Therapy Island: Translating Worksheet-Based CBT Micro-Skills into Therapist-Mediated Virtual Reality

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Abstract

Cognitive Behavioral Therapy (CBT) relies on structured cognitive exercises typically enacted through worksheets and guided reflection. Although virtual reality (VR) has demonstrated effectiveness in exposure-based treatments, less work has examined how core CBT processes can be translated into embodied interaction within therapist-led sessions. We present *Therapy Island*, a therapist-mediated VR prototype that maps worksheet-based exercises into immersive metaphors supporting emotion externalization, temporal reframing, and grounding regulation. It is structured as a brief immersive touchpoint embedded within therapist–client dialogue and operationalizes object manipulation, spatial progression, and environmental transformation as mechanism-aligned interaction scaffolds. We conducted an exploratory qualitative study with 11 participants to examine how these embodied translations were experienced during sessions. Findings suggest that immersive metaphors shaped emotional articulation and temporal perspective-taking while revealing considerations for comfort and workflow integration. As a work-in-progress, this study contributes a design translation framework and a therapist-mediated VR insertion model for mechanism-aligned immersive psychotherapy.

CCS Concepts

• **Human-centered computing** → **Interaction devices**; **Human computer interaction (HCI)**.

Keywords

Virtual Reality, Cognitive Behavioral Therapy, Cognitive Restructuring, Embodied Interaction, Therapist-Mediated Systems

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1 Introduction

Cognitive Behavioral Therapy (CBT) is widely regarded as one of the most empirically supported treatments for anxiety, depression, and related mental health conditions [6, 7, 14, 20]. Beyond its demonstrated efficacy, CBT is characterized by structured cognitive operations enacted through representational tools such as thought records, emotion wheels, and guided reflection worksheets [43]. These artifacts scaffold mechanisms including emotion differentiation, cognitive restructuring, externalization, and temporal distancing—processes that shift individuals from immersive emotional identification toward reflective evaluation [9]. While these processes are foundational to CBT practice, they often require sustained abstract reasoning and metacognitive effort, i.e., conscious reflection on one's own thinking patterns [21]. This cognitive demand may contribute to broader engagement challenges in psychotherapy. Despite strong empirical support for CBT overall [38], psychotherapy attrition remains a persistent concern, with substantial proportions of clients discontinuing treatment prematurely [3]. Engagement barriers may be particularly salient during cognitively demanding phases that rely heavily on worksheet-based reflection and verbal abstraction [36]. Designing technologies that preserve therapeutic mechanisms while supporting experiential engagement therefore remains an ongoing challenge for mental health HCI research [33].

Virtual Reality (VR) has emerged as a promising medium for mental health interventions [40, 41]. Within CBT, VR-assisted interventions have demonstrated effectiveness in exposure-based treatments for anxiety disorders, phobias, and post-traumatic stress [30, 31, 46]. More recently, researchers have explored automated VR interventions aimed at scaling treatment delivery and increasing accessibility [22, 23]. However, much of this work conceptualizes VR primarily as a vehicle for graded exposure or immersive symptom reduction [19, 24]. Comparatively less attention has been paid to how immersive interaction might support the underlying cognitive mechanisms central to CBT, particularly those traditionally enacted through structured worksheets and therapist-guided dialogue [35, 37].

Although CBT processes such as emotion differentiation and cognitive restructuring are well theorized clinically [6, 9], there is limited guidance on how these structured cognitive exercises can be translated into spatial interaction, object manipulation, and embodied metaphors within immersive environments [23, 37]. This gap raises a design translation problem: how can structured cognitive exercises be mapped to embodied interaction mechanics while preserving therapeutic intent? Prior VR psychotherapy research

