Bodyfulness VR: Exploring Virtual Reality as a Medium for Somatic Meditative Practices

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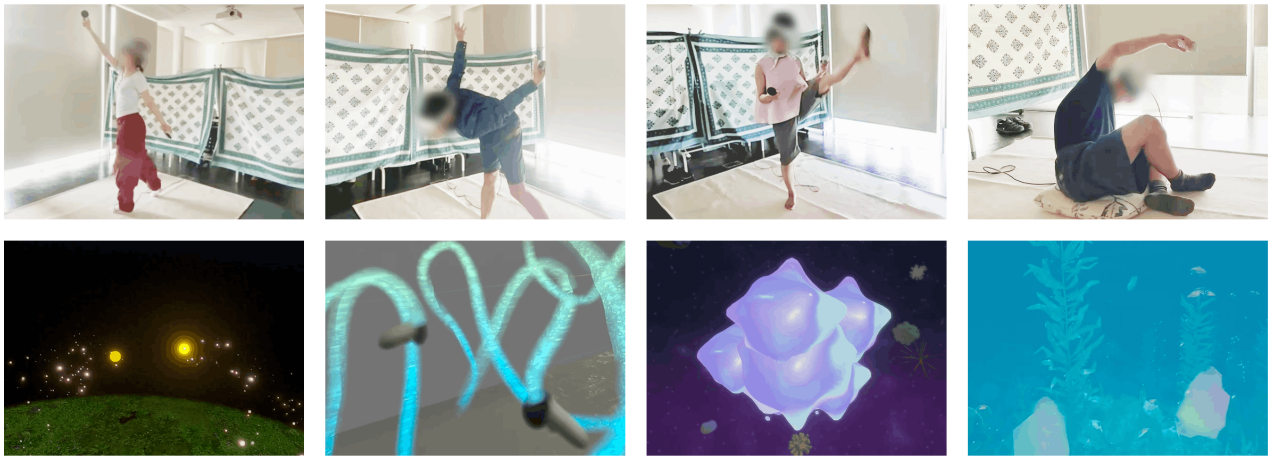

Figure 1: Bodyfulness VR is a virtual reality program designed to support somatic meditative practices. Developed in collaboration with experienced dance meditators, it explores the potential of VR as a medium for fostering mindful bodily experiences. The photos above show dance meditation novices and experts engaging with Bodyfulness VR.

Abstract

Within body-centered HCI, growing attention has been given to the body not only as an instrument of the mind but as a source of experience and presence. Dance meditation exemplifies this orientation by fostering mindful connection to the body through spontaneous, unstructured movement. In this context, VR has been widely adopted for structured instruction in static meditation and choreographed dance, yet its potential to foster freer, meditative bodily engagement has received little attention. To address this gap, we collaborated with dance meditators and co-designed Bodyfulness VR, a four-module system supporting (1) somatic awareness, (2) movement exploration, (3) emotional release, and (4) physical relaxation. Using the system as a design probe, we examined how VR could mediate somatic meditative practices. Findings from our user study indicate that VR could lower barriers to dance meditation by reducing self-consciousness and supporting bodily engagement, while movement-guiding affordances may also redirect attention toward task-oriented action, constraining bodily expression. By articulating this tension, our work contributes design implications for balancing structure and openness in VR systems that aim to support somatic mindfulness.

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CCS Concepts

• **Human-centered computing → Virtual reality**.

Keywords

virtual reality, VR, body-centered HCI, dance meditation, somatic meditation, mindfulness

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1 INTRODUCTION

In many traditions, the human body has been viewed in relation to the mind as subordinate, framed mainly as a material object to be disciplined and managed [3, 30]. With modern technological advancements, this perspective has frequently been reinforced, as the body is increasingly represented through practices of measurement, monitoring, and optimization [17, 25, 27].

Several philosophers have challenged this long-standing marginalization of the body. Merleau-Ponty's phenomenology attempted to reconceptualize the body as the center of human cognition and experience that fundamentally stem from embodied perception and movement [69]. Similarly, Don Ihde noted that technologies can both perpetuate reductionist views of the body and open possibilities for enhancing embodied experience [29]. This paradigm shift has also influenced HCI, particularly with the "Somatic Turn" in the late 20th century, which repositioned the body not as a mere input device or information processor, but as the locus of lived experience [10, 27].

