Designing Socially Augmented XR for Loneliness: Participatory Insights from Lived Experience

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Abstract

Extended reality (XR) systems increasingly leverage augmented social and emotional cues to enhance communication, presence, and empathy. However, little is known about how such augmentations are experienced by people for whom social interaction itself is emotionally distressing. In this paper, we present findings from a participatory design workshop with individuals with lived experiences of loneliness, combining in-depth focus group discussion with hands-on virtual reality (VR) use. Our analysis reveals that loneliness is experienced less as a lack of social contact and more as a loss of agency, sustained by protective withdrawal and avoidance-based coping. While participants viewed VR as emotionally compelling and hopeful, they also identified risks of reinforcing escapism, stigma, and dependence. Through speculative co-design, participants envisioned socially augmented VR experiences that prioritise emotional safety, adaptive therapeutic support, and gradual re-engagement with real-world connection. We contribute design implications for social XR systems in therapeutic contexts, arguing that social augmentation should function as a scaffold for agency and growth rather than as a substitute for human connection. Our work highlights the value of participatory approaches in shaping ethically grounded and user-centred social XR interventions.

Keywords

Loneliness, virtual reality (VR), participatory design, cognitive behavioural therapy (CBT)

1. Introduction

Loneliness is a distressing subjective experience arising from a perceived gap between desired and actual social relationships [1, 2]. It is associated with serious mental and physical health consequences, including depression [3], cognitive decline [4], and increased mortality [5]. Despite its prevalence and impact, existing interventions remain limited in reach and effectiveness, often focusing on increasing social contact rather than addressing the cognitive and emotional mechanisms that sustain loneliness [6, 7, 8].

Extended reality (XR), and virtual reality (VR) in particular, have gained traction in mental health contexts due to their immersive, engaging, and adaptable qualities [9, 10, 11]. Research on social XR has explored how augmented social and emotional cues, such as expressive avatars [12] or affective feedback [13], can enhance communication, empathy, and inclusion. Yet these developments often assume that increasing social presence or interaction is inherently beneficial.

For people experiencing loneliness, however, social interaction can be emotionally risky. Prior work suggests that loneliness is characterised by hypervigilance to social threat [6, 14], negative self-appraisal, and protective withdrawal [15, 16]. In such contexts, socially augmented XR systems may inadvertently reinforce avoidance or dependence if not carefully designed.

In this paper, we explore how individuals with lived experiences of loneliness understand their needs in relation to socially augmented VR. Rather than evaluating a specific system, we adopt a participatory and exploratory approach to design insights indicating when and how social augmentation may support wellbeing. Through a full-day workshop combining focus groups, hands-on VR exploration, and

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speculative co-design, we examine (1) how participants conceptualise loneliness, (2) how they perceive VR as a medium for addressing it, and (3) what kinds of socially augmented XR experiences they find meaningful and appropriate.

In this work we make three key contributions. We first provide empirical insights into how loneliness is experienced as a loss of agency rather than simply a lack of interaction. Second, we identify key tensions for social XR design in therapeutic contexts, including emotional safety versus vulnerability and immersion versus avoidance. Third, we articulate design implications for socially augmented XR systems that emphasise agency, inclusivity, and ethical deployment.

2. Background and Related Work

Research on loneliness spans psychological, social, and technological perspectives, with growing interest in how immersive and socially augmented systems mediate emotional and social experience. As XR technologies are increasingly applied to wellbeing contexts, understanding their implications for connection, agency, and inclusion has become a key concern across HCI and social XR research.

2.1. Loneliness and Intervention Challenges

Loneliness is widely understood as a subjective and multidimensional phenomenon, shaped by emotional, cognitive, and behavioural factors [6, 7]. Interventions that solely aim to increase social contact, including social events or group activities, have shown limited effectiveness, particularly when they fail to address maladaptive social cognition [6, 17, 18]. Cognitive biases, such as internalised patterns of negative self-appraisal and heightened vigilance to social threat, are central to the severity of loneliness as a condition [6].

Cognitive behavioural therapy approaches which target these internal mechanisms have demonstrated greater efficacy [6, 7], but remain resource-intensive and difficult to scale [19]. As a result, there is growing interest in technology-mediated interventions that can support personalised, accessible, and scalable support while addressing the underlying cognitive dimensions of loneliness [20, 21].

