of these associations. For example, it may be that those with more positive attitudes and a better understanding are more likely to become familiar with VR through continued use. However, our qualitative findings do appear to indicate that negative experiences with VR do not factor into a willingness to use VRT.

Recommendations

Future research should seek to further validate the present questionnaire. Once this has been accomplished, the questionnaire could be used to investigate what factors improve or worsen attitudes to VRT and VRT guided by a virtual coach. For example, does trying VR improve perceptions? Are increasing sales of domestic VR kits associated with improved attitudes? It is also important to explore how these attitudes translate into behaviour i.e. whether positive attitudes predict patient preference and engagement with VRTs. The impact of the level of automation versus formulation of the virtual coach has on attitudes should also be explored as this was a salient concept within the qualitative data. The AVRT Scale could be adapted and applied to other areas where virtual reality is used to deliver interventions, such as behaviour change interventions or as a training tool. The questionnaire can also be used alongside treatment development, evaluation, and implementation to explore the barriers and facilitators specific to a VRT and VRT guided by a virtual coach or the perceptions of certain populations to aid the translation of research into practice [45]. Long term, any research that considers barriers to the uptake, engagement, and adoption of VRT has the potential to alleviate the demand on trained therapists in clinical settings, thus improving access to psychological therapies.

Declaration of interests

No conflicts of interest.

Funding

AGB is funded by NIHR MindTech MedTech Co-operative. The views expressed are those of the authors and not necessarily those of the NHS, the NIHR or the Department of Health. These organisations had no role in study design, including; collection, management, analysis and interpretation of data; writing of the report; and the decision to submit the report for publication.

Acknowledgements

AGB would like to acknowledge the support of the NIHR Nottingham Biomedical Research Centre

Data sharing agreement

All relevant data is included in this publication. Researchers who would like access to the scale for further validation or adaptation may contact the corresponding author with a methodologically sound proposal.

Multimedia Appendix 1: Supplementary Materials

References

1. Lee KM. Presence, Explicated. *Commun Theory*. 2004;14(1):27-50. doi:10.1111/J.1468-2885.2004.TB00302.X
2. Kilkelly F, O'Brien R, Ticho S. *The Growing Value of XR in Healthcare in the United Kingdom*; 2021. <https://www.xrhealthuk.org/the-growing-value-of-xr-in-healthcare>.
3. Eshuis L V., van Gelderen MJ, van Zuiden M, et al. Efficacy of immersive PTSD treatments: A systematic review of virtual and augmented reality exposure therapy and