The integration of body and mind has historically been emphasized in mindful, body-centered practices such as *dance meditation*, an emerging meditative practice that uses dance as the primary modality for practicing mindfulness [41, 77]. Closely situated within "Meditation with Movement" [43], dance meditation centers on exploring the body through free, unstructured movement [36] that emerges organically and spontaneously [40, 44].

Dance meditation is associated with a range of psychological and physical benefits, including reduced anxiety, improved body awareness, and more positive self-perceptions [6, 36, 41, 52]. However, its broader adoption is constrained by both psychological and experiential barriers. Among novices, the term "dance" often suggests specialized performance skills, creating hesitation and pressure [63]. Even for experienced practitioners, maintaining deep immersion while letting go of self-consciousness about their movements remains a persistent challenge [54, 63]. These barriers underscore the need for approaches that can reduce entry pressures, provide a psychologically safe space, and facilitate sustained immersion.

In this context, virtual reality (VR) may offer unique affordances that can address these barriers. First, VR creates a private, visually isolated space where practitioners are freed from concerns about external judgment, potentially reducing the self-consciousness that impedes both novice entry and experienced practice [57]. Second, VR's capacity for embodied interaction and multisensory immersion can facilitate the sustained attention and bodily awareness central to meditative practice [60, 74]—affordances difficult to replicate through audio guidance alone. Third, VR enables experiences that transcend physical constraints, such as inhabiting alternative embodiments or moving within altered physics, opening new avenues for somatic exploration [2, 65].

Despite this potential, most VR meditation research has focused on structured, relatively static practices such as seated breathing meditation [12, 19, 46], with movement-based and improvisational approaches remaining underexplored [18, 70]. Similarly, VR dance applications have primarily supported choreographed instruction rather than free-form, meditative movement [7, 35]. This gap is notable because dance meditation's emphasis on spontaneity, bodily autonomy, and non-judgmental awareness presents design challenges distinct from both guided meditation and instructional dance. To address this gap, we ask: **How should VR be designed to support dance meditation—a practice characterized by spontaneous movement, present-moment awareness, and non-judgmental bodily engagement?**

To investigate this question, we conducted design workshops with 17 participants experienced in dance meditation and related somatic practices. Through in-depth interviews and collaborative ideation, we developed an understanding of their practices and identified four recurring modes in their meditative journeys. Many participants described beginning with *bodily awareness*, grounding themselves through attention to sensations; progressing to *movement exploration*, experimenting with diverse movements; deepening into *emotional release*, expressing and processing feelings through physical motion; and culminating in *physical relaxation*, allowing the body to settle without judgment or intention.

Building on these understandings and participants' design ideas, we developed **Bodyfulness VR**, a four-module VR program, as a design probe to explore how VR could shape somatic meditative practices. Rather than aiming to offer complete or optimized solutions, the system was intentionally designed to invite diverse forms of bodily engagement and to surface experiential tensions in VR-supported dance meditation. The program was structured into four modules to materialize distinct modes observed in participants' meditative journeys and to support focused reflection on different modes of somatic engagement. Each module corresponds to one mode: **Luminous Awakening** invites users to awaken *bodily awareness* by interacting with glowing fireflies; **Kinetic Strokes** encourages *movement exploration* by visualizing bodily traces as colorful trajectories; **Emotive Unload** supports *emotional release* through a responsive virtual mass that morphs with movement; and **Aqueous Drift** guides *physical relaxation* by allowing users to embody a jellyfish drifting through an underwater world.

To understand how participants engaged with different modules and how these engagements accumulated into an overall meditative flow, we conducted an exploratory user study with 12 participants of varying dance, meditation, and VR experience. Participants attended two sessions one week apart—first experiencing each module individually, then consecutively as a continuous flow—allowing us to capture both module-specific responses and shifts in bodily attention, movement, and meaning across the meditative journey.

Our findings suggest that VR could help lower barriers for newcomers by easing hesitation and supporting initial immersion, while

also offering opportunities to extend somatic awareness and expression for more experienced practitioners. At the same time, some participants noted challenges, including moments where movement-guiding interactions reframed movement as task-like action, lingering self-consciousness, and the need to adapt to the novelty of VR. Taken together, these findings highlight tensions in how VR structures bodily attention and agency. Based on these findings, we propose design guidelines for integrating VR into mindful bodily experiences to foster a more attentive and compassionate relationship with the body, rather than evaluation, judgment, or performance.