2.2. Social XR and Therapeutic Technologies

Social XR research typically explores how XR systems can enhance communication through augmented social and emotional cues. Techniques such as expressive avatars [12], multimodal feedback [13] and group emotion visualisation [22] aim to increase social presence and empathy across distributed environments. Applications span many domains such as education, collaboration, and healthcare.

In mental health contexts, VR has shown promise in exposure therapy [10], anxiety reduction [9], and emotional regulation [23]. However, VR interventions for loneliness remain underexplored and often mirror traditional approaches by focusing narrowly on social interaction or passive relaxation [6, 7]. Studies frequently report high engagement but limited impact on validated loneliness measures [24], raising questions about what kinds of augmentation are appropriate for this domain.

2.3. Participatory Design for Loneliness Interventions

Recent HCI work increasingly advocates participatory design for loneliness interventions, emphasising the importance of grounding design decisions in lived experience [25, 26]. Participatory approaches not only improve relevance and engagement, but can also foster agency and wellbeing through the design process itself [25]. Despite these calls, many social XR systems remain designer-driven, with limited documentation of how user perspectives shape design rationales. Our work responds to this gap by positioning individuals with lived experience of loneliness as experts in defining how socially augmented XR should, and should not, be designed.

3. Method

To investigate how socially augmented XR might meaningfully support loneliness, we adopted a participatory and exploratory methodology grounded in lived experience. Given the deeply subjective, stigmatised, and context-dependent nature of loneliness, our aim was not to measure intervention efficacy, but to surface experiential insights, tensions, and design aspirations that are often inaccessible through evaluative or large-scale methods. We therefore prioritised depth, reflection, and co-creation over generalisability.

3.1. Study Design

We conducted a full-day participatory workshop combining qualitative inquiry, experiential learning, and speculative design. The workshop consisted of three phases: (1) an initial focus group exploring lived experiences of loneliness, (2) hands-on exploration of a commercially available VR relaxation platform, DR.VR by Rescape Innovation Ltd., and (3) a co-design session focused on envisioning VR-based loneliness interventions.

Our research questions were:

- **RQ1:** How do individuals with lived experience conceptualise loneliness and its persistence?
- **RQ2:** How do they perceive VR as a medium for addressing loneliness?
- **RQ3:** What forms of socially augmented XR do they consider meaningful and appropriate?

Ethical approval was obtained from the Research and Ethics Committee at Swansea University.

3.2. Participants

Three participants (two female, one male; aged 45–64) were recruited through a healthy ageing research centre. All self-identified as having personal experiences of loneliness. Participants each represented diverse cultural backgrounds, and one participant was a wheelchair user, contributing important accessibility perspectives.

Loneliness and social isolation were assessed using the De Jong Gierveld Loneliness Scale and the Lubben Social Network Scale. All participants were classified as both subjectively lonely and objectively isolated to varying degrees.

While small, the sample size enabled in-depth engagement with a hard-to-reach population. Loneliness is often associated with stigma [27] and shame [28], creating barriers to recruitment. Participants' willingness to share openly was therefore particularly valuable.

3.3. Procedure and Analysis

Discussions were audio-recorded and transcribed. We conducted a reflexive thematic analysis following Braun and Clarke's six-phase approach [29], combining inductive coding with deductive alignment to the research questions. Analysis focused on identifying experiential patterns and design-relevant insights, rather than generalisable claims.

4. Findings

Our findings reveal a set of experiential tensions that shape how participants understand loneliness and evaluate the role of VR in addressing it. Participants framed loneliness as both externally initiated and internally sustained, producing a complex relationship with technology characterised by hope, caution, and ambivalence. Following hands-on VR use, participants moved beyond reflection on past experiences to articulate concrete aspirations for how VR, and socially augmented XR more broadly, could better support emotional and social wellbeing.

4.1. Loneliness as a Loss of Agency

Participants described loneliness as originating from circumstances largely beyond their control, including illness, caregiving responsibilities, bereavement, abandonment, and broader societal changes. These disruptions fractured existing social routines and often resulted in prolonged isolation. However, participants emphasised that loneliness became persistent through internalisation rather than the events themselves.

Experiences of rejection or disconnection were frequently followed by self-deprecation, paranoia, and a sense of being fundamentally misunderstood. Participants spoke of questioning their own social worth and assuming negative interpretations of others' behaviour, which diminished confidence and motivation to reach out. Protective withdrawal was a common response, such that avoiding others was framed as a way to prevent further rejection or emotional harm, even while participants expressed an ongoing desire for connection.

Coping strategies largely centred on avoidance and over-occupation. Participants described deliberately keeping their minds busy through games, media consumption, studying, or solitary routines to suppress feelings of loneliness. While these strategies provided temporary relief, participants recognised that they did not address underlying emotional or relational needs. This produced a persistent tension between wanting meaningful connection and fearing the vulnerability required to pursue it, which strongly shaped participants' attitudes towards technology-mediated interaction.

4.2. VR as Compelling but Risky

Following hands-on engagement with VR, participants expressed optimism about its potential to support wellbeing. VR was described as intuitive, immersive, and emotionally engaging, with all participants noting how easily it captured their attention and reduced external distractions. Some viewed VR as a way to "reverse" technology's isolating effects, reimagining digital systems as tools for restoration rather than withdrawal.

At the same time, participants articulated clear concerns. Accessibility issues, such as fogging lenses for glasses wearers and physically demanding interactions, disrupted immersion and excluded some users. These barriers were particularly salient for participants with mobility impairments, highlighting how design assumptions about bodies and movement can limit inclusivity.

Participants also raised broader social and psychological risks. They worried about stigma associated with using VR for loneliness, the potential for over-dependence, and the possibility that VR could become an "excuse not to interact" in the real world. Importantly, participants consistently distinguished between anxiety reduction and alleviating loneliness. While calming and relaxing experiences were valued, they were not seen as sufficient. As one participant noted, *"the gadgets might help you feel calm, but that doesn't mean you're not lonely."*

These reflections position loneliness as a stress test for social XR, since emotional immersion and presence alone do not guarantee meaningful connection, and may even reinforce avoidance if not carefully designed.

4.3. Design Aspirations for Socially Augmented XR

Beyond reflecting on their experiences, participants voiced explicit aspirations for how VR could be designed to better support loneliness. These ideas emerged through speculative discussion following VR use, and were often framed in contrast to participants' existing coping strategies of distraction and withdrawal.

First, participants emphasised the importance of agency and choice in social engagement. Rather than constant social presence, they wanted flexibility to move between solitary and shared experiences depending on their emotional state. Being able to control when, how, and with whom they interacted was described as essential for emotional safety, particularly given fears of rejection and overstimulation.

Second, participants frequently aligned VR's potential with therapeutic intent, drawing on concepts associated with cognitive behavioural therapy. They described self-regulation exercises, personalised

feedback, and gradual exposure to challenging situations as proactive tools for long-term change. Unlike passive distraction, these activities were framed as a way to help users build emotional skills and confidence that could transfer beyond the virtual environment.

Third, participants reflected on the role of immersion. Realism and presence were valued for their ability to enhance focus and emotional engagement, making experiences feel impactful. However, participants cautioned against immersion becoming a form of escape. Instead, they expressed a desire for VR experiences that supported growth and preparedness, describing successful experiences as those that could act as a *"catapult"* towards real-world engagement rather than a refuge from it.

Finally, participants consistently positioned VR as a bridge rather than a replacement for human connection. Socially augmented experiences were welcomed when they reduced internal barriers, such as fear, self-blame, and uncertainty, therefore supporting re-entry into meaningful relationships. Across discussions, participants stressed that the ultimate goal of VR should be to strengthen users' lives beyond the headset, not to contain social experience within it.

5. Design Implications for Socially Augmented XR

Drawing on the experiential tensions identified in Section **??**, we derive four design implications for socially augmented XR systems intended to support loneliness. These implications abstract from the findings to articulate broader design principles relevant to social XR contexts. Together, they position social augmentation not as an end in itself, but as a carefully scaffolded process oriented toward agency, growth and real-world connection.

5.1. Support Graded Agency Between Solitude and Sociality

Socially augmented XR should support graduated transitions between solitary and shared experiences, rather than assuming constant or immediate social presence. Loneliness-related vulnerability often fluctuates, and systems that require sustained openness risk overwhelming users or reinforcing withdrawal. Designing for graded engagement enables users to regulate exposure to others over time, adjusting intensity, proximity and reciprocity as emotional readiness evolves.

This suggests that social augmentation should operate as a continuum, supporting moments of reflection, preparation, and partial engagement alongside richer social interaction. Mechanisms such as adjustable social visibility, low-stakes shared activities, or temporally bounded encounters can help users navigate this continuum without forcing premature intimacy. By focusing on transitions rather than states, social XR can better accommodate the dynamic nature of loneliness.

5.2. Embed Therapeutic Intent Beyond Affective Relief

Social XR systems for loneliness should make their therapeutic orientation explicit, extending beyond affective relief towards cognitive and behavioural support. While emotional soothing may be valuable, it is insufficient on its own to address rooted patterns of avoidance and self-blame. Design should therefore highlight proactive mechanisms that support skill-building, reflection, and incremental behavioural change.

This includes structuring experiences around practices such as emotional regulation, personalised feedback, and progressively challenging scenarios. Importantly, these interventions should be legible to users: making goals, progress, and rationale visible supports trust and encourages active participation. In doing so, social XR can move from passive experience delivery towards facilitating intentional, self-directed, and long-term change.

5.3. Leverage Immersion to Scaffold Growth, Not Escape

Immersion is a defining strength of XR that makes experiences feel impactful, but its use in loneliness interventions requires careful consideration. Rather than maximising realism or absorption for its own

sake, socially augmented XR should employ immersion specifically to support transfer of confidence, skills, and emotional readiness beyond the virtual environment.

Designing for transfer means framing immersive experiences as rehearsal spaces rather than destinations. Scenarios should emphasise continuity with everyday life, where users can recognise parallels between virtual challenges and real-world situations. Reflection prompts, debriefing moments, and explicit links between in-VR actions and offline possibilities can help prevent immersion from becoming a form of containment or escape.

5.4. Design Social Augmentation as a Bridge to the Real World

Finally, social augmentation should be ethically oriented towards real-world reintegration, positioning XR as a transitional scaffold rather than a substitute for human connection. Systems that retain users within closed social loops risk reinforcing isolation, even when interactions feel meaningful in the moment.

Design should therefore encourage outward-facing trajectories, supporting users in translating reduced anxiety or increased confidence into offline relationships and activities. This may involve aligning virtual experiences with real-world goals, suggesting follow-on actions, or supporting hybrid interactions that bridge digital and physical contexts. By orienting augmentation beyond the headset, social XR can contribute to sustainable social wellbeing and the reduction of internal barriers, rather than technologically mediated replacement.

6. Discussion and Contributions

Our findings contribute to social XR research by reframing social augmentation as an experiential and ethical design problem rather than a purely technical one. For individuals experiencing loneliness, increased social signalling or interaction is not inherently beneficial. Instead, augmentation must be selective, situational, and responsive to users' emotional readiness. This challenges dominant assumptions in social XR, as richer cues or greater social presence do not necessarily improve outcomes, particularly in contexts marked by vulnerability and self-protective withdrawal.

More broadly, our work invites a rethinking of how social augmentation is evaluated in therapeutic XR. Effectiveness may lie less in observable interaction metrics and more through shifts in agency, confidence, and willingness to re-engage beyond the system itself. By grounding design implications in lived experience, this study also highlights the ethical role of participatory design, not only as a method for improving usability, but as a mechanism for resisting the prescriptive or potentially harmful models of "social improvement" that are often embedded in socially intelligent XR systems.

7. Conclusion

This paper presented participatory insights into designing socially augmented XR for loneliness. By engaging individuals with lived experience, we revealed key tensions that challenge assumptions in social XR design. We argue that effective social augmentation should scaffold agency, support therapeutic growth, and bridge towards real-world connection rather than substitute for it. We invite the community to build on these insights in developing ethical, inclusive, and human-centred social XR systems.

Future work should move beyond conceptual principles to operationalise these design aspirations into concrete XR prototypes to empirically evaluate their impact. Implementing and comparatively assessing different social augmentation strategies would enable researchers to determine which approaches most effectively reduce loneliness and support meaningful social reconnection. Longitudinal studies are particularly needed to examine sustained effects over time, including impacts on well-being and offline relationship development. Additionally, integrating objective measures of engagement and emotional responses, such as physiological indicators or behavioural analytics, alongside self-report data could

provide deeper insight into mechanisms of change. Together, these directions would strengthen the evidence base for socially augmented XR and advance its responsible application in addressing loneliness.

Declaration on Generative AI

During the preparation of this work, the author(s) used ChatGPT-5 in order to: improve writing style; grammar and spelling check. After using these tool(s)/service(s), the author(s) reviewed and edited the content as needed and take(s) full responsibility for the publication's content.

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