- a meta-analysis of virtual reality exposure therapy. *J Psychiatr Res.* 2021;143(November 2020):516-527. doi:10.1016/j.jpsychires.2020.11.030
4. Falconer CJ, Rovira A, King JA, et al. Embodying self-compassion within virtual reality and its effects on patients with depression. *BJPsych Open.* 2016;2(1):74-80. doi:10.1192/bjpo.bp.115.002147
 5. Ferrer-García M, Gutiérrez-Maldonado J. The use of virtual reality in the study, assessment, and treatment of body image in eating disorders and nonclinical samples: a review of the literature. *Body Image.* 2012;9(1):1-11. doi:10.1016/j.bodyim.2011.10.001
 6. Morina N, Ijntema H, Meyerbröcker K, Emmelkamp PMG. Can virtual reality exposure therapy gains be generalized to real-life? A meta-analysis of studies applying behavioral assessments. *Behav Res Ther.* 2015;74:18-24. doi:10.1016/j.brat.2015.08.010
 7. Opris D, Pinteá S, Garcia-Palacios A, Botella C, Szamosközi S, David D. Virtual reality exposure therapy in anxiety disorders: a quantitative meta-analysis. *Depress Anxiety.* 2012;29(2):85-93. doi:10.1002/da.20910
 8. Valmaggia L. The use of virtual reality in psychosis research and treatment. *World Psychiatry.* 2017;16(3):246-247. doi:10.1002/wps.20443
 9. Hayward M. Increasing access to psychological treatments for mental illness. *The Lancet Psychiatry.* 2018;5(8):606-607. doi:10.1016/s2215-0366(18)30262-1
 10. Freeman D, Lambe S, Kabir T, et al. Automated virtual reality therapy to treat agoraphobic avoidance and distress in patients with psychosis (gameChange): a multicentre, parallel-group, single-blind, randomised, controlled trial in England with mediation and moderation analyses. *The Lancet Psychiatry.* 2022:375-388. doi:10.1016/s2215-0366(22)00060-8
 11. Freeman D, Haselton P, Freeman J, et al. Automated psychological therapy using immersive virtual reality for treatment of fear of heights: a single-blind, parallel-group, randomised controlled trial. *The Lancet Psychiatry.* 2018;5(8):625-632. doi:10.1016/S2215-0366(18)30226-8
 12. Rizzo A, Shilling R, Forbell E, Scherer S, Gratch J, Morency LP. Autonomous Virtual Human Agents for Healthcare Information Support and Clinical Interviewing. In: *Artificial Intelligence in Behavioral and Mental Health Care.* ; 2016. doi:10.1016/B978-0-12-420248-1.00003-9
 13. Altunkaya J, Craven M, Lambe S, et al. Estimating the Economic Value of Automated Virtual Reality Cognitive Therapy for Treating Agoraphobic Avoidance in Patients With Psychosis: Findings From the gameChange Randomized Controlled Clinical Trial. *J Med Internet Res* 2022;24(11)e39248 <https://www.jmir.org/2022/11/e39248>. 2022;24(11):e39248. doi:10.2196/39248
 14. Lindner P, Miloff A, Zetterlund E, Reuterskiöld L, Andersson G, Carlbring P. Attitudes toward and familiarity with virtual reality therapy among practicing cognitive behavior therapists: A cross-sectional survey study in the era of consumer VR platforms. *Front Psychol.* 2019;10(FEB). doi:10.3389/fpsyg.2019.00176
 15. Chung OS, Johnson AM, Dowling NL, et al. Are Australian Mental Health Services Ready for Therapeutic Virtual Reality? An Investigation of Knowledge, Attitudes, Implementation Barriers and Enablers. *Front Psychiatry.* 2022;13(February):1-12. doi:10.3389/fpsyg.2022.792663
 16. Benbow AA, Anderson PL. A meta-analytic examination of attrition in virtual reality exposure therapy for anxiety disorders. *J Anxiety Disord.* 2018. doi:10.1016/j.janxdis.2018.06.006
 17. Keller MS, Park HJ, Cunningham ME, et al. Public Perceptions Regarding Use of

- Virtual Reality in Health Care: A Social Media Content Analysis Using Facebook. *J Med Internet Res.* 2017;19(12). doi:10.2196/jmir.7467
18. Brown P, Waite F, Lambe S, et al. Automated Virtual Reality Cognitive Therapy (gameChange) in Inpatient Psychiatric Wards: Qualitative Study of Staff and Patient Views Using an Implementation Framework. *JMIR Form Res.* 2022;6(4). doi:10.2196/34225
 19. Chung OS, Robinson T, Johnson AM, et al. Implementation of Therapeutic Virtual Reality Into Psychiatric Care: Clinicians' and Service Managers' Perspectives. *Front Psychiatry.* 2022;12(January):1-13. doi:10.3389/fpsyt.2021.791123
 20. Borghouts J, Eikey E, Mark G, et al. Barriers to and facilitators of user engagement with digital mental health interventions: Systematic review. *J Med Internet Res.* 2021;23(3). doi:10.2196/24387
 21. JISC. JISC: Online surveys. JISC. <https://www.jisc.ac.uk>. Published 2022.
 22. Field A. *Discovering Statistics Using IBM SPSS Statistics*. Vol 58. SAGE Publications, Inc; 2017.
 23. Aref-Adib G, McCloud T, Ross J, et al. Factors affecting implementation of digital health interventions for people with psychosis or bipolar disorder, and their family and friends: a systematic review. *The Lancet Psychiatry.* 2019. doi:10.1016/S2215-0366(18)30487-5
 24. Glegg SMN, Levac DE. Barriers, Facilitators and Interventions to Support Virtual Reality Implementation in Rehabilitation: A Scoping Review. *PM R.* 2018;10(11):1237-1251.e1. doi:10.1016/j.pmrj.2018.07.004
 25. March S, Day J, Ritchie G, et al. Attitudes toward e-mental health services in a community sample of adults: Online survey. *J Med Internet Res.* 2018;20(2). doi:10.2196/jmir.9109
 26. Nichols S, Patel H. Health and safety implications of virtual reality: A review of empirical evidence. *Appl Ergon.* 2002;33(3):251-271. doi:10.1016/S0003-6870(02)00020-0
 27. Schwartzman D, Segal R, Drapeau M. Perceptions of virtual reality among therapists who do not apply this technology in clinical practice. *Psychol Serv.* 2012. doi:10.1037/a0026801
 28. Tinwell A, Nabi DA, Charlton JP. Perception of psychopathy and the Uncanny Valley in virtual characters. *Comput Human Behav.* 2013;29(4):1617-1625. doi:10.1016/j.chb.2013.01.008
 29. Wrzesien M, Burkhardt JM, Botella C, Alcañiz M. Towards a Virtual Reality- and Augmented Reality-Mediated Therapeutic Process model: a theoretical revision of clinical issues and HCI issues. *Theor Issues Ergon Sci.* 2015;16(2):124-153. doi:10.1080/1463922X.2014.903307
 30. Miragall M, Baños RM, Cebolla A, Botella C. Working alliance inventory applied to virtual and augmented reality (WAI-VAR): Psychometrics and therapeutic outcomes. *Front Psychol.* 2015;6(OCT). doi:10.3389/fpsyg.2015.01531
 31. IBM Corp. Released. IBM SPSS Statistics version 25.0. 2017. 2017.
 32. Kaiser HF. An index of factorial simplicity. *Psychometrika.* 1974;39(1):31-36. doi:10.1007/BF02291575/METRICS
 33. George D, Mallery P. *SPSS for Windows Step by Step: A Simple Guide and Reference. 11.0 Update (4th Ed.)*. Boston: Allyn & Bacon.; 2003.
 34. Hsieh HF, Shannon SE. Three Approaches to Qualitative Content Analysis. *Qual Health Res.* 2005;15(9):1277-1288.
 35. Gergov V, Lindberg N, Lahti J, Lipsanen J, Marttunen M. Effectiveness and Predictors of Outcome for Psychotherapeutic Interventions in Clinical Settings Among