Our contributions are as follows:

- An empirically grounded characterization of dance meditation practice, identifying four recurring modes—bodily awareness, movement exploration, emotional release, and physical relaxation—that can inform the design of technologies supporting somatic mindfulness.
- An exploration of the design space for VR-supported dance meditation, through collaborative design with experienced dance meditators, illustrating how different VR interactions can support distinct modes of somatic experience.
- Design implications for VR-supported dance meditation that articulate key tensions between guidance and openness, and outline how VR systems may support individual meditative flow and bodily exploration without foregrounding evaluation, judgment, or performance.

In the following section, we first conceptualize dance meditation and identify key research gaps. Sections 3-5 describe the design process, including an overview of our design probe, "Bodyfulness VR." Sections 6–7 present findings from an exploratory user study of the VR program, followed by design implications for VR-supported dance meditation in Section 8.

2 RELATED WORK

In this section, we examine the relationships between the body and technologies, conceptualize dance meditation, and review prior research on meditation and dance in VR, highlighting its potential to support meditation with a focus on body and movement.

2.1 Human Body, Technology, and HCI

Across intellectual history, the body has often been positioned in relation to the mind, frequently treated as subordinate to the spirit [3, 30]. Rooted in mind-body dualism, this tradition regarded the body largely as an instrumental means to serve the mind [37, 56]. In contemporary society, this orientation has at times been reinforced through new forms of measurement and control enabled by technological progress [47, 62]. Philosophers of technology have noted that such technological modes of being could encourage us to see the world, other people, and even our own bodies as resources to be optimized [17, 25].

These tendencies are widely visible in the spread of digital tools such as wearable devices and healthcare applications, which make it easier to track and record physical states [51]. Such tools have contributed to what has been described as a "metric culture" in which the body is understood through continuous monitoring and numerical indicators such as heart rate, sleep patterns, or calorie expenditure [27, 73]. However, this approach may risk reducing the body to an optimization object, overlooking the more subjective and holistic dimensions of lived experience [1, 9, 61].

In contrast, phenomenological approaches have reconceptualized the body as the primary mediator of human existence. Merleau-Ponty emphasized that human cognition and experience emerge through embodied perception and movement, describing the body as the "general medium for having worlds" [69]. Additionally, Don Ihde highlighted the ambivalent role of technology: while it may diminish embodied experience in some contexts, it also has the potential to support a renewed recognition of corporeality and enrich our relationships with the body [29].

These philosophical discourses have also informed HCI research by repositioning the body from a passive input device to a central site of experience [27]. Mueller et al. [50] advanced this view by contrasting the conventional framing of the body as an external, measurable entity (*Körper*) with the body as a sensing and feeling entity (*Leib*). More recently, Kaygan et al. [32] extended this by drawing attention to the unconscious dimensions of the "deep body," exploring how internal sensations and emotional flows can become central resources for interaction design.

2.2 Dance Meditation

Meditative practices have historically emphasized the integration of body and mind, with diverse body-related techniques highlighting the sensory and kinesthetic experiences [13, 41, 43]. In this context, dance has recently garnered interest as a promising modality for cultivating mindfulness—a state of awareness grounded in the present moment, arising from nonjudgmental attention to the ongoing flow of experience during meditation or specific activities [31]. Unlike performance-oriented dance, which may promote regulation and objectification of the body, meditative approaches utilize dance to cultivate a compassionate relationship with the body [13, 77]. Its expressivity [77] and moment-to-moment focus on shifting bodily sensations and movements [49] align closely with the attentional and internal nature of meditative practice.

While the incorporation of dance into mindfulness is growing, the field is marked by terminological inconsistency ("dancing mindfulness," "mindful movement," "conscious dance," "dance-based mindfulness," "contemplative movement") and unclear conceptual boundaries [41, 77]. In this paper, we define *dance meditation* as an approach that uses dance as the primary modality for practicing mindfulness and meditation [41, 77], aligning most closely with Matko et al. