“This is me”: Participant Experiences of Creating and Using Personalised Avatars within Virtual Reality

Katherine Free

DClinPsy Thesis (Volume 1), 2024

University College London

UCL Doctorate in Clinical Psychology

Thesis declaration form

I confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

Signature: *Signature removed*

Name: Katherine Free

Date: 23rd June 2024

Overview

Part 1: Systematic Review

A systematic review investigating the effectiveness of digital interventions for self-criticism. Self-criticism is a transdiagnostic process and has been found to be associated with a wide range of psychopathology. Encouraging evidence exists for the use of digital interventions in mental health, and digital interventions targeting self-criticism may have a positive effect on a wide range of mental health conditions. Twenty-one studies met the inclusion criteria and were retrieved for inclusion in this review. The narrative synthesis revealed that the majority of interventions were unguided and focused on cultivating self-compassion. Positive effects on self-criticism were reported in 17 studies.

Part 2: Empirical paper

A research paper exploring participants' experiences of engaging in a virtual reality paradigm using personalised avatars to facilitate self-compassion. The project was jointly conducted with Siobhan Fitzpatrick (SF - Trainee Clinical Psychologist). SF's paper was quantitative in nature, whereas the current paper is qualitative and focuses on the subjective experience of participants' creating and using personalised avatars within the intervention. Semi-structured interviews were conducted with sixteen adult participants, and thematic analysis was used to analyse the data. The themes generated point to various positive and negative effects of avatar personalisation. The themes indicate that personalisation can have a positive impact on avatar connection, and embodiment, and can encourage meaningful intervention engagement. However, there were individual differences and the findings suggest that self-representative avatars can increase users'

self-awareness, for example of their body image or communication style, which can trigger self-criticism or negative emotional responses.

Part 3: Critical appraisal

This appraisal includes my reflections on the research process, the challenges I encountered, and justification for the decisions I made. The appraisal also focuses on ethical factors I considered when conducting the research.

Impact Statement

Academic

The prevalence and popularity of digital interventions has surged in the past decade, with many interventions being adapted for online use. This systematic review and empirical study contribute valuable insights into the effectiveness of digital interventions. The systematic review highlights the positive impact of short-term online interventions on self-criticism, particularly those focusing on compassion. All studies retrieved for this review were conducted with non-clinical populations. This highlights a gap in the literature, and the impact of digital interventions on self-criticism in clinical populations warrants further exploration. Meanwhile, the empirical paper explores users' subjective experiences with personalised avatars in a virtual reality self-compassion intervention, providing insights on several factors, such as barriers and facilitators to avatar identification, technological weaknesses, uncanniness, increased self-awareness and risk of self-criticism. It also proposes potential developments to the intervention, such as additional customisation options, using idealised avatars, and being comforted by a familiar figure instead of oneself. These suggestions warrant further investigation. Additionally, the study identifies future areas for research, such as the impact of personalisation on clinical populations, particularly individuals with body image related difficulties and high levels of self-criticism.

Clinical

This research offers valuable insights into the experience of embodiment and connection with personalised avatars in virtual reality interventions. It also highlights the challenges that users can face when engaging with novel and unfamiliar interventions such as virtual

reality. The analysis suggests that providing participants with more time to adapt to the virtual environment would be beneficial, and therefore clinicians should consider how best to guide and familiarise users to virtual settings prior to therapeutic interventions. Additionally, the study reveals the impact of physical similarity on avatar identification and sense of embodiment and suggests personalisation can increase the meaningfulness of self-compassion interventions for users. However, participants also expressed concerns such as the potential for emotional distress, particularly for individuals with mental health conditions, high levels of self-criticism and body image difficulties. These findings can guide clinicians in implementing similar interventions and suggest the need for careful consideration of individuals before implementing such interventions to prevent potential distress.

Public Health

Digital interventions, including VR, are often viewed as impersonal in comparison to in-person support. However, avatar personalisation may help bridge this gap and allow VR interventions to be more individualised, while still offering controlled and accessible care. This is particularly significant in the current social context in the United Kingdom, where there are multiple barriers preventing individuals from accessing in-person support and demand for mental health services and support remains high. This research emphasises the need for further studies of similar interventions to investigate their effectiveness and ensure their safety, particularly for clinical populations.

Table of Contents

Index of Tables and Figures

Part 1: Systematic Review

Part 2: Empirical Paper

Abbreviations

JK – Dr John King (Research Supervisor)

SF – Siobhan Fitzpatrick (UCL Trainee Clinical Psychologist)

Acknowledgements

I would like to thank my research supervisor Dr. John King. John's encouragement and reassurance throughout this process has been invaluable. He has provided support with remarkable flexibility and I have appreciated his friendly conversational approach. I have particularly valued his ability to encourage independent thinking and learning while also offering his expertise and feedback.

I also wish to express a huge thanks to my research partner, Siobhan Fitzpatrick. Siobhan's reassurance and laughter were a lifeline throughout many high-stress moments in the past year, particularly during recruitment. Her willingness to listen, offer advice, and respond to my countless questions and voice notes has been a tremendous support and I cannot imagine navigating this process without her. I look forward to our celebrations once this project is finally completed.

Thank you to my partner Tom, for being my cheerleader during moments of frustration and doubt, always assuring me that everything would be ok. I also thank my friends and family for their encouraging words that kept me motivated. A special thank you goes to my DClinPsy friends, Elna, Lottie, Shannon and Charlotte. Thank you for all your advice, encouragement and support, particularly at times of high stress.

Finally, I would like to thank all the participants who volunteered to take part in this study. This thesis was only possible due to their valuable contributions, and I am privileged to have had participants who were willing to share their personal reflections with me.

Part 1: Literature Review

The Effectiveness of Digital Interventions in Reducing Self-criticism: A Systematic Review

Abstract

Aims: Self-criticism is a transdiagnostic process and has been found to be a vulnerability factor for a wide range of psychopathology. This review aimed to investigate the effectiveness of digital interventions for reducing self-criticism, and to synthesise the findings from randomised controlled trials.

Method: Three electronic databases, PsycINFO, Web of Science and Medline, were searched from their inception to February 2024 for randomised controlled trials (RCTs) evaluating any digital intervention and its effect on self-criticism outcomes. The author assessed study eligibility for inclusion, with a second reviewer independently assessing 10% of the full papers. Data were extracted, and a risk of bias assessment was conducted for all selected studies. The results were synthesised narratively.

Results: Out of the 2043 articles identified, 58 papers were reviewed in full, and 21 papers met the inclusion criteria (N = 2,254 participants). Seventeen studies utilised web-based intervention delivery, two used mobile applications, and two used web-conferencing platforms. Most interventions focused on cultivating self-compassion and utilised stand-alone unguided formats. All studies involved multi-component interventions, with treatment length ranging from 7 to 70 days. Positive impacts of the online interventions on self-criticism were reported in 17 studies, and 12 studies found this effect was sustained at follow-up.

Conclusion: This review indicates that digital interventions are effective in reducing levels of self-criticism in nonclinical populations. The studies included in this review primarily consisted of short-term and unguided interventions, making them relatively low-resource. However, the longer-term impact of these interventions is unclear, and there is

a need for studies investigating the strength of these effects over time, particularly within clinical populations.

Introduction

The aim of this systematic review is to provide an overview of the existing literature exploring the effectiveness of digital interventions in reducing self-criticism.

Self-criticism

Individuals that are high in self-criticism can experience their sense of self as 'critical, hostile and persecuting' and are more likely to view themselves through a harsh and scrutinising lens (Gilbert and Procter, 2006; Shahar et al., 2012). This can lead to negative emotions such as disgust for the self and feelings of guilt, unworthiness, and hopelessness (Zaccari, Mancini & Rogier, 2024). Gilbert et al. (2004) suggested that self-criticism can have different forms and functions and there may be different underpinnings behind self-criticism. For example, it may be the result of an individual's effort to improve themselves or to 'get rid' of undesirable aspects of the self. These different forms are referred to as the inadequate self and hated self, and both are negatively associated with self-esteem and life satisfaction (Wakelin et al., 2022).

Self-criticism and Psychopathology

Evidence indicates that self-criticism is a transdiagnostic process, and that high trait self-criticism is a vulnerability factor for the development of psychopathology (Kannan & Levitt, 2013). A self-critical personality style has consistently been associated with a range of psychological difficulties. For example, high self-criticism is a risk factor for individuals experiencing depression over the course of their lives (Ehret et al., 2015; Thakur & Baumann, 2022; Werner et al., 2019). Self-criticism has also been associated with anxiety

and was found to be elevated in those with social phobia (Cox et al., 2004). There is also evidence of a relationship between self-criticism and eating disorders. Dunkley and Grilo (2007) revealed that self-criticism was associated with the over-evaluation of weight and shape in individuals with binge eating disorder. Similarly, studies have shown that self-criticism is a strong predictor of all the eating disorder sub-scales measured by the Eating Disorder Inventory-2 (EDI-2), including drive for thinness and body dissatisfaction (Fenning et al., 2008). Other mental health related difficulties have also been associated with self-criticism, such as interpersonal difficulties (Werner et al., 2019), increased suicidality (O'Neil et al., 2021) and self-injurious behaviour (Glassman et al., 2007). There is substantial evidence that self-critical thinking is elevated in individuals across a wide variety of psychological difficulties. Therefore, treatments that aim to target self-criticism could potentially act as a form of early intervention for other psychological difficulties.

Self-criticism and Intervention Outcomes

Literature suggests that self-critical individuals have poorer outcomes and are less likely to be successful in reducing their symptoms following engagement with therapeutic interventions. This has been found for treatments such as cognitive behavioural therapy (CBT) (Löw et al., 2020). Self-criticism is also associated with poorer response to pharmacological treatments (Shahar et al., 2015). Therefore, interventions that focus explicitly on these processes are important and alleviating self-criticism may be central in the process of change in many interventions (Casthilo et al., 2017). Consequently, it is important to identify individuals that are highly self-critical and develop interventions that explicitly target self-criticism. These interventions may be particularly helpful for early

intervention or relapse prevention and will be relevant for the treatment of a range of mental health problems.

Research has found that explicitly targeting self-criticism in psychological interventions can be effective in improving outcomes. This has been observed across different therapeutic approaches, such as CBT and psychodynamic therapy. For example, Enns et al. (2002) found a reduction in self-criticism is a successful predictor of symptoms of depression after engagement in a CBT intervention. Similarly, Handley et al. (2015) found a reduction in self-criticism predicted a reduction in depression and anxiety symptoms. A 2017 study found comparable results within psychodynamic therapy and found a reduction in self-criticism was associated with a reduction in psychological distress (Lowyck et al., 2017). These findings support the idea that reducing self-criticism may be a potential mechanism of change within psychological interventions.

Self-compassion and Compassion Focused Interventions

Research suggests that self-compassion is associated with reduced psychological distress (Garcia-Campayo et al., 2024). Compassion towards oneself involves having a non-judgmental understanding to one's inadequacies and difficulties (Neff, 2003). Neff (2003) defined self-compassion using three key elements. These include being supportive and kind to oneself (self-kindness), acknowledging life challenges as part of the human experience (common humanity), and having an awareness of one's experiences in an accepting and mindful manner (mindfulness). Gilbert (2004) suggested that self-criticism and self-compassion are two related but distinct processes and developing self-compassion can act as a counter response to self-criticism. Interventions

that focus on fostering self-compassion and decreasing levels of self-criticism have received attention in recent years (Wakelin et al., 2022). Several studies have found that increasing self-compassion can allow individuals to minimise their self-critical voice and reduce the negative emotions that come with it (Leaviss & Uttley, 2015).

Compassion-focused therapy (CFT) developed by Paul Gilbert (2014) is one of the more researched treatments that explicitly aims to reduce individual's self-criticism. CFT aims to replace self-critical thoughts and generate compassionate feelings for the self. The intervention employs multiple techniques, such as mindfulness, compassionate imagery, and practising compassionate ways of thinking (Sommers-Spijkerman et al., 2018). A meta-analysis by Kirby et al. (2017) found that compassion-based interventions are helpful for both clinical and non-clinical populations in reducing self-criticism and Wakelin et al. (2022) reported a medium size effect for self-compassionate training in reducing self-criticism. There are several types of compassion-related interventions including compassionate mind training (CMT) which aims to improve user's ability to self-soothe at times of stress and influence levels of self-criticism (Matos et al., 2017).

Digital Interventions

Research suggests that individuals with high self-criticism may be less likely to seek or accept psychological support due to fear of stigmatisation and experiences of shame (Krieger et al., 2016). Therefore, lower threshold interventions such as digital interventions, may help reduce these barriers and encourage therapeutic engagement. Digital interventions include mobile applications, web-based programmes, and virtual reality (VR) (Park et al., 2022). Wide scale access to the internet, via computers and

mobile devices, in recent decades has encouraged a surge of interest in using digital interventions to improve mental health (Firth et al., 2017). Additionally, the onset of Covid-19 and its disruption on healthcare fast forwarded the adoption of digital technologies being used in mental health services. The pandemic meant many health care services had to adapt their delivery and shift towards offering digital interventions, such as video conferencing (Ganjali et al., 2022; Wind et al., 2020). This led to an increased acceptance towards digital interventions by both clinicians and service users and has been described as a 'turning point' in digital healthcare (Wind et al., 2020).

Many digital interventions, such as internet-based CBT, have been found to be effective for the treatment of mental health difficulties (Andrews et al., 2018). There is a large evidence base for digital interventions in adult populations, for example digital interventions have been found to be effective for depression (Firth et al., 2017) and anxiety (Adelman et al., 2014). Furthermore, a meta-analysis by Carlbring et al. (2017) indicated that internet-based interventions can be as effective as face-to-face interventions for a wide variety of mental health difficulties. Digital interventions vary in their delivery, for example they can be guided or unguided, and can provide aid to those who would not otherwise access psychology (Griffiths & Christensen, 2006).

The majority of digital interventions are based on existing treatments and therapeutic approaches but are adapted to be accessed online (Fairburn & Patel, 2017). The most researched type of digital interventions are based on forms of CBT (Andersson and Titov, 2014). However, digital adaptations for other therapy modalities, such as acceptance and commitment therapy (Thompson et al., 2021), compassion focused therapy (Kelman et al., 2018), and mindfulness (Spijkerman et al., 2016) have also been

found to be effective. Digital interventions can be cost-effective and convenient in terms of time and travel for users and they can reduce barriers for accessing psychological support, such as fear of stigma, due to the increased anonymity (Andersson & Titov, 2014; Johnson et al., 2022). Therefore, they can act as a stepping stone for an individual accessing psychological support and may encourage treatment engagement in certain groups (Bond et al., 2023).

Aim of Review

This review aims to summarise the existing literature and various designs of digital mental health interventions targeting self-criticism, and to synthesise the findings from randomised controlled trials. To my knowledge, this is the first systematic review focusing on self-criticism in digital interventions.

Method

This systematic review was conducted according to the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA).

Information Sources

This review includes all literature published from inception to the 9th of February 2024. Three bibliographic databases were systematically searched to identify all relevant studies reporting on digital interventions facilitating a reduction in self-criticism. These consisted of PsycINFO (Ovid), Medline (Ovid) and the Web of Science database.

Search Strategy

A comprehensive search strategy was developed using a combination of keywords relating to:

- Self-criticism: self-critic* OR inner-critic* OR self-contempt* OR self-hat* OR self-attack* OR self-judg* OR “self-directed hostility” OR self-condemn OR “self-directed negative thinking” or “self-criticizing attacking and self-reassuring scale” or FSCRS or “self-compassion and self-criticism scale” or SCCS.
- Digital delivery: digital OR online OR technology OR online-based OR internet OR internet-based OR internet-delivered OR remote OR web OR web-based OR virtual OR computer* OR app* OR application* OR e-health OR e-mental health OR m-health OR mhealth OR mobile technolog* OR vr OR virtual reality OR ai OR artificial intelligence OR augmented reality.
- Intervention: intervention* OR therap* OR psychotherap* OR treatment* OR training OR counselling OR counseling OR program* OR psychoeducation OR CBT OR cognitive therapy* OR cognitive behavi* OR mindfulness OR ACT OR acceptance and commitment OR psychoanalysis.

The following search limits were used where possible: book, authored book, edited book, encyclopaedia, or dissertation abstract (See Appendix B for the full database searches including MeSh terms).

Eligibility Criteria

To be included in this review, a study had to: (1) be an empirical study; (2) be published in a peer-reviewed journal; (3) have a randomised controlled design (RCT); (4) examine

an intervention that measured self-criticism as an outcome measure; (5) deliver an intervention primarily via a digital platform (including mobile phones and web-based interventions); (6) and include participants aged 18 years and above. Exclusion criteria consisted of studies where digital aspects of the intervention were not the primary part. For example, studies where online methods were only used to collect self-report measures or to share psychoeducational materials.

Study Selection

All search results and identified citations were imported into EndNote, a reference management software, in which duplicates were identified and removed. The remaining papers were then imported into Rayyan, a web-based service designed to assist the screening process and help accelerate the initial screening of titles and abstracts. The primary researcher (KF) independently screened titles and abstracts to determine if the articles met the eligibility criteria. All full texts were then examined by KF and 10% of the full-text articles were screened independently by reviewer SF. Any discrepancies about inclusion were resolved by discussion.

Data Extraction

Information relating to general study characteristics was extracted. This included the author, year of publication, country of data collection, study design, sample size, and population characteristics (i.e. age, gender, and ethnicity). Information relating to the primary focus of the review included type of treatment and comparator used, type of digital intervention and technology, length of intervention, intervention approach, delivery

format, the self-criticism related outcome measure, effectiveness of the intervention, and follow up period.

Data Synthesis

The data were subjected to a narrative synthesis. Quantitative meta-analysis was considered but after weighing up the heterogeneity of the studies (population, duration, outcome measures, and follow-up length) and researcher constraints, it was decided that a quantitative approach was not indicated in this instance.

Risk of Bias

The quality of studies was assessed using a modified version of the Cochrane Collaboration's tool for assessing risk of bias (ROB) in randomised trials. This framework looked at selection bias, performance bias, detection bias, attrition bias, and reporting bias, using the anchors of a low, high, or unclear risk of bias.

Results

Reviewing Process

A total of 2043 records were identified from the three database searches. Following the deletion of duplicates, 1501 hits remained for the title and abstract screening. A total of 58 full-text articles were then reviewed for inclusion and 21 papers met the criterion and were included in this review (see Table 1 for study characteristics). The most common reason for reports not to be selected during the full-text screening were: the paper was

not an RCT or did not include outcome measures related specifically to self-criticism. A PRISMA flow diagram demonstrates the selection process used in this review (see Figure 1).

Risk of Bias of Studies

The framework revealed a moderate-to-severe risk of bias in many of the studies (see Figure 2). The domain most poorly reported was detection bias, with all studies being rated as ‘high’ risk. This was due to studies not being blind to the outcome assessment due to using self-report measures. After this, performance bias was the next highest risk domain, with seventeen studies being unable to blind participants to the intervention being received. Eleven studies were rated as high risk for ‘attrition bias’ and four studies were rated as having unclear risk. However, this is often expected in RCTs, particularly in studies involving digital interventions. Selection bias and reporting bias were the lowest risk of bias domains. Across the studies, nine were rated as ‘low’ risk and twelve were rated as ‘unclear’ risk for selection bias. For reporting bias all twenty-one studies were rated as ‘low’ risk. The study by Hooley et al. (2018) was highlighted as the strongest study overall because they had the highest proportion of low risk rated domains (4/5 domains were rated as low). Nine studies were rated as high risk of bias in three out of five domains (Gammer et al 2020; Halamova et al., 2020; Halamova et al., 2020b; Halamova et al., 2022; Kariyawasam et al 2019; Krieger et al., 2019; Lancheros et al., 2023; Leboeuf et al., 2022; Ondrejkova et al., 2022).

Table 1.

Participant and study characteristics of studies included in the review

Author (Year) Country	Age (M)	Gender Female %	Population	Intervention name and approach	Type of technology	Comparator	Brief intervention description	Duration and frequency
1. Al-Refae et al. (2021) Canada	25.24	78.80%	Non-clinical	Serene (app) - Mindfulness, self-compassion and cognitive behavioural therapy	Mobile Application	Waitlist	Participants were instructed to do at least one mindfulness meditation a day. They were also asked to complete a cognitive restructuring task. A journaling section was available but was not required.	4 weeks Daily
2. Dhokia et al. (2020) Unknown	45.53	65.80%	Non-clinical Adults with concerns about use of analgesics for chronic pain	Online CMT intervention - Compassionate mind training	Online - no more information provided	Active control - relaxation music	The intervention comprised of psycho-educational videos with audio and computerized tasks designed to replace self-critical thoughts with self-reassuring thoughts.	20 days Unclear
3. Drabu et al. (2022) China and United States	23.24	71.40%	Non-clinical Adults high in self-criticism (SRS score	Loving Kindness for Ourselves - Mindful Self-Compassion (MSC)	Online - no more information provided	Active - National Geographic audio recording	Participants engaged in a compassion-based guided meditation called “Loving Kindness for Ourselves”. They received daily links via email, which included audio-guided meditations. They then submitted a daily entry and wrote self-	25 days Daily (25 minutes)

			of ≥21) and NSSI thoughts or engagement				compassionate letter. They were also sent exercises, such as body scans and breathing meditations.	
4. Dreisoerner et al. (2023) Germany	27.5	83.80%	Non-clinical	Be Your Friend intervention - Mindful Self-Compassion (MSC)	Zoom videoconferencing	Waitlist	The intervention included two online workshops. The content was loosely based on the Mindful Self-Compassion Program (MSC) by Neff and Germer (2018). The first workshop included exercises such as guided meditations and the writing exercise 'How would you treat a friend?'. The goal of the second workshop was to practice self-compassion through exercises.	1 week Weekly (80 minutes)
5. Gammer et al. (2020) United Kingdom	35.19	100%	Non-clinical Mothers of infants under 1 years old	Kindness for mums online - Mindfulness and self-compassion based	Web-based - Accessible on any computer or smartphone	Waitlist	This intervention was based on a self-help book by Hartley-Jones (2016). It drew on mindfulness and self-compassion. Content was tailored to mothers by applying examples to common experiences. Illustrative quotes from other mothers formed a significant part of the content. Exercises were designed to be brief.	6 weeks Daily (3 minutes) and Weekly (15 minutes)

6. Gu et al. (2022) South Korea	22.85	87.50%	Non-clinical Students high in self-criticism (DEQ-SC score ≥ 70)	Online compassion focused therapy-based intervention (CFI) – Compassion focused therapy	Online - no more information provided	Waitlist and Active Control - Rational Emotive Behaviour Therapy	The CFI intervention included psychoeducation regarding the three emotion regulation systems, finding and validating the inner critical voice, imagery practice, and mindfulness meditation practice.	4 weeks Daily (20 minutes) and Weekly (2 hours)
7. Halamová et al. (2018) Slovakia	Unknown	84.30%	Non-clinical	Emotion Focused Training for Self-Compassion and Self-protection (EFT-SCP) - Emotion Focused Training (EFT)	Web-based - Accessible on any computer or smartphone	Care as usual/ no treatment	The intervention included psychoeducation, which explained the intended impact of the intervention tasks, a description of the task, a link to an online document for participants to complete the EFT task, and questions about the task designed to encourage participants to reflect on their experience	14 days Daily (30 minutes)
8. Halamova et al (2018b) Slovakia	25.46	85.40%	Non-clinical	Internet-based MBI - Mindfulness based intervention	Web-based - Accessible on any computer or smartphone	Care as usual/ no treatment	Participants were instructed to complete a daily mindfulness-based exercise. Participants received emails consisting of psychoeducation explaining the intended impact of the exercise, instructions for the exercise, and post-exercise questions. The majority of exercises were presented as audio recordings.	15 days Daily (15 minutes)

9. Halamova et al. (2020) Unknown	Unknown	81.40%	Non-clinical	Online Compassionate intervention - Mindful Self-Compassion (MSC)	Online - no more information provided	Care as usual/ no treatment	Participants received emails prompting them to complete MSC tasks. Each email consisted of psychoeducation which explained the intended impact of the exercise, the exercise, and questions about the exercise designed to encourage reflection.	14 days Daily (15 minutes)
10. Halamová et al. (2020b) Unknown	25.79	84.70%	Non-clinical	Online CMT intervention - Compassionate mind training	Web-based - Accessible on any computer or smartphone	Care as usual/ no treatment	Each participant received an email prompting them to complete the CMT task. The exercises were selected from a multitude of different exercises available in Compassionate Mind Training.	13 days Daily
11. Halamová et al. (2022) Slovakia	39.6	96.90%	Non-clinical Helping professionals	Emotion-focused Training	Online - no more information provided	Care as usual/ no treatment	The intervention is based on the evidenced based model of change in EFT and develops both self-compassion and self-protection. Participants received daily emails with EFT tasks. Each task included psychoeducation, instructions how to complete the task and questions about the participant's experience of the task. The intervention includes exercises on compassion fatigue, compassion, self-compassion, self-criticism, self-care, work-life balance and strengthening trauma protection skills necessary for helping professionals.	14 days Daily

12. Hooley et al. (2018) United States	25.63	85.40%	Non-clinical Engaged in NSSI twice in the past month	Online daily diary - Autobiographical Self-Enhancement Training (ASET) Cognitive intervention	Web-based - Accessible on any computer or smartphone	Active Control - Emotional Writing (EW) vs Journal Writing (JW)	Participants assigned to the ASET condition were asked to write for five minutes each day about something that happened that day that made them feel good about themselves as a person.	28 days Daily (5 minutes)
13. Kariyawasam et al. (2023) United Kingdom and Sri Lanka	Unknown	70.60%	Non-clinical	Online CMT intervention Compassionate mind training	Web-based - Qualtrics online platform	Waitlist	This study involved psychoeducation videos and compassionate mind training scripts. It also included exercises such as mindfulness, building and cultivating your compassionate self, soothing rhythm breathing, and compassion for a close person and for yourself. Participants engaged in video or audio material every day.	2 weeks Daily (30 minutes)
14. Kelman et al. (2018) United States and India	Unknown	100%	Non-clinical Pregnant, pregnant within the last year, or intending to become pregnant in the future	Online CBT or CMT - Cognitive behavioural therapy and compassionate mind training	Web-based - Accessible on any computer or smartphone	Active - CBT vs CMT	The CMT condition included psychoeducation and exercises such as, finding ourselves here in the flow of life, old brain and new brain, the three circles of affect regulation and pregnancy, and cultivating the compassionate self. The CBT condition was based on standard cognitive-behavioural concepts of working with cognitions, behavioural activation, interpersonal effectiveness, and sleep hygiene.	14 days Multiple times a week (45-minutes minimum)

15. Krieger et al. (2019) Switzerland	37.69	77.60%	Non - clinical Adults high in self-criticism (≥ 20 on FSCRS I-S subscale)	Online mindfulness-based compassionate living (MBCL) - Mindfulness-Based Compassionate Living	Web-based - Accessible on any computer or smartphone	Care as usual/ no treatment	The intervention included six modules: an introduction to mindfulness, the three affect regulation systems, stress reaction and self-compassion, inner patterns, the compassionate mode, self & others, and common humanity. The intervention included texts, audio files, and a diary function.	8 weeks Weekly (1 hour)
16. Lancheros et al. (2023) Colombia	23.25	Unknown	Non-clinical students Emotional symptoms - DASS 21 cut-off for depression (5-6), anxiety (4), and stress (8-9)	Online group Mindful Self-Compassion (MSC) - Mindful Self-Compassion	Google Meet Platform	Waitlist	This was a group intervention with 4 sessions: (1) Self-compassion and mindfulness were conceptualised, (2) practices of loving-kindness and compassionate voice were developed, (3) skills based on self-compassion and mindfulness were trained to cope with emotional experiences (4) interpersonal difficulties were explored, and gratitude practices were performed.	4 weeks Weekly

17. Leboeuf et al. (2022) France	34.6	81%	Non-clinical	Online Compassionate mind training (CMT) - Compassionate mind training	Web-based – via a University web page	Care as usual/ no treatment	The intervention was based on the compassionate workbook by Irons and Beaumont (2017). The exercises were inspired by some exercises from the book, which builds on the three flows of compassion, and consisted of experiential, intellectual, and emotional guidance towards understanding and implementing compassion.	4 weeks Daily (15 minutes)
18. Levin et al (2018) United States	22.76	68.90%	Non-clinical Adults high in self-criticism (≥19 on FSCRS I-S subscale)	Cognitive defusion mobile app and restructuring app - Cognitive Behavioural Therapy	Mobile Application - android or IOS device	Active Control and waitlist	The cognitive defusion app guided users through a set of brief, interactive defusion skills. Participants selected from a variety of metaphors for cognitive fusion/defusion and applied them to difficult thoughts. The cognitive restructuring app included skill sessions such as “alternate thoughts” and “taking perspective”. Both conditions also provided “quick tips” and interactive exercises, which used thought monitoring.	2 weeks Daily
19. Nadeau et al. (2020) United Sates	38.12	100%	Non-clinical	Yourself Truly program - Mindful Self Compassion (MSC)	Online - no more information provided	Waitlist	Yourself Truly was developed by Howard (2018). The intervention consisted of 10 modules, including psychoeducational video lecture discussing self-love and acceptance, an interview with a prominent expert in the field, a guided experiential exercise, a case interview, and homework.	10 weeks Weekly

20. Ondrejkova et al. (2022) Slovakia	25.5	86%	Non-clinical	Online Mindfulness-Based Compassionate Living (MBCL)-Mindfulness-Based Compassionate Living	Email	Care as usual/ no treatment	Daily tasks were selected from an official MBCL training programme (Van den Brink et al., 2018) and were emailed to participants each morning with information about the aim of the task, instructions, and a link to questions prompting reflections. This included exercises such as breathing, the safe place, the three systems in your life, embodying compassion, a compassionate letter, inner critic, inner helper, forgiving yourself, revisiting the good, a day in your life, a compassionate prevention plan, and the River of Life.	15 days Daily
21. Swee et al (2023) United States	20.44	76.90%	Non-clinical undergraduate students High in shame (≥65 on the Experience of Shame Scale)	Online self-compassionate letter-writing intervention - Compassion focused therapy (CFT)	Online - no more information provided	Waitlist	Participants watched an online video that provided psychoeducation about self-compassion. They also listened to audio recordings which guided them through imaginal and written exercises, such as writing a compassionate letter to an imagined other. In the second session participants began self-compassionate letter writing. They were then asked to complete daily letters.	16 days Daily (30 minutes)

Figure 1.

PRISMA Flow Diagram for Systematic Review.