- Adolescents. *Front Psychol.* 2021;12:347. doi:10.3389/FPSYG.2021.628977/BIBTEX
36. Karlsson H, Kronström K, Nabi H, et al. Low Level of Optimism Predicts Initiation of Psychotherapy for Depression: Results from the Finnish Public Sector Study. *Psychother Psychosom.* 2011;80(4):238-244. doi:10.1159/000323613
 37. Falkenström F, Granström F, Holmqvist R. Therapeutic alliance predicts symptomatic improvement session by session. *J Couns Psychol.* 2013;60(3):317-328. doi:10.1037/A0032258
 38. Tremain H, McEnery C, Fletcher K, Murray G. The Therapeutic Alliance in Digital Mental Health Interventions for Serious Mental Illnesses: Narrative Review. *JMIR Ment Heal* 2020;7(8)e17204 <https://mental.jmir.org/2020/8/e17204>. 2020;7(8):e17204. doi:10.2196/17204
 39. Clark-Gordon C V., Bowman ND, Goodboy AK, Wright A. Anonymity and Online Self-Disclosure: A Meta-Analysis. <https://doi.org/10.1080/0893421520191607516>. 2019;32(2):98-111. doi:10.1080/08934215.2019.1607516
 40. Bond J, Kenny A, Pinfold V, et al. A Safe Place to Learn: Peer Research Qualitative Investigation of gameChange Virtual Reality Therapy. *JMIR Serious Games.* 2023;11. doi:10.2196/38065
 41. Price M, Anderson P. The role of presence in virtual reality exposure therapy. *J Anxiety Disord.* 2007;21(5):742-751. doi:10.1016/J.JANXDIS.2006.11.002
 42. Evans G, Wells NM. Housing and mental health. *Artic J Consult Clin Psychol.* 2000. doi:10.1037/0022-006X.68.3.526
 43. Bennett-Levy J, Richards D, Farrand P, et al., eds. *Oxford Guide to Low Intensity CBT Interventions*. OUP Oxford; 2010. doi:10.1093/med/9780199590117.001.0001
 44. Grassini S, Laumann K. Are Modern Head-Mounted Displays Sexist? A Systematic Review on Gender Differences in HMD-Mediated Virtual Reality. *Front Psychol.* 2020;11:1604. doi:10.3389/FPSYG.2020.01604/XML/NLM
 45. Andleeb H, Bergin A, Robotham D, Brown S, Martin J. Relevant involvement and how it can improve implementation for novel digital mental health interventions. In: *IMPLEMENTATION SCIENCE.* ; 2020.

Supplementary Files

Multimedia Appendixes

Supplementary Material.

URL: <http://asset.jmir.pub/assets/10cde26885cd9a7f259ef554935f38a8.pdf>