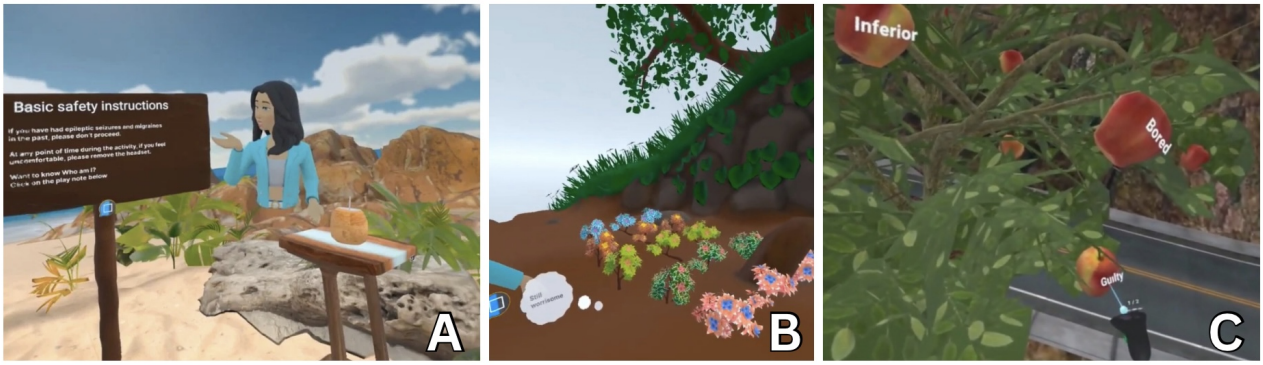

Figure 1: Flow of the Therapy Island VR prototype embedded during an in-person therapy session. (A) The client dons the VR headset and enters the island environment, where their therapist's virtual avatar provides safety instructions and orients them to the selected CBT-activity of the day. (B) The participant engages in the chosen activity, such as selecting or moving objects and forward locomotion. The therapist remains present outside VR, monitoring progress and activity flow via a desktop interface, and steps in where guidance is needed. (C) Upon completion, the session transitions back to face-to-face dialogue, where insights from the experience are discussed.

has emphasized exposure paradigms or standalone digital interventions [16, 35]. In contrast, relatively little work has examined therapist-mediated VR touchpoints embedded within ongoing CBT sessions, where workflow integration and shared interpretive dialogue must be maintained [25, 44]. This positioning aligns with broader HCI perspectives on human-in-the-loop systems that prioritize augmentation over automation [39].

In this work-in-progress paper, we present *Therapy Island* (Fig. 1), a therapist-mediated VR prototype that translates worksheet-based CBT processes into embodied metaphors within an immersive environment. Grounded in Beckian CBT principles [9], it operationalizes emotion differentiation, temporal reframing, and grounding regulation through interactive activities designed to instantiate therapeutic mechanisms via object manipulation, spatial progression, and environmental transformation. The system functions as a brief immersive segment embedded within therapist-led sessions, preserving collaborative dialogue and post-experience interpretation.

In an exploratory study with 11 participants, we evaluate design feasibility and experiential enactment as an early-stage investigation of the system [4, 32]. By examining how embodied interaction [34], therapist-mediated workflow integration, and environmental scaffolding shape the performance of cognitive exercises, we offer initial theoretical and practical insights into how immersive technologies can support core processes of evidence-based psychotherapy while preserving therapist-guided practice [26].

We make three contributions. First, we introduce a design translation framework that maps CBT processes to embodied VR interaction mechanics while maintaining alignment with therapeutic mechanisms. Second, we conceptualize a therapist-mediated delivery model in which immersive interaction functions as a structured in-session touchpoint within ongoing psychotherapy. Third, we report preliminary feasibility findings from an exploratory qualitative study (N=11) examining how these embodied translations were experienced during sessions.

2 Therapy Island

Therapy Island was designed to translate worksheet-based CBT processes into embodied VR experiences embedded within therapist-led sessions. The system instantiates core therapeutic mechanisms—such as externalization, temporal distancing, and attentional regulation—through spatial interaction in immersive environments [1]. This section describes (1) how opportunity areas were identified within the CBT process, (2) the mechanism-aligned translation framework guiding design decisions, (3) how these principles were instantiated in *Therapy Island*, and (4) how the system was integrated into therapist-mediated workflow.