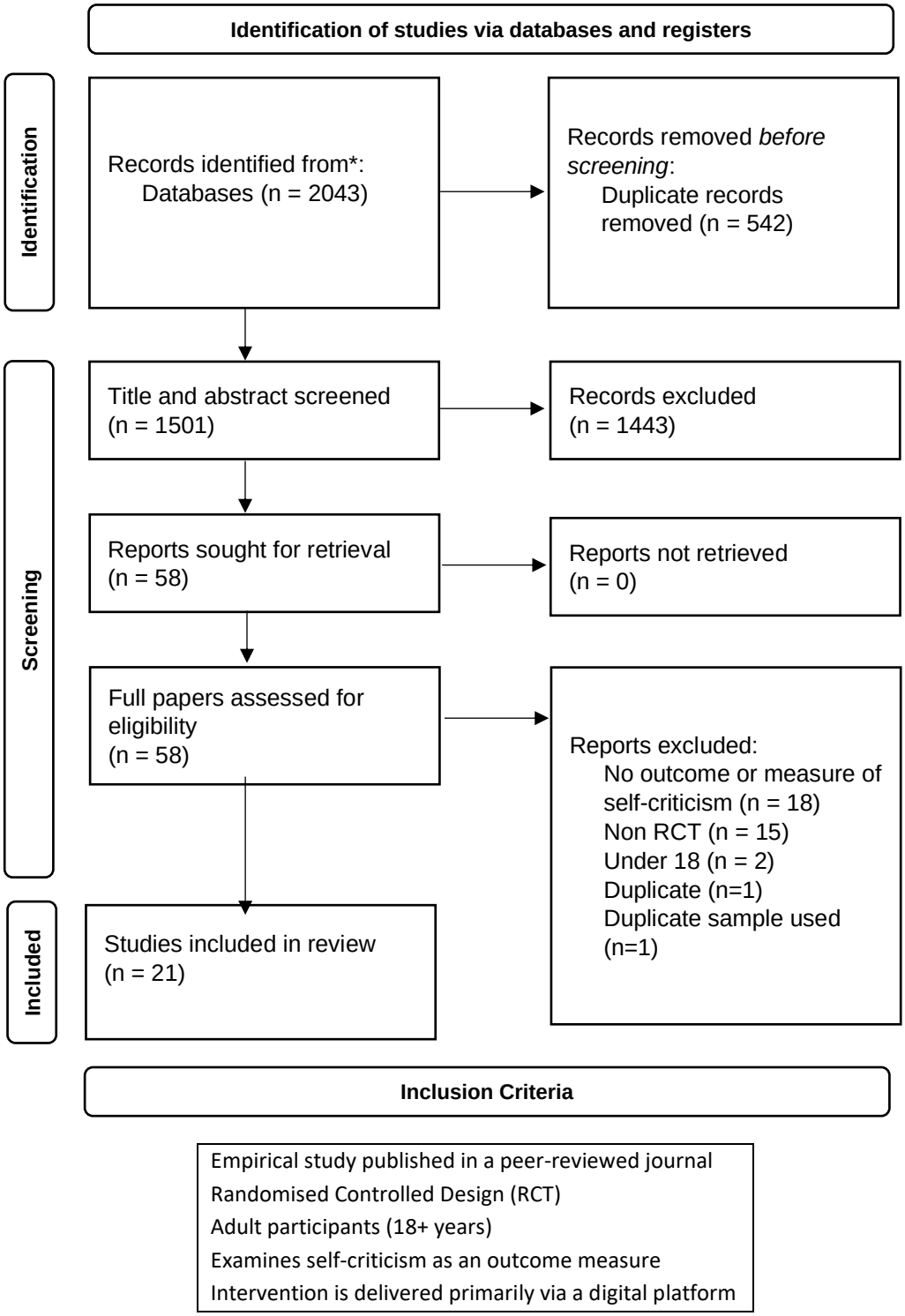
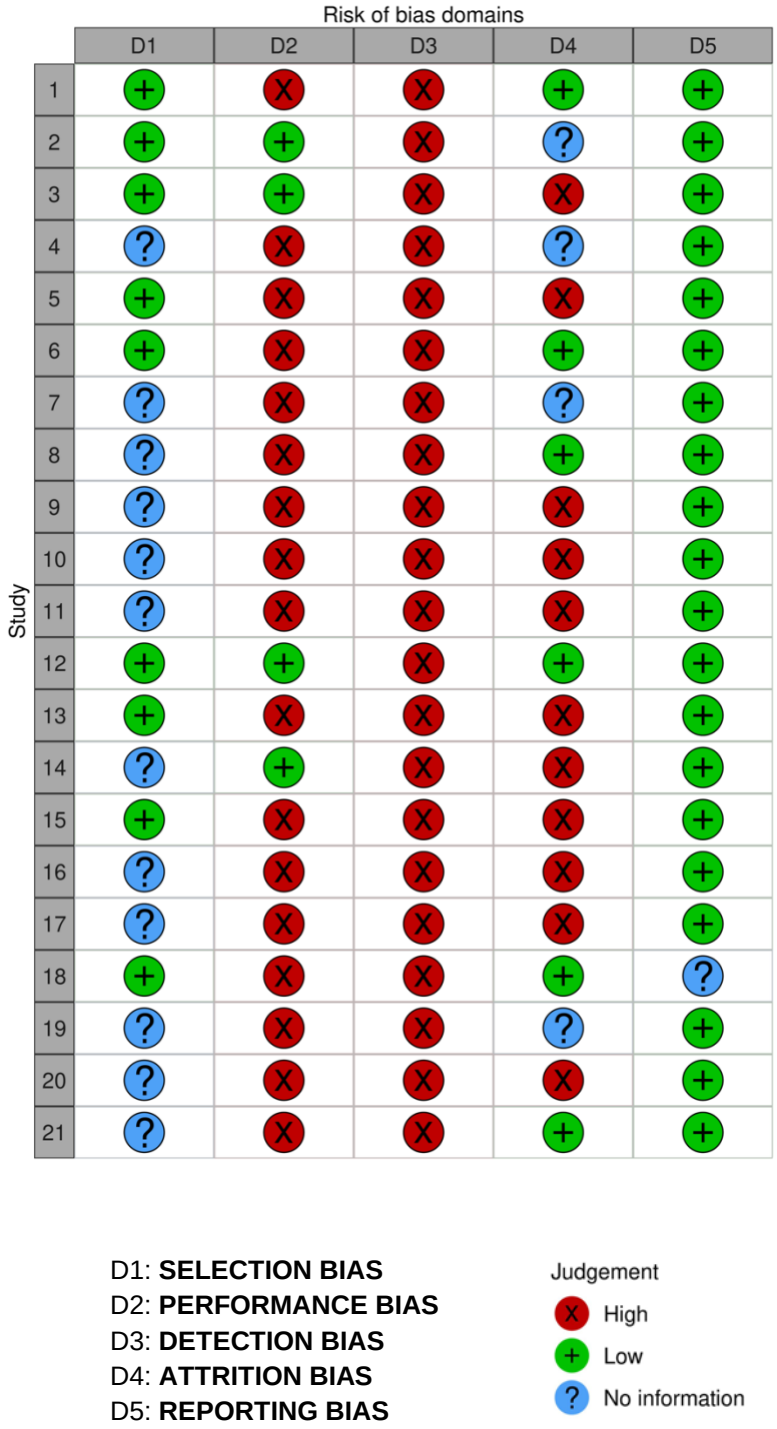


Figure 8.

Risk of Bias (ROB) Domains Traffic Light Plot.



Participant and Setting Characteristics

Country of data collection

The studies included in this review were carried out between 2018-2023 in a range of countries. The most common country was the United Stated (n = 7). This was followed by Slovakia (n = 4) and the United Kingdom (n = 2). The remaining countries were all included in this review once: Switzerland, South Korea, Germany, France, Colombia, Sri Lanka, China, Canada, and India.

Sample size

The overall number of participants included in this review is 2,254, with a mean of 107.3 participants across all studies. The studies included a range of 32 (Gu et al., 2022) to 477 (Kariyawasam et al., 2023) participants.

Population characteristics

All participants in the included samples were above 18 years old, and their mean age ranged from 20.44 (Swee et al., 2024) to 45.53 (Dhokia et al., 2023) years old. The overall mean participant age across the studies was 29.3, although four of the studies in this review did not provide the mean age of participants. Most of the selected studies used samples that were predominantly White or Caucasian. The percentage of participants who were white or Caucasian exceeded 50% in most studies, aside from the studies by Al Rafae et al. (2021), where 37% of participants identified as white, and Drabu et al. (2022), where only 4.7% identified as Caucasian. Eleven of the selected studies did not provide data on the sample's ethnicity. The population of the selected studies were

predominantly female and the percentage of participants who were women exceeded 65.8% in all studies, with three studies having only female participants (Gammer et al., 2020; Kelman et al., 2018; Nadeau et al., 2018).

The study populations varied and were comprised of individuals who were helping professionals, pregnant women, mothers of young children, and individuals who were concerned about their use of analgesics for chronic pain, engaged in non-suicidal self-injury, or suffered from self-criticism or high shame in daily life. All 21 studies targeted 'non-clinical' populations. However, some studies only included participants who reached 'cut off' scores for certain traits, such as self-criticism measured using the Forms of Self-Criticizing/attacking and Self-reassuring Scale (Krieger et al., 2019; Levin et al., 2018) or the Depressive Experiences Questionnaire Self-criticism *(*Gu et al., *2022),* shame measured via the Experience of Shame Scale (Swee et al., 2023), and depression measured using the Depression, Anxiety and Stress Scale (Lancheros et al., 2023). Two studies sought participants who had endorsed or engaged in non-suicidal self-injury (Drabu et al., 2022; Hooley et al., 2018). In one study 25% of the sample self-declared a diagnosis of a mental health disorder (Al-Refae et al., 2022).

Intervention Characteristics

Digital characteristics

The majority of studies were web-based and accessible to participants via a computer or mobile phone device (Gammer et al., 2020; Halamova et al., 2018; Halamova et al., 2018b; Halamova et al., 2020b; Hooley et al., 2018; Kariyawasam et al., 2023; Kelman et

al., 2018; Krieger et al., 2019; Leboeuf et al., 2022). Two study interventions were delivered via mobile applications (Al-Refae et al., 2021; Levin et al., 2018) and two were delivered via video-conferencing systems, using Zoom (Dreisoerner et al., 2023) and Google Meet (Lancheros et al., 2023). One of the selected studies only interacted with participants and shared materials via email (Ondrejkova et al., 2022). Out of the selected studies seven did not provide detail describing what the 'online' technology involved (Dhokia et al., 2020; Drabu et al., 2022; Gu et al., 2022; Halamova et al., 2020; Halamova et al., 2022; Nadeau et al., 2020; Swee et al., 2023).

Duration and frequency

The duration of the intervention varied considerably between the different studies included in this review. The study of Dreisoerner et al. (2023) assessed participants' reductions in self-criticism after completing a 7-day intervention, whereas the study with the longest duration was that of Nadeau et al. (2020) which examined a 70-day intervention. The mean duration of intervention was 23.09 days.

The frequency of the intervention (how often the intervention was completed) also varied amongst the selected studies. Thirteen of the interventions involved participants completing daily tasks (Al-Refae et al., 2021; Drabu et al., 2022; Halamova et al., 2018; Halamova et al., 2018b; Halamova et al., 2020; Halamova et al., 2020b; Halamova et al., 2022; Hooley et al., 2018; Kariyawasam et al., 2023; Leboeuf et al., 2022; Levin et al., 2018; Onderejkova et al., 2022; Swee et al., 2023). These daily tasks varied in duration and took between 5 (Hooley at al., 2018) to 30 minutes (Halamova et al., 2018; Kariyawasam et al., 2023; Swee et al., 2023) per day to complete. The mean duration of

the daily tasks were 18.7 minutes. However, six studies did not specify the duration of the daily tasks.

Four studies involved participant participation on a weekly basis and sessions varied from 60-80 minutes in length per week (Dreisoerner et al., 2023; Kreieger et al., 2019; Nadeau et al., 2020; Lancheros et al., 2023). Two of the selected studies used both weekly sessions and daily tasks (Gammer et al., 2020; Gu et al., 2022). One of the selected studies did not state the frequency of completion (Dhokia et al., 2020) and one study involved participant involvement three times per week (Kelman et al., 2018).

Delivery format

Only two of the selected studies were facilitated by clinicians or researchers via online videoconferencing (Dreisoerner et al., 2023; Lancheros et al., 2023). The remaining studies in this review utilised stand-alone interventions that were unguided. Some of the studies used standardised emails prompts to remind participants to complete tasks (Halamova et al., 2018; Halamova et al., 2018b; Halamova et al., 2022; Hooley et al., 2018; Kelman et al., 2018; Levin et al., 2021). Some authors also provided contact details so that participants could receive further guidance or assistance from a psychologist (Krieger et al., 2019; Nadeau et al., 2020) or a researcher (Dhokia et al., 2022; Leboeuf et al., 2022) on request.

Randomised controlled trials vary in the comparator groups they use. Researchers can choose passive control groups (such as waitlist controls or treatment as usual) or active control groups (such as alternative interventions). Fifteen of the selected studies compared the digital intervention to a wait-list control or care as usual/ no treatment (Al

Rafae et al., 2021; Dreisoerner et al., 2023; Gammer at al., 2020; Halamova et al., 2018; Halamova et al., 2018b; Halamova et al., 2020; Halamova et al., 2020b; Halamova et al., 2022; Krieger et al., 2019; Kariyawasam et al., 2023; Lancheros et al., 2023; Leboeuf et al., 2022; Nadeau et al., 2020; Ondrejkova et al., 2022; Swee et al., 2023). Four studies compared the digital intervention to an active control only, for example participants listening to relaxing music or journaling (Drabu et al., 2022; Dhokia et al., 2020; Hooley et al., 2018; Kelman et al., 2018). Two studies compared the digital intervention with both an active and passive control group (Gu et al., 2022; Levin et al., 2018).

Intervention approaches

Although the interventions examined were variable in content and in length, most interventions focused on cultivating compassion. This included online versions of compassionate mind training (CMT) (Dhokia et al., 2020; Halamova et al., 2020b; Karlyawasam et al., 2023; Kelman et al., 2018; Leboeuf et al., 2022), mindful self-compassion (MSC) programmes (Dreisoerner et al., 2023; Drabu et al., 2023; Halamova et al., 2018; Lancheros et al., 2023), mindfulness-based compassionate living (MBCL) interventions (Kriger et al 2019; Ondrejkova et al., 2022) and other interventions based on compassion focused therapy (CFT) (Gu et al., 2022; Swee et al., 2023). Three studies were influenced by both mindfulness and self-compassion-based interventions (Al-Refae et al., 2021; Gammer et al., 2020; Nadeau et al., 2020). Exercises and techniques inspired by cognitive behavioural therapy were used in three of the selected studies (Al-Refae et al., 2021; Kelman et al., 2018; Levin et al., 2018). Two studies involved an online adapted version of emotion focused training (Halamova et al., 2018; Halamova et al., 2022) and

the remaining two studies used either autobiographical self-enhancement training, which is a novel cognitive intervention (Hooley et al., 2018), or a mindfulness-based stress-reduction programme (Halamova et al., 2018b). Some interventions' content was based off multiple approaches, for example the study of Al-Refae et al. (2021) used mobile application 'SERENE' and utilised strategies from CBT, mindfulness, and self-compassion literature.

Key intervention elements

The studies included multiple components and there was overlap with the treatment elements included in the interventions (see Table 2 for a visual representation of included studies intervention components). The most popular intervention element was psychoeducation (n=17). This included psychoeducation based on the three-emotion regulation system and explained concepts such as self-criticism and self-compassion. Many of the studies also used the psychoeducation element to explain the intended impact of the exercises included in the intervention to encourage participant motivation. Audio guided exercises were used in many of the interventions (n=16). This included audio body scans (Drabu et al., 2022; Halamova et al 2018b; Halamova et al 2020; Halamova et al 2020b; Krieger et al., 2019) and guided meditations (Drabu et al., 2022; Dreisoerner et al., 2023; Gu et al., 2022; Halamova et al 2018b; Halamova et al 2020; Kelman et al., 2018; Krieger et al., 2019; Nadeau et al., 2021). Mindfulness practices were commonly introduced during the interventions (n=10), as was compassionate letter writing (n=9), breathing exercises (n=9), compassionate focused imagery (n=9) and journal or diary entries (n=6). CBT inspired techniques were also used (n=5) such as

cognitive restructuring (Al-Refae et al., 2021; Levin et al., 2018), cognitive defusion (Levin et al., 2018), and behavioural activation (Kelman et al., 2018; Leboeuf, et al., 2022).

Outcome Characteristics

Self-criticism based outcome measure

A variety of outcome measures were used to measure self-criticism (see Table 3). The most popular method to measure self-criticism was the Forms of Self-Criticism/Reassuring Scale (FSCRS) developed by Gilbert (2004), split in to the 'hated self' and 'inadequate self' subscales. Some studies used the combined measure 'inadequate + hated-self' subscale to measure self-criticism. This measure has 22 items and uses a 5-point likert scale. This was used in fifteen of the selected studies (Dhokia et al., 2020; Gammer et al., 2020; Halamova et al., 2018; Halamova et al., 2018b; Halamova et al., 2020; Halamova et al., 2020b Halamova et al., 2022; Kariyawasam et al., 2023; Kelman et al., 2018; Krieger et al., 2019; Lancheros et al., 2023; Leboeuf et al., 2022; Levin et al., 2018; Ondrejkova et al., 2022; Swee et al., 2023). This measure has been validated in various clinical as well as nonclinical samples in different countries (Halamová et al. 2017a; Leboeuf et al., 2019).

Five studies utilised the Self-Compassion Scale (SCS) developed by Neff (2003) (Al-Refae et al., 2021; Dreisoerner et al., 2023; Halamova et al., 2020; Lancheros et al., 2023; Nadeau et al., 2020). The studies used the self-judgement (being disapproving of one's inadequacies) subscale of the SCS as a measure of self-criticism. Two studies used the Self-Rating Scale (SRS) for self-critical cognitions developed by Hooley et al. (2010)

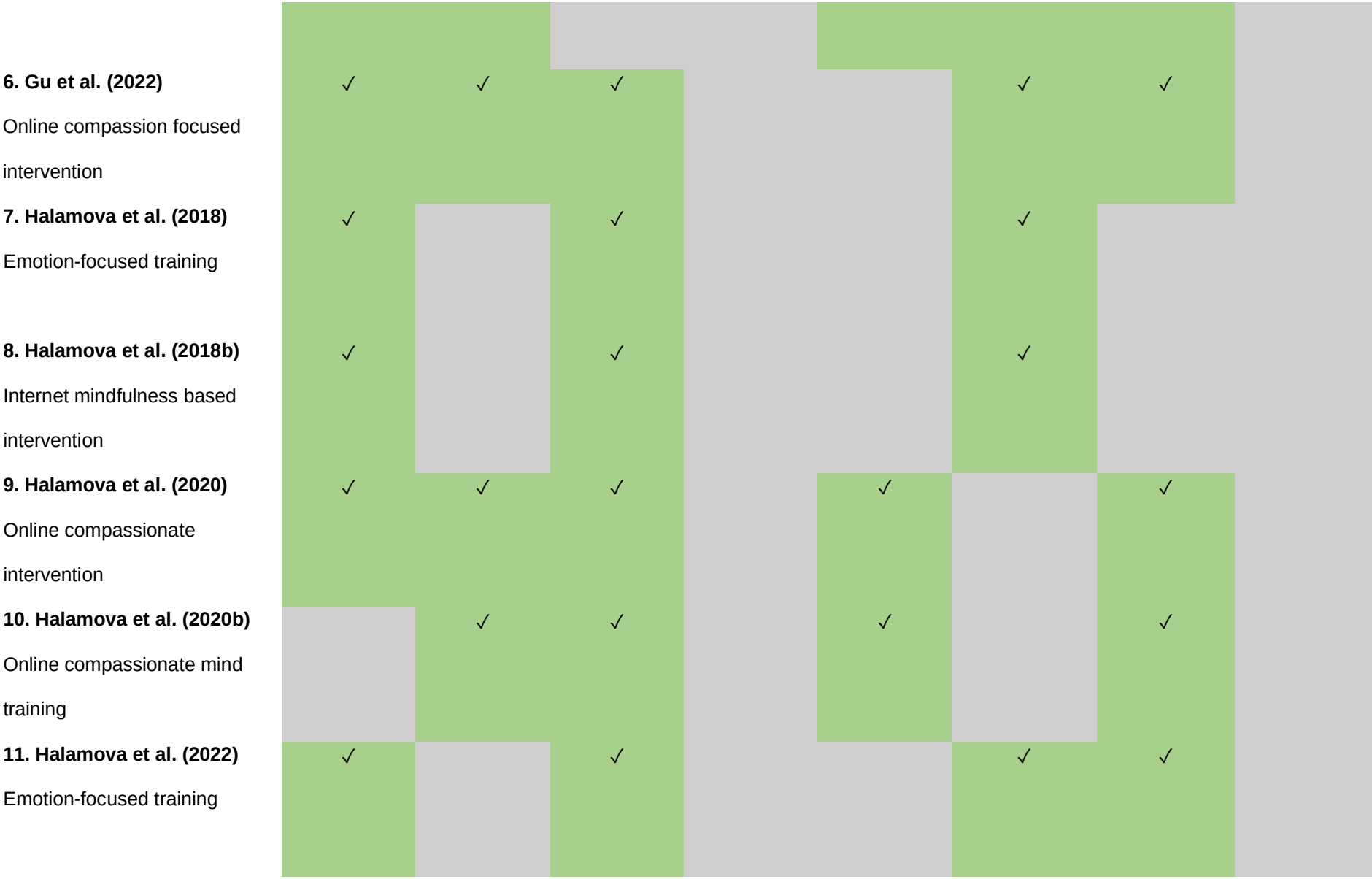
(Drabu et al., 2022; Hooley et al., 2018). This measure has 8 items and assesses self-critical beliefs using a 7-point likert scale.

Three studies used two different measures of self-criticism within the intervention. Halamova et al. (2020) and Lancheros et al. (2023) both used the FSCRS AND SCS subscale, and Drabu et al. (2023) used the Self-Rating Scale (SRS) and the Self-criticism Affect Misattribution Procedure (AMP). The AMP involves a brief computerised task and is an implicit measure of self-criticism. Gu et al. (2022) used the Self-criticism Scale from the Depressive Experiences Questionnaire (DEQ-SC). The DEQ was developed by Blatt et al. (1976) and the study authors used 15 self-criticism related items as a screening tool.

Table 2.

Intervention elements of the included studies.

Study Reference Intervention Name	**Psychoeducation**	**Compassionate letter Writing**	**Audio Guided Exercises**	**Diary or journal entries**	**Breathing Exercises**	**Mindfulness meditation**	**Compassion focused imagery**	**CBT based elements**
1. Al-Refae et al. (2021) Serene mobile application	✓			✓		✓		✓
2. Dhokia et al. (2020) Online compassionate mind training	✓				✓		✓	
3. Drabu et al. (2022) Loving kindness for ourselves		✓	✓		✓			
4. Dreisoerner et al. (2023) Be your friend	✓	✓	✓			✓		
5. Gammer et al. (2020) Kindness for mums online	✓				✓	✓	✓	


6. Gu et al. (2022)
Online compassion focused intervention
7. Halamova et al. (2018)
Emotion-focused training
8. Halamova et al. (2018b)
Internet mindfulness based intervention
9. Halamova et al. (2020)
Online compassionate intervention
10. Halamova et al. (2020b)
Online compassionate mind training
11. Halamova et al. (2022)
Emotion-focused training

12. Hooley et al. (2018)													
1: Autobiographical Self-Enhancement Training						✓							
2: Expressive writing						✓							
13. Kariyawasam et al. (2023) Brief compassionate mind training	✓			✓			✓	✓					
14. Kelman et al. (2018)													
1. Online cognitive behavioral intervention	✓												✓
2. Online compassionate mind training	✓			✓									
15. Krieger et al. (2019) Mindfulness-based compassionate living	✓	✓		✓		✓		✓		✓		✓	
16. Lancheros et al. (2023) Mindfulness and self-compassion program	✓			✓						✓			

17. Leboeuf, et al. (2022) Online compassionate mind training	✓	✓	✓		✓		✓	✓
18. Levin et al. (2018)								
1: Cognitive Defusion Mobile App				✓				✓
2: Cognitive Restructuring App				✓				✓
19. Nadeau et al. (2021) Yourself truly programme	✓		✓	✓				✓
20. Ondrejkova et al. (2022) Mindfulness-based compassionate living	✓	✓	✓		✓		✓	
21. Swee et al. (2023) Self-compassionate letter-writing	✓	✓	✓					
Total	17	9	16	6	9	10	9	6

Note. '✓' is used to mark inclusion of this element within the study's intervention.

Baseline to post intervention and follow up evaluations

The aim of this systematic review was to explore whether digital interventions have been effective in reducing self-criticism (see Table 3 for an overview of study findings). The majority of studies reported that the digital interventions were statistically effective (improvements were made) in at least one self-criticism subscale or outcome measure (n=17). The effect sizes ranged from small to large, with the majority falling under a moderate effect size. Seven showed a statistically significant decrease in the inadequate-self subscale post intervention (Halamova et al., 2018b; Kariyawasam et al., 2023; Krieger et al., 2019; Lancheros et al., 2023; Leboeuf et al., 2022; Ondrejkova et al., 2022; Swee et al., 2023). The effect sizes ranged from small to moderate. Additionally, five studies found a significant reduction in the self-hate subscale from the FSCRS post intervention (Dhokia et al., 2020; Halamova et al., 2020b; Krieger et al., 2019; Levin et al., 2018; Ondrejkova et al., 2022). For two of these studies a moderate effect size was observed, and three studies demonstrated a large effect size. Four studies used the combined 'inadequete + hated-self' subscale to measure self-criticism, three of which found a statistically significant effect post intervention (Halamova et al. 2018; Halamova et al. 2020b; Halamova et al. 2022). In the remaining studies, a non-significant effect was found post intervention suggesting the online intervention did not lead to significant reductions in self-criticism (Dreisoerner et al., 2023; Gammer et al., 2020; Halamova et al., 2018; Halamova et al., 2020).

Three of the selected studies did not report follow up assessments and therefore no information on the sustainability of the intervention effects was available (Al-Refae et al., 2021; Lancheros et al., 2023; Levin et al., 2018). The remaining studies included

follow up assessments which ranged from 1 week (Dhokia et al., 2020; Drabu et al., 2022; Dreisoerner et al., 2023) to 12 weeks (Gammer at al., 2020). The mean follow-up period was approximately 5.2 weeks. The following studies (n=12) found longer term or sustained effects on self-criticism at the follow up period (Dhokia et al., 2020; Drabu et al., 2022; Gu et al., 2022; Halamova et al., 2018; Halamova et al., 2018b; Halamova et al., 2020b; Halamova et al., 2022; Kariyasawam et al., 2023; Krieger et al., 2019; Lancheros et al., 2023; Nadeau et al., 2020; Ondrejakova et al., 2022; Swee et al., 2023)

Table 3.

Outcome measures and findings of studies included in the review

Author (Year)	Sample Size	Self-criticism measure used	Time points measured	Findings
1. Al-Refae et al. (2021)	165	Self-Compassion Scale (SCS) Self-judgement subscale	Pre and post intervention	The serene mobile application group yielded significantly greater reductions in self-judgment than the waitlist control group ($p = 0.002$, $d = -0.44$)
2. Dhokia et al. (2020)	73	Forms of Self Criticizing/Attacking and Self-Reassuring Scale (FSCRS)	Pre, post intervention and follow up (1 week)	The CMT intervention yielded significantly greater reductions in self-criticism in the hated-self subscale in than the relaxation music group ($p < .001$, $\eta p2 = 0.147$). This reduction was maintained at follow-up. The findings were not significant for the inadequate-self subscale.
3. Drabu et al. (2022)	63	Self-Rating Scale (SRS) assessing self-critical cognitions (Explicit) Self-criticism Affect Misattribution Procedure (AMP) (Implicit)	Pre, post intervention and follow up (1 week)	The intervention group yielded significantly greater reductions in explicit self-criticism. This reduction was maintained at follow-up ($p = 0.001$, partial $\eta 2 = .170$). Findings showed no significant effect for implicit self-criticism scores.

4. Dreisoerner et al. (2023)	155	Self-Compassion Scale (SCS) Self-judgement subscale	Pre, post intervention and follow up (1 week)	There was no significant effect of the intervention on self-judgement (p=.099, cohen's f = .16).
5. Gammer et al. (2020)	206	Forms of Self Criticizing/Attacking and Self-Reassuring Scale (FSCRS) Hated & Inadequate Self subscales	Pre, post intervention and follow up (12 weeks)	There were no significant differences between the intervention group and controls for self-criticism (p> 0.33 - effect size not reported)
6. Gu et al. (2022)	32	Self-criticism Scale of the Depressive Experiences Questionnaire (DEQ-SC)	Pre, post intervention and follow up (2 weeks)	The CFI group yielded significant reductions in self-criticism (p<.001, effect size not reported). This reduction was maintained at follow-up.
7. Halamová et al. (2018)	51	Forms of Self Criticizing/Attacking and Self-Reassuring Scale (FSCRS)	Pre, post intervention and follow up (8 weeks)	The EFT-SCP intervention was effective at reducing self-criticism (hated-self subscale) (p<0.05, relative effect 0.39). This reduction was maintained at follow-up. There was no significant effect of the intervention on Inadequate Self subscale at follow-up.
8. Halamova et al (2018b)	62	Forms of Self Criticizing/Attacking and Self-Reassuring Scale (FSCRS)	Pre, post intervention and follow up (8 weeks)	The intervention yielded a significant reduction in self-criticism. This reduction was maintained at follow-up. There was a significant effect of the intervention on

				FSCRS 'Inadequate + Hated-self' ($p < 0.05$, relative effect = 0.44) and inadequate self ($p < 0.05$, relative effect = 0.46), however these were not maintained at follow up. A significant effect was found at follow up for hated-self ($p<0.05$, relative effect = 0.42).
9. Halamova et al. (2020)	122	Forms of Self Criticizing/Attacking and Self-Reassuring Scale (FSCRS)	Pre, post intervention and follow up (8 weeks)	The intervention did not have significant effect on the FSCRS 'inadequate + hated-self' subcale (p=0.660), the inadequate-self subscale (p=0.208) or the hated-self subscale (0.147) of the FSCRS.
		Self-Compassion Scale (SCS) Self-judgement subscale		The intervention was effective at significantly reducing self-criticism post intervention ($p < 0.05$, relative effect = 0.54) but these reductions were not maintained at follow up (p=0.098, relative effect = 0.49)
10. Halamová et al. (2020b)	46	Forms of Self Criticizing/Attacking and Self-Reassuring Scale (FSCRS)	Pre, post intervention and follow up (8 weeks)	The intervention was effective at significantly reducing self-criticism on the FSCRS inadequate + hated self subscale (p=.008, relative effect =.41) and the hated-self subscale (p=.004, relative effect =.34). This effect was maintained at follow up.

11. Halamová et al. (2022)	65	Forms of Self Criticizing/Attacking and Self-Reassuring Scale (FSCRS)	Pre, post intervention and follow up (8 weeks)	The intervention was effective at significantly reducing self-criticism measured by the FSCRS 'inadequate + hated-self' subscale (p=0.007). This effect was maintained at the two month follow up (p=p = 0.006, d = 0.71). No significant effect was found for hated-self subscale (p=0.432).
12. Hooley et al. (2018)	144	Self-Rating Scale (SRS) assessing self-critical cognitions	Pre, post intervention and follow up (4 weeks)	The ASET group reported significantly less self-criticism at post-treatment than the JW group (p = .047), however this was not maintained at follow-up (p = .41). Effect sizes were not reported.
13. Kariyawasam et al. (2023)	477	Forms of Self Criticizing/Attacking and Self-Reassuring Scale (FSCRS)	Pre, post intervention and follow up (2 weeks)	In both the UK and Sri Lankan sample the FSCRS inadequate-self subscale scores were significantly reduced when compared to the waitlist control group (Sri Lankan sample p=0.015, ηp2 = 0.03 and UK sample p < 0.001, ηp2 = 0.06). There was not a significant effect on the FSCRS hated-self subscale. Post intervention changes were maintained at follow up (Sri Lanka sample - p=0.002, ηp2 = 0.34, and UK sample p < 0.001, ηp2 = 0.27).

14. Kelman et al. (2018)	84	Forms of Self Criticizing/Attacking and Self-Reassuring Scale (FSCRS)	Pre, post intervention and follow up (2 weeks)	There was no significant effect of the intervention on self-criticism.
15. Krieger et al. (2019)	121	Forms of Self Criticizing/Attacking and Self-Reassuring Scale (FSCRS)	Pre, post intervention and follow up (8 weeks)	The intervention was effective at significantly reducing self-criticism and a decrease was present on the FSCRS inadequate-self ($p < .01$, cohen's $d = 0.44$) and hated-self subscales ($p < .01$, cohen's $d = 0.15$). This effect was maintained at follow up.
16. Lancheros et al. (2023)	35	Forms of Self Criticizing/Attacking and Self-Reassuring Scale (FSCRS) Self-Compassion Scale (SCS) Self-judgement subscale	Pre and post intervention	The intervention was effective at reducing self-criticism on the SCS self-judgement subscale ($p < 0.001$, $\eta p = 0.469$), the FSCRS inadequate scale ($p < 0.001$, $\eta p = 0.349$), and the hated self subscale ($p < 0.001$, $\eta p = 0.325$).
17. Leboeuf et al. (2022)	91	Forms of Self Criticizing/Attacking and Self-Reassuring Scale (FSCRS)	Pre, post intervention and follow up (4 weeks)	The intervention was effective at significantly reducing self-criticism in the FSCRS inadequate scale ($p = <.001$, $\eta 2p = .04$), but this effect was not maintained at follow up. The intervention was not significantly effective at reducing self-criticism on the hated-self subscale.

18. Levin et al. (2018)	51	Forms of Self Criticizing/Attacking and Self-Reassuring Scale (FSCRS)	Pre and post intervention	Equivalent improvements were found from the defusion and restructuring apps relative to the waitlist on self-criticism. Significant time by condition interactions were found for hated-self (p<.05, Cohen's d = 0.53). The only non-significant time by condition interaction was for inadequate self-criticism.
19. Nadeau et al. (2020)	57	SCS - self-judgement scale	Pre, post intervention and follow up (4 weeks)	The intervention was effective at reducing self-judgment (p < .01, ηp2 = .14). This was maintained at follow up.
20. Ondrejkova et al. (2022)	50	Forms of Self Criticizing/Attacking and Self-Reassuring Scale (FSCRS)	Pre, post intervention and follow up (8 weeks)	The intervention was effective at significantly reducing self-criticism (p<.001, rm = 0.71) measured by the self-judgement subscale in the SCS and the results persisted in the follow-up. The intervention was effective in reducing the FSCRS inadequate scale (p <.001, rm = 0.71) and hated-self subscale (p =<.05, rm = 0.46).
21. Swee et al (2023)	68	Forms of Self Criticizing/Attacking and Self-Reassuring Scale (FSCRS) Inadequate Scale	Pre, post intervention and follow up (4 weeks)	The self-compassionate letter intervention was effective at significantly reducing self-criticism measured by the inadequate-self subscale. This was maintained during the 1-month follow-up (p=0.04, cohen’s d = 0.43)

Discussion

This systematic review aimed to evaluate the effectiveness of digital interventions in reducing self-criticism. The results highlight the variety of digital interventions that are currently available, the populations studied, and the commonly used outcome measures. Existing literature indicates that digital interventions can lead to a variety of promising psychological outcomes. Similarly, this review corroborates the effectiveness of digitally delivered interventions, and revealed that they can be effective in reducing levels of self-criticism in nonclinical populations. This review provides a narrative synthesis due to the heterogeneity of intervention methods and outcome measures used in the included studies.

The results illustrate that the majority of the digital approaches used were statistically significant in reducing levels of self-criticism (17 out of the 21 included studies). The current reviews findings revealed moderate effect sizes, replicating findings from Wakelin et al. (2020), who found that self-compassion related interventions produced medium reductions in self-criticism. Additionally, twelve of the included studies demonstrated a significant reduction in self-criticism levels at follow up, suggesting that the positive effects on self-criticism are maintained post intervention completion. This is in line with evidence that principles from in-person intervention can be effectively delivered online and produce similar outcomes (Carlbring et al., 2018; Santarossa et al., 2018). However, the majority of the reviewed studies included a short follow up period which makes it difficult to draw robust conclusions regarding the long-term effectiveness of digital interventions in reducing self-criticism. Digital interventions are relatively novel

in comparison to in-person interventions, and therefore further research on their long-term efficacy should be conducted (Nwosu et al., 2022).

The six studies with the lowest risk of bias (rated as low risk in at least three risk domains) align with the overall findings and strengthen the evidence base for the efficacy of digital interventions for reducing self-criticism (Al-Refae et al., 2021; Dhokia et al., 2022; Drabu et al., 2022; Gu et al., 2022; Hooley et al., 2020). All six studies demonstrated a significant reduction in self-criticism, with five measuring effects at follow up and four finding that these effects were maintained over time. These higher quality studies were given greater weight when forming conclusions in comparison to included studies with higher risk of bias, enhancing the reliability of the review. These studies support the overall conclusion of this review.

All studies included in this review investigated nonclinical samples. However, some studies targeted specific groups, such as individuals who had engaged with non-suicidal self-injury, or those who reached 'cut off' scores for certain traits like self-criticism and depression. These studies demonstrated significant reductions in self-criticism in at least one outcome measure. These findings are promising and suggest that digital interventions may be acceptable and effective for individuals with certain difficulties, such as a higher baseline level of self-criticism or other mental health related problems. Given that self-criticism is implicated in the generation and maintenance of mental health conditions and psychological distress, these findings suggest that digital interventions could serve as an early intervention for a range of mental health difficulties.

The majority of the studies consisted of relatively short-term interventions, with an average treatment length of 23.09 days and a range of 1-10 weeks. This duration is similar

to findings from previous systematic reviews, for example a review investigating digital interventions for mental health difficulties found that active interventions were short and ranged from 4 to 12-weeks (Nwosu et al., 2022). Existing literature suggesrs a correlation between the duration of therapy and the effectiveness of interventions, indicating that more intensive treatments (longer duration and increased number of sessions) result in larger effect sizes. For instance, a systematic review by Walkelin et al. (2022) found greater reductions in self-criticism with longer interventions. One reason may be that individuals with higher levels of self-criticism struggle to generate a compassionate inner voice, and thus require more intensive treatment to develop this skill (Low et al., 2020). Exploring the impact of longer-term digital interventions on self-criticism would help to further understand the potential of online approaches.

Unguided Interventions

The level of human support provided in many of the included studies was minimal, with most being unguided. This suggests that digital interventions may be a valuable resource for an underfunded area, as they require minimal clinician involvement while still providing a significant impact on self-criticism. However, previous research has identified that some form of human or therapist support significantly influences user engagement (Rickwood & Bradford, 2012). For example, qualitative findings suggest that participants are less likely to adhere to treatments if there is limited human contact (Beatty & Binnion, 2016). Additionally, it is important to be aware that trial settings significantly impact participant engagement with unguided interventions, and this thus influences how well intervention findings can be generalised to real life settings (Baumel et al., 2019). The studies in the

current review indicate that unguided interventions were still able to produce effective outcomes despite limited clinician or researcher involvement. However, this is something that requires careful consideration regarding participant adherence and engagement with digital interventions in real-world settings. Balancing the cost-effectiveness of interventions, resource allocation, and the development of therapeutic engagement and rapport is crucial to optimise the benefits of digital interventions for self-criticism.

Therapeutic Approach and Mechanisms of Change

Various theoretical approaches were employed to target self-criticism across the included interventions. A large proportion of studies in this review utilised components from compassion-focused therapy. This aligns with existing research on self-criticism, for example reviews by Walkelin et al. (2022) and Ferrai et al. (2019) both found that self-compassion-related interventions produced moderate reductions in self-criticism compared to control groups. The majority of the studies included in these two reviews were direct and in-person. The current review's findings are comparable to these and suggest that digital interventions can be as effective as their in-person equivalents.

Other therapeutic approaches were also utilised in the current review, indicating that various models can be successfully administered via digital platforms to reduce self-criticism. These include approaches such as mindfulness, emotion-focused training, cognitive based interventions, and mixed approaches, and highlight the versatility of digital interventions. Techniques based on cognitive behavioural therapy approaches were utilised less frequently, with only five of twenty-one studies using CBT techniques. This is in line with the evidence base that suggests individuals with high levels of self-

criticism are less likely to experience symptom improvement or engage with cognitive behavioural approaches (Hawley et al., 2022; Löw et al., 2020).

Understanding the components that lead to significant changes in self-criticism, and how they interact is critical for the further development and evaluation of digital interventions. Most digital interventions included in this review were complex and contained multiple components. For instance, on average the included studies utilised four different intervention elements, with the most popular being psychoeducation, audio guided exercises, and mindfulness. However, within these multiple exercises and techniques were used. This makes it difficult to identify what intervention ingredients had the largest impact on self-criticism. Additionally, lack of clarity and precision in the terminology used to describe components of digital interventions makes it difficult to group interventions and identify active components. For instance, in this review seven studies described their programme as ‘online’ but did not provide further detail on what this entailed. This makes it difficult for studies to be replicated, but also means it is challenging to determine whether the outcomes are the result of the intervention content, therapeutic approach, or the mode of digital delivery.

The majority of the included studies utilised the Forms of Self-criticim/Self-Reassurance Scale (FRSCS) to measure self-criticism. The ‘hated-self’ (H-S) factor focuses on a desire to ‘get rid’ of undesirable aspects of oneself, whereas the ‘inadequate-self’ (I-S) focuses on highlighting one’s own inadequacies. Many studies in this review found significant reductions in only one the two subscales, suggesting that different underlying mechanisms impact each factor. Research indicates that different populations exhibit varying levels of the two self-criticism factors, with H-S being linked to a more

pathological form of self-criticism, which are rarer in nonclinical samples (Sommer-Spijkerman et al., 2018). This may have increased the risk of floor effects and made significant changes more challenging in interventions. However, existing literature implies that I-S and H-S may not be distinct factors for individuals in nonclinical samples (Halamova et al., 2018c). Gaining a better understanding of these potential distinctions of self-criticism and the degree to which they differentiate across populations could enhance the development of more effective, targeted and clinically meaningful interventions.

User Engagement and Attrition

The risk of bias tool indicated high risk in the attrition domain for the majority of studies included in this review. Attrition, the loss of subjects from a study sample, is a very common issue in research trials particularly in those investigating digital interventions (Gonzalez Salas Duhne et al., 2022). For instance, a recent meta-analysis investigating digital interventions for depression revealed that on average approximately 50% of participants completed the full intervention (Moshe et al., 2021). Measuring participant engagement with digital interventions is challenging and there is not currently a standard way to measure ‘meaningful’ engagement (Lipschitz et al., 2023). Existing literature has highlighted that higher severity of symptoms is associated with lower usage of online programmes (Nicholas et al., 2010; von Brachel et al., 2014). Additionally, Chien et al. (2020) investigated an internet-based CBT intervention for individuals with depression and found that only 10.6% of the sample were ‘high engagers’. The studies in the current review only investigated non-clinical samples, so it is possible that attrition rates may increase, and engagement may decrease with clinical populations (Nwosu et al., 2022).

Therefore, it is important to consider how individuals with mental health difficulties may respond to similar interventions. For example, a recent review by Nelson et al. (2024) found that patients with higher levels of baseline mental health symptoms tend to select digital interventions in conjunction with traditional in-person treatments, rather than as stand-alone interventions. Thus, blended treatment approaches may be more appropriate for clinical populations.

Strength of Conclusions

The heterogeneity of the intervention approaches means the conclusions formed from this review are tentative and limited. The included studies varied in their mode of delivery, intervention approach, frequency, duration, and the therapeutic approaches and exercises included within the interventions. Additionally, a range of self-report measures to assess self-criticism were used across the selected studies, making a reliable synthesis of the studies difficult.

Furthermore, the comparators used across the studies ranged from active comparators to passive controls, such as waitlist or treatment as usual. Passive controls were used in 15 out of the 21 included studies. Effect sizes tend to be larger when digital interventions are compared to nonactive controls, and the difference is smaller when there is an active comparator (Hollis et al., 2017). This suggests the studies included in this review may potentially inflate the positive effects of digital intervention on self-criticism (Nelson et al., 2024). Although this is common across novel interventions, future studies comparing digital interventions against other active controls will help provide greater validity to the efficacy of digital interventions in reducing self-criticism.

Limitations

There were several limitations of this review. Notably, the studies consisted of predominantly female participants and the majority were conducted in high-income countries. Therefore, the results may not be generalisable to the wider population. Comparable gender skews have been observed in similar systematic reviews, such as a review investigating the impact of compassion focused therapy on self-criticism and self-soothing, where females comprised of over 65% of participants in nearly all studies (Vidal & Soldevilla, 2023). However, research has shown that women are more likely to engage with digital mental health intervention than men suggesting the current trails may be reflective of gender preferences (Lipschitz et al., 2023). Additionally, the ethnicity of participants was not reported consistently by the included studies. There is currently mixed evidence on the relationship between participant ethnicity and engagement with digital interventions. However, individuals from ethnic minorities tend to engage less with traditional in-person mental health services (Lipschitz et al., 2023). Therefore, there is need for a better understanding of the interplay between ethnicity and digital intervention engagement and efficacy.

The quality appraisal of the included studies was conducted independently by the researcher. To support the assessment, the Cochrane guides were closely followed and existing systematic reviews utilising the Cochrane ROB tool were consulted to inform decision-making. However, it is important to highlight that this process is subjective, and the lack of a second-rating increases the potential for misinterpretation of study information, and misclassifications of risk domains. This in turn may have impacted the

overall reliability of the systematic review's conclusions. In the future, incorporating a second-rating is important to help to minimise this risk.

Lastly, while this review provides some insight on the potential of digital interventions to improve self-criticism, it is important to acknowledge this review focused on randomised controlled trials. While RCTs are considered the gold-standard, this approach may have excluded relevant quasi-experimental studies. Digital interventions are rapidly evolving, and this strict adherence to RCTs might have overlooked newer forms of technology, such as interventions using virtual reality and artificial intelligence, and their potential impact on self-criticism. For example, Falconer et al. (2016) investigated the impact of a virtual reality self-compassion intervention on self-criticism, a study that this review did not encompass. Furthermore, there is an absence of qualitative data or feedback in the included studies. Qualitative data can offer valuable insights into the acceptability of interventions from the participant's perspective and help our understanding of what elements of an intervention contributed to its success. Future reviews should provide a more comprehensive analysis of the impact of digital interventions efficacy in reducing self-criticism by incorporating qualitative methods.

Implications for Research and Clinical Practice

This systematic review included 2,254 participants. However, despite the extensive sample size the mechanisms of change are unclear. Therefore, further research exploring this would facilitate a better understanding, and support the development of more targeted and concise interventions to address self-criticism. Furthermore, striking the balance between resource efficiency and treatment effectiveness is vital. Digital interventions can

offer promise in terms of cost-effectiveness and accessibility. However, it is important to consider how best to maintain intervention engagement and outcomes while minimising use of resources. Moreover, it is worth noting that individuals within clinical populations may struggle more to overcome self-criticism or engage with digital interventions compared to their nonclinical counterparts. Consequently, the current findings may overestimate the efficacy of digital interventions. Thus, further research focusing specifically on clinical populations is warranted.

Conclusions

In recent years, there has been rapid growth in the development and accessibility of digital interventions for mental health difficulties. The findings from this systematic review of 21 randomised controlled trials provides promising results and indicates that digital interventions are effective in reducing levels of self-criticism in nonclinical populations. Given the association between self-criticism and a wide range of psychopathology these findings hold potential to foster improved psychological outcomes, and digital interventions could act as an early intervention and play a pivotal role in the stepped model of care.

The studies included in this review primarily consisted of short-term and unguided interventions, making them relatively low resource. Although these interventions demonstrated immediate effectiveness, the longer-term impact of these digital interventions is unclear, and consequently there is a need for studies investigating the strength of these effects over time, particularly with clinical populations. Such

investigations could offer further insights into the impact of digital interventions on self-criticism and their potential benefit and use within mental health care.

References

Adelman, C. B., Panza, K. E., Bartley, C. A., Bontempo, A., & Bloch, M. H. (2014). A meta-analysis of computerized cognitive-behavioral therapy for the treatment of DSM-5 anxiety disorders. *The Journal of clinical psychiatry*, *75*(7), 695–704. https://doi.org/10.4088/JCP.13r08894

Al-Refae, M., Al-Refae, A., Munroe, M., Sardella, N. A., & Ferrari, M. (2021). A Self-Compassion and Mindfulness-Based Cognitive Mobile Intervention (Serene) for Depression, Anxiety, and Stress: Promoting Adaptive Emotional Regulation and Wisdom. *Frontiers in psychology*, 12, 648087. https://doi.org/10.3389/fpsyg.2021.648087

Andersson, G., & Titov, N. (2014). Advantages and limitations of Internet-based interventions for common mental disorders. *World psychiatry: official journal of the World Psychiatric Association (WPA)*, *13*(1), 4–11. https://doi.org/10.1002/wps.20083

Andrews, G., Basu, A., Cuijpers, P., Craske, M. G., McEvoy, P., English, C. L., & Newby, J. M. (2018). Computer therapy for the anxiety and depression disorders is effective, acceptable and practical health care: An updated meta-analysis. *Journal of anxiety disorders*, 55, 70–78. https://doi.org/10.1016/j.janxdis.2018.01.001

Baumel, A., Edan, S., & Kane, J. M. (2019). Is there a trial bias impacting user engagement with unguided e-mental health interventions? A systematic comparison of published reports and real-world usage of the same programs. *Translational behavioral medicine*, *9*(6), 1020–1033. https://doi.org/10.1093/tbm/ibz147

Beatty, L., & Binnion, C. (2016). A systematic review of predictors of, and reasons for, adherence to online psychological interventions. International Journal of Behavioral Medicine, 23(6), 776–794. https://doi.org/10.1007/s12529-016-9556-9

Bond, R. R., Mulvenna, M. D., Potts, C., O'Neill, S., Ennis, E., & Torous, J. (2023). Digital transformation of mental health services. *Npj mental health research*, *2*(1), 13. https://doi.org/10.1038/s44184-023-00033-y

Bradford, S., & Rickwood, D. (2015). Young People's Views on Electronic Mental Health Assessment: Prefer to Type than Talk?. *Journal of child and family studies*, *24*(5), 1213–1221. https://doi.org/10.1007/s10826-014-9929-0

Carlbring, P., Andersson, G., Cuijpers, P., Riper, H., & Hedman-Lagerlöf, E. (2018). Internet-based vs. face-to-face cognitive behavior therapy for psychiatric and somatic disorders: an updated systematic review and meta-analysis. *Cognitive behaviour therapy*, *47*(1), 1–18. https://doi.org/10.1080/16506073.2017.1401115

Castilho, P., Pinto-Gouveia, J., & Duarte, J. (2017). Two forms of self-criticism mediate differently the shame-psychopathological symptoms link. *Psychology and psychotherapy*, *90*(1), 44–54. https://doi.org/10.1111/papt.12094

Chien, I., Enrique, A., Palacios, J., Regan, T., Keegan, D., Carter, D., Tschiatschek, S., Nori, A., Thieme, A., Richards, D., Doherty, G., & Belgrave, D. (2020). A Machine Learning Approach to Understanding Patterns of Engagement With Internet-Delivered Mental Health Interventions. *JAMA network open*, *3*(7), e2010791. https://doi.org/10.1001/jamanetworkopen.2020.10791

Cox, B. J., Fleet, C., & Stein, M. B. (2004). Self-criticism and social phobia in the US national comorbidity survey. *Journal of affective disorders*, *82*(2), 227–234. https://doi.org/10.1016/j.jad.2003.12.012

Dhokia, M., Elander, J., Clements, K., & Gilbert, P. (2020). A randomized-controlled pilot trial of an online compassionate mind training intervention to help people with chronic pain avoid analgesic misuse. *Psychology of addictive behaviors: journal of the Society of Psychologists in Addictive Behaviors*, 34(7), 726–733. https://doi.org/10.1037/adb0000579

Drabu, S., Sündermann, O., & Hong, R. Y. (2022). A one-week online self-compassion training reduces self-criticism and pain endurance in adults with non-suicidal self-injury ideation: A randomized-waitlist controlled study. *Mindfulness*, 13(5), 1232–1245. https://doi.org/10.1007/s12671-022-01870-2

Dreisoerner, A., Ferrandina, C., Schulz, P., Nater, U. M., & Junker, N. M. (2023). Using group-based interactive video teleconferencing to make self-compassion more accessible: A randomized controlled trial. *Journal of Contextual Behavioral Science*, 29, 230–239. https://doi.org/10.1016/j.jcbs.2023.08.001

Dunkley, D. M., & Grilo, C. M. (2007). Self-criticism, low self-esteem, depressive symptoms, and over-evaluation of shape and weight in binge eating disorder patients. *Behaviour research and therapy*, *45*(1), 139–149. https://doi.org/10.1016/j.brat.2006.01.017

Ehret, A. M., Joormann, J., & Berking, M. (2015). Examining risk and resilience factors for depression: The role of self-criticism and self-compassion. *Cognition & emotion*, *29*(8), 1496–1504. https://doi.org/10.1080/02699931.2014.992394

Enns, M. W., Cox, B. J., & Pidlubny, S. R. (2002). Group cognitive behaviour therapy for residual depression: Effectiveness and predictors of response. *Cognitive Behaviour Therapy, 31*(1), 31– 40. https://doi.org/10.1080/16506070252823643

Fairburn, C. G., & Patel, V. (2017). The impact of digital technology on psychological treatments and their dissemination. *Behaviour research and therapy*, *88*, 19–25. https://doi.org/10.1016/j.brat.2016.08.012

Falconer, C. J., Rovira, A., King, J. A., Gilbert, P., Antley, A., Fearon, P., Ralph, N., Slater, M., & Brewin, C. R. (2016). Embodying self-compassion within virtual reality and its effects on patients with depression. *BJPsych open*, 2(1), 74–80. https://doi.org/10.1192/bjpo.bp.115.002147

Fennig, S., Hadas, A., Itzhaky, L., Roe, D., Apter, A., & Shahar, G. (2008). Self-criticism is a key predictor of eating disorder dimensions among inpatient adolescent females. *The International journal of eating disorders*, 41(8), 762–765. https://doi.org/10.1002/eat.20573

Ferrari, M., Hunt, C., Harrysunker, A., Abbott, M. J., Beath, A. P., & Einstein, D. A. (2019). Self-compassion interventions and psychosocial outcomes: A meta-analysis of RCTs. Mindfulness, 10(8), 1455–1473. https://doi.org/10.1007/s12671-019-01134-6

Firth, J., Torous, J., Nicholas, J., Carney, R., Pratap, A., Rosenbaum, S., & Sarris, J. (2017). The efficacy of smartphone-based mental health interventions for depressive symptoms: a meta-analysis of randomized controlled trials. *World psychiatry: official journal of the World Psychiatric Association (WPA)*, *16*(3), 287–298. https://doi.org/10.1002/wps.20472

Gammer, I., Hartley-Jones, C., & Jones, F. W. (2020). A randomized controlled trial of an online, compassion-based intervention for maternal psychological well-being in the first year postpartum. *Mindfulness,* 11(4), 928–939. https://doi.org/10.1007/s12671-020-01306-9

Ganjali, R., Jajroudi, M., Kheirdoust, A., Darroudi, A., & Alnattah, A. (2022). Telemedicine solutions for clinical care delivery during COVID-19 pandemic: A scoping review. *Frontiers in public health*, *10*, 937207. https://doi.org/10.3389/fpubh.2022.937207

García-Campayo, J., Barceló-Soler, A., Martínez-Rubio, D., Navarrete, J., Pérez-Aranda, A., Feliu-Soler, A., Luciano, J. V., Baer, R., Kuyken, W., & Montero-Marin, J. (2024). Exploring the Relationship Between Self-Compassion and Compassion for Others: The Role of Psychological Distress and Wellbeing. *Assessment,* 31(5), 1038–1051. https://doi.org/10.1177/10731911231203966

Gilbert P. (2014). The origins and nature of compassion focused therapy. *The British journal of clinical psychology*, *53*(1), 6–41. https://doi.org/10.1111/bjc.12043

Gilbert, P. (2009). Introducing compassion-focused therapy. *Advances in Psychiatric Treatment*, 15(3), 199–208. doi:10.1192/apt.bp.107.005264

Gilbert, P., & Procter, S. (2006). Compassionate Mind Training for People with High Shame and Self-Criticism: Overview and Pilot Study of a Group Therapy Approach. *Clinical Psychology & Psychotherapy, 13*(6), 353–379. https://doi.org/10.1002/cpp.507

Gilbert, P., Clarke, M., Hempel, S., Miles, J. N. V., & Irons, C. (2004). Criticizing and reassuring oneself: An exploration of forms, styles and reasons in female

students. *British Journal of Clinical Psychology*, 43, 31–50. doi:10.1348/014466504772812959

Glassman, L. H., Weierich, M. R., Hooley, J. M., Deliberto, T. L., & Nock, M. K. (2007). Child maltreatment, non-suicidal self-injury, and the mediating role of self-criticism. *Behaviour research and therapy*, *45*(10), 2483–2490. https://doi.org/10.1016/j.brat.2007.04.002

Gonzalez Salas Duhne, P., Delgadillo, J., & Lutz, W. (2022). Predicting early dropout in online versus face-to-face guided self-help: A machine learning approach. *Behaviour research and therapy*, *159*, 104200. https://doi.org/10.1016/j.brat.2022.104200

Griffiths, K. M., & Christensen, H. (2006). Review of randomised controlled trials of internet interventions for mental disorders and related conditions. *Clinical Psychologist, 10*(1), 16–29. https://doi.org/10.1080/13284200500378696

Gu, X., Li, S., & Hyun, M.-H. (2022). Does compassion-focused therapy-based online intervention work for Chinese international students with high self-criticism? A randomized controlled trail. *SAGE Open*, 12(3). https://doi.org/10.1177/21582440221121596

Halamová, J., Kanovský, M., Jakubcova, K., Kupeli, N. (2020). Short Online Compassionate Intervention Based On Mindful Self-compassion Program. *Československá psychologie* , 64 (2) pp. 236-250

Halamová, J., Kanovský, M., Jurková, V., & Kupeli, N. (2018b). Effect of a short-term online version of a mindfulness-based intervention on self-criticism and self-compassion in a nonclinical sample. *Studia Psychologica,* 60(4), 259–273.

Halamová, J., Kanovský, M., Pačutová, A., & Kupeli, N. (2020b). Randomised Controlled Trial of an Online Version of Compassion Mind Training in a Nonclinical Sample. *Europe's journal of psychology*, 16(2), 262–279. https://doi.org/10.5964/ejop.v16i2.1683

Halamová, J., Kanovský, M., Varšová, K., & Kupeli, N. (2018). Randomised controlled trial of the new short-term online emotion focused training for self-compassion and self-protection in a nonclinical sample. *Current psychology*, 40(1), 333–343. https://doi.org/10.1007/s12144-018-9933-4

Halamová, J., Ondrejková, N., & Kováč, K. (2022). Randomized controlled trial of emotion-focused training for helping professionals. *Frontiers in Psychology*, 13. https://doi.org/10.3389/fpsyg.2022.1024451

Handley, A. K., Egan, S. J., Kane, R. T., & Rees, C. S. (2015). A randomised controlled trial of group cognitive behavioural therapy for perfectionism. *Behaviour research and therapy*, *68*, 37–47. https://doi.org/10.1016/j.brat.2015.02.006

Hawley, L. L., Rappaport, L. M., Padesky, C. A., Hollon, S. D., Mancuso, E., Laposa, J. M., Brozina, K., & Segal, Z. V. (2022). Self-critical perfectionism, dependency and entropy during cognitive behavioural therapy for depression. *The British journal of clinical psychology*, 61(4), 911–928. https://doi.org/10.1111/bjc.12366

Hollis, C., Falconer, C. J., Martin, J. L., Whittington, C., Stockton, S., Glazebrook, C., & Davies, E. B. (2017). Annual Research Review: Digital health interventions for children and young people with mental health problems - a systematic and meta-review. *Journal of child psychology and psychiatry, and allied disciplines*, *58*(4), 474–503. https://doi.org/10.1111/jcpp.1266

Hooley, J. M., Fox, K. R., Wang, S. B., & Kwashie, A. N. D. (2018). Novel online daily diary interventions for nonsuicidal self-injury: a randomized controlled trial. *BMC psychiatry*, 18(1), 264. https://doi.org/10.1186/s12888-018-1840-6

Johnson, J. A., Sanghvi, P., & Mehrotra, S. (2022). Technology-Based Interventions to Improve Help-Seeking for Mental Health Concerns: A Systematic Review. *Indian journal of psychological medicine*, *44*(4), 332–340. https://doi.org/10.1177/02537176211034578

Kannan, D., & Levitt, H. M. (2013). A review of client self-criticism in psychotherapy. *Journal of Psychotherapy Integration, 23*(2), 166–178. https://doi.org/10.1037/a0032355

Kariyawasam, L., Ononaiye, M., Irons, C., & Kirby, S. E. (2023). Exploring the Cross-cultural Applicability of a Brief Compassionate Mind Training: a Study Comparing Sri Lankan and UK People. *Mindfulness,* 14(2), 429–447. https://doi.org/10.1007/s12671-022-02041-z

Kelman, A. R., Evare, B. S., Barrera, A. Z., Muñoz, R. F., & Gilbert, P. (2018). A proof-of-concept pilot randomized comparative trial of brief internet-based Compassionate mind training and cognitive-behavioral therapy for perinatal and intending to become pregnant women. *Clinical Psychology & Psychotherapy,* 25(4), 608–619. https://doi.org/10.1002/cpp.2185

Kirby, J. N., Tellegen, C. L., & Steindl, S. R. (2017). A Meta-Analysis of Compassion-Based Interventions: Current State of Knowledge and Future Directions. *Behavior therapy*, *48*(6), 778–792. https://doi.org/10.1016/j.beth.2017.06.003

Krieger, T., Martig, D. S., van den Brink, E., & Berger, T. (2016). Working on self-compassion online: A proof of concept and feasibility study. *Internet interventions*, *6*, 64–70. https://doi.org/10.1016/j.invent.2016.10.001

Krieger, T., Reber, F., von Glutz, B., Urech, A., Moser, C. T., Schulz, A., & Berger, T. (2019). An Internet-Based Compassion-Focused Intervention for Increased Self-Criticism: A Randomized Controlled Trial. *Behavior therapy*, *50*(2), 430–445. https://doi.org/10.1016/j.beth.2018.08.003

Lancheros, J. E., Vargas Nieto, J. C., & Arcila Ibarra, S. (2023). Mindfulness and self-compassion decrease emotional symptoms, self-criticism, rumination and worry in college students: A preliminary study of the effects of group self-compassion-based interventions. *Journal of Evidence-Based Psychotherapies*, 23(2), 1–24. https://doi.org/10.24193/jebp.2023.2.8

Leaviss, J., & Uttley, L. (2015). Psychotherapeutic benefits of compassion-focused therapy: an early systematic review. *Psychological medicine*, *45*(5), 927–945. https://doi.org/10.1017/S0033291714002141

Leboeuf, I., Andreotti, E., Irons, C., Beaumont, E., & Antoine, P. (2022). A randomized controlled study of a French compassionate mind training. *Mindfulness,* 13(11), 2891–2903. https://doi.org/10.1007/s12671-022-01987-4

Levin, M. E., Haeger, J., An, W., & Twohig, M. P. (2018). Comparing cognitive defusion and cognitive restructuring delivered through a mobile app for individuals high in self-criticism. *Cognitive Therapy and Research*, 42(6), 844–855. https://doi.org/10.1007/s10608-018-9944-3

Lipschitz, J. M., Pike, C. K., Hogan, T. P., Murphy, S. A., & Burdick, K. E. (2023). The engagement problem: A review of engagement with digital mental health interventions and recommendations for a path forward. Current treatment options in psychiatry, 10(3), 119–135. https://doi.org/10.1007/s40501-023-00297-3