2.1 Design Grounding and Opportunity Mapping

We began by mapping the standard phases of Beckian CBT to identify points at which immersive interaction could meaningfully support therapeutic processes. CBT typically progresses through (1) psychoeducation and rapport building, (2) identification of maladaptive thoughts, (3) cognitive restructuring and belief revision, and (4) behavioral experimentation [15, 18]. These phases involve distinct cognitive operations and therapist–client interaction patterns, suggesting that not all components are equally suitable for immersive translation [11].

To ground this mapping in clinical practice, we conducted five semi-structured design consultations with practicing clinicians and psychiatry-affiliated researchers to better understand core CBT workflows and process emphasis. These consultations occurred prior to IRB approval and were used to inform system scoping rather than to generate analyzable research data. Drawing on insights from these discussions, alongside CBT theory [7, 9], we identified emotion differentiation, temporal reframing, and grounding regulation as promising candidates for immersive support, particularly during restructuring-oriented phases of therapy.

Table 1: Mechanism-aligned translation of CBT processes into embodied VR interaction mechanics

CBT Process	Therapeutic Mechanism	Immersive Translation	Embodied Interaction Mechanic
Emotion differentiation	Externalization and affect categorization	Emotion-labeled objects distributed along a spatial pathway	Selecting and relocating objects to transform internal states into manipulable entities
Temporal reframing	Temporal distancing and cognitive reappraisal	Environmental growth metaphor aligned with staged time prompts	Forward locomotion coupled with progressive environmental transformation
Grounding regulation	Attentional stabilization and arousal modulation	Multisensory natural environment supporting distributed perception	Guided identification of visual, auditory, and movement-based stimuli

Figure 2: Activity 1: Emotion differentiation through embodied interaction. (A) The emotion wheel is used as a traditional tool to identify complex and nuanced emotions. (B) In our VR environment, characters inspired by the Inside out movie [45], are introduced by the virtual avatar of the therapist, each corresponding to a specific emotional state. *All 3D assets were sourced from Sketchfab under Creative Commons Attribution 4.0 licenses [12, 13, 28, 29, 42].* (C) Participants follow the characters that best match how they are currently feeling, making internal emotions visible within the space. (D) In this example, sadness-related emotions are represented as apples on a tree, which participants can pick and place into a basket, allowing them to physically interact with these emotions. (E) Through this process, identifying and organizing emotions becomes an active spatial experience rather than a paper-based exercise.

2.2 Design Translation Framework

We propose a mechanism-aligned translation framework mapping core CBT processes to embodied VR interaction mechanics (Table 1). The framework focuses on instantiating underlying therapeutic processes through spatial interaction. The mapping was guided by three principles: preserving therapeutic mechanisms, embodying abstract cognitive operations, and maintaining therapist-mediated workflow compatibility.

Preserving therapeutic mechanisms. CBT worksheets scaffold processes such as externalization, cognitive reappraisal, and temporal distancing [9]. These mechanisms constitute the active ingredients of cognitive change. Accordingly, interaction mechanics were selected to reinforce reflective evaluation rather than introduce gamified incentives or performance-based feedback.

Embodying abstract cognitive operations. CBT frequently employs spatial metaphors (e.g., "stepping back" from a thought or "looking ahead" to the future), suggesting that cognitive change is conceptually grounded in embodied experience. Theories of embodied cognition propose that physical movement and perceptual interaction can scaffold abstract reasoning [35, 37]. We therefore instantiated processes such as emotion differentiation and temporal reframing through object manipulation, spatial locomotion, and environmental transformation, aligning physical movement with cognitive operations.

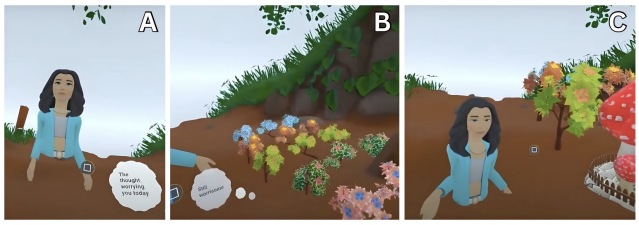

Figure 3: Activity 2: Temporal distancing represented through forward spatial movement and progressive tree growth metaphor. (A) Guided by the virtual avatar of the therapist, the client begins this activity by focusing on a currently challenging thought, which appears as a big thought bubble. (B) As client moves forward along a pathway, the surrounding landscape gradually changes to represent a week, month and year and the thought bubble keeps becoming smaller. (C) The visible growth of trees and appearance of wildlife coming in, and the gradual disappearance of the thought bubble, supports reflection on how their perspective changes with the passage of time.

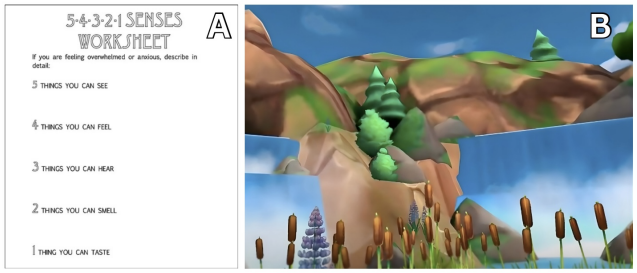

Figure 4: Activity 3: Grounding exercise within an immersive natural environment. (A) The 5-4-3-2-1 exercise is used as a traditional tool in standard therapy sessions.(B) In our VR recreated version, client enters a natural landscape that includes visual elements such as trees and water, along with ambient sounds. Clients are prompted by the virtual avatar of the therapist to identify specific sights and sounds around them, encouraging focused awareness of the present moment. By embedding the exercise within an immersive setting, grounding becomes an experiential activity rather than a worksheet-based task.

Maintaining workflow compatibility. Because CBT is dialogic and therapist-guided, immersive interaction was designed as a bounded experiential segment embedded within ongoing sessions. This therapist-mediated insertion model preserves collaborative interpretation and clinical oversight [27, 44].

2.3 Instantiation in Therapy Island

The above framework was operationalized through three immersive activities (Fig. 2–Fig. 4).

Activity 1: Emotion Differentiation Through Externalization. Participants traverse a pathway and encounter characters denoting emotions and objects labeled by nuanced affective terms. By selecting and relocating these objects, they transform internal emotional states into manipulable external entities. This embodied process supports emotion differentiation while creating distance from immediate emotional reactions.

Activity 2: Temporal Perspective and Cognitive Reframing. Participants describe a current stressor and move forward along a path while responding to prompts referencing extended time horizons of a week, month, and year. Progressive environmental growth visually marks the passage of time. By aligning forward locomotion with imagined temporal progression, the activity instantiates temporal distancing and supports cognitive reappraisal.

Activity 3: Grounding as Regulation Scaffold. Participants enter a multi-sensory natural environment and identify visual, auditory, and movement-based stimuli, adapting the traditional 5-4-3-2-1 grounding technique into spatial engagement. The immersive environment functions as an attentional scaffold to stabilize affect prior to reflective dialogue.

The VR prototype was developed through an iterative pipeline combining ShapesXR for rapid prototyping and spatial design, Blender for custom 3D asset creation, and Unity as the development engine for interaction logic and scene integration. The final application was built and deployed to a Meta Quest 2 headset.

2.4 Therapist-Mediated Workflow Integration

Therapy Island was designed as a therapist-mediated touchpoint embedded within ongoing CBT sessions. The therapist selects an activity via a desktop interface while the participant engages through the VR headset. After approximately 10 minutes, the session transitions back to verbal debrief and reflection. This workflow preserves therapist oversight and maintains CBT's collaborative structure, ensuring that immersive interaction functions as a scaffold for dialogue.

This therapist-mediated configuration directly informed the study protocol described in Section 3.2.

Following prototype development, refinements were made to support reflective engagement and session flow, including simplifying navigation, clarifying avatar instructions, and minimizing environmental distraction.

3 Methods

This study employed an exploratory qualitative feasibility design [8] to examine how participants experienced the embodied translation of core CBT processes within the *Therapy Island*. The primary objective was to assess perceived session-level experience of the proposed design translation and therapist-mediated delivery model, rather than to evaluate therapeutic efficacy. This methodological approach is appropriate for early-stage system evaluation, where the goal is to examine experiential enactment and design alignment prior to controlled outcome testing. Institutional Review Board (IRB) approval was obtained prior to data collection, and all participants provided informed consent.

3.1 Participants

Eleven participants (N = 11) were recruited from a large university in the United States using convenience and snowball sampling [10]. Interested individuals completed a brief online screening form to confirm eligibility criteria, including proficiency in English and

Table 2: Participant demographics. M = Male, F = Female.

ID	Highest Degree Earned	Age (yr)	Gender	Primary Diagnosis	VR Activity Completed		
					A1	A2	A3
P1	B.A.	20	F	PTSD	✓		✓
P2	B.Tech.	19	F	PTSD	✓	✓	
P3	MS	23	M	Major Depressive Disorder	✓	✓	
P4	MS	22	M	Generalized Anxiety Disorder			✓
P5	B.Tech.	21	M	Social Anxiety Disorder	✓	✓	
P6	B.Tech.	19	F	Major Depressive Disorder		✓	✓
P7	MS	25	F	PTSD	✓	✓	
P8	MS	22	M	Depression and Anxiety	✓	✓	
P9	PhD	29	M	Generalized Anxiety Disorder		✓	✓
P10	PhD	28	F	PTSD	✓	✓	
P11	PhD	31	F	Generalized Anxiety Disorder		✓	

familiarity with structured therapy sessions. This ensured that feedback reflected an understanding of typical CBT exercises and session flow. Participants were undergraduate, master's, and doctoral students between the ages of 19 and 31 who reported prior or ongoing experience with therapy for academic or personal stressors.

Participants were not screened for specific diagnoses, as the study focused on interaction feasibility and perceived enactment of cognitive exercises rather than treatment outcomes. The sample was intentionally selected to evaluate whether the embodied interaction mechanics were intelligible and experientially meaningful within a therapy-informed population. Participation was voluntary and no compensation was provided.

3.2 Procedure

Sessions were conducted in a private campus meeting space to ensure confidentiality and minimize distraction, using the deployed Meta Quest 2 application described in Section 2.3. Each session lasted approximately 30 minutes and consisted of three stages.

First, during the **pre-interaction interview**, participants described prior therapy experiences and familiarity with CBT exercises. This phase established baseline understanding of worksheet-based cognitive practices [2]. Second, during the **VR interaction**, participants engaged with one or more of the three VR activities (emotion differentiation, temporal reframing, grounding) as stated in Table 2. The researcher operated the system via a desktop interface and followed a standardized facilitation protocol to guide participants through the prototype interactions. Third, during the **post-interaction interview**, participants reflected on clarity of interaction, emotional impact, metaphor comprehension, perceived usefulness within therapy sessions, and overall experience.

Safety protocols were established prior to participation, which included discontinuing any session if a participant reports dizziness, discomfort, or psychological distress.

3.3 Data Collection and Analysis

Data sources included pre- and post-interaction interview responses, researcher observational field notes documented digitally, along with screen recordings of participants' in-app VR activity during headset use. With separate consent, photographs of participants wearing the headset were also captured. All data were stored on secure, university-approved cloud storage platforms. As the study focused exclusively on experiential evaluation of the VR prototype, no therapeutic intervention or clinical assessment was conducted.

Interview recordings were transcribed and analyzed using an inductive thematic analysis approach [17]. Pre-interaction interviews were used to establish participants' prior familiarity with worksheet-based CBT practices and expectations of traditional session flow. These baseline accounts informed interpretation of how immersive interaction was experienced relative to conventional therapy exercises. Post-interaction interviews provided detailed reflections on emotional articulation, metaphor comprehension, perceived engagement, and workflow integration.

Analysis proceeded iteratively. Initial open coding identified segments related to emotional articulation, metaphor interpretation, immersion, perceived session impact, and interaction flow. Codes were then refined and consolidated into higher-level themes corresponding to embodied reflection, temporal perspective shifting, and environmental context.

Observational field notes and screen recordings were reviewed alongside interview transcripts to contextualize participant reflections and identify moments of hesitation, pacing shifts, or interaction friction. Given the exploratory design and small sample size, the analysis prioritized identifying recurring experiential patterns and design-relevant insights rather than statistical generalization.

4 Findings

This exploratory study examined how participants experienced the embodied translation of core CBT processes within the *Therapy Island*. Across interviews, participants' accounts aligned closely with the mechanism-oriented design translation articulated in Section 2. In particular, findings indicate that object manipulation supported emotional externalization, spatial locomotion scaffolded temporal distancing, and environmental context shaped how reflective engagement unfolded within therapist-mediated sessions.

4.1 Embodied Externalization of Emotion

Our findings suggest that object manipulation supported emotional differentiation by rendering internal affective states spatially tangible. Participants were observed to pause before selecting emotion-labeled objects, and many described Activity 1 as helping them articulate and separate emotional states that were previously diffuse. Several participants characterized the act of selecting and placing objects into a basket as creating distance between self and emotion. P1 reported, *"Plucking apples from that tree created a layer of separation between me and the emotions I am feeling."* P3 similarly reflected, *"It was like I could look at them instead of being inside them. Somehow made me feel lighter."*

Several participants contrasted this embodied interaction with traditional worksheet exercises. P5 stated, *"I feel like I am playing a game, and learning along the way!"*, while P7 commented, *"This is so much more fun than hearing mundane theories and filling in worksheets."* Beyond engagement, participants emphasized increased clarity in differentiating feelings. P2 noted, *"It helped me separate different feelings that I usually mix together."* P8 added, *"When I picked up the apple labeled guilt, it made me realize that what I was feeling wasn't just stress. It meant something more."*.

These responses suggest that embodied object selection functioned as an externalization mechanism, supporting affect categorization and reflective distance in a manner consistent with the intended design translation.

4.2 Spatialized Temporal Perspective-Taking

Our interviews indicate that forward locomotion and environmental transformation scaffolded temporal distancing by aligning imagined future states with physical movement. Activity 2 prompted participants to reflect on how emotional intensity might evolve over time. Several described the visual progression as "impactful" and "a surprising way to understand that negative feelings might not last." P6 noted, *"While physically moving helped me imagine how I might feel a few months from now. It made the future feel more real."* P11 shared, *"Seeing the trees grow made me realize this won't feel this intense forever."*

Participants also described a coupling between bodily movement and cognitive shift. P10 stated, *"It was like my body was catching up with the idea that time passes."* The progressive shrinking of the thought representation and growth of the environment structured engagement with future-oriented reflection.

At the same time, participants identified opportunities to strengthen the temporal metaphor. P3 reflected, *"It would be nice if I walk, the sky changes colors showing day and night time, or even the seasons change, like spring and winter."* This response indicates that while the environmental growth metaphor was legible, its expressive range could be expanded. Incorporating cyclical cues such as light shifts and seasonal transitions may deepen the embodied experience of temporal change.

Collectively, these responses indicate that spatial progression instantiated temporal reframing as intended, supporting cognitive reappraisal through embodied experience rather than abstract instruction alone.