Löw, C. A., Schauenburg, H., & Dinger, U. (2020). Self-criticism and psychotherapy outcome: A systematic review and meta-analysis. *Clinical psychology review*, *75*, 101808. https://doi.org/10.1016/j.cpr.2019.101808

Lowyck, B., Luyten, P., Vermote, R., Verhaest, Y., & Vansteelandt, K. (2017). Self-critical perfectionism, dependency, and symptomatic distress in patients with personality disorder during hospitalization-based psychodynamic treatment: A parallel process growth modeling approach. *Personality Disorders: Theory, Research, and Treatment, 8*(3), 268–274. https://doi.org/10.1037/per0000189

Matos, M., Duarte, C., Duarte, J., Pinto-Gouveia, J., Petrocchi, N., Basran, J., & Gilbert, P. (2017). Psychological and physiological effects of compassionate mind training: A pilot randomised controlled study. *Mindfulness, 8*(6), 1699–1712. https://doi.org/10.1007/s12671-017-0745-7

Moshe, I., Terhorst, Y., Philippi, P., Domhardt, M., Cuijpers, P., Cristea, I., Pulkki-Råback, L., Baumeister, H., & Sander, L. B. (2021). Digital interventions for the treatment of depression: A meta-analytic review. *Psychological bulletin*, *147*(8), 749–786. https://doi.org/10.1037/bul0000334

Nadeau, M. M., Caporale-Berkowitz, N. A., & Rochlen, A. B. (2021). Improving women's self-compassion through an online program: A randomized controlled trial. *Journal of Counseling & Development*, 99(1), 47–59. https://doi.org/10.1002/jcad.12353

Neff, K. D. (2003). Self-Compassion: An Alternative Conceptualization of a Healthy Attitude Toward Oneself. *Self and Identity, 2*(2), 85–101. https://doi.org/10.1080/15298860309032

Nelson, B. W., Peiper, N. C., & Forman-Hoffman, V. L. (2024). Digital mental health interventions as stand-alone vs. augmented treatment as usual. *BMC public health*, *24*(1), 969. https://doi.org/10.1186/s12889-024-18412-1

Nicholas, J., Proudfoot, J., Parker, G., Gillis, I., Burckhardt, R., Manicavasagar, V., & Smith, M. (2010). The ins and outs of an online bipolar education program: a study of program attrition. *Journal of medical Internet research*, *12*(5), e57. https://doi.org/10.2196/jmir.1450

Nwosu, A., Boardman, S., Husain, M. M., & Doraiswamy, P. M. (2022). Digital therapeutics for mental health: Is attrition the Achilles heel?. *Frontiers in psychiatry*, *13*, 900615. https://doi.org/10.3389/fpsyt.2022.900615

O'Neill, C., Pratt, D., Kilshaw, M., Ward, K., Kelly, J., & Haddock, G. (2021). The relationship between self-criticism and suicide probability. *Clinical psychology & psychotherapy*, *28*(6), 1445–1456. https://doi.org/10.1002/cpp.2593

Ondrejková, N., Halamová, J., & Strnádelová, B. (2022). Effect of the intervention mindfulness based compassionate living on the—Level of self-criticism and self-compassion. *Current Psychology: A Journal for Diverse Perspectives on Diverse Psychological Issues*, 41(5), 2747–2754. https://doi.org/10.1007/s12144-020-00799-w

Park, S. Y., Nicksic Sigmon, C., & Boeldt, D. (2022). A Framework for the Implementation of Digital Mental Health Interventions: The Importance of Feasibility and

Acceptability Research. *Cureus*, *14*(9), e29329. https://doi.org/10.7759/cureus.29329

Santarossa, S., Kane, D., Senn, C. Y., & Woodruff, S. J. (2018). Exploring the Role of In-Person Components for Online Health Behavior Change Interventions: Can a Digital Person-to-Person Component Suffice?. *Journal of medical Internet research*, *20*(4), e144. https://doi.org/10.2196/jmir.8480

Shahar, B., Carlin, E. R., Engle, D. E., Hegde, J., Szepsenwol, O., & Arkowitz, H. (2012). A pilot investigation of emotion-focused two-chair dialogue intervention for self-criticism. *Clinical psychology & psychotherapy*, *19*(6), 496–507. https://doi.org/10.1002/cpp.762

Shahar, B., Szsepsenwol, O., Zilcha-Mano, S., Haim, N., Zamir, O., Levi-Yeshuvi, S., & Levit-Binnun, N. (2015). A wait-list randomized controlled trial of loving-kindness meditation programme for self-criticism. *Clinical psychology & psychotherapy*, *22*(4), 346–356. https://doi.org/10.1002/cpp.1893

Sommers-Spijkerman, M., Trompetter, H., Schreurs, K., & Bohlmeijer, E. (2018). Pathways to Improving Mental Health in Compassion-Focused Therapy: Self-Reassurance, Self-Criticism and Affect as Mediators of Change. *Frontiers in psychology*, *9*, 2442. https://doi.org/10.3389/fpsyg.2018.02442

Spijkerman, M. P., Pots, W. T., & Bohlmeijer, E. T. (2016). Effectiveness of online mindfulness-based interventions in improving mental health: A review and meta-analysis of randomised controlled trials. *Clinical psychology review*, *45*, 102–114. https://doi.org/10.1016/j.cpr.2016.03.009

Swee, M. B., Klein, K., Murray, S., & Heimberg, R. G. (2023). A Brief Self-Compassionate Letter-Writing Intervention for Individuals with High Shame. *Mindfulness,* 14(4), 854–867. https://doi.org/10.1007/s12671-023-02097-5

Thakur, N., & Baumann, N. (2022). Breaking the anxious cycle of self-criticism: Action orientation buffers the detrimental effects of a self-critical personality style. *Journal of affective disorders*, *301*, 30–35. https://doi.org/10.1016/j.jad.2022.01.014

Thompson, E. M., Destree, L., Albertella, L., & Fontenelle, L. F. (2021). Internet-Based Acceptance and Commitment Therapy: A Transdiagnostic Systematic Review and Meta-Analysis for Mental Health Outcomes. *Behavior therapy*, *52*(2), 492–507. https://doi.org/10.1016/j.beth.2020.07.002

Vidal, J., & Soldevilla, J. M. (2023). Effect of compassion-focused therapy on self-criticism and self-soothing: A meta-analysis. *The British journal of clinical psychology*, *62*(1), 70–81. https://doi.org/10.1111/bjc.12394

von Brachel, R., Hötzel, K., Hirschfeld, G., Rieger, E., Schmidt, U., Kosfelder, J., Hechler, T., Schulte, D., & Vocks, S. (2014). Internet-based motivation program for women with eating disorders: eating disorder pathology and depressive mood predict dropout. *Journal of medical Internet research*, 16(3), e92. https://doi.org/10.2196/jmir.310

Wakelin, K. E., Perman, G., & Simonds, L. M. (2022). Effectiveness of self-compassion-related interventions for reducing self-criticism: A systematic review and meta-analysis. *Clinical psychology & psychotherapy*, *29*(1), 1–25. https://doi.org/10.1002/cpp.2586

Werner, A. M., Tibubos, A. N., Rohrmann, S., & Reiss, N. (2019). The clinical trait self-criticism and its relation to psychopathology: A systematic review. *Journal of affective disorders*, *246*, 530–547. https://doi.org/10.1016/j.jad.2018.12.069

Wind, T. R., Rijkeboer, M., Andersson, G., & Riper, H. (2020). The COVID-19 pandemic: The 'black swan' for mental health care and a turning point for e-health. *Internet interventions*, *20*, 100317. https://doi.org/10.1016/j.invent.2020.100317

Zaccari, V., Mancini, F., & Rogier, G. (2024). State of the art of the literature on definitions of self-criticism: a meta-review. *Frontiers in psychiatry*, *15*, 1239696. https://doi.org/10.3389/fpsyt.2024.1239696

Part 2: Empirical Paper

“This is me”: Participant Experiences of Creating and Using Personalised Avatars within Virtual Reality

Abstract

Aims: Virtual reality has emerged as a potentially revolutionary tool for assessing and treating mental health difficulties. Avatars are digital representations of users and create a sense of presence within the virtual environment. This qualitative study aimed to explore participants' subjective experiences of creating and using personalised avatars within a virtual reality self-compassion intervention.

Method: This qualitative study reports data from semi-structured interviews conducted with sixteen adult participants who completed a virtual reality self-compassion intervention using personalised avatars. The interviews were analysed using thematic analysis (Braun & Clarke, 2006).

Results: The analysis revealed four main themes and seventeen sub-themes: *'you're in a different world and in a different body',* '*avatar identification'*, *'emotional response'*, and '*time to reflect*'. These themes suggest that personalised avatars can enhance the meaningfulness of the intervention and increase participants' connection to the virtual world. However, individual differences were reported, with some users experiencing uncanniness, increased self-awareness, self-judgement and difficult emotions.

Conclusions: The findings indicate that personalised avatars in the self-compassion VR intervention enhanced user engagement, avatar connection, and self-awareness. They encouraged reflective thinking and fostered a more self-compassionate perspective. Further research is needed to investigate the longer-lasting impact of interventions using personalised avatars with clinical populations to understand the potential risk of such therapeutic interventions.

Introduction

Self-criticism is a transdiagnostic problem that underpins a range of psychopathology (Gilbert & Irons, 2005). Self-criticism has been associated with numerous mental health difficulties, including depression and anxiety. Moreover, high self-criticism has also been associated with other mental health related difficulties, such as self-harm and suicidal ideation (Gao et al., 2023; O'Neil et al., 2021). The prevalence of these difficulties has increased in recent years and imposes a substantial strain on both individual well-being and health care systems (GBD Disease and Injury Incidence and Prevalence Collaborators, 2018). Individuals with high levels of self-criticism can encounter difficulties in generating a compassionate inner voice. This is a factor known to impact therapeutic engagement and progress and has been exemplified in research studies demonstrating poorer therapeutic outcomes in individuals with elevated self-criticism following engagement with therapy, such as cognitive behavioral therapy (Low et al., 2020).

What is compassion?

There are various definitions of compassion, however five core components have been identified. These consist of recognising suffering, understanding it is universal, feeling empathetic for those who are suffering, tolerating any distress associated with the suffering, and being motivated to act to alleviate the suffering (Gilbert, 2020). Paul Gilbert, a prominent figure in compassion literature, views compassion through an evolutionary lens and developed a model comprising of three human motivational systems. These systems consist of the threat system, which focuses on seeking protection from danger, the drive system, which motivates and guides us to important resources, and the soothing system, which manages distress and promotes bonding (Gilbert, 2009). According to

Gilbert all three systems contribute to human survival and wellbeing. Self-criticism is linked to the overactivation of the threat or drive system and can elicit feelings of self-directed hatred (Gilbert et al., 2010). In contrast, compassion is associated with the activation of the soothing system.

Compassion has been defined as a ‘sensitivity to suffering in self and others, with a commitment to try to alleviate and prevent it’ (Gilbert, 2014). Gilbert described three flows of compassion. These consist of compassion towards others, compassion we feel from others towards ourselves and compassion towards ourselves. The latter, also recognised as self-compassion, involves 'offering nonjudgmental understanding to one’s pain, inadequacies and failures’ (Neff, 2003; Gilbert, 2014). According to Gilbert (2014), self-compassion serves as a balance between the threat and drive systems and fosters psychological well-being.

Neff (2003) developed a comprehensive model of self-compassion, describing three core components. These consist of self-kindness (extending kindness and understanding to oneself during challenging moments rather than resorting to self-criticism), common humanity (recognizing one's experiences as normal and a part of the shared human experience), and mindfulness (the ability to maintain a non-judgmental awareness of painful or negative thoughts and emotions). The interplay of these three components fosters the development of a self-compassionate mind. Self-compassion has garnered interest in recent years, driven by the recognition that individuals often exhibit greater harshness towards themselves than to others. Evidence suggests that cultivating self-compassion can serve as a protector against the negative consequences of self-

judgement and acts as a protective factor for mental health difficulties (Barnard & Curry, 2011).

Recognised for its role in contributing to mental health resilience, self-compassion is an important target for interventions (Hiddings et al., 2024). Empirical evidence consistently highlights the positive impact of self-compassion on overall well-being, demonstrating a positive association with reduced symptoms of a range of mental health disorders, such as depression and anxiety (Baker et al., 2019; Barnard & Curry, 2011; Crego et al., 2022). Furthermore, self-compassion has been found to be a key mechanism of change across multiple therapeutic modalities (Baer, 2010). This has prompted the development of numerous compassion-focused interventions (Kirby et al., 2017).

Compassion focused interventions

Extensive research indicates that compassion is a trainable skill, suggesting that one can improve their capacity for compassion through practice and training. Improving levels of compassion can have many positive psychological benefits, particularly for individuals with mental health difficulties (Jazaieri et al., 2013). Originating from this understanding, Compassion Focused Therapy (CFT) was developed by Paul Gilbert for individuals who have high levels of self-criticism and difficulty generating self-warmth (Gilbert and Proctor, 2006). CFT integrates various techniques that support individuals to generate compassionate feelings for themselves (Gilbert, 2009). The aim of CFT is to help individuals develop a sense of inner warmth and safeness. A recent meta-analysis investigating the impact of CFT revealed its effectiveness in reducing overall negative mental health outcomes, such as depression and self-criticism, while also enhancing

levels of compassion towards the self and others (Petrocchi et al., 2023). Interventions that cultivate self-compassion have been found to yield a significant moderate reduction in self-criticism in comparison with control groups (Wakelin et al., 2022).

Specific interventions have been developed to cultivate self-compassion in individuals, for example Compassionate Mind Training (CMT). This intervention involves specific compassionate skills including compassionate imagery, soothing-rhythm breathing, and the practice of compassionate behaviours such as letter writing (Leaviss and Utley, 2014; Maner et al., 2023). These interventions have demonstrated efficacy in both clinical and non-clinical settings (Leaviss and Utley, 2014).

Compassion-focused interventions have traditionally been delivered by professionals in person, however, studies have found that online and face-to-face intervention delivery are equally effective in reducing difficulties such as self-criticism (Wakelin et al., 2022). Online interventions can be delivered via various channels, including videoconferencing platforms, web-based interventions accessible via computers or mobile phones, mobile applications and virtual reality (VR). In recent years there have been significant transformations in the provision of digital interventions. Covid-19 and its subsequent lockdown measures forced service providers to adapt their delivery and led to an increase in digital interventions being offered. Research indicates that digital interventions hold the potential for accessible and cost-effective care and has shown promising findings for the effect of digital interventions (Gega et al, 2022; Philippe et al., 2022). For instance, Krieger et al (2019) demonstrated significant improvements in levels of self-compassion following engagement with an internet-based compassion-focused intervention. Furthermore, a study by Kariyawasam et al. (2023) revealed that a brief

online CMT intervention was significantly effective in increasing compassion across the three flows (self-compassion, compassion towards others, and receptivity to compassion from others).

Virtual Reality and Self-Compassion

Virtual reality technology provides users with realistic and immersive experiences and offers a promising approach for mental health interventions (Phillipe et al., 2022). With advancements in technology, VR equipment, such as head mounted displays, is becoming more readily available and accessible. Immersive virtual reality (IVR) has been identified as a potentially revolutionary tool for the assessment, understanding and treatment of mental health difficulties (Fairburn and Patel, 2017). VR interventions can enhance mental well-being by providing safe and interactive environments where individuals can develop and practice coping strategies tailored to their specific difficulties (Jingili et al., 2023). Moreover, VR interventions may address barriers associated with in person therapy, such as accessibility, geographical constraints and logistical difficulties, whilst still offering individualised treatment in a controlled environment (Freeman et al., 2017).

Research indicates that VR treatments are comparable in efficacy to in-person equivalent interventions, and the skills learnt in the virtual environment are effectively translated to real world settings (Freeman et al., 2017). A substantial number of studies conducted in recent years have explored the therapeutic potential of VR and have shown that IVR interventions can be a valuable tool for addressing a range of mental health conditions such as anxiety, phobias, psychosis, depression and substance use (Baghaei

et al., 2021; Craig et al., 2018; Freeman et al., 2018; Freeman et al., 2022; Geraets et al., 2021). CBT VR interventions have garnered the most attention, with virtual reality exposure therapy (VRET) emerging as a particularly popular approach (Jingili et al., 2023). However, various other therapeutic approaches have also been adapted for use in virtual reality settings.

A systematic review by Zillinsky and Halamova (2023) revealed overall positive results for the impact of VR interventions on both self-compassion and self-criticism. IVR enables activities not feasible in the real world and presents promising opportunities for therapeutic interventions. One technique involves the ability to change perspectives, which holds significant potential for interventions targeting self-compassion and self-criticism. For instance, Falconer et al (2014; 2016) demonstrated the utility of VR in aiding individuals experiencing depression to cultivate self-compassion by allowing participants to re-experience their compassionate response from the perspective of a child avatar. These two studies explored IVR as an alternative to conventional compassion imagery-based techniques and found the intervention effectively enhanced self-compassion and reduced self-criticism in both healthy and clinical populations. Building on these findings, a recent study by Hiddings et al. (2024) found that a single session VR involving perspective change was sufficient in reducing self-criticism and increasing self-compassion in participants.

The Impact of Avatar Personalisation

Avatars are digital representations of users and play a key role in providing a sense of presence within a digital environment (Bailenson et al., 2008; Yuen et.al., 2013).

Research in online gaming indicates that customization of avatars is positively associated with a player's identification with their avatar (Liao et al., 2019). Additionally, customization of avatars can impact user's psychological connection to and embodiment of their avatar (Rheu et al., 2022).

Digital mental health interventions are often perceived as being impersonal by users. However, the technology possesses the capability for personalised experiences, which could act as a significant advantage (van Lotringen et al., 2023). Existing research suggests that when given the opportunity to customize avatars, individuals opt for features that mirror their own, such as skin tone and gender, aiming to replicate their own self-image (Langener et al., 2022). Similarly, Messinger et al. (2019) observed that when creating avatars users tend to retain many of their core identity elements, such as race, gender, and physical features.

Evidence suggests that avatar realism positively influences acceptance of the virtual body, with similarities in appearance between participants and their avatars strengthening feelings of avatar ownership, embodiment and self-recognition (Latoschik et al., 2017; Kilteni et al., 2012). Sense of embodiment refers to the process where individuals perceive the virtual body as their own body and feel they have independent control over it (Kilteni et al., 2012). Research has highlighted that body ownership experienced by users of avatars is significantly influenced by various factors, including similarity of the avatar's appearance, including its body shape, skin tone and attire (Waltermate, 2018).

Research by Waltemate et al. (2018) investigated the impact of avatar personalisation and revealed that avatars created via body scanning techniques fostered

a stronger sense of body ownership and elicited a heightened emotional response from participants. Additionally, in a meta-analysis conducted by Mottelson et al. (2023) approximately half of the included studies reported that avatar appearance significantly influenced the sense of body ownership. However, the extent of avatar customization offered varied across these studies and further investigation of avatar appearance is needed. Research comparing avatars based on users' own faces, using a facial photograph, or avatars based on a stranger's face reported that individuals with avatars resembling their own face experienced a heightened sense of embodiment within the VR (Suk & Laine, 2023).

However, the process of avatar creation and identification may also be associated with adverse outcomes for users. Higgins' (1987) social discrepancy theory posits that negative emotions can arise as a result of the discrepancy between an individual's ideal self and their actual self. Research in VR indicates that individuals with larger discrepancy between their actual and ideal self tend to prefer more idealised avatars over realistic ones (Loewen et al., 2020). Therefore, it is important to further understand how individuals perceive their avatars and the emotional consequences they might have. For instance, studies have revealed that after engaging in a virtual session with an avatar, participants exhibited negative evaluations of their bodies and experienced decreased body satisfaction (Park, 2018). Furthermore, theories suggest that near-photorealistic virtual humans may evoke feelings of unease in individuals, a phenomenon known as the Uncanny Valley effect. This discomfort could hinder emotional engagement within the virtual environment (McDonnell & Breidt, 2010). Moreover, a realistic but imperfect depiction of a user within the avatar can evoke negative emotions (Mori et al., 2012).

Qualitative research investigating personalised avatars

A study conducted by Morris et al. (2023) explored avatar self-representation using semi-structured interviews with ten women in midlife (aged 45-65 years) using social virtual reality platforms. Their findings revealed that participants sought avatars that accurately represented them in terms of their age, gender, and body type. Moreover, participants expressed a desire for nuanced representations of themselves, including features such as their hair and body. This theme was encapsulated in a participant's quote included in the paper: "It would be very refreshing if our avatars could convey our wrinkles, and our gray hair, and whatever it is, and again, different body types." (Morris et al., 2023). Similarly, a diary study exploring social virtual reality experiences among individuals with disabilities found that participants preferred avatars with disability signifiers reflective of their own disability and desired avatars that mirrored their own attributes (Zhang et al., 2023).

Suk and Laine's (2023) study investigated the impact of facial similarity between avatars and participants on perceived embodiment. One group of participants experienced the VR content with an avatar based on their own facial image, and the other group interacted with an avatar displaying a stranger's facial image. Following their VR experience, participants expressed that the similarity between their face and the avatar's face positively affected their sense of embodiment. For example, one participant shared, "because the avatar's face is my face, I felt like I was really in this body". A recent study by Radiah et al. (2023) conducted short feedback interviews comparing personalised and non-personalised avatars following user engagement with VR. Although these interviews

were not formally analysed the data collected suggests that in general participants felt more comfortable with their personalised avatars and identified with them more.

While certain themes have begun to emerge in the literature, there remains a scarcity of research delving into participant's qualitative experiences of using avatars in virtual reality, particularly within a compassion focused intervention. Consequently, our understanding of users' emotional responses (both positive and negative) to creating and using personalised avatars remains limited.

Study Aims

Interventions aimed at cultivating self-compassion are gaining popularity, with virtual reality emerging as a promising avenue for increasing access to such interventions. This study uses an adapted version of the IVR intervention utilised by Falconer et al. (2014) to explore the impact of avatar personalisation. While existing studies indicate a desire for avatar customization and self-representation within VR, there are limited studies exploring user experiences with personalised avatars. To address this gap this study represents, from my knowledge, the first qualitative exploration of the impact of personalised avatars within a self-compassion intervention. Further understanding is crucial for informing the development of similar interventions and future advancements, particularly within clinical populations.

This research project is a joint study with SF, whose study aims to investigate pre and post intervention outcomes using quantitative analysis. SF's project seeks to delve into the distinction between personalised and non-personalised avatars across various outcomes, including self-criticism, self-compassion, and body satisfaction. In contrast, the

present study adopts a qualitative approach and focuses on participants' experiences of creating and using personalised avatars within a virtual reality self-compassion-based intervention.

The broad research question for this project was:

1. What were the participants' subjective experiences of creating and using personalised avatars within the virtual reality self-compassion intervention?

The findings aim to enhance our understanding of the positive and negative effects associated with self-representative avatars. This insight could inform whether personalised avatars would be acceptable within a clinical sample and provide support for their potential adoption within clinical settings.

Method

This study was conducted as part of a joint project with SF, a trainee clinical psychologist at University College London (UCL). Tasks and responsibilities were divided between both researchers. This included various aspects of the project, for instance, project planning, ethical approval, recruitment and avatar creation. Participants were randomised into either a 'personalised' or 'non-personalised' avatar condition. Only a sub-set of participants who had experienced a 'personalised' avatar within the intervention were included in this sample, while those who encountered a 'non-personalised' avatar were not invited for interview. This paper is qualitative in nature and research questions and will not include an overview of the outcome measures or questionnaires used within SFs

quantitative project. This study's procedure was partially based on a previous trainee's version of the project (Barrington, 2022).

Recruitment and Setting

Participants were recruited via the UCL SONA database (https://uclpsychology.sona-systems.com/main.aspx), which includes UCL students, alumni, and members of the general population. The advertisement on SONA offered a concise overview of the study and outlined information regarding participant compensation (see Appendix C). Participants were offered financial reimbursement (£10 voucher) or course credits as compensation for their involvement in the study. They applied via the SONA subject pool portal, and multiple time slots were available to accommodate for participant availability.

Participants were invited to a designated building on University College London (UCL) campus. Semi-structured interviews took place directly after participants had completed the intervention. However, one participant requested an interview later, which took place via Microsoft Teams. Participants that attended the interviews received further compensation (£10 voucher or additional course credits).

Participants

All participants included in the study were adults aged 18 years or older and were fluent in reading and speaking English. Participants were not eligible for the study if they were undergoing treatment for a diagnosed mental health condition, or if they had a neurological condition, such as epilepsy, that might heighten susceptibility to potential adverse effects from IVR, such as motion sickness. Study materials were distributed to

all participants via email, and those who did not complete these materials prior to the intervention were excluded from the study.

Determining the number of participants to be included in qualitative research using thematic analysis is not straightforward or fixed. Braun and Clarke (2013) encourage researchers to use their subjective judgements to make decisions on the number of participants but have previously suggested 6-15 participants for a medium-sized thematic analysis project (Braun and Clarke, 2013). In the present study, the length of the interviews was shorter than expected. Therefore, I conducted interviews with slightly more participants than the upper limit of this range to ensure the data was rich. I felt the sixteen interviews allowed the aims of the study to be fully addressed while also remaining feasible within the constraints of my role as a trainee clinical psychologist.

Sixteen participants attended interviews, all of whom were included in the analysis (see Table 1 for demographic characteristics). The participants' ages ranged from 18 to 60, with a mean age of 29.6 years, and the majority of participants identified as female (n=13, 81.2%). In terms of ethnicity, 56.3% of participants identified as 'Asian / Asian British' (n=9), 25% as 'White/ Caucasian/ White British' (n=4), 16.3% as 'Mixed Ethnicity' (n=2), with one individual identifying as White and Asian and one identifying as White and Japanese, and 6.2% as 'Middle Eastern / North African' (n=1). Eleven out of the sixteen participants reported prior experience using virtual reality (68.7%).

Table 1.

Participant Demographics

Participant	Age	Gender	Ethnicity
1	60	Male	White / Caucasian / White British
2	21	Female	White / Caucasian / White British
3	21	Female	Asian / Asian British
4	28	Female	Asian / Asian British
5	19	Female	Asian / Asian British
6	18	Male	Asian / Asian British
7	50	Male	Middle Eastern / North African
8	21	Female	Asian / Asian British
9	47	Female	Mixed Ethnicity
10	35	Female	Asian / Asian British
11	19	Female	White / Caucasian / White British
12	39	Female	Asian / Asian British
13	29	Female	Mixed Ethnicity
14	24	Female	Asian / Asian British
15	21	Female	Asian / Asian British
16	21	Female	White / Caucasian / White British

Ethical Approval and Considerations

The research was conducted under research supervisor JK's programme approval from the University College London (UCL) Division of Psychology and Language Sciences Ethics Committee (Project ID: CEHP/2021/587, see Appendix D). No ethical problems or concerns were raised by the study. Written forms of consent were received from all participants (see Appendix E). The potential risks associated with IVR has been documented in the literature, for example cyber sickness (Scafer, Carbonara & Korpi,

2019). This can include disorientation, nausea, and headaches. Participants were made aware of these risks prior to their participation and no participants reported any physical symptoms following completion of the intervention. All participants were aware they could withdraw from the research study at any point. Participants were provided with KF and SF's email address and were aware they could access support from them or the project's supervisor JK if required. However, no participants opted for any further support following completion of the intervention.

The Virtual Environment and Avatar Creation

Personalised avatars used in the study were created using Character Creator 3 (CC3) with the Headshot plugin (Reallusion Inc.). The Character creator headshot plug-in was used to generate 3D faces from the participants' uploaded passport style photographs. Tools within CC3 were then used by the researcher(s) to modify and manually adjust features, such as hair style and colour, facial features and skin tone. The intervention was delivered using an Oculus Quest headset (Meta Platforms inc.) and a Virtual Bodyworks software.

Procedure

Upon signing up for the study via SONA, participants were randomly allocated to one of two conditions using an online random sequence generator. This consisted of embodying a 'personalised' avatar (condition 1) or embodying a 'non-personalised' avatar (condition 2). The present study only includes participants from the personalised avatar condition. Participants were promptly contacted via email by the researcher(s) and provided with an

information sheet (see Appendix F) and a consent form. The researcher(s) requested that participants complete the consent form prior to their designated study slot. If the participant had not returned the consent form, they were required to provide written informed consent upon arrival.

Participants in the personalised avatar condition received materials via email that were relevant to their group. This included instructions for capturing a passport-style photograph of their face (see Appendix G) and a document including avatar body size options (Appendix H). Participants were asked to choose an avatar body size that they felt best represented their own body shape. The submitted photograph and chosen body type were then used by the researcher(s) to create the participant's personalised avatar using CC3. Failure to submit a suitable photograph or select a representative body type at least 12 hours before their scheduled time resulted in participant exclusion, as this timeframe was deemed insufficient for the creation of a personalised avatar. The email also included a link to an online survey, which included requests for demographic information and additional outcome measures. All surveys and questionnaires were developed by SF using the Microsoft Forms platform (https://forms.office.com). Participant responses to the outcome measures were analysed as part of SF's dissertation project and will not be included in the present paper.

The Virtual Reality Intervention

This study's design and procedure was partly based on Falconer et al's. (2014) intervention and a previous trainee's version of the project (Barrington, 2022). Firstly, participants all watched a short compassion-focused psychoeducational video (3:33

minutes). The video involved audio narrated PowerPoint slides and included a definition and an example of compassion. Participants were provided with instructions regarding the virtual reality task and were asked if they had any questions regarding the study. Participants were introduced to a script that they would use within the intervention, which included three stages for giving a compassionate response. An example statement was provided for each stage (see appendix I for the script)

1. *Va*lidation: To acknowledge that the other person is upset and that it is acceptable for them to react in this way.
2. Redirection of Attention: To direct the other person's attention towards something that is more positive and comforting.
3. Memory Activation: To support the other person to recall a memory of a person who loves them. This memory is supposed to bring positive feelings of comfort and safety.

The compassionate statements were presented to participants both verbally and visually and they were encouraged to memorize them to recite during the VR intervention. Participants were told they could adapt the wording to align with their natural conversational style and had the option to rehearse with the researcher(s) if they felt it would be helpful.

Participants were informed that they would use these statements to comfort a distressed child during the intervention, and that the child would listen and respond to their words. They were aware that their delivery would be audio recorded. Following this, participants were invited to try on the HMD, and it was carefully adjusted to ensure both comfort and optimal functionality. Additionally, headphones were attached to the headset

to ensure all audio was transmitted through them. Participants were provided with two hand controllers which allowed for hand tracking and their movements to be represented within the virtual world. Participants were then guided through the intervention.

Firstly, participants engaged in a short embodiment exercise (roughly 3 minutes in length) designed to familiarise them with the virtual environment and foster a sense of body ownership. The exercise instructed participants to explore the virtual room by directing their gaze in different directions, to look at their reflection in the virtual mirror and to practice movements such as raising and lowering their arms. After completing the embodiment exercise, participants were introduced to a child avatar seated across from them (see Appendix J for the adult avatar perspective). The child avatar was designed to intentionally maintain ambiguity regarding both its gender and ethnicity. The researcher(s) adjusted the child's level of distress using an android mobile device allowing the child to positively respond to the comforting words spoken to them. At each stage the child exhibited fewer visible signs of distress, for example, their demeanour changed from crying to being sat upright and nodding.

In the next phase of the intervention, participants experienced a perspective change and transitioned to embody the child avatar (see Appendix K for child avatar perspective). To facilitate this shift, all participants engaged in the embodiment exercise again. This exercise provided participants with the opportunity to fully immerse themselves in the role of the child avatar. In the final stage of the intervention, participants experienced a playback of the recording, offering them an opportunity to receive compassion from their personalised avatar. The recording included the audio of their own voice reciting the compassionate statements and a replay of the movements they made.

Following the VR intervention, those who had consented then attended an interview to explore their experiences of the VR and their personalised avatar. Following the interview, participants had the opportunity to ask the researcher(s) any questions.

Data Collection

The majority of interviews took place in-person on UCL Campus, apart from one interview that took place via Microsoft Teams. The sixteen interviews conducted were deemed sufficient for providing an exploration of the experiences of using personalised avatars within the self-compassion VR intervention. Thirteen interviews were completed by KF and three by SF, and all were recorded on a Dictaphone. The recordings were transferred to a UCL secure database and removed from the Dictaphone. The Microsoft Word transcription function was used to create an initial transcription from the interviews. KF then independently listened to each recording and edited and updated the transcription for accuracy.

The interview schedule was developed based on the research question (see Appendix L). I spoke with SF and research supervisor JK to discuss broad topics that needed to be covered within the interviews. The schedule was not used rigidly, and the researcher followed up with questions related to participant responses, enabling the interviews to be participant-driven and inductive in approach. In an attempt to reduce bias, the questions included in the schedule were open-ended. The questions covered different aspects of the intervention, such as their experience of virtual reality (‘what was your experience of using virtual reality within this intervention?’), self-compassion elements of the intervention (‘how did you find learning the compassionate script?’) and

questions focusing specifically on their experience of avatar personalisation ('how did you experience your personalised avatar within the intervention?'). The researchers asked additional questions and prompts depending on the participant's response to gather the richest data possible and get a true sense of their intervention experience. The average length of the interviews was 21:31 with a range of 15:38-25:25 (minutes: seconds).

Data Analysis

Data was coded using thematic analysis of the interview data and was conducted based on Braun and Clarke's (2006) approach. Thematic analysis has been described as highly flexible and is a useful method that can be applied across different frameworks for examining the perspectives of participants and generating unanticipated insights (Braun and Clarke, 2006; King, 2004). As I am relatively new to qualitative analysis, I also benefitted from the structured guidelines available for thematic analysis.

The approach used within this project was exploratory and data driven. Virtual reality in mental health interventions is a relatively new phenomenon and there is limited research regarding personalised avatars. Therefore, an inductive approach was more suited to this project rather than coding based on specific existing themes within the literature. I used semantic level analysis, which follows the idea that language reflects and enables us to articulate meaning and experience.

The analysis involved the following stages:

1. Familiarisation with the data: I listened to the interview recordings, transcribed the interviews and read the interview transcripts to support my familiarisation with the data.

2. Generating initial codes: I imported all the manuscripts into N-Vivo, a qualitative data analysis computer software package. Then, to capture patterns within the data I completed line-to-line coding and identified and labelled data that was relevant to the research questions. Two interview transcripts were independently coded by SF, and we discussed our interpretations of the data to help refine the themes. Coding differences arose, particularly in the level of detail used when coding themes. SF initially applied broader categories, however this approach resulted in codes that lacked the specificity to distinguish between similar yet distinct themes, for example “sense of presence" and "embodiment". To resolve this SF and I engaged in discussions to compare coding strategies and identified the need for more detailed codes. Through re-coding sections of the data, more specific codes were created. These discussions ensured that coding was consistent and also captured the richness of the data.
3. Searching for and generating themes: I collated the codes and examined them to identify any patterns or themes across the data set.
4. Reviewing themes: At this phase, I consolidated, reorganised or dropped themes if they did not reflect the data. The reviewing of themes was also discussed with my research supervisor JK.
5. Defining and naming themes: I named each theme to ensure they fully encapsulated the content.
6. Producing the report: I chose data extracts that reflected the identified themes to go alongside the report narrative.

Epistemological and Personal Reflexivity

Reflexivity is an essential part of qualitative analysis to maintain research quality (Braun and Clarke, 2022). Reflexivity requires the researcher to ‘own their perspectives’ and consider how they have influenced aspects of the research, including the data collection and data analysis (Braun and Clarke, 2022). I strove to conduct the research inductively and attempted to hold in mind any pre-conceptions I might hold, while also recognizing that as a researcher I am not a ‘blank slate’. Willig (2013) identified two types of reflexivity, epistemological and personal.

In this research I took a constructivist position, which assumes knowledge is constructed by individuals' subject experiences and allows multiple realities to exist (Guba & Lincoln, 1994). From this perspective, I recognise the role of social contexts in shaping knowledge and experiences and adopt the view that meaningfulness is highly influential in the development and interpretation of codes and themes (Byrne, 2021).

I’ve had limited professional and personal experience of using compassion focused interventions. However, I have been educated about self-compassion and its benefits. I was partly drawn to this research project due to my own interest in virtual reality, having had my own positive experiences of VR in different contexts such as art galleries and theatre, and I find the potential of VR exciting. I have also having been educated about positive findings of VR in mental health, for example with individuals with anxiety and psychosis. Therefore, I was conscious that I might elicit responses from participants that reflected enthusiasm for this intervention. However, I also had doubts about the effectiveness of a single session intervention and the current technology, for example its accuracy in fully reflecting participants’ appearance.

Results

The thematic analysis revealed four main themes and seventeen sub-themes. The four primary themes identified were: *'you're in a different world and in a different body',* '*avatar identification'*, *'emotional response'*, and '*time to reflect*'. Table 2 illustrates the distribution of themes and sub-themes across the sixteen participants included in the study.

A thematic map displaying the relationship between themes is presented in Figure 1. The arrows between the themes illustrate their interactions. A two headed arrow has been placed between *'avatar identification'* and realism of the intervention and embodiment ('*you're in a different world and in a different body'*) and indicates their close relationship. Challenges related to VR embodiment and the perceived realism of the intervention affect how well participants identify with their avatars. In turn, *avatar identification* influences how natural and lifelike the VR setting feels to the user.

Similarly, there is a mutual interaction between '*avatar identification'* and *'emotional response'. E*xisting levels of self-criticism or self-judgement may affect how participants view their avatar and consequently how they identify with them. Additionally, the degree to which an avatar physically mirrors the user can elicit mixed emotional responses, ranging from positive attitudes to negative emotions and potential emotional distress.

A two headed arrow has also been placed between the participant's '*emotional response'* and *'time to reflect'.* Again, these are mutually interactive, as emotions elicited within the intervention may prevent or encourage meaningful reflection and change, for example heightened self-judgement may prevent self-compassion and learning from the

intervention. Additionally, personal reflections and self-awareness may elicit different positive or negative emotions for different individuals.

Finally, two unidirectional arrows indicate the influence between themes: one from '*avatar identification'* to *'time to reflect'*, and another from '*you're in a different world and a different body*' to '*emotional response'*. A stronger connection and identification with the personalised avatar seem crucial for the participant's learnings from the intervention, and the extent to which it felt meaningful and engaging for the user. Additionally, unfamiliarity or technical barriers related to the intervention may lead to more self-critical or negative reactions, potentially distracting users from the intervention tasks. The perceived realism of the environment and avatar also relates to how users perceive their avatars, including any discomfort they may experience when interacting with the virtual world and avatars.

At least two transcript excerpts have been included for each sub-theme. All excerpts were selected based on how clearly they demonstrate the corresponding sub-themes. Participant numbers are used to maintain confidentiality.

1. "You're in a different world and in a different body"

The first theme generated was the concept of immersion in the virtual world. This theme encompasses participants' experiences of being within the virtual environment and how the virtual setting and body mirrored real life. The sub-themes describe some of these aspects in more detail.

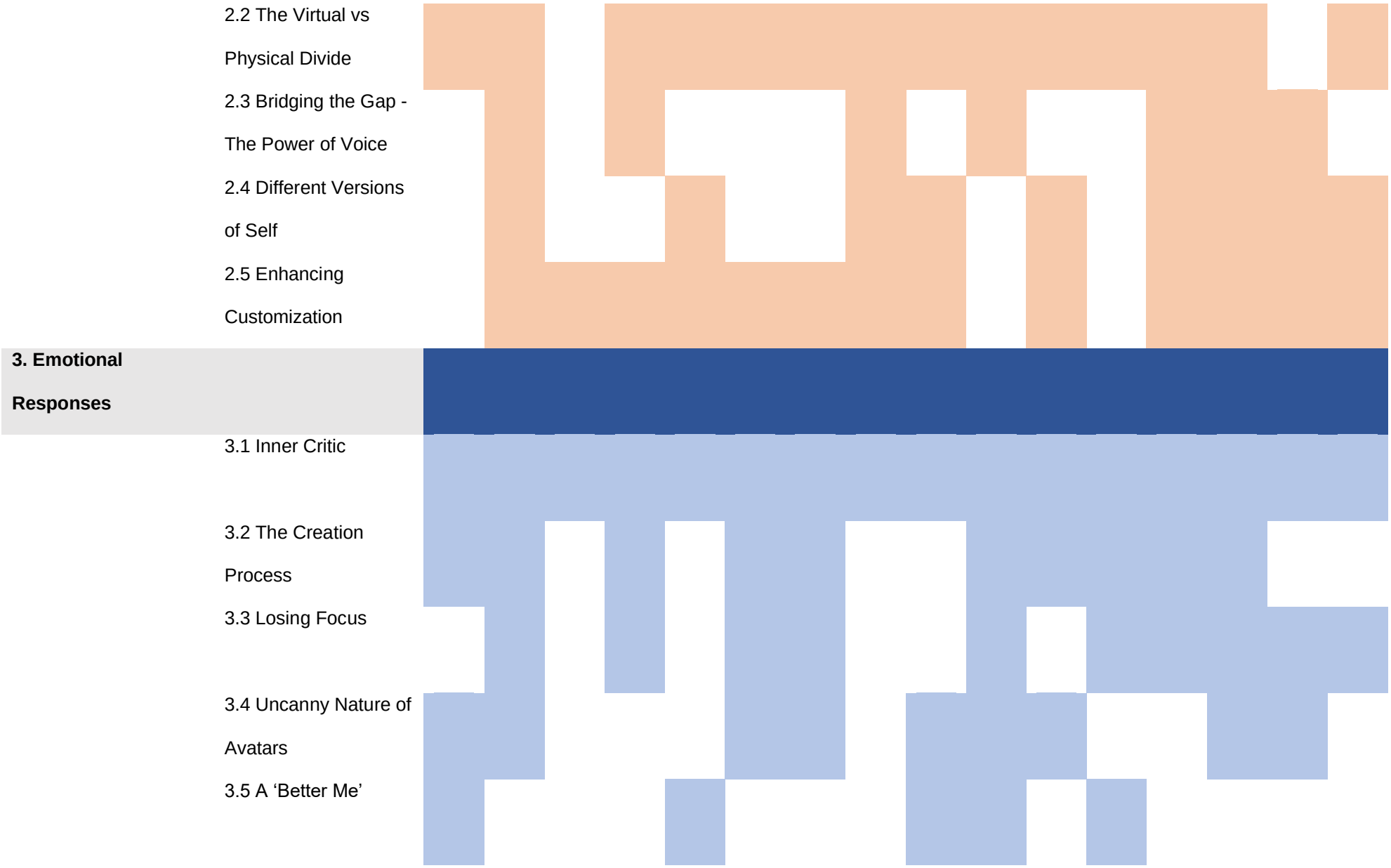
1.1 Embodiment and Movement

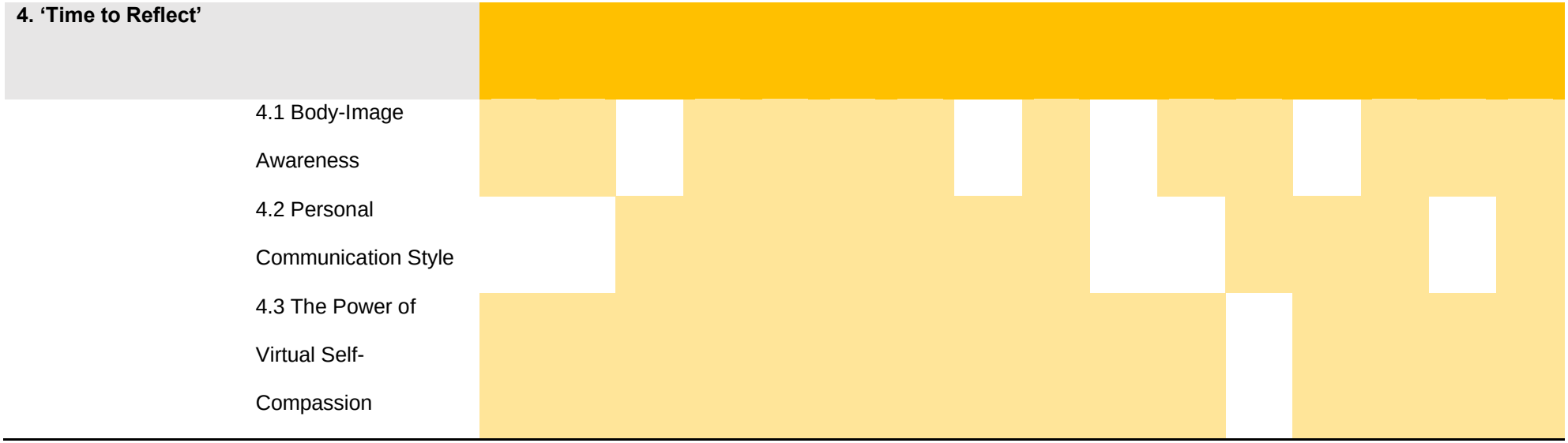
Out of the sixteen participants, fifteen emphasized the importance of avatar movement for embodiment. The display of familiar and lifelike gestures and movements by the avatar was a recurring theme. Participants shared that recognizing their own gestures helped them feel more emotionally connected to the virtual body and enhanced their sense of embodiment, even if they did not relate to the avatar's physical features. Additionally, the ability to control the avatar's hand and body movements was highlighted as a significant factor in feeling embodied. This suggests that movement and gestures enhance self-identification with the avatar and make the VR experience more believable.

Table 2.

Distribution of themes in participant interviews

Themes	Sub-themes	Participant															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. "You're in a different world and in a different body"																	
	1.1 Embodiment and Movement																
	1.2 Environment Realism																
	1.3 Novelty and Familiarisation																
	1.4 Technological Barriers																
2. Avatar Identification																	
	2.1 Avatar Connection																

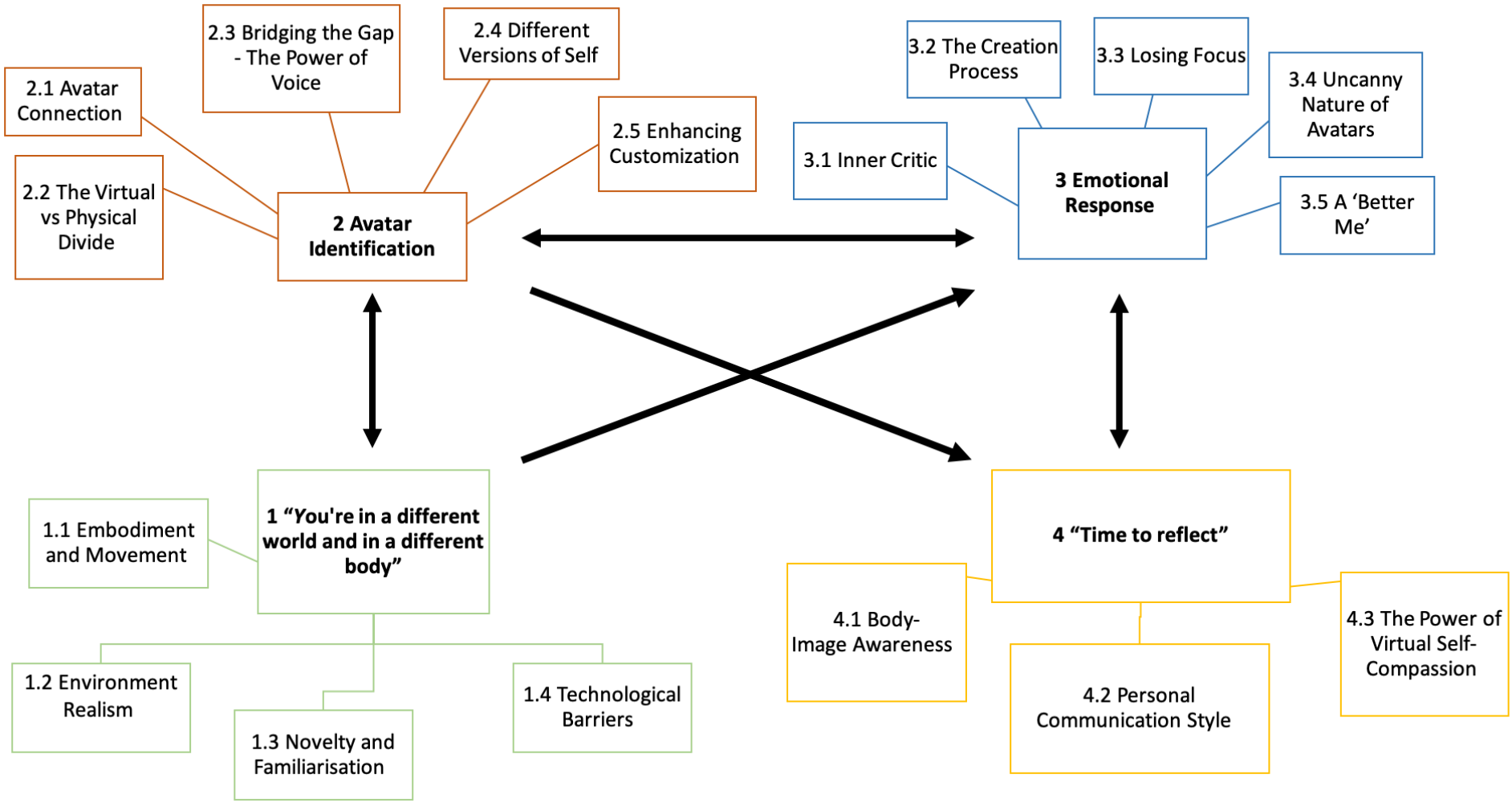

2.2 The Virtual vs Physical Divide
2.3 Bridging the Gap - The Power of Voice
2.4 Different Versions of Self
2.5 Enhancing Customization
3. Emotional Responses
3.1 Inner Critic
3.2 The Creation Process
3.3 Losing Focus
3.4 Uncanny Nature of Avatars
3.5 A ‘Better Me’



Key: *Squares filled with colour represent evidence for a theme is present within the participant interview.*

Figure 1.

A Visual Map Representing Study Themes and Sub-themes



The realism of the avatar's facial movements and expression was also noted to be key for full immersion. Discrepancies between the participant's normal gestures and the avatar's movement detracted from the experience, demonstrating how even small inaccurate gestures can disrupt the sense of control and embodiment of the personalised avatar.

"Well, to be honest, I don't really recognize my face in Avatar. Yeah, but I guess like most features are captured but like still not seeing them as myself. But once after the movement started, I was like 'ok this is me'" (Participant 5)

"I think it really felt like it was me at some points, because I could see my face and like I could, I could see like my expression on the avatar and especially my movement when I was a child. So I think using a personalised avatar definitely helped me feel like I'm that avatar" (Participant 14)

1.2 Environment Realism

Nearly all participants commented on the realism of the environment (n=15). Although some commented on positive aspects of the virtual environment, describing it as feeling 'normal' or 'comfortable', many participants felt the setting was relatively artificial, clinical or 'lab-like'. This lack of realism hindered participants emotional connection to the VR scenario and detracted from their sense of presence in the virtual world. Participants acknowledged that the VR world did not feel like an extension of real life, making it harder for them to fully connect with the intervention.

Some participants likened the experience to a video game, which suggests there is a clear boundary between the virtual environment and real life. This prevented

users from fully immersing themselves in the environment and experiencing all the benefits of the intervention, such as changing perspectives and receiving compassion from their avatar.

“Yeah, it felt a bit like unreal. It's like I know it's unreal, so I'm not there” (Participant 10)

“The closer the whole setting looks to reality, the truer it feels, and that felt a bit like a very lab setting to me and I think that it didn't really touch me in a way" (Participant 11)

1.3 Novelty and Familiarisation

In ten of the interviews, participants described the VR setting as unfamiliar or new. For some users, this novelty led to feelings of being ‘playful’, ‘curious’ or excited, and sparked a desire to explore the virtual world further. However, for others the novelty felt uncomfortable and created a sense of unnaturalness. Participants suggested that increased time to adapt to the virtual setting and their avatar might help increase their sense of connection to the virtual world. There was consistent recognition among various participants of the need for repeated VR exposure to overcome the initial novelty and strangeness experienced. Participants suggested that with additional VR sessions, practice and familiarization they would be more likely to mentally adjust to the new environment and learn to navigate the virtual world and control their avatars more effectively.

“Well, I feel like I may need more sessions to just be more familiarized with this process because it was feeling really weird to see someone like actually represent me to come

from myself. I think maybe after a few sessions, maybe five or six, I'll be OK to accept that I can control myself, like the concept of it" (Participant 15)

"But then I feel like once I got past it, I could see it as myself. Like, ok 'yeah that is kind of my face'. And like the more I looked at it, the more I was like, yeah, that is kind of a resemblance actually" (Participant 16)

1.4 Technological Barriers

Eleven of the sixteen participants shared how technological limitations negatively impacted their VR experience. Many participants noted that their avatar's movements felt unnatural or robotic. Additionally, participants frequently mentioned physical mismatches, such as their feet not being aligned with the avatar's body. These technological difficulties reduced their sense of body control and presence in the virtual world.

Glitches, such as odd limb movements or avatar skin showing through items of clothing, also took away from the illusion of being in the virtual environment. Participants highlighted how VR equipment, such as hand controllers, created dissonance between their actions and their avatar's movements. These technological limitations made it difficult for some users to perceive the avatars as human, impacting their connection to the avatar.

*"When you're sitting in a chair, and when you look down, you expect to see your legs right underneath you, but they were just like over there. It almost felt like my torso would like bend to the side, and when I looked in the mirror. I was kind of like a very weirdly positioned and shaped person" (*Participant 2)

*“I felt like the hands was quite interesting, but then when I was waving I noticed that obviously the finger would point up and I wasn't actually doing that, so it didn't completely feel like I was in the body” (*Participant 13)

2. Avatar Identification

All sixteen participants described varying degrees of identification with their personalised avatar. The sub-themes below elaborate on specific elements of the intervention that either encouraged or reduced participant identification, such as physical resemblance and the use of their own voice.

2.1 Avatar Connection

Thirteen participants commented on their connection to their personalised avatar. Most participants described feeling more connected to avatars that physically resembled them. Similar body shape and facial features helped users identify with their virtual selves and enhanced the sense of realism. Specific traits, such as gender, hair style and skin tone, also appeared to play a crucial role in promoting identification and helped users see themselves as the avatars. Participants described that a closer physical resemblance to their avatar enhanced their emotional and personal connection to both the avatar and the intervention.

However, physical inconsistencies disrupted this identification. For example, most participants struggled to form a connection with the generic child avatar, particularly due to the inconsistency with its body size and their actual size. On the other hand, the personalised avatar, even if not a perfect representation, fostered a stronger sense of identification and presence. Some users suggested that

personalizing the child avatar based on their younger selves would help further increase their connectedness to the intervention.

"I think the closer it is to you, the more you can feel that you're in the situation and you're that person. So yeah, I think that's the benefit like it gets closer to you and it like touches you more a bit more personally" (Participant 11)

“When I was listening to myself speak and then I was obviously seeing myself, I was thinking, you know, ‘OK, that's actually a representation of me speaking to a child’. Whereas if it was wasn't a personalised avatar I think it would maybe feel a bit more disconnected” (Participant 13)

“I actually felt it was a little hard to have the self-compassion in the VR world, because if the VR showed the more real younger self then maybe I would feel more self-compassion, but the VR person felt far from the real person in reality” (Participant 8)

2.2 The Virtual vs Physical Divide

All sixteen participants noted discrepancies between the physical appearance of their personalised avatar and their real selves. These discrepancies included differences in the avatar’s facial features, body shape, movement, and skin tone. Participants often felt that their avatars did not fully represent them and differed from how they perceived themselves. Although many participants could identify with some aspects of the avatar, they were aware of the subtle inaccuracies in their appearance, such as hair parting, eye size, or slight distortions in their features.

These discrepancies negatively impacted identification with the avatars and users’ immersion in the virtual intervention. Due to the perceived physical mismatches,

some participants reported an emotional disconnection from their avatars and a sense of surrealism. Many expressed a sense of dissatisfaction with how the personalised avatars looked. Even though individuals could identify parts of themselves within the avatar, they felt it did not align with their perceived self, and this prevented them from fully immersing themselves in the virtual environment. These inaccuracies affected participants' identification with the avatars and thus their connection to the intervention overall. This issue was also raised regarding the child avatar, with participants finding it difficult to connect to the child's point of view due to physical differences, thus highlighting the importance of tailoring avatars to users.

"I would say that the facial features were mine, but like they were in the body in a weird kind of way. There was no harmony in a sense, like I could see it was not me. And the same with the body it was similar but it was not necessarily mine. Like so yeah, I could see it was not me but with my face". (Participant 11)

"Well, now you mentioned that, the body shape was probably my body shape, quite broad and tall. Yeah, maybe the face, the facial shape was the same as mine. Now, you mentioned that was supposed to be me. But in terms of the facial detail, I didn't feel that at all" (Participant 7)

"I think I don't feel that connected maybe with the other one. Yeah, maybe because it's a young black kid, I didn't feel like I was a young black kid. Yes, I didn't feel upset when I was meant to be feeling upset. I didn't feel reassured". (Participant 12)

2.3 Bridging the Gap – The Power of Voice

Using participants' own voices within the intervention was highlighted as particularly meaningful by seven participants. They highlighted that hearing their own voices helped them relate more closely with the avatar and reinforced their sense of identification with the adult avatar. Participants shared that even when there were visual mismatches between their actual and virtual selves, the familiar audio helped reduce any dissonance and anchored their sense of self in the virtual environment, helping to maintain a connection with the personalised avatar.

Additionally, users felt that hearing their own voice was crucial for receiving compassion within the intervention and helped the words feel more impactful. This impact contributed to a deeper emotional engagement with the intervention.

"Yeah, it didn't feel like I was in the body at times, like most of the time actually. I felt like looking at myself, as mentioned about looking at myself, felt weird. But then we hear our own voice, and that was the thing that, like, made me be like 'Ohh that is still me OK'" (Participant 14)

"Yeah, but still the voice almost sounded like I was reassuring myself in my head, so it still was reassuring, even though the avatar itself wasn't very, reassuring, if that made sense" (Participant 2)

2.4 Different Versions of Self

Six participants raised a sense of disconnection as they felt the personalised avatar did not accurately represent them at the time of their participation. They highlighted that the avatar was based on an old static image and did not reflect their current selves.

Discrepancies in the avatar's physical appearance led participants to feel 'strange' or 'weird' as it failed to align with their current perception of themselves. Factors such changes in hair colour or style, and clothing were highlighted as important areas. For example, the virtual avatar having wavy instead of straight hair. This demonstrates how small inaccuracies can affect avatar identification.

Participants suggested that avatars based on older photos failed to capture their current appearance and proposed using recent full-body videos or real-time scanning to create more accurate personalised avatars. This indicates a desire for more up-to-date avatar representations that reflect participants' real time appearance, which might help make the transition into the VR setting more seamless, as if they are simply 'stepping in' to the VR world.

"Yeah, it it's just, you know, a very simple thing, it was still my hair. It just depends on how I decide to dry it like it's as simple as that, and so it was similar to the picture, but not to the me like today. Yeah, like the one who came here". (Participant 11)

"If you could kind of come in do like a scan and then kind of immerse yourself in the experience, because I also think if I was wearing the same outfit that I was wearing now. Because when I was looking down, I could see like my jeans and things through the gap. Yeah. So that really made. 'OK, I'm in this experience rather than actually there'". (Participant 13)

2.5 Enhancing Customization

Fourteen participants expressed a desire for enhanced customization of the VR avatars to achieve a more accurate representation of themselves. They emphasized

the importance of physical similarity between their virtual and actual selves and suggested a more interactive customization process. Participants described the significance of being able to recognize themselves in the avatar, and proposed methods such as sending full body videos, or undergoing scans to create avatars based on their real-life appearance.

Additionally, participants suggested that changes such as more accurate hair, clothing, movement style, and overall appearance would contribute to a more convincing avatar and reduce feelings of dissonance. Some also expressed a desire for the avatar to wear clothes that represented their current personal style, instead of the generic clothing used within the study. Participants proposed increased involvement in the creation process, such as giving feedback to the researcher(s) and altering the appearance of their avatar after viewing it.

However, some participants were also aware that further customization may involve more time and resources and acknowledged the need to strike a balance between full avatar customisation and identification.

"Probably the clothing like the way the avatar was dressed up was like that that's definitely not something I would wear, and it doesn't necessarily mean much, but again as I was saying before the way you dress up like really says a lot about you. So sometimes that like helps matching things, like I would recognise like myself, you know". (Participant 11)

"Maybe like to be able to see how the avatar looked like, and be like this is me or this is not me, let me change that. I know some games are like that. You can change things like the clothes or hair on one by one, those dress up games". (Participant 14)

3. Emotional Responses

The third main theme generated was users' emotional responses towards their personalised avatar and the intervention. All participants reflected on the emotions elicited by the entire process. Many participants shared neutral or mixed feelings towards their avatar, while for some, the personalised aspect of the intervention triggered difficult and negative emotions. The data suggests an interaction between a participant's existing levels of self-confidence and judgement and their reactions to their avatar. The sub-themes touch on aspects of the intervention that led to participants' emotional reactions and how these responses then impacted receptiveness to the intervention.

3.1 Inner Critic

All sixteen participants described the potential for critical thoughts towards themselves or their virtual representations. Their insights highlighted the complex interaction between existing self-image, self-perception and the use of self-representative avatars in virtual interventions. The interviews indicate that individuals with a higher baseline of self-consciousness or body image difficulties are more prone to self-criticism following engagement with a personalised avatar. Some reported that their avatars triggered negative emotions and reinforced existing insecurities, for example relating to body weight and size. They found their avatars confronting as they highlighted perceived imperfections which exacerbated self-critical tendencies.

Even those who felt more positive or neutral towards their self-representative avatars expressed concerns that individuals with lower self-confidence, body-related difficulties, or mental health disorders may struggle with personalised avatars.

Most participants shared a discomfort or dislike towards hearing their own voice within the intervention, which heighted levels of self-consciousness or self-criticism. Additionally, participants tended to criticize their performance, such as body language, words and tone of voice used when providing compassion within the intervention. These different emotional responses to one's avatar within the intervention demonstrate the need for careful consideration in creating and using personalised avatars, particularly with individuals who are more sensitive to self-criticism.

"No, I didn't like it as well, I was like 'shit I really need to lose weight or something, is that what I look like?'". (Participant 12)

*"I could see myself, like my thinking going towards there, but I think because I've grown to like know that and accept some parts of my body, but it's taken a long time. So, I could see myself like tending towards that if I was not like now, like if you showed me this like a few years earlier I might have easily, like, gone into the other way [referring to self-doubt about their body]". (*Participant 14)

3.2 The Creation Process

In this study, the creation process involved sending a passport style photograph to the researcher(s) and choosing a body type that participants felt most represented them from a specified list. Responses to the creation process were mixed. While most participants found the process as expected and relatively straightforward, others reported some discomfort or self-consciousness related to creating their avatar.

Some participants expressed feeling uncomfortable about sharing personal photos, especially those that were unflattering or passport-style, as these did not

capture their preferred self-image. Additionally, some participants struggled with selecting a body type that they felt accurately represented them and described feeling boxed into predefined categories that did not align with their perception of themselves. This process made them more aware of their physical body and led to comparison.

However, most participants accepted the creation process, which suggests that with further support and more representative body type options, participants could overcome initial discomfort and engage more effectively with the creation process.

"I don't know how personal I can get through this, but I don't particularly like usually taking pictures of myself in general, like I just don't like looking at me in that way. So, it was weird like to send the picture of me...and it was like 'look at me, this is my worst version of myself". (Participant 11)

"So, it made me realize, like where do I fit into this? I feel a bit like boxed up into like that category, which is quite interesting because I've never really thought of like something as like I never really compared myself with others if I have to go out, like if I have bigger arms or bigger legs". (Participant 14).

3.3 Losing Focus

Ten participants included in the analysis described experiencing distraction during the intervention, often due to preoccupation relating to the appearance or voice of their personalised avatar. The novelty of seeing or hearing their virtual selves frequently led to discomfort. This consequently detracted some users from fully engaging with all the intervention elements. Details like physical discrepancies and audio or visual

technological issues pulled participants' attention away from the intervention experience.

Participants described concentrating more on their own perceptions and judgments rather than fully engaging with the experience. For example, some felt unable to shift perspectives or listen to the compassionate statements while in the child's point of view. This indicates that personalisation may increase the risk of distraction and prevent users from applying the self-compassionate aspects of the intervention in comparison to a more generic avatar.

"Like when you hear your voice recording, like, see a video of yourself and kind of more thinking about, like, 'what am I doing in that?'. That's just like strange, more focused on like, maybe like the self consciousness aspect of it, like, 'wow I look weird in that' or like 'I don't like the way my voice sounds' rather than like hearing the actual words". (Participant 16)

*"Yeah and just looking at it for the first time and seeing it so, I completely forgot about experiencing it as the kid, so I felt like I was myself. I didn't change over into the kid here, because I could see myself there. So it was quite difficult then. If it wasn't me, if it was maybe a plain normal avatar then maybe it would be easier to switch into the kid". (*Participant 12)

3.4 Uncanny Nature of Avatars

In nine interviews, participants described feelings related to the uncanniness of virtual avatars. Some highlighted the eeriness and discomfort associated with seeing a virtual representation of themselves, frequently using words like 'strange' and 'weird' to

describe their avatars. This aligns with the idea of the uncanny valley hypothesis, where digital representations can evoke unease or discomfort.

Some participants described feeling confused by simultaneously identifying with their avatar's features while also feeling disconnected and alienated from their virtual self. The mismatch between participant's expectations of their personalised avatar and the reality amplified the 'strange' nature of the avatars. Additionally, some participants mentioned the robotic and lifeless appearance of the avatars, with unnatural body movement and eye contact, making their virtual self-appear cold and unsettling. However, not all participants reported similar feelings, suggesting a general acceptance of the avatars' appearance and the potential for overcoming discomfort. This highlights the importance of individual differences in response to avatar representations, and the opportunity to improve avatars to reduce the uncanny effects.

"I thought that it felt a bit strange and a bit unnatural if I'm honest because I think because I'm aware it's an avatar and I'm one of those people, that doesn't like, I don't know what you call it, like abstract things... I like things to feel real". (Participant 10)

"But on the other hand, when I was looking at when I was a child, the Avatar was a bit robotic, so I felt, and kind of lifeless in the eyes, so I didn't feel very comforted by it". (Participant 2)

3.5 A 'Better me'

The last sub-theme under emotional responses was a 'better me'. Although less frequent, this theme was described by six participants and focuses on the idea of avatars representing an idealised version of participants. Some participants shared a

desire to enhance their avatars and described having idealized representations in other contexts, such as social media or video games.

During the creation process, users reflected on the inner tension between choosing an avatar that represented their real self versus one that represented their ideal self and body. Participants mentioned specific desired enhancements such as reducing their body size, adding makeup, or having better clothing and hair. Some participants believed that an idealised avatar would lead to more positive emotional reactions. For example, one participant shared their personalised avatar appeared younger than their actual self with no wrinkles, and this felt 'pleasant' for them.

"I think in a virtual reality I'd rather have a slim body because the whole point of virtual reality is to have a fantasy version of yourself... I would have been happier to see a slimmer figure in my virtual world". (Participant 12)

"I would definitely change the hair styles and maybe put some makeup on just like basically adjust my appearance to be like a 'better me' style like, not necessarily reflecting the real world me, but like an ideal me". (Participant 5)

4. 'Time to Reflect'

The last theme generated was "time to reflect". This theme focuses on participants' key learnings following engagement with the intervention and their avatar. Participants shared how their personalised avatar encouraged personal reflections and provided them with space to contemplate how they perceive themselves, their emotional and compassionate responses, and how they treat themselves and others.

4.1 Body Image Awareness

Many participants noted that interacting with their personalised avatars heightened their awareness of their own physical state and body image. For example, some participants observed specific details about their avatar, such as a slimmer face or a larger torso, and felt it acted as a reminder of their current or desired body shape. This increased awareness elicited a range of emotional responses for participants, from increased self-criticism to a more compassionate view towards their bodies.

For some users, the heightened self-awareness triggered negative emotions and discomfort, but for others it sparked curiosity or acceptance and was not associated with any emotional distress. Additionally, some participants discussed the positive impact of their personalised avatar, as they were able to focus on the positive aspects of themselves rather than their perceived flaws, and it encouraged reflective thinking about their body which they usually do not spend time thinking about.

These findings suggest that personalised avatars may be a valuable tool for enhancing body awareness and acceptance. However, they must be used thoughtfully to avoid potential adverse effects, particularly for individuals with existing body image concerns.

"*I think I think it just raised my awareness of like what my current physical state is, I think that was it. I, yeah I mean, I didn't feel bad or, but it's just kind of like a reminder, like oh I would like rather be this guy or this shape than this, but it wasn't a big thing, right".* (Participant 1)

"As you know, I'm a psychology student so, I would say this is coming from personal experience. I don't feel particularly uncomfortable about anything, but even more it sort

of gave me the time to reflect on my different body parts, and I think that's positive for me". (Participant 4)

4.2 Personal Communication Style

Participants revealed that the VR intervention allowed them to reflect on their own personal communication styles and consider changes they might make in real life. These reflections led to insights about their usual ways of interacting with others and highlighted areas for potential growth in fostering more compassionate and effective communication.

For example, some participants recognised their usual manner was more blunt or direct than they realised, and the intervention prompted them to consider changing their communication style to seem more understanding. Additionally, participants reflected on their chosen words and gestures they used, noting that improving their body language might enhance their communication style and make interactions with others more positive and effective.

Furthermore, participants described a discrepancy between their intention to be kind and gentle in their approach within the VR and the actual impact of hearing their words from an external perspective. This awareness prompted them to consider how they treat themselves, suggesting that the intervention could be a positive learning experience and lead to more self-compassionate and mindful responses in the future.

"Yes, noticing that when I'm listening to it I don't feel exactly relaxing. So I know that ok in the future, whether with myself or with other people it can be different in such a way, because I'm not even aware I'm speaking those words while I'm speaking" (Participant 4)

“Interestingly, normally I don't talk like that, but I think this could be quite useful. Maybe I should be more kinder when I talk to people, I’m quite direct... but I'm trying to be more indirect and easier to get on with... so I think it’s good, to speak a bit softer”. (Participant 12)

4.3 The Power of Virtual Self Compassion

Following engagement in the intervention, most participants highlighted a shift in their perspective, and described how the VR experience allowed for a different or more sympathetic view of oneself. In general, participants felt that avatar personalisation helped the intervention interactions feel more meaningful. Additionally, participants expressed feeling comforted by their own voice and gestures, suggesting that the personalised avatar elicited a strong emotional connection and made the intervention feel impactful.

Participants also reported that the self-compassion elements of the study encouraged them to become more aware of how they treat themselves in other contexts outside of the VR and described finding the experience reassuring overall. These reflections suggest that seeing and hearing oneself in a compassionate light can help cultivate a more understanding and compassionate self-view.

Alternatively, a few participants shared a preference for receiving comfort from others rather than oneself, such as using the voice of a close family member or a lost loved one. They believed this would help the interactions feel more authentic and reflect real life situations more closely.

“I think maybe a bit like more sympathetic somehow, more kind of looking at yourself in a different way, in a different light. OK. “Ohh that's how I am in the world”. (Participant 1)

“I think it feels like, it's like you feel more like I'm talking to myself, like it's not just some generic thing. We’re so used to using bots and things, like even in the doctors, but if it was like a personalised avatar then I know that's been created for me and that's like myself, like my own best friend, talking to me. Which I think would be more useful and constructive and would have more meaning for me”. (Participant 10)

“I'm definitely listening more carefully to what she says and feeling quite proud. Like I said, at the same time feeling quite reassuring, soothing compassion at the same time reflecting this is not usually what I would say, or it's quite unconscious. So it's half and half, but in general I really like this experience mainly because of that”. (Participant 4)

Discussion

Avatars are digital representations and allow participants to interact and feel a sense of presence in virtual environments (Belk et al. 2013; Hoi and Cho, 2014). While there is growing interest in the potential impact of avatar customisation and personalisation, existing qualitative data is scarce. The current study aimed to explore users’ subjective experiences of creating and using personalised avatars within a virtual reality intervention designed for cultivating self-compassion.

The present study conducted semi-structured interviews with sixteen adult participants following their engagement in a VR intervention. The thematic analysis revealed four core themes: ‘*you’re in a different world and in a different body’*, ‘*avatar*

identification', '*emotional responses'* and '*time to reflect',* with seventeen sub-themes. These themes provide deeper insights into users' experience of creating and interacting with self-representative avatars. The discussion will contextualise these findings in relation to existing literature.

Avatar Self-similarity

The theme '*avatar identification'* and its sub-themes highlight elements of the VR intervention that encouraged or hindered avatar identification. The findings indicate that personalisation positively impacted individual's connection to their avatars. For instance, physical similarities, such as facial features and hairstyle, helped users identify more with their virtual selves. These findings tie in with previous studies demonstrating that individuals who used avatars that were similar to themselves reported greater avatar identification (Trepte & Reinecke, 2010; Hoi & Choo, 2014). Additionally, qualitative feedback from a study by Radiah et al. (2023) investigating the effect of avatar personalisation on perceived emotions found that participants identified more with avatars that resembled their gender and were personalised compared to non-personalised. These findings are particularly important for therapeutic interventions, where the effectiveness of VR relies heavily on users' ability to immerse themselves fully and connect to the virtual context.

Furthermore, the theme '*you're in a different world and in a different body'* provides some insight into the impact of personalisation on embodiment and the realism of the intervention. Participants frequently noted that physical similarities between the avatar's body size and shape and their own positively influenced their sense of avatar control. This aspect was particularly pertinent when participants transitioned to the child avatar perspective, and participants shared that the small body

size reduced their sense of embodiment. Results from a study by Kim et al. (2020) similarly revealed that participants experienced the greatest sense of body ownership when the avatar's body size matched their own.

An important finding revealed from the analysis was the power of using participants' own voices within the intervention. Voice is a direct signal that conveys a large amount of personal information, and participants reported that hearing their own voice enhanced identification with their avatars. Studies investigating social gaming have reported similar findings. For example, research by Carter et al. (2015) suggests that using a player's own voice significantly influences their sense of immersion and helps merge user and game character identities. Additional studies have found that avatar voices resembling the user's voice can lead to increased avatar identification, sense of presence, and body ownership (Kim et al., 2023). A study by Kim et al. (2023) investigating avatar self-similarity in social VR experiences found that voice had a more significant impact on the VR experience than appearance. The sub-theme from the present study '*bridging the gap - the power of voice'* supports these findings, suggesting that the impact of voice is particularly significant and can encourage identification despite physical discrepancies between the actual and virtual self. This highlights the importance of auditory as well as visual similarity for encouraging identification and connection to virtual avatars.

The Impact of Non-verbal Communication

In addition to verbal communication, humans use a range of non-verbal cues to communicate, such as facial expression, body language, and eye gaze (Bogdanoyych et al., 2016). Participants noted that viewing avatar body movements and gestures that reflected their own were critical for the believability of social interactions within the

VR intervention. A study by Kim et al. (2020) also highlights the importance of avatar movement, indicating that synchronized motion led participants to perceive avatars as being similar in size to their own body, even if it was not. This emphasizes the significance of body movement for body ownership. This finding is supported by qualitative data from the current study, particularly within the sub-theme '*embodiment and movement'*, where participants highlighted that recognizing their own gestures enhanced their sense of embodiment.

The significance of avatar movement has also been highlighted by Wu et al. (2021), who found that avatar eye contact and contextual movements were more important than how realistic the avatars looked. In the current study, unrealistic eye contact and gaze was raised by users as factors that reduced their connection to their personalised avatars, making them appear 'cold'. Moreover, a study by Bogdanoyych et al. (2016) demonstrated significant improvements in gaze behaviour led to improvements in communication between virtual avatars. This highlights the crucial role of nonverbal communication in VR interactions, and how the accuracy of gestures and body movement significantly impact sense of embodiment and realism (Zhang et al., 2024).

The current study utilised a head-mounted display and two hand controllers to track users upper body movement during the intervention. Participants shared this set up negatively impacted their sense of embodiment as it impacted the naturalness of their real-life movements, and also created inconsistency between their actual and virtual movements leading to a *'virtual vs physical divide*'. Humans are acutely aware of their own body position, making any discrepancies with the avatar clearly noticeable (Ponton et al., 2023). Participants specifically mentioned issues such as the avatar's inability to lean forward accurately, the lack of leg movement, and holding controllers

in real life when their avatar was not. To improve movement accuracy, other tracking methods may be beneficial. For instance, equipment that allows for hand free interactions, such as data gloves or additional trackers that collect the posture and movement of humans in real time, could enhance the realism of the avatar movements (Dey et al., 2022; Yang et al., 2019).

Individualisation in Virtual Reality

As demonstrated by the sub-theme '*avatar connection',* the majority of participants recognised similarities between their virtual and actual selves and reported a sense of connection with their personalised avatars. Nevertheless, many users also suggested that additional customisation opportunities would enhance their avatar's physical resemblance. This aligns with existing research indicating that greater similarity between users and their avatars in terms of facial and body appearance enhances relationship formation towards their avatar and increases immersion (Suh et al., 2011; Park & Kim, 2023). The '*enhancing customisation'* sub-theme includes participant suggestions to further individualize their avatars, such as adjusting their hair colour and style, clothing, and movement styles to better reflect themselves. Some users recommended specific changes to the creation process, such as incorporating body scans or videos to ensure avatars accurately reflect participants' real-time appearance. Existing studies demonstrate that using techniques like 3D face scanning and precise body measurements, for instance height, shoulder width, and hip width, improves the accuracy of facial features and body size, and consequently strengthens avatar connection and body ownership (Jung et al., 2022).

In a recent study investigating VR and self-compassion, Baghaei et al. (2021b) provided participants a VR experience where they could customise their avatar's

physical characteristics, such as gender, skin colour, hair colour, and clothing. Qualitative feedback from their study revealed that avatar customisation was one of the most appreciated features by users (Baghaei et al., 2021b). Additionally, research indicates that allowing users to customize their avatars fosters a stronger sense of ownership (Young Chung, Kim & Lee, 2024). However, in the current study, users had limited involvement in the creation process. Aside from submitting a photo and selecting a body type, they were unable to modify other aspects of their avatar. The '*enhancing customisation'* sub-theme reflects participant's desire for more active involvement in the creation process, supporting the idea of more collaborative and step-by-step approaches. Investing time in refining the creation process and offering greater user input could improve user ownership, enjoyment and connection to the VR intervention (Chung, Kim & Lee, 2024).

The sub-theme *'a better me'* reflects the desire of some participants to enhance their features, such as altering their body size, adding make up or choosing better hairstyles or clothing for their avatars. Similarly, previous research has found that users often create avatars that represent their idealised selves (Chung, Kim & Lee, 2024; Ko & Park, 2023). Loewen, Burris and Nacke (2021) suggested that players' preference for realistic or idealised avatars were linked to the extent of their perceived discrepancies between who they are and who they want to be. The study found that those who preferred idealized avatars tended to perceive a greater discrepancy between their actual and ideal selves (Loewen et al., 2020). This suggests that individual avatar preferences could offer insights in to individuals' sense of self and self-esteem. Similar findings were found in a feasibility study by Baghaei et al. (2021b) where mental health professionals found that customisation choices provided them with further understanding of their clients. Future research should explore the

experience of using idealised avatars within VR interventions, the potential emotional implications associated with it, and whether it can support clinical understanding.

The Uncanny Valley Effect

As previously discussed, many participants reported positive aspects related to their personalised avatars, noting benefits such as increased connection to the avatar and the intervention, as well a greater sense of embodiment. However, the data also revealed the sub-theme '*uncanny nature of avatars',* where some users described discomfort upon viewing their personalised avatar, using terms such as 'weird', 'strange' and 'odd' to describe their experience. The uncanny valley effect is a well-known model proposed by robotics professor Masahiro Mori. He suggested that robots that closely resemble but do not exactly look like humans can evoke a sense of eeriness in observers (Mori et al., 2012). This phenomenon is particularly significant in virtual reality interventions, where avatars often do not fully resemble 'healthy humans' due to technological limitations. This can then potentially trigger discomfort and a sense of unease (Elliot, Henry & Baghaei, 2023).

Other studies investigating the impact of avatar personalisation have produced similar findings. For instance, Dollinger et al. (2023) explored the effects of avatar individualisation in VR on body awareness and found that participants often perceived their personalised avatars as more eerie compared to generic avatars. Similarly, Latoschik et al. (2017) found that interactions with personalised avatars resulted in higher ratings of eeriness, although these findings were not statistically significant. These quantitative results, combined with the qualitative data from the current study, provide some evidence for the uncanny valley effect in virtual reality, and highlights the importance of finding a balance in avatar design. For instance, creating avatars

that enhance identification while avoiding potential feelings of unease. A study proposal by Elliot, Henry and Baghaei (2023) aims to address this challenge by investigating the use of individualised humanoid ‘cartoon’ avatars in comparison to lifelike avatars. This approach may allow for the benefits of personalisation while potentially reducing the risk of triggering the uncanny valley effect. Further research in this area is crucial to enhance user comfort and engagement.

Technological errors

Participants reported several technological malfunctions, including inaccurate body positions, clunky avatar movements, and glitches such as skin showing through avatar clothing. The sub-theme ‘*technological barriers’* highlights how these issues can reduce immersion and detract from the realism of the study. Natural avatar interactions are essential for achieving high realism in VR settings, and previous studies have emphasised the importance of believable and authentic communication (Nagendran et al., 2022). A study by Toothman and Neff (2019) found that motion tracking errors in VR reduced users’ experience of embodiment. Similarly, qualitative feedback from a study by Nagendran et al. (2022) indicated a desire for natural avatar movements and improved graphics (Halim et al., 2023). In the current study, users described some movements as ‘robotic’ and explained how technological limitations affected their perception of the avatars and how human they appeared. This lack of realism hindered their emotional connection and sense of immersion, suggesting the need to address technological limitations to improve the VR experience.

Despite these issues, many participants were able to overlook technological imperfections and still identify with their self-representative avatars. A study by Bengtsson and Van Counvering (2022) found that constructed glitches did not break

immersion to the extent that the VR scenario lost its impact. It is important to acknowledge the significant cost and resources required to improve technological equipment. Therefore, further research should examine the extent to which technological limitations impact immersion and what level of realism might be perceived as sufficient, rather than striving for perfection.

Reflexivity was applied throughout the research process. From the beginning, the researcher worked to acknowledge any preconceived ideas about the intervention's effectiveness, particularly those driven by personal excitement about VR technology. During the semi-structured interviews, urges to point out the technology's limitations before participants used it were noted. These reflections were recorded in a journal to track the researcher's thoughts and feelings throughout the study. After discussing with colleague SF, it was clear that these urges likely stemmed from a desire to lower participants' expectations and encourage openness to the VR study, revealing a potential personal bias. By recognizing, documenting and discussing these urges, they were managed more effectively, ensuring that the analysis remained data-driven rather than influenced by personal bias.

Self-awareness vs Self-criticism

One of the prominent themes identified from the thematic analysis was *'time to reflect'*. This theme included the three sub-themes '*body image awareness'*, '*personal communication style'* and *'the power of virtual self-compassion'*. These sub-themes capture participants' heightened self-awareness and reflections following engagement with their personalised avatars. Research in gaming and social media indicate that avatars closely resembling users in facial features and body shape can increase self-awareness and self-focus (Kim et al., 2023). Moreover, Vasalou et al. (2007) found

greater avatar similarity was associated with increased self-awareness (Vasalou et al., 2007).

The theory of objective self-awareness (Duval & Wickland, 1972) suggests that viewing oneself as an object promotes self-awareness, a phenomenon that has often been demonstrated through mirror tasks. In the current intervention, participants view their personalised avatar via a virtual mirror reflection, thus potentially activating a similar self-awareness process. Moreover, previous studies have shown that embodying personalised avatars can heighten individuals' levels of self-awareness, diverting their attention inward to become more aware of their attitudes and emotional states (Hooi & Cho, 2013; Koek & Chen, 2024). In the current study, participants noted that the intervention provided them with a space to reflect on their interactions with themselves and others in daily life, for example perceiving the self as blunt and awkward or comforting and reassuring.

Responses to this reported self-awareness varied among participants, with some finding it beneficial and others finding it preoccupying. The sub-theme '*losing focus'* illustrates how increased awareness of appearance and communication style prompted reflections that distracted users from fully engaging with the intervention tasks, such as listening to the compassionate statements or embodying the child avatar.

The theme '*emotional responses'* revealed a spectrum of user reactions towards increased self-awareness. A key finding was the potential of personalised avatars to increase body awareness and consequently amplify levels of self-criticism, particularly among individuals with existing insecurities. This was encapsulated by the *'inner critic'* sub-theme, where participants expressed concerns that those with body-related difficulties or lower self-confidence might experience their avatars as

confronting. Some participants also noted that personalised avatars highlighted perceived imperfections, such as their tone of voice or other aspects of their physical appearance. For instance, participants noted that listening to their own voice was uncomfortable and triggered self-consciousness. To reduce potential self-criticism, some participants suggested that their avatar's voice should represent that of a familiar loved one. Further research is needed to explore the impact of voice within VR settings, specifically the effect of hearing the voice of a familiar other, such as a compassionate family member or friend, on avatar identification and connection.

Studies such as Kim et al. (2023) have similarly found that interactions with personalised avatars can heighten individuals' self-consciousness, while Ridgway and King (2017) reported decreases in body satisfaction and mood following users' viewing their 3D scanned avatars. However, the literature presents mixed findings. For instance, a study using facial images by Koek and Chen (2024) found no negative changes in self-esteem following interactions with personalised avatars. The current study's results echo previous research where although some participants reported finding their avatars uncomfortable, others experienced them as neutral or positive reminders of their physical characteristics. Similarly, participants in existing studies have described their avatars as a "reality check" of their current selves (Horne et al., 2022). Future studies exploring the potential negative impact of personalised avatars are needed, and clinicians should consider individual differences, such as baseline levels of self-criticism, when offering similar interventions.

The Impact of Personalisation on Self-compassion

Participants shared that the intervention has the capacity to strengthen their ability to be compassionate towards themselves, as highlighted by the sub-theme 'the power of

virtual self-compassion'. Participants in the current study expressed that receiving compassion from their personalised avatars was both reassuring and meaningful. This experience prompted them to reconsider their typical ways of self-interacting and foster a more sympathetic self-view, suggesting that personalised avatars can encourage users to actively engage with intervention content. Similarly, research by Birk and Mandryk (2019) found that customized avatars increased levels of engagement and effort in interventions. Participants in the current study described how personalisation heightened their sense of embodiment and control over their avatars. Gall et al. (2021) found that individuals who reported higher levels of embodiment experience stronger emotional responses. This suggests that increased virtual embodiment through personalisation may amplify emotional responses to therapeutic interventions, and thus potentially enhance outcomes.

Clinical Implications and Future research

These findings contribute to existing literature and suggest that personalised avatars can enhance participant identification and connection. Moreover, it suggests that observing oneself as an avatar encourages reflective thinking and can promote a more self-compassionate perspective. Although the focus of this intervention was on cultivating self-compassion, the findings also hold broader implications for VR interventions.

The study highlights several clinical implications. Firstly, personalised avatars may heighten self-criticism and trigger negative emotions in users, particularly among individuals with pre-existing insecurities. This indicates the need for careful consideration of individual differences before offering personalised avatars to avoid potential emotional distress. Additionally, the findings indicate a desire for a more

refined avatar creation process and increased customisation options. Greater user involvement in the creation process could offer valuable insights into individual preferences and differences and could be a useful tool to aid clinicians in better understanding their patients.

As discussed, the findings highlight individual differences in avatar personalisation, with some users favouring realistic avatars that closely resemble their physical selves, while others spoke of a preference for idealised avatars, especially when there is a larger discrepancy between their actual and ideal selves. This suggests that personalisation could be offered along a continuum, allowing for customisation from more realistic to idealised self-representations. Providing such flexibility and allowing individuals to choose an avatar that best aligns with their needs, could reduce potential negative experiences, enhance connection to their avatar, and create a more personalised experience. Clinically providing users with the ability to tailor their avatars along this continuum may also help account for psychological factors like self-criticism or low self-esteem, further improving the intervention's effectiveness.

Furthermore, the study identified challenges that participants can face when engaging with novel VR interventions, demonstrating that avatars can trigger a sense of unease. Consequently, clinicians using similar approaches should introduce users to virtual environments thoughtfully, and carefully consider how best to guide individuals through the intervention to ensure they have time to adapt and become comfortable with the experience.

The study also proposes several avenues for future research and intervention development. For instance, expanding avatar customisation options to better reflect individual characteristics, introducing idealised self-avatars, and incorporating familiar

voices in the VR experience. These potential avenues warrant further investigation in order to understand users' subjective experiences, as well as their impact on user embodiment and avatar identification. Lastly, further studies with clinical populations, such as individuals with body image related difficulties, high self-criticism or other mental health problems, are needed to understand the potential risks of using personalised avatars in therapeutic interventions.

Study Limitations

Several limitations impacted the realism of the study. Firstly, the researcher(s) encountered various challenges during the avatar creation process. Many of the participant submitted photos were overexposed, resulting in inaccurate avatar skin tones and hair colours in CC3, which were difficult to manually adjust and affected how representative the avatars were. Moreover, participants noted the lack of diverse body options. Despite researcher attempts to provide numerous options, these appeared overly masculine or feminine and were limited in design. Technological errors also led to inaccuracies, such as robotic movements and awkward body positioning. Additionally, exporting avatars from CC3 significantly reduced their quality, compromising their 'life-life' appearance. These factors all likely impacted participants' sense of immersion, the similarly between themselves and their avatars, and their overall attitude and response towards their personalised avatars.

Although qualitative studies are not intended to be generalised to wider populations, it is important to highlight that a significant proportion of participants (68.7%) in this study had prior experience with VR. Future studies should aim to include both individuals with prior experience and those who are VR-naïve, as responses to the technology and avatars may differ between these groups.

Furthermore, this study only conducted interviews with participants who experienced the personalised avatar condition. As a result, this paper was not able to form any comparisons or gain insights into how individuals experienced their non-personalised avatars. For example, whether differences exist in relation to feelings of uncanniness, emotional responses to the avatars, or avatar identification.

Lastly, interviews were conducted immediately after participants had completed the intervention. This timing may have limited participants ability to fully process their thoughts and reflections on the tasks. Conducting interviews at a later time point could provide valuable insights into what aspects of the avatars and intervention resonated most with participants, and better understand the longer-lasting impacts of creating and using a personalised avatar within the self-compassion VR intervention.

Conclusions

The findings from this qualitative study are promising, indicating that users mostly had positive experiences of creating and using personalised avatars in the self-compassion virtual reality intervention. The study suggests that personalised avatars can facilitate valuable experiences, such as increased engagement, stronger avatar connection, identification, and heightened self-awareness. However, the findings also revealed concerns that personalised avatars can be confronting for users and may trigger self-critical thoughts. It is important to consider individual differences, such as participants' existing body image concerns, sense of self and actual-ideal discrepancies, as these factors could lead to negative emotional reactions following interactions with personalised avatars.

References

Baer, R. A. (2010). Self-compassion as a mechanism of change in mindfulness- and acceptance-based treatments. In R. A. Baer (Ed.), *Assessing mindfulness and acceptance processes in clients: Illuminating the theory and practice of change* (pp. 135–153). Context Press/New Harbinger Publications.

Baghaei, N., Chitale, V., Hlasnik, A., Stemmet, L., Liang, H., & Porter, R. (2021). Virtual Reality for Supporting the Treatment of Depression and Anxiety: Scoping Review. *JMIR Mental Health*, *8*(9), e29681. doi: 10.2196/29681

Baghaei, N., Stemmet, L., Khaliq, I., Ahmadi, A., Halim, I., Liang, H.-N., Xu, W., Billinghurst, M., & Porter, R. (2021b). Designing individualised virtual reality applications for supporting depression: A feasibility study. *Companion of the 2021 ACM SIGCHI Symposium on Engineering Interactive Computing Systems*. https://doi.org/10.1145/3459926.3464761

Bailenson, J. N., Blascovich, J., & Guadagno, R. E. (2008). Self-representations in immersive virtual environments. *Journal of Applied Social Psychology, 38*(11), 2673–2690. https://doi.org/10.1111/j.1559-1816.2008.00409.x

Baker, D. A., Caswell, H. L., & Eccles, F. J. R. (2019). Self-compassion and depression, anxiety, and resilience in adults with epilepsy. *Epilepsy & behavior*, *90*, 154–161. https://doi.org/10.1016/j.yebeh.2018.11.025

Barnard, L. K., & Curry, J. F. (2011). Self-compassion: Conceptualizations, correlates, & interventions. *Review of General Psychology*, *15*(4), 289–303. https://doi.org/10.1037/a0025754

Barrington, A. (2022). Embodying Compassion in Virtual Reality using Celebrity Avatars [Doctoral thesis, University College London].

https://discovery.ucl.ac.uk/id/eprint/10156048/8/Barrington_10156048_thesis_sig_removed.pdf

Birk, M. V., & Mandryk, R. L. (2019). Improving the Efficacy of Cognitive Training for Digital Mental Health Interventions Through Avatar Customization: Crowdsourced Quasi-Experimental Study. *Journal of medical Internet research*, *21*(1), e10133. https://doi.org/10.2196/10133

Bogdanovych, A., Trescak, T., & Simoff, S. (2016). What makes virtual agents believable? *Connection Science,* 28(1), 83–108. https://doi.org/10.1080/09540091.2015.1130021

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Braun, V., & Clarke, V. (2013). Successful qualitative research: A practical guide for beginners. London: Sage.

Braun, V., & Clarke, V. (2022). Toward good practice in thematic analysis: Avoiding common problems and be(com)ing a knowing researcher. *International journal of transgender health*, 24(1), 1–6. https://doi.org/10.1080/26895269.2022.2129597

Byrne, D. (2021). A worked example of Braun and Clarke's approach to reflexive thematic analysis. *Quality & Quantity*, *56*(3), 1391–1412. https://doi.org/10.1007/s11135-021-01182-y

Carter, M., Allison, F., Downs, J., & Gibbs, M. (2015). Player identity dissonance and voice interaction in games. *Proceedings of the 2015 Annual Symposium on Computer-Human Interaction in Play*. https://doi.org/10.1145/2793107.2793144

Craig, T., Rus-Calafell, M., Ward, T., Leff, J., Huckvale, M., & Howarth, E. et al. (2018). AVATAR therapy for auditory verbal hallucinations in people with psychosis: a single-blind, randomised controlled trial. *The Lancet Psychiatry*, *5*(1), 31-40. doi: 10.1016/s2215-0366(17)30427-3

Crego, A., Yela, J. R., Riesco-Matías, P., Gómez-Martínez, M. Á., & Vicente-Arruebarrena, A. (2022). The Benefits of Self-Compassion in Mental Health Professionals: A Systematic Review of Empirical Research. *Psychology research and behavior management*, 15, 2599–2620. https://doi.org/10.2147/PRBM.S359382

Dey, A., Barde, A., Yuan, B., Sareen, E., Dobbins, C., Goh, A., Gupta, G., Gupta, A., & Billinghurst, M. (2022). Effects of interacting with facial expressions and controllers in different virtual environments on presence, usability, affect, and neurophysiological signals. *International Journal of Human-Computer Studies*, 160, Article 102762. https://doi.org/10.1016/j.ijhcs.2021.102762

Döllinger, N., Beck, M., Wolf, E., Mal, D., Botsch, M., Latoschik, M. E., & Wienrich, C. (2023). “if it’s not me it doesn’t make a difference” - the impact of avatar personalization on user experience and body awareness in virtual reality. *2023 IEEE International Symposium on Mixed and Augmented Reality (ISMAR)*. https://doi.org/10.1109/ismar59233.2023.00063

Elliott, T. C., Henry, J. D., & Baghaei, N. (2023). Designing humanoid avatars in individualised virtual reality for Mental Health Applications. *2023 IEEE International Symposium on Mixed and Augmented Reality Adjunct (ISMAR-Adjunct)*. https://doi.org/10.1109/ismar-adjunct60411.2023.00069

Fairburn, C. G., & Patel, V. (2017). The impact of digital technology on psychological treatments and their dissemination. *Behaviour research and therapy*, *88*, 19–25. https://doi.org/10.1016/j.brat.2016.08.012

Falconer, C. J., Rovira, A., King, J. A., Gilbert, P., Antley, A., Fearon, P., Ralph, N., Slater, M., & Brewin, C. R. (2016). Embodying self-compassion within virtual reality and its effects on patients with depression. *BJPsych open*, 2(1), 74–80. https://doi.org/10.1192/bjpo.bp.115.002147

Falconer, C. J., Slater, M., Rovira, A., King, J. A., Gilbert, P., Antley, A., & Brewin, C. R. (2014). Embodying compassion: a virtual reality paradigm for overcoming excessive self-criticism. *PloS one*, 9(11), e111933. https://doi.org/10.1371/journal.pone.0111933

Freeman, D., Haselton, P., Freeman, J., Spanlang, B., Kishore, S., & Albery, E. et al. (2018). Automated psychological therapy using immersive virtual reality for treatment of fear of heights: a single-blind, parallel-group, randomised controlled trial. *The Lancet Psychiatry*, *5*(8), 625-632. doi: 10.1016/s2215-0366(18)30226-8

Freeman, D., Lambe, S., Kabir, T., Petit, A., Rosebrock, L., & Yu, L. et al. (2022). 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*, *9*(5), 375-388. doi: 10.1016/s2215-0366(22)00060-8

Freeman, D., Reeve, S., Robinson, A., Ehlers, A., Clark, D., Spanlang, B., & Slater, M. (2017). Virtual reality in the assessment, understanding, and treatment of

mental health disorders. *Psychological medicine*, 47(14), 2393–2400. https://doi.org/10.1017/S003329171700040X

Gall, D., Roth, D., Stauffert, J. P., Zarges, J., & Latoschik, M. E. (2021). Embodiment in Virtual Reality Intensifies Emotional Responses to Virtual Stimuli. *Frontiers in psychology*, *12*, 674179. https://doi.org/10.3389/fpsyg.2021.674179

Gao, Y., Liu, X., Liu, J., & Wang, H. (2023). The Effects of Self-Criticism and Self-Compassion on Adolescents' Depressive Symptoms and Nonsuicidal Self-Injury. *Psychology research and behavior management*, *16*, 3219–3230. https://doi.org/10.2147/PRBM.S417258

GBD Disease and Injury Incidence and Prevalence Collaborators (2018). Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990-2017: a systematic analysis for the Global Burden of Disease Study 2017. *Lancet (London, England)*, *392*(10159), 1789–1858. https://doi.org/10.1016/S0140-6736(18)32279-7

Gega, L., Jankovic, D., Saramago, P., Marshall, D., Dawson, S., Brabyn, S., Nikolaidis, G. F., Melton, H., Churchill, R., & Bojke, L. (2022). Digital Interventions in mental health: Evidence syntheses and economic modelling. *Health Technology Assessment*, 26(1), 1–182. https://doi.org/10.3310/rcti6942

Geraets, C., van der Stouwe, E., Pot-Kolder, R., & Veling, W. (2021). Advances in immersive virtual reality interventions for mental disorders: A new reality?. *Current Opinion In Psychology*, *41*, 40-45. doi: 10.1016/j.copsyc.2021.02.004

Gilbert P. (2014). The origins and nature of compassion focused therapy. *The British journal of clinical psychology*, *53*(1), 6–41. https://doi.org/10.1111/bjc.12043

Gilbert P. (2020). Compassion: From Its Evolution to a Psychotherapy. *Frontiers in psychology*, 11, 586161. https://doi.org/10.3389/fpsyg.2020.586161

Gilbert, P. (2009). Introducing compassion-focused therapy. *Advances in Psychiatric Treatment*, 15(3), 199–208. http://dx.doi.org/10.1192/apt.bp.107.005264

Gilbert, P., & Procter, S. (2006). Compassionate Mind Training for People with High Shame and Self-Criticism: Overview and Pilot Study of a Group Therapy Approach. *Clinical Psychology & Psychotherapy,* 13(6), 353–379. https://doi.org/10.1002/cpp.507

Gilbert, P., McEwan, K., Irons, C., Bhundia, R., Christie, R., Broomhead, C., & Rockliff, H. (2010). Self-harm in a mixed clinical population: the roles of self-criticism, shame, and social rank. *The British journal of clinical psychology*, 49(Pt 4), 563–576. https://doi.org/10.1348/014466509X479771

Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (pp. 105–117). Thousand Oaks, CA: Sage Publications, Inc.

Halim, I., Stemmet, L., Hach, S., Porter, R., Liang, H. N., Vaezipour, A., Henry, J. D., & Baghaei, N. (2023). Individualized Virtual Reality for Increasing Self-Compassion: Evaluation Study. *JMIR mental health*, 10, e47617. https://doi.org/10.2196/47617

Hiddings, M., Veling, W., Pijnenborg, G. H. M., & van der Stouwe, E. C. D. (2024). A single-session VR intervention addressing self-compassion and self-criticism with and without perspective change: Results of a randomized controlled experiment. *Behaviour research and therapy*, 173, 104466. https://doi.org/10.1016/j.brat.2023.104466

Higgins, E. T. (1987). Self-discrepancy: A theory relating self and affect. *Psychological Review*, 94(3), 319–340. https://doi.org/10.1037/0033-295X.94.3.319

Horne, M., Hardy, M., Murrells, T., Ugail, H., & Hill, A. J. (2022). Using Personalized Avatars as an Adjunct to an Adult Weight Loss Management Program: Randomized Controlled Feasibility Study. *JMIR formative research*, *6*(10), e36275. https://doi.org/10.2196/36275

Jazaieri, H., Jinpa, G. T., McGonigal, K., Rosenberg, E. L., Finkelstein, J., Simon-Thomas, E., Cullen, M., Doty, J. R., Gross, J. J., & Goldin, P. R. (2013). Enhancing compassion: A randomized controlled trial of a compassion cultivation training program. *Journal of Happiness Studies: An Interdisciplinary Forum on Subjective Well-Being,* 14(4), 1113–1126. https://doi.org/10.1007/s10902-012-9373-z

Jingili, N., Oyelere, S. S., Nyström, M. B. T., & Anyshchenko, L. (2023). A systematic review on the efficacy of virtual reality and gamification interventions for managing anxiety and depression. *Frontiers in digital health*, 5, 1239435. https://doi.org/10.3389/fdgth.2023.1239435

Jung, M., Sim, S., Kim, J., & Kim, K. (2022). Impact of Personalized Avatars and Motion Synchrony on Embodiment and Users' Subjective Experience: Empirical Study. *JMIR serious games*, *10*(4), e40119. https://doi.org/10.2196/40119

Kariyawasam, L., Ononaiye, M., Irons, C., & Kirby, S. E. (2023). Exploring the Cross-cultural Applicability of a Brief Compassionate Mind Training: a Study Comparing Sri Lankan and UK People. *Mindfulness*, 14(2), 429–447. https://doi.org/10.1007/s12671-022-02041-z

Kilteni, K., Groten, R., & Slater, M. (2012). The sense of embodiment in virtual reality. Presence: *Teleoperators and Virtual Environments*, 21(4), 373–387. https://doi.org/10.1162/pres_a_00124

Kim, H., Park, J., & Lee, I. K. (2023). "To be or Not to be Me?": Exploration of Self-Similar Effects of Avatars on Social Virtual Reality Experiences. *IEEE transactions on visualization and computer graphics*, *29*(11), 4794–4804. https://doi.org/10.1109/TVCG.2023.3320240

Kim, S. Y., Park, H., Jung, M., & Kim, K. K. (2020). Impact of Body Size Match to an Avatar on the Body Ownership Illusion and User's Subjective Experience. *Cyberpsychology, behavior and social networking,* 23(4), 234–241. https://doi.org/10.1089/cyber.2019.0136

King N. (2004). Using templates in the thematic analysis of text. In Cassell C., Symon G. (Eds.), *Essential guide to qualitative methods in organizational research*, 257–270. London, UK: Sage.

Kirby J. N. (2017). Compassion interventions: The programmes, the evidence, and implications for research and practice. *Psychology and psychotherapy*, 90(3), 432–455. https://doi.org/10.1111/papt.12104

Koek, W. J. D., & Chen, V. H. H. (2024). My avatar makes me feel good? The effect of avatar personalisation and virtual agent interactions on self-esteem. *Behaviour & Information Technology.* Advance online publication. https://doi.org/10.1080/0144929X.2024.2349176

Krieger, T., Reber, F., von Glutz, B., Urech, A., Moser, C. T., Schulz, A., & Berger, T. (2019). An Internet-Based Compassion-Focused Intervention for Increased Self-Criticism: A Randomized Controlled Trial. *Behavior therapy*, 50(2), 430–445. https://doi.org/10.1016/j.beth.2018.08.003

Langener, S., Klaassen, R., VanDerNagel, J., & Heylen, D. (2022). Immersive Virtual Reality Avatars for Embodiment Illusions in People With Mild to Borderline Intellectual Disability: User-Centered Development and Feasibility Study. *JMIR serious games*, 10(4), e39966. https://doi.org/10.2196/39966

Latoschik, M. E., Roth, D., Gall, D., Achenbach, J., Waltemate, T., & Botsch, M. (2017). The effect of avatar realism in immersive social virtual realities. *Proceedings of the 23rd ACM Symposium on Virtual Reality Software and Technology.* https://doi.org/10.1145/3139131.3139156

Leaviss, J., & Uttley, L. (2015). Psychotherapeutic benefits of compassion-focused therapy: an early systematic review. *Psychological medicine*, 45(5), 927–945. https://doi.org/10.1017/S0033291714002141

Liao, G.Y., Cheng, T. C. E., & Teng, C.-I. (2019). How do avatar attractiveness and customization impact online gamers' flow and loyalty? *Internet Research*, 29(2), 349–366. https://doi.org/10.1108/intr-11-2017-0463

Loewen, M. G. H., Burris, C. T., & Nacke, L. E. (2021). Me, Myself, and Not-I: Self-Discrepancy Type Predicts Avatar Creation Style. *Frontiers in psychology*, *11*, 1902. https://doi.org/10.3389/fpsyg.2020.01902

Löw, C. A., Schauenburg, H., & Dinger, U. (2020). Self-criticism and psychotherapy outcome: A systematic review and meta-analysis. *Clinical psychology review*, *75*, 101808. https://doi.org/10.1016/j.cpr.2019.101808

Maner, S., Morris, P. G., & Flewitt, B. I. (2023). A systematic review of the effectiveness of compassion focused imagery in improving psychological outcomes in clinical and non-clinical adult populations. *Clinical psychology & psychotherapy*, 30(2), 250–269. https://doi.org/10.1002/cpp.2801

McDonnell, R., and Breidt, M. (2010). “Face Reality: Investigating the Uncanny Valley for Virtual Faces,” in ACM SIGGRAPH ASIA 2010 Sketches, SA ’10, New York, NY, USA (Association for Computing Machinery), 1–2. https://doi.org/10.1145/1899950.1899991

Messinger, P. R., Ge, X., Smirnov, K., Stroulia, E., & Lyons, K. (2019). Reflections of the extended self: Visual self-representation in avatar-mediated environments. *Journal of Business Research*, 100, 531–546. https://doi.org/10.1016/j.jbusres.2018.12.020

Mori, M., MacDorman, K., & Kageki, N. (2012). The uncanny valley [from the field]. *IEEE Robotics & Automation Magazine*, *19*(2), 98–100. https://doi.org/10.1109/mra.2012.2192811

Morris, M. E., Rosner, D. K., Nurius, P. S., & Dolev, H. M. (2023). “I don’t want to hide behind an avatar”: Self-representation in Social VR among women in midlife. Proceedings of the 2023 ACM Designing Interactive Systems Conference. https://doi.org/10.1145/3563657.3596129

Mottelson, A., Muresan, A., Hornbæk, K., & Makransky, G. (2023). A systematic review and meta-analysis of the effectiveness of body ownership illusions in virtual reality. *ACM Transactions on Computer-Human Interaction,* 30(5), 1–42. https://doi.org/10.1145/3590767

Nagendran, A., Compton, S., Follette, W. C., Golenchenko, A., Compton, A., & Grizou, J. (2022). Avatar led interventions in the Metaverse reveal that interpersonal effectiveness can be measured, predicted, and improved. *Scientific reports*, *12*(1), 21892. https://doi.org/10.1038/s41598-022-26326-4

Neff, K. D. (2003). Self-Compassion: An Alternative Conceptualization of a Healthy Attitude Toward Oneself. *Self and Identity*, 2(2), 85–101. https://doi.org/10.1080/15298860309032

Park, J. (2018). The effect of virtual avatar experience on body image discrepancy, body satisfaction and weight regulation intention. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace,* 12(1), article 3. doi: https://doi.org/10.5817/CP2018-1-3

Petrocchi, N., Ottaviani, C., Cheli, S., Matos, M., Baldi, B., Basran, J. K., & Gilbert, P. (2023). The impact of compassion-focused therapy on positive and negative mental health outcomes: Results of a series of meta-analyses. *Clinical Psychology: Science and Practice.* Advance online publication.

Philippe, T. J., Sikder, N., Jackson, A., Koblanski, M. E., Liow, E., Pilarinos, A., & Vasarhelyi, K. (2022). Digital Health Interventions for delivery of mental health care: Systematic and comprehensive meta-review. *JMIR Mental Health*, 9(5). https://doi.org/10.2196/35159

Ponton, J. L., Ceballos, V., Acosta, L., Ríos, A., Monclús, E., & Pelechano, N. (2023). Fitted avatars: Automatic skeleton adjustment for self-avatars in virtual reality. *Virtual Reality*, *27*(3), 2541–2560. https://doi.org/10.1007/s10055-023-00821-z

Radiah, R., Roth, D., Alt, F., & Abdelrahman, Y. (2023). The influence of avatar personalization on emotions in VR. *Multimodal Technologies and Interaction*, *7*(4), 38. https://doi.org/10.3390/mti7040038

Rheu, M. M., Ratan, R., Sah, Y. J., Cherchiglia, L., & Day, T. (2022). Jogging in your avatar's footsteps: The effects of avatar customization and control intuitiveness. *Frontiers in Virtual Reality*, 3. https://doi.org/10.3389/frvir.2022.873689

Ridgway, J. L., & King, M. (2017). “Before and after Avatar Exposure: The Impact of Body Scanning Technology on Body Satisfaction, Mood, and Appearance Management”, *International Textile and Apparel Association Annual Conference Proceedings* 74(1). https://doi.org/10.31274/itaa_proceedings-180814-412

Suk, H. and Laine, T.H. (2023). Influence of Avatar Facial Appearance on Users’ Perceived Embodiment and Presence in Immersive Virtual Reality, *Electronics*, 12(3), 583 https://doi.org/10.3390/electronics12030583

Toothman, N., & Neff, M. (2019). The impact of avatar tracking errors on user experience in VR. *2019 IEEE Conference on Virtual Reality and 3D User Interfaces* (VR). https://doi.org/10.1109/vr.2019.8798108

van Lotringen, C., Lusi, B., Westerhof, G. J., Ludden, G. D. S., Kip, H., Kelders, S. M., & Noordzij, M. L. (2023). The Role of Compassionate Technology in Blended and Digital Mental Health Interventions: Systematic Scoping Review. *JMIR mental health*, 10, e42403. https://doi.org/10.2196/42403

Vasalou, A., Joinson, A. N., & Pitt, J. (2007). Constructing my online self: Avatars that increase self-focused attention. In *Conference on Human Factors in Computing Systems - Proceedings* (pp. 445-448) https://doi.org/10.1145/1240624.1240696

Wakelin, K. E., Perman, G., & Simonds, L. M. (2022). Effectiveness of self-compassion-related interventions for reducing self-criticism: A systematic review and meta-analysis. *Clinical psychology & psychotherapy*, 29(1), 1–25. https://doi.org/10.1002/cpp.2586

Waltemate, T., Gall, D., Roth, D., Botsch, M., & Latoschik, M. E. (2018). The Impact of Avatar Personalization and Immersion on Virtual Body Ownership, Presence,

and Emotional Response. *IEEE transactions on visualization and computer graphics*, 24(4), 1643–1652. https://doi.org/10.1109/TVCG.2018.2794629

Willig, C. (2013). Introducing qualitative research in psychology: Adventures in theory and method (3rd ed.). London: McGraw-Hill Education.

Wu, Y., Wang, Y., Jung, S., Hoermann, S., & Lindeman, R. W. (2021). Using a fully expressive avatar to collaborate in virtual reality: Evaluation of task performance, presence, and Attraction. *Frontiers in Virtual Reality*, *2*. https://doi.org/10.3389/frvir.2021.641296

Young Chung, W., Kim, D., & Lee, D. (2024). What factors affect psychological ownership when creating an avatar?: Focusing on customization and the ideal self. *Telematics and Informatics*, *88*, 102098. https://doi.org/10.1016/j.tele.2024.102098

Yuen, E. K., Herbert, J. D., Forman, E. M., Goetter, E. M., Comer, R., & Bradley, J. C. (2013). Treatment of social anxiety disorder using online virtual environments in second life. *Behavior therapy*, 44(1), 51–61. https://doi.org/10.1016/j.beth.2012.06.001

Zhang, J., & Juvrud, J. (2024). Gender expression and gender identity in virtual reality: Avatars, role-adoption, and social interaction in VRChat. *Frontiers in Virtual Reality*, *5*. https://doi.org/10.3389/frvir.2024.1305758

Zhang, K., Deldari, E., Yao, Y., & Zhao, Y. (2023). A diary study in Social Virtual Reality: Impact of avatars with disability signifiers on the social experiences of people with disabilities. *The 25th International ACM SIGACCESS Conference on Computers and Accessibility.* https://doi.org/10.1145/3597638.3608388

Žilinský, T., & Halamová, J. (2023). The Effects of Virtual Reality on Enhancement of Self-Compassion and Self-Protection, and Reduction of Self-Criticism: A

Systematic Review. *International journal of environmental research and public health*, 20(3), 2592. https://doi.org/10.3390/ijerph20032592

Part 3: Critical Appraisal

This critical appraisal includes a personal reflection of my experiences during the research process for both the literature review and the empirical paper. The focus is primarily on my experience with conducting the empirical research, which involved preparing and recruiting for the study, and analysing the qualitative data. Additionally, it explores how the chosen methods and my role as a researcher may have influenced the findings.

1. Literature Review

Finding an initial topic for the systematic review was challenging. Although accelerating rapidly, research exploring the use of virtual reality in clinical applications is still relatively new (Garrett et al., 2018). Consequently, I discovered that topics of interest had either been recently reviewed or, from initial scoping reviews, seemed to lack sufficient literature for a review. The chosen topic, the effectiveness of digital interventions in reducing self-criticism, was my third attempt after realising that systematic reviews on my previous ideas had already been conducted. This was disheartening, and therefore if I was to conduct a similar review in the future, I would dedicate significant time to thoroughly research my ideas to ensure they have not yet been investigated.

This was my first time conducting a systematic review, and I initially lacked confidence in my ability. However, I enjoyed the step-by-step process and found guidance in the book ‘Doing a Systematic Review: A Student’s Guide’ by Boland, Cherry and Dickson (2017), which helped me stay organised throughout the review stages. Support from my research supervisor as well as the UCL librarian provided additional reassurance and support. For instance, a meeting with the librarian

confirmed the accuracy of my database search and identified terms, alleviating some of my self-doubt. One notable observation from this process was that each stage took longer than anticipated. Despite using programmes, such as Rayyan, to assist with the process screening consumed a significant amount of time. This might be partly due to the novelty of the process for me as well my desire to be as thorough as possible.

I found assessing the included studies risk of bias particularly challenging. Evaluating the quality of studies was difficult, and I felt some discomfort marking many domains as 'high', especially since domains such as attrition and blindness are common in randomised controlled trials (RCT) involving digital interventions. Choosing a well-developed tool such as the Cochrane tool for randomised trials meant there was clear guidance for me to follow (Higgins et al., 2019). Reading existing similar systematic reviews that had also used Cochrane tools to assess risk of bias helped build my confidence with my decisions, for example Zillinky's and Halamova's review (2023).

I chose to focus specifically on RCTs because they are considered the gold-standard in research. However, this limited my search and may have excluded multiple quasi-experimental studies. The final review included 21 studies which felt like a substantial number given my researcher constraints. However, the narrative synthesis might have benefited from incorporating a variety of methodological approaches and thus could have provided a wider understanding of digital interventions that target self-criticism, such as virtual reality or artificial intelligence. Qualitative research has traditionally been excluded from systematic reviews however it is becoming increasingly valued and the need for more diverse forms of systematic reviews

including both quantitative and qualitative data has been recognised (Dixon-Woods et al., 2006).

2. Empirical paper

Considering Participant Identity

This project was conducted jointly with SF, a fellow trainee clinical psychologist. During the initial stages, we dedicated considerable time determining the best way to request demographic information from participants, particularly regarding gender identity and ethnicity. Researchers need to be aware of the complex nature of social identities and thus carefully consider how to collect data on participant identity, this is important for both ethical reasons and research integrity (Hughes et al., 2022). We made it clear that participants did not need to provide demographics, offering the option to choose "prefer not to disclose". Often, demographic questions in research studies ask participants to choose an option that does not represent them, or they do not identify with. This can lead to frustration and marginalization (Hughes et al., 2016). Additionally, terms frequently used in demographic questionnaires such as "other" can provoke unintended negative responses (Sanchez, 2010). SF and I explored various methods of asking about gender and ethnicity online. We found a document by the University of Arizona (2024) titled 'Assessment Toolbox: Demographics' particularly useful. This approach allowed multiple ethnicities to be self-selected, including an open text option, and asked participants 'how do you self-identify?'.

In the included sample 56.3% self-identified as Asian/Asian British. Research indicates that compassion is an evolved social mentality based on the motivation to care for others (Gilbert, 2014). Cross-cultural perceptions of compassion and

communication styles can differ; however, this has not been fully explored in the literature (Matsumono, 2008; Steindl, 2019). When conducting the intervention, I noted individual variation in how participants communicated with the distressed child, and some participants shared that the provided compassionate statements felt very different to how they would typically respond to others in distress. Further research is needed to investigate how individual communication styles and preferences might influence compassion focused interventions. In terms of this study, individual preferences and existing compassionate responses might have impacted how individuals experienced their recording playback and consequently how they experience their avatar overall.

Difficulties with the Creation Process

Creating the avatars presented numerous challenges. The Character Creator 3 (CC3) programme templates are designed more for gaming contexts, with many inappropriate hairstyle and clothing options for our purpose. This meant we had limited suitable options to choose from. Additionally, modifying the body size and shape of the avatars was difficult. The tools often defaulted to extremes, such as very curvy female figures or very muscular males, and it was fully difficult to adjust this. We were mindful of individuals who do not reflect these body types or who do not identify with a particular gender. When creating the body options for the study, we aimed to avoid creating distinct male and female options by not including the avatar's faces in the list provided to participants. However, creating gender ambiguous avatars was more difficult than anticipated due to prominent features in the program, such as larger breasts, or broad shoulders which would automatically increase with increased body size even if we attempted to reduce them. Participants commented on the lack of

variety in the available body sizes and how it was challenging to choose a body that represented them, sharing a desire for better physical similarity. Similarly, a study found that participants sought avatars with more nuance and disliked the hypersexualiastion that resulted from the avatar's clothing and body parts (Morris et al., 2023).

There were multiple issues we needed to manage during the creation process, that led to many highly stressful moments. Errors such as skin tone appearing grey or white, inaccurate hairstyles and colour, skin showing through clothing, and other technological malfunction, such as the dark eyes mirroring the appearance of eyeliner impacted the appearance of the avatars. Unfortunately, many of the adjustments made in the CC3 programme did not translate accurately to the HMD headset, meaning multiple trial and error edits were necessary for the majority of the avatars. Participants noted some of these errors and shared that it impacted their connection to the avatar and the virtual environment, thus impacting their experience of using personalised avatars. I noted that during the intervention I often felt an urge to point out any disparities and glitches, and lower participant expectations of the accuracy of the avatars. This suggests that significant technological improvements are needed to optimize avatar use within VR interventions. Creating and editing the avatars while also completing clinical placement was difficult to juggle. Reflecting on the experience I would recommend an earlier submission deadline for participants to submit their photographs, to give researchers sufficient time and to ensure the avatars are as representative and accurate as possible.

The VR intervention

This was my first experience conducting research and actively collecting data in person. Initially the two researchers conducted the intervention jointly, until we felt confident managing it independently. This collaboration was crucial, as there were many steps involved in transferring avatars from CC3 to the HMD headset, and any small error could have significant negative impacts. Working together initially allowed us to support each other and ensured a better experience for participants. Technological errors are often unexpected and require immediate problem solving. Having both researchers present reduced the risk of needing to cancel research slots. In the future, scheduling longer intervals between client sessions could reduce the rush and, consequently, the likelihood of errors.

Reflecting on my experience of the VR process has made me consider how similar interventions might translate into clinical practice or services within the NHS. The NHS is currently experiencing some of the most severe pressures in its history, and there are rising levels of burnout and stress in health care staff (Johnson et al., 2018). Virtual reality and digital interventions have the potential to offer cost-effective and accessible care (Gega et al, 2022; Philippe et al., 2022). However, my experience of creating the avatars was that it is easy for mistakes to be made, and the process took more time and resources than expected. Therefore, this process might be challenging for clinicians with already high workload pressures. Similarly, existing studies highlight some barriers related to implementing virtual reality interventions into clinical practice. For example, in a qualitative study by Levac and Miller (2013), clinicians raised concerns that too much personal commitment is required to prepare and implement VR for clinical use. This suggests that additional tasks, such as personalising avatars within interventions may feel even more effortful. Additionally, my own experience of working within NHS services, and witnessing the workload

pressures experienced by clinicians, suggests that with the current technology implementing personalised avatars within interventions will be challenging to integrate successfully, and staff would require sufficient support to implement it effectively.

A few participants expressed some discomfort with needing to send their photograph to the researcher(s) and shared concerns relating to the safety of sharing this information. While this was not a theme generated by the analysis, it is important to consider how patients may feel about sending photographs of themselves, and how this might be stored or used in an NHS context. A recent survey with over 2,200 people found that 83% of people trusted the NHS to keep their data secure (NHS England, 2024). However, the data suggests 23% of people fall into the 'Disengaged and Health Data Protective' category, summarized by the quote "I don't understand why the NHS needs my data, so I'd prefer not to share it with them" (NHS England, 2024). This suggests that for clinical implementation, time will need to be spent explaining the rationale for needing such data, and why it might be beneficial for clients to send photographs for the creation of personalised avatars.

The Semi-structured Interviews

In consultation with my research supervisor, we decided to focus exclusively on the subjective experiences of individuals who took part in the 'personalised' condition. This decision presented some challenges since participants had only experienced one form of intervention. This made it difficult for some users to articulate their positive or negatives experiences of using personalised avatars, as they lacked a basis for comparison. For instance, participants mentioned feeling a higher sense of connection to their avatar, but it is unknown how they would have responded to the generic avatars. Consequently, I found it difficult when writing the paper, particularly the

discussion section, as I was aware I had not captured the experience of using non-personalised avatars and whether this condition may lead to similar or different experiences. Previously, I have been involved in predominantly quantitative studies that investigate significant differences between groups, and as a result it was an adjustment for me to not be able to form such comparisons and conclusions.

The interviews with participants were shorter than anticipated. I had initially expected them to last about 40 minutes, but the average was 21:31 (minutes: seconds). Some participants appeared to struggle to make meaningful reflections following the intervention, often providing few word responses. One possible reason for this could have been the short interval between completing the intervention and participating in the interview. Offering interviews at a separate time might have been beneficial and allowed participants time to reflect on their experience more deeply. Moreover, since the interview was conducted at the end of the session, this increases the risk of participant fatigue which may have impacted their engagement and led to poorer quality responses. Similar findings have been found for 'survey fatigue', a phenomenon where response quality reduces following participation with a long survey (Kumar et al., 2022). Overall, I found the SONA database an easy, accessible and convenient method of recruiting participants. However, it also introduced potential challenges. For instance, the majority of participants (over 68%) reported prior experience with virtual reality, with many having used it in other UCL based studies. Repeat participation may have impacted participant's behaviour and how they experienced the VR study. This also impacts generalisability, as they were largely motivated by financial compensation or course credits offered by the study.

When listening to the interview recordings during the transcription stage, I noticed instances where I failed to seek further information following a participant's

short response. At the time, it is likely I was cautious not to seem forceful but reflecting back I often quickly moved on to the next question, and further prompting would have been useful for deeper exploration. Asking follow-up questions such as “can you tell me more about that?” could have provided more in-depth responses and thus richer data for analysis. Additionally, in the study participants were provided with a definition for avatar embodiment, but not for other terms such as sense of presence and identification. Without clear definitions participants might have used these terms interchangeably, which could have impacted the themes revealed by the analysis. For example, the concept of presence in virtual reality is often conflated with the concept of immersion (Korzel & Lupkowski, 2024). However, my aim was to take an inductive approach, and bringing in multiple VR related terms may have risked moving away from the participants’ voices and reflections.

Responding to Emotional Reflections

In some interviews, participants shared vulnerable and personal experiences with me, such as their struggles with illness during childhood, or difficulties related to body image and self-esteem. As a trainee psychologist, navigating how to respond to these reflections from a researcher perspective felt difficult. I often felt compelled to offer a validating response as I would in clinical sessions, and at times I found myself summarizing their experience to convey my understanding of their difficulties. Yet, in doing so I sometimes used language that different from theirs, potentially influencing their subsequent responses and how they described their experiences. Reflecting on these interactions prompted me to question what an ‘appropriate’ researcher stance looks like in qualitative analysis, and how best to respond empathetically. However, it was crucial to me that participants felt heard and that the interview experience was

positive, or at least pleasant. Moreover, I believe my responses could have supported better communication in the interviews, encouraging participants to share deeper reflections, thus making the data more authentic and richer.

Thematic analysis

This was my second experience conducting qualitative analysis. The first time I conducted qualitative analysis I was a research assistant and we coded data to themes based on an existing framework, known as the 'Acceptability of Healthcare Interventions Framework'. While this prior experience familiarised me with programmes such as NVivo, the coding processes for thematic analysis felt markedly different. Initially, the absence of structure or a predefined framework in thematic analysis felt challenging, and I noticed I was concerned about missing relevant information, and consequently I initially generated an excessive number of codes, even if they weren't relevant to the research question. However, I also appreciated the flexibility of the approach and its inductive nature. Following Braun and Clarkes (2006) seminal paper was helpful in providing a step-by-step guide, and I also found Byrne's (2021) paper 'A worked example of Braun and Clarke's approach to reflexive thematic analysis' particularly beneficial. The concrete example presented alongside each phase of thematic analysis facilitated my learning process and helped me navigate thematic analysis with more confidence.

My interest in digital technology and virtual reality partly drew me to this research project. I have personally enjoyed virtual reality in various contexts, such as the theatre and museums, and find the technology exciting. Additionally, my involvement in previous research investigating the impact of digital interventions, for example a self-management smartphone application for individuals with psychosis,

further fuelled my interest in this area. I was mindful of these biases and took steps to limit the impact of my assumptions on the research findings, for example maintaining the use of my research log. This self-awareness helped me approach the data differently and attempt to keep the analysis grounded in the participants' perspectives.

Conclusion

In this appraisal, I have shared my reflections on undertaking both pieces of work, discussing some of the key research decisions made and reflecting on the methodological challenges we faced. I have also considered how I might conduct the project differently based on what I have learned. One significant learning was the value of conducting the research project jointly. Collaborating with another researcher created a space for sharing and refining ideas, and also facilitated many practical aspects of the research, such as recruitment and managing technological difficulties. If I am involved in research in the future I will strongly consider being part of a wider research team or collaborating with other committed individuals, as this approach made the entire process more manageable and enjoyable.

References

Boland, A., Cherry, M. G., & Dickson, R. (2017). *Doing a systematic review: A student's guide*. SAGE.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Byrne, D. (2022). A worked example of Braun and Clarke's approach to reflexive thematic analysis. *Quality & Quantity, 56*(3), 1391-1412. https://doi.org/10.1007/s11135-021-01182-y

Dixon-Woods, M., Bonas, S., Booth, A., Jones, D. R., Miller, T., Sutton, A. J., Shaw, R. L., Smith, J. A., & Young, B. (2006). How can systematic reviews incorporate qualitative research? A critical perspective. *Qualitative Research, 6*(1), 27–44. *https://doi.org/10.1177/1468794106058867*

Garrett, B., Taverner, T., Gromala, D., Tao, G., Cordingley, E., & Sun, C. (2018). Virtual Reality Clinical Research: Promises and Challenges. *JMIR serious games*, *6*(4), e10839. *https://doi.org/10.2196/10839*

Gega, L., Jankovic, D., Saramago, P., Marshall, D., Dawson, S., Brabyn, S., Nikolaidis, G. F., Melton, H., Churchill, R., & Bojke, L. (2022). Digital Interventions in mental health: Evidence syntheses and economic modelling. *Health Technology Assessment*, 26(1), 1–182. https://doi.org/10.3310/rcti6942

Gilbert P. (2014). The origins and nature of compassion focused therapy. *The British journal of clinical psychology*, *53*(1), 6–41. https://doi.org/10.1111/bjc.12043

Higgins, J. P. T., Savović, J., Page, M., Elbers, R., & Sterne, J. A. C. (2019). Assessing risk of bias in a randomized trial. In J. P. T. Higgins, J. Thomas, J. Chandler, M. Cumpston, T. Li, M. J. Page, & V. A. Welch (Eds.), *Cochrane Handbook for*

Systematic Reviews of Interventions (2nd ed., pp. 205-228). Wiley-Blackwell. *https://doi.org/10.1002/9781119536604.ch8*

Hughes, J. L., Camden, A. A., & Yangchen, T. (2016). Rethinking and updating demographic questions: Guidance to improve descriptions of research samples. *Psi Chi Journal of Psychological Research*, 21(3), 138–151. https://doi.org/10.24839/2164-8204.JN21.3.138

Hughes, J., Camden, A., Yangchen, T., Smith, G., Domenech Rodríguez, M., Rouse, S., McDonald, C., & Lopez, S. (2022). Guidance for researchers when using inclusive demographic questions for surveys: Improved and updated questions. *Psi Chi Journal of Psychological Research, 27*(4), 232-255. https://doi.org/10.24839/2325-7342.JN27.4.232

Jeong, D., Aggarwal, S., Robinson, J., Kumar, N., Spearot, A., & Park, D. (2022). Exhaustive or exhausting? Evidence on respondent fatigue in long surveys. *Journal of Development Economics, 161*, Article 102992. https://doi.org/10.1016/j.jdeveco.2022.102992

Johnson, J., Hall, L. H., Berzins, K., Baker, J., Melling, K., & Thompson, C. (2018). Mental healthcare staff well-being and burnout: A narrative review of trends, causes, implications, and recommendations for future interventions. *International journal of mental health nursing*, *27*(1), 20–32. *https://doi.org/10.1111/inm.12416*

Korżel, K., & Łupkowski, P. (2024). The phenomenon of presence in virtual reality is mistakenly equated with immersion. *Presence: Teleoperators & Virtual Environments*, *31*(1), 1–25. https://doi.org/10.1162/pres_a_00404

Levac, D. E., & Miller, P. A. (2013). Integrating virtual reality video games into practice: clinicians' experiences. *Physiotherapy theory and practice*, *29*(7), 504–512. *https://doi.org/10.3109/09593985.2012.762078*

Matsumoto, D., Yoo, S. H., Fontaine, J., Anguas-Wong, A., Arriola, M., Ataca, B., Bond, M., Boratav, H., Breugelmans, S., Cabecinhas, R., Chae, J., Chin, W., Comunian, A., DeGere, D., Bley, L., Djunaidi, A., Fok, H., Friedlmeier, W., Ghosh, A., & Grossi, E. (2008). Mapping expressive differences around the world: The relationship between emotional display rules and individualism versus collectivism. *Journal of Cross-Cultural Psychology, 39*(1), 55-74. https://doi.org/10.1177/0022022107311854

Morris, M., Rosner, D., Nurius, P., & Dolev, H. (2023). “I don't want to hide behind an avatar”: Self-representation in social VR among women in midlife. *Proceedings of the ACM on Human-Computer Interaction, 7*(CSCW1), 537-546. https://doi.org/10.1145/3563657.3596129

NHS England. (2024). Public attitudes to data in the NHS and social care. Retrieved June 23, 2024, from https://digital.nhs.uk/data-and-information/keeping-data-safe-and-benefitting-the-public/public-attitudes-to-data-in-the-nhs-and-social-care/disengaged-and-health-data-protective

Philippe, T. J., Sikder, N., Jackson, A., Koblanski, M. E., Liow, E., Pilarinos, A., & Vasarhelyi, K. (2022). Digital Health Interventions for delivery of mental health care: Systematic and comprehensive meta-review. *JMIR Mental Health*, 9(5). https://doi.org/10.2196/35159

Sanchez, D. T. (2010). How do forced-choice dilemmas affect multiracial people? The role of identity autonomy and public regard in depressive symptoms. *Journal of*

Applied Social Psychology, 40(7), 1657–1677. https://doi.org/10.1111/j.1559-1816.2010.00634.x

Steindl, S., Yiu, R., Baumann, T., & Matos, M. (2019). Comparing compassion across cultures: Similarities and differences among Australians and Singaporeans. *Australian Psychologist, 55*(4), 314-325. https://doi.org/10.1111/ap.12433

The University of Arizona. (2024, June 19). Assessment Toolbox: Demographics. Retrieved from https://assessmentresearch.arizona.edu/professional-development/toolkit

Žilinský, T., & Halamová, J. (2023). The effects of virtual reality on enhancement of self-compassion and self-protection, and reduction of self-criticism: A systematic review. *International Journal of Environmental Research and Public Health, 20*(3), Article 2592. https://doi.org/10.3390/ijerph20032592

Appendices

Appendix A: Joint Project Contributions

As detailed in the Method section, this project was jointly conducted with trainee clinical psychologist Siobhan Fitzpatrick. My study was qualitative in nature, focusing on participants' subjective experiences of creating and using personalised avatars within the IVR intervention. In contrast, Siobhan's quantitative study aimed to understand the impact of personalisation on self-compassion, self-criticism and VR experience measures.

Many aspects of the study were conducted collaboratively. For instance, tasks such as completing the ethics amendment document, revising information sheets and consent forms (building on a previous study by trainee Amy Barrington), and registering the study on the SONA recruitment platform were done together. Some tasks, however, were completed separately, for example Siobhan created the Microsoft form questionnaires and I created the interview schedule. However, these elements were reviewed together before finalisation.

During the recruitment phase both researchers facilitated the IVR intervention with participants. This involved sending the pre-intervention questionnaire and email, developing the avatars, and guiding the participants through the intervention. Initially, Siobhan and I recruited participants together until we were confident in the process, after which we recruited independently. I continued recruitment until data for the 16 qualitative participants was collected. Siobhan assisted by conducting three of the sixteen semi-structured qualitative interviews. All parts of the write up were completed separately.

Appendix B: Database Full Searches

PSYCINFO search

1	(self-critic* or inner-critic* or self-contempt* or self-hat* or self-attack* or self-judg* or self-directed hostility or self-condemn or self-directed negative thinking or “self-criticizing attacking and self-reassuring scale” or FSCRS or “self-compassion and self-criticism scale” or SCCS).ab,id,ti,tm.	4545
2	self-criticism/	988
3	(digital or online or technology or online-based or internet or internet-based or internet-delivered or remote or web or web-based or virtual or computer* or app* or application* or e-health or e-mental health or m-health or mhealth or mobile technolog* or vr or virtual reality or ai or artificial intelligence or augmented reality).ab,id,ti,tm.	1948944
4	digital interventions/	1784
5	(intervention* or therap* or psychotherap* or treatment* or training or counselling or counseling or program* or psychoeducation or CBT or cognitive therapy* or cognitive behavi* or mindfulness or ACT or "acceptance and commitment" or psychoanalysis).ab,id,ti,tm.	1912216
6	1 or 2	4624
7	4 or 5	1912323
8	3 and 6 and 7	837
9	limit 8 to ("0200 book" or "0240 authored book" or "0280 edited book" or "0300 encyclopedia" or "0400 dissertation abstract")	239
10	8 not 9	598

Medline Search

1	(self-critic* or inner-critic* or self-contempt* or self-hat* or self-attack* or self-judg* or self-directed hostility or self-condemn or self-directed negative thinking or "self-criticizing attacking and self-reassuring scale" or FSCRS or "self-compassion and self-criticism scale" or SCCS).tw	6270
2	(digital or online or technology or online-based or internet or internet-based or internet-delivered or remote or web or web-based or virtual or computer* or app* or application* or e-health or e-mental health or m-health or mhealth or mobile technolog*	9210921

	or vr or virtual reality or ai or artificial intelligence or augmented reality).tw	
3	(intervention* or therap* or psychotherap* or treatment* or training or counselling or counseling or program* or psychoeducation or CBT or cognitive therapy* or cognitive behavi* or mindfulness or ACT or "acceptance and commitment" or psychoanalysis).tw	9675669
8	1 and 2 and 3	942

Web of Science Search

1	TS=(self-critic* or inner-critic* or self-contempt* or self-hat* or self-attack* or self-judg* or “self-directed hostility” or self-condemn or “self-directed negative thinking” or “self-criticizing attacking and self-reassuring scale” or FSCRS or “self-compassion and self-criticism scale” or SCCS)	10,403
2	TS=(intervention* OR therap* OR psychotherap* OR treatment* OR training OR counselling OR counseling OR program* OR psychoeducation OR CBT OR “cognitive therapy*” OR “cognitive behavi*” OR mindfulness OR ACT OR “acceptance and commitment” OR psychoanalysis)	14,284,959
3	TS=(digital OR online OR technology OR online-based OR internet OR internet-based OR internet-delivered OR remote OR web OR web-based OR virtual OR computer* OR app OR application* OR e-health OR e-mental health OR m-health OR mhealth OR “mobile technolog*” OR vr OR “virtual reality” OR ai OR “artificial intelligence” OR “augmented reality”)	10,712,232
4	#1 AND #2 AND #3	503

Appendix C: SONA Advertisement

Study Name	Personalised avatars - virtual reality intervention
Study Type	**Standard (lab) study** This is a standard lab study. To participate, sign up, and go to the specified location at the chosen time.
Credit	1 Credit
Duration	45 minutes
Sign-Up Restrictions	You must NOT have signed up or completed ANY of these studies: Speaking to your younger self in virtual reality! [Credit or Paid]
Abstract	[Credit or paid!] This study aims to explore the differences between having a personalised vs non-personalised avatar when practicing self-compassion using IVR, and to explore whether body satisfaction impacts this.
Description	In this project, self-compassion will be practiced using an avatar in an IVR exercise. The study aims to determine whether having an avatar that is personalised to look like the participant results in a difference in self-compassion outcomes, and the participants' experience of the IVR, compared to participants with a non-personalised avatar. For additional payment some participants will be invited to speak about their experience further in a short interview. We are also interested in the role of body satisfaction, and whether this impacts the experience of participants with a personalised avatar. Participants that meet the inclusion criteria will be randomly allocated to an avatar condition and will be asked to complete a questionnaire with some measures. Please note, depending on the avatar condition you are allocated to, you may be asked to send a passport style photo (can be taken on a phone), which will be solely used for the study and deleted at the end of the IVR exercise. The study will involve: - Asking about your demographic information (e.g. gender, age). You can choose whether or not to provide some of this information. - Questionnaires asking about self-compassion, body image satisfaction, and your virtual reality experience. - Taking part in a VR intervention, this will involve embodying an avatar and taking part in a short self-compassion intervention.

	- You may also be asked to be involved in a short interview discussing your experience (<40 minutes for additional £10 voucher). Participation is optional and confidential, and you can withdraw at any time.
Preparation	The total 45 minutes will include completion of a pre-exercise task (10 minutes) which will be emailed ahead of time. This will involve completing questionnaires, and choosing your avatar or sending a passport style photograph to the researchers
Eligibility Requirements	Adults 18+ that have fluency in reading and speaking English. Exclusion criteria: Individuals with neurological conditions and those who are currently undergoing treatment for a diagnosed mental health difficulty
Researchers	Siobhan Fitzpatrick Katie Free

Appendix D: Progamme Ethical Approval

A4 **Approval from the Departmental Ethics Committee**

(Approval cannot be given by the principal researcher of this project – if necessary the application must be sent to an Ethics Officer from a different Research Department, or to the College Ethics Committee, for approval)

Declaration by the Research Department Ethics Chair:

2

I have reviewed this project and I approve it. X

The project is registered with the UCL Data Protection Officer and a formal signed risk assessment form has been completed.

Allocated Departmental Project ID Number for the approved application:

__CEHP/2021/587_____

Name of the Research Department Ethics Chair (type in):	Jean-Baptiste Pingault
Date:	15/07/2021

Appendix E: Consent Form

CONSENT FORM FOR ADULTS

Please read the statements below after reading the information sheet.

Title of Study: The experience of using a personalised avatar when completing a self-compassion virtual reality intervention

Institute of Cognitive Neuroscience

Researcher(s): Katherine Free (Trainee Clinical Psychologist)
Siobhan Fitzpatrick (Trainee Clinical Psychologist)

Principal Researcher: Dr John King, *UCL Senior Lecturer (Contact details removed)*

The UCL Data Protection officer provides oversight of UCL activities involving the processing of personal data, and can be contacted at: data-protection@ucl.ac.uk. This study has been approved by the PALS Research Ethics Committee (Project ID Number: CEHP/2021/58).
Thank you for considering taking part in this research. If you have any questions arising from the Information Sheet, or explanation already given to you please ask the researcher(s) before you decide whether to take part in the study. You will be given a copy of this Consent Form to keep and refer to at any time.

I confirm that I understand that by ticking/initialling each box below I am consenting to this element of the study.

I understand that it will be assumed that any unticked/initialled boxes mean that I DO NOT consent to that part of the study. I understand that by not giving consent for any one element that I may be deemed ineligible for the study.

		Tick Box
1.	I confirm that I have read and understood the Information Sheet for the above study. I have had an opportunity to consider the information and what will be expected of me. I have also had the opportunity to ask any questions which have been answered to my satisfaction.	
2.	I understand that all personal information will remain confidential and that all efforts will be made to ensure I cannot be identified. I understand that the passport style photograph (if supplied) will be deleted following completion of the intervention. I understand that all data gathered in this study will be stored anonymously and securely.	

	I may be asked to take part in an interview which will be audio recorded using a Dictaphone. All interview data will be transcribed and anonymized, and any recordings will be deleted. I am aware that direct interview quotes may be used in publications but that I will remain anonymous throughout and it will not be possible to identify me.	
3.	I understand that my information may be subject to review by responsible individuals from the University for monitoring and audit purposes.	
4.	I understand that my participation is voluntary and that I am free to withdraw at any time without giving a reason. I understand that if I decide to withdraw, any personal data I have provided up to that point will be deleted unless I agree otherwise.	
5.	I understand the potential risks of participating and the support that will be available to me should I become distressed during the course of the research.	
6.	No promise or guarantee of benefits have been made to encourage me to participate	
7.	I understand that the data will not be made available to any commercial organizations but is solely the responsibility of the researcher(s) undertaking this study.	
8.	I understand that I will be compensated for the portion of time spent in the study with university course credits. I understand that if I participate in the additional interview I will be compensated with a £10 voucher.	
9.	I agree that my anonymised research data may be used by others for future research. [No one will be able to identify you when this data is shared.]	
10	I hereby confirm that: (a) I understand the exclusion criteria as detailed in the Information Sheet and explained to me by the researcher(s); and (b) I do not fall under the exclusion criteria.	
11	I am aware of who I should contact if I wish to lodge a complaint.	
12	I voluntarily agree to take part in this study.	
13	I understand that use of the information for this project will be held up to the end of the experiment and up to a maximum 5 years from the end of it. I would be happy for the data I provide to be archived at the Institute of Cognitive Neuroscience under machines secured with passwords. I understand that other authenticated researchers will have access to my anonymised data.	
14	**Overseas Transfer of Data** I understand data will not be transferred outside the EEA.	

If you would like your contact details to be retained so that you can be contacted in the future by UCL researchers who would like to invite you to participate in follow up studies to this project, or in future studies of a similar nature, please tick the appropriate box below.

	Yes, I would be happy to be contacted in this way	
	No, I would not like to be contacted	

_____	_____	_____ _____
Name of participant (If applicable)	Date	Signature
_____	_____	_____
Researcher(s)	Date	Signature

Appendix F: Participant Information Sheet

Participant Information Sheet For Adults

This study has been approved by PALS Research Department's Ethics Chair [Project ID: **CEHP/2021/587**]

Title of Study: The experience of using a personalised avatar when completing a self-compassion virtual reality intervention

---

Name and Contact Details of the Researcher(s):
Katherine Free (Trainee Clinical Psychologist) and Siobhan Fitzpatrick (Trainee Clinical Psychologist)
University College London (UCL)
Contact details removed

Name and Contact Details of the Principal Researcher:
Prof. John King, Research Department of Clinical, Education and Health Psychology
University College London (UCL)
Contact details removed

---

1. **Invitation to take part in a research study**
   We would like to invite you to take part in our research study. You should participate only if you want to do so. Before you decide whether to take part, we would like you to understand why the study is carried out, what you would be asked to do, and how the study will be conducted. Please take some time to read this sheet thoroughly, and to discuss it with other people if you wish. One of our team will go through the information sheet with you and answer any questions you have. Please feel free to ask any further questions about the study, or if you find anything on this sheet unclear.

2. **What is the project's purpose?**
   We are interested in participant's experience of using avatars that are either personalised (self-representative) or non-personalised during a virtual reality self-compassion intervention. We are particularly interested in the potential positive and negative aspects of this experience. We are also interested in understanding the role of body image when using personalised vs non-personalised avatars.

3. **Why have I been chosen?**
   You are a healthy adult and you have volunteered to take part in this study. There will around 50 participants in this study.

4. **Do I have to take part?**
   No. Your participation in the study is entirely voluntary. It is your choice whether or not you would like to participate. If you do give consent to take part in the study, you are still free to leave the

study at any point, without giving a reason. If you leave, any information for the research that we have already collected from you will be destroyed.

5. **What is the research study's inclusion criteria?**
   In order to take part in this research study you must:
   - Be 18+ years old
   - Be fluent in speaking and reading English
   - Not be experiencing current neurological difficulties
   - Not currently be in treatment for any mental health difficulty
6. **What will happen to me if I take part?**
   If you agree to participate, you will be asked to sign a consent form. You will be sent some baseline measures in a questionnaire to complete and depending on the condition you are allocated to, you may be asked to send a passport style photograph of yourself to the researcher(s) prior to attending the session. Upon completion of the questionnaire and receipt of the photograph, you will be invited to attend a session at UCL Campus. We will go through this information sheet and the consent form and answer any questions you might have about the study before you take part in the IVR exercise.
   Below is a summary of what the study will entail from start to finish:
   - You will randomly be allocated to one of two conditions: you will experience self-compassion when you are embodied in virtual reality as a generic or non-personalised avatar (human body) or alternatively, you will experience self-compassion when you are embodied in virtual reality as a personalised avatar (self-representative body).
   - If you are allocated to the personalised avatar condition a self-representative avatar will be created using VR technology and a passport style photo of you sent in advance. You will also be asked to select a body shape that best represents your body shape from pre-prepared options.
   - If you are allocated to the non-personalised avatar condition, we will not require a photo from you. Instead we will ask you to choose an avatar that you feel most comfortable with from a selection of pre-prepared options.
   - You will be asked to complete a questionnaire comprised of baseline measures which look at body image satisfaction, relationship to compassion and self-criticism.
   - The researcher will then give you information about compassion based on current psychological knowledge and practice in compassion focused therapy. The researcher will give you task instructions and guide you through reading a 'compassionate script'. You will have opportunities to ask questions and practice lines to ensure you feel comfortable expressing yourself.
   - You will then take part in the virtual reality experience where you will embody either a personalised avatar or a non-personalised avatar and will experience both giving and receiving compassion.
   - The researcher(s) will ask you to complete a questionnaire again with similar questions to before and some additional questions about your experience of the VR.
   - If you are allocated to the personalised avatar condition you may also be invited to an interview with one of the researchers. This will explore your experience of having a personalised avatar created of you and using the personalised avatar during the self-

compassion virtual reality intervention. The interview will last for approximately 45 minutes and will be audio recorded using a Dictaphone.

At the end of the session, the study researcher(s) will conduct a debriefing and address any other questions or concerns you may have. The duration may vary from person to person, but we don't expect it to take more than one hour (or two hours if you are invited to interview).

7. **What are the possible disadvantages and risks of taking part?**
   Immersive VR can induce disorientation and, in very rare cases, nausea. These problems are unlikely to occur during this study as we are using a set-up in which the virtual and physical movements are always synchronised. We will support you if you become upset or distressed during the study. You will be given time at the end of the study to be fully debriefed with a member of the research team.

8. **What are the possible benefits of taking part?**
   Previous studies using a similar immersive virtual reality intervention have found positive effects for participants who have been involved – participants have reported a significant increase in positive emotions and a reduction in negative emotions following the experience. It has also been found that the experience has led to a decrease in self-criticism and an increase in self-compassion. We hope that one possible effect of this experience could be a change in people's attitude towards compassion. The experience also provides psychological education around concepts of compassion and a stepped approach to providing a compassionate response to someone in distress.

9. **What if something goes wrong?**
   If you have further questions or concerns regarding participation in this research study, you may contact one of the researchers detailed on this form. If you are unhappy with how you have been treated or if you have been injured whilst participating in this study, please contact the Principal Investigator (John King). If you feel your complaint has not been handled in a satisfactory way (by a researcher or Principal Investigator), you should contact the Chair of the UCL Ethics Committee (ethics@ucl.ac.uk).

10. **Will my taking part in this project be kept confidential?**
    All the information that we collect about you during the course of the research will be kept strictly confidential. The data collected from you will be pseudonymised and stored on UCL password protected computers. You will not be able to be identified in any ensuing reports or publications.

11. **Limits to confidentiality**
    Confidentiality will be respected unless there are compelling and legitimate reasons for this to be breached. If this was the case, we would inform you of any decisions that might limit your confidentiality.

12. **What will happen to the results of the research project?**
    The data will be used only for the purpose of informing the research questions in this study and will only be accessed by the research team. The results may be published in scientific journals, but

you will in no way be identifiable. We would be happy to send you a copy of any publications arising from the research or a summary of the main findings. The data will be retained for at least 5 years and may be accessed in the future by the research team for comparison with future data. Prof John King is custodian of the data.

13. **Data Protection Privacy Notice**

The data controller for this project will be University College London (UCL). The UCL Data Protection Office provides oversight of UCL activities involving the processing of personal data, and can be contacted at data-protection@ucl.ac.uk.

Your personal data will be processed for the purposes outlined in this notice. The legal basis that would be used to process your personal data will be the provision of your consent. You can provide your consent for the use of your personal data in this project by completing the consent form that has been provided to you.

Your personal data will be processed so long as it is required for the research project. If we are able to anonymise or pseudonymise the personal data you provide we will undertake this, and will endeavour to minimise the processing of personal data wherever possible.

If you are concerned about how your personal data is being processed, please contact UCL in the first instance at data-protection@ucl.ac.uk. If you remain unsatisfied, you may wish to contact the Information Commissioner's Office (ICO). Contact details, and details of data subject rights, are available on the ICO website at: https://ico.org.uk/for-organisations/data-protection-reform/overview-of-the-gdpr/individuals-rights/

13. Contact for further information

For questions and further information, please contact the researcher(s) (details above) or the principal investigator (details above).

You will be provided with a copy of this information sheet to take away with you.

Thank you for reading this information sheet and for considering taking part in this research study.

Appendix G: Email Instructions

Subject: IMPORTANT - study information

Dear X,

Thank you for signing up for our study (Personalised Avatars – Virtual Reality Intervention).
Please read this email carefully as it contains important information and a task to complete ahead of the in-person virtual reality exercise.

Your **participant ID** is **X** please make note of this as you will be prompted for it in the pre-exercise task. Each participant is randomly allocated to a condition, you have been randomly allocated to the **personalised** condition. As noted in the advertisement we are inviting some participants to partake in an interview about their experience. For a reimbursement of £10 (amazon voucher), would you be willing to stay for a short period beyond the VR exercise to share your experiences?

We have attached a **participant information sheet** and **consent form** outlining information relevant to the study and who to contact if you have any concerns or questions. Please take time to **read these ahead of completing the pre-exercise task** and **email a signed copy of the consent form back to the researchers** if you are happy to proceed. Should you encounter difficulties signing or sending the consent form, we will provide hard copies during the in-person session. Should you decide not to proceed we will erase your data.

Finally, please see the following link for the pre-exercise task, this involves a questionnaire that should take approximately 10 minutes to complete and **must be completed ahead of the in-person session**. At the end of the questionnaire, you will be asked to select a body shape for your avatar, the various options are within the questionnaire and also included in this email as an attachment. As you have been allocated to the **personalised** condition, we ask that you select the body that you feel best represents your own body shape, as this will be the body used on your avatar. We appreciate that the options are limited and are not fully representative of all body shapes.

We also ask that you email the researchers a passport-style photograph of yourself for your avatar. **This must be emailed to the researchers at least 24 hours before the in-person session**. This can be taken on a phone, but for the best results:
Your photo must be:

- A clear close-up of your entire head. There should not be any other people or objects present in the photo.
- Taken in a brightly lit room (natural lighting is best)
- Focused with no blurring
- Against a plain light coloured background

In your photo you must:

- Be facing forwards and be looking in to the camera. Facing the light provides the best results, to avoid shadowing over one side of the face
- Have your eyes open and visible

- Have a plain expression and your mouth closed.
- Not have hair in front of your eyes.
- Remove glasses if possible (please contact the researchers if this is a problem)
- Avoid adding filters

Pre-Exercise Task - Personalised Condition

The study will take place at Bedford Way, UCL (26 BEDFORD WAY). Please meet the researcher(s) near the reception.

Please do not hesitate to contact either Katie or Siobhan if you have any queries.

Kind Regards

Katie & Siobhan
Personalised Avatar Study Researchers

Appendix H: Avatar Body Shape Options

You have been allocated to the personalised condition of the study. We ask that you select a body that you feel best represents your own body shape, as this will be the body used on your avatar. We appreciate that the options are limited and are not fully representative of all body shapes.

1		**2**	
3		**4**	

5		6	
7		8	
9		10	

11			

Appendix I: Compassion Intervention Script

Excessive self-criticism is a key psychological process associated with increased vulnerability to developing a range of mental health difficulties, for instance low mood. However, research tells us that this can be moderated by self-compassion.

Self-compassion involves being warm and understanding toward ourselves when we suffer, fail, or feel inadequate, rather than ignoring our pain or being self-critical. Compassion based therapies help people develop more positive ways of self-relating

Today's study is focused on using virtual reality to help people practice and foster self-compassion. It will involve embodying an avatar in VR, delivering a short script focused on compassion to a distressed avatar, and then re-embodiment of the distressed avatar. You will then hear a playback of your recording.

There are three components to giving a compassionate response. These are outlined below with some examples you can use to soothe the distressed child. You will have the opportunity you practice your delivery of these responses with the researcher(s).

1. **Validation:**
   "It's not nice when things happen that we don't like. It's really made you feel bad about yourself hasn't it?"

2. **Redirection of Attention:**
   "Sometimes when we feel bad about ourselves it's helpful to think of someone who loves us and believes in us".

3. **Memory Reactivation:**
   "What might they say to you now that would make you feel a bit better about yourself?"

Appendix J: Screenshot of the Adult Avatar's Perspective

Appendix K: Screenshot of the Child Avatar's Perspective

Appendix L: Semi-structured Interview Questions

1. What has been your prior experiences with using Virtual Reality?
    a. *Prompt – If they have prior experience with VR did it include avatars – if yes, what was their experience of this?*

2. How would you describe your experience of using Virtual Reality in this study?

3. What did you think about the self-compassion elements within the study/ intervention?
    a. Prompts – Learning the compassionate script
    b. Prompt - Witnessing the distressed child
    c. *Prompt – Delivering the script*
    d. *Prompt - Embodying the child*
    e. Prompt - Hearing and seeing the recorded playback from the child POV

4. What do you think could have been different about the self-compassion intervention to improve your experience?

5. How did you experience the process of creating the personalised avatar?
    a. Prompt – What were their thoughts/ feelings towards taking the photo?
    b. Prompt - What were their thoughts / feelings towards sending the photo?
    c. Prompt - What were their thoughts / feelings towards choosing the body type?

6. How did you experience your personalised avatar within the VR intervention? Prompt – What were their thoughts/ feelings towards the adult avatars:

    a. Face
    b. Hair
    c. Body shape
    d. Overall degree of personalisation

7. What could have been different about your personalised avatar to improve your experience, and why?

8. What were the positive effects of using a personalised avatar within the intervention, and why?

9. What were the negative effects of using a personalised avatar within the intervention, and why?

10. Embodiment allows a person to feel that they are controlling a virtual body as if it were their own (Tham et al., 2018). How did you experience being in the body of the personalised avatar in VR intervention?

11. How did you experience being in the body of the distressed child in the VR intervention?

12. What might be the potential benefit <u>of others</u> using personalised avatars in similar interventions?

13. What might be the potential disadvantages <u>of others</u> using personalised avatars in similar interventions?