4.3 Environmental Atmosphere as Affective Scaffold

Our findings further suggest that environmental tone influenced how reflective exercises were experienced within the session. Participants contrasted the island setting with traditional clinical spaces, describing the VR environment as "less gloomy" and "more open." P9 remarked, *"This feels like we are on a vacation."* P4 stated, *"Something about this island just made it feel lighter. Not so heavy."*

Field notes further indicated relaxed body posture and reduced visible hesitation during grounding activities. The immersive setting was described as an "icebreaker," particularly for individuals newer to therapy. P6 noted that *"the island makes therapy feel less like a chore after a long day at school."* P1 added, *"I think I'd be more comfortable bringing up harder stuff there."*

Participants also expressed interest in greater environmental personalization. P5 suggested that *"alternative settings such as a mountain or café could make the experience feel more personally relevant"*, and P2 asked whether *"more activities"* would be available. These responses suggest that while the environmental scaffold was well received, future iterations should consider adaptive or customizable settings to accommodate individual therapeutic preferences.

These accounts suggest that environmental design shaped perceived openness during reflective tasks while remaining embedded within therapist-guided dialogue.

5 Discussion and Future Work

Together, the findings suggest that mechanism-aligned VR interactions enacted the targeted CBT processes while surfacing opportunities for refinement, supporting the feasibility of this therapist-mediated model for experiential therapy. This work-in-progress study examined how worksheet-based CBT processes can be translated into embodied interaction within a therapist-mediated VR environment. The goal was to evaluate design feasibility and experiential enactment as an early-stage investigation of a mechanism-aligned immersive system. The findings highlight three interrelated considerations for immersive psychotherapy design: alignment with therapeutic mechanisms, integration within therapist-guided workflow, and the role of environmental context in shaping reflective engagement.

Much prior VR-CBT research has emphasized exposure paradigms or automated interventions [5, 22]. *Therapy Island*, in contrast, was designed to instantiate reflective cognitive processes typically delivered through worksheets and dialogue. Participants described object selection and relocation as creating psychological distance from their emotions, consistent with CBT's emphasis on externalization and observational stance-taking [9]. Similarly, forward locomotion paired with environmental transformation supported temporal distancing by aligning physical movement with imagined progression through time. Although this study did not assess clinical outcomes, the findings suggest that immersive metaphors can meaningfully shape how cognitive exercises are enacted. These results reframe the design translation problem as one of aligning interaction mechanics with therapeutic processes rather than visually reproducing traditional therapy artifacts in three-dimensional form.

The study also examined how immersive interaction integrates within therapist-guided workflow. The system preserved therapist control over activity selection, pacing, and post-experience debrief, embedding VR as a brief experiential segment within ongoing CBT dialogue. Participants described the immersive segment as facilitating reflection while remaining anchored to therapist guidance. This therapist-mediated configuration contrasts with fully automated VR systems that aim to replace or scale therapist involvement. The findings suggest that immersive systems for mental health may benefit from prioritizing collaborative integration and human oversight, particularly when supporting structured cognitive processes that depend on guided interpretation.

Participants' responses further indicate that environmental tone influenced how reflective exercises were experienced during the session. The immersive setting appeared to reduce perceived heaviness and support openness when engaging with emotionally challenging material. While such environmental effects are not unique to this system, the findings suggest that atmospheric design can function as a contextual scaffold that shapes readiness for cognitive restructuring within therapist-mediated sessions.

This study was designed as an early-stage feasibility investigation. The sample was limited to 11 university students familiar with therapy, which constrains the breadth of experiential perspectives captured and limits the transferability of findings to broader clinical populations. Sessions were brief, cross-sectional, and limited to approximately 10 minutes of immersive interaction, which does not reflect the sustained or repeated engagement that would characterize integration within ongoing therapy. No participants reported symptoms of simulator sickness during these sessions; however, longer or repeated exposures may introduce comfort-related considerations that this protocol did not capture. Additionally, the researcher facilitated the sessions rather than a practicing clinician, and consequently, the results do not establish generalizability, long-term engagement, therapeutic alliance, symptom reduction, or attrition effects [3]. Future research should examine therapist usability and workflow integration in clinical contexts and include direct clinician feedback during deployment. Longitudinal studies are needed to evaluate whether embodied interaction measurably influences cognitive restructuring, emotional regulation, or sustained engagement within standard CBT practice. Further investigation of personalization strategies and adaptive scaffolding may clarify how immersive interaction can be tuned to individual therapeutic needs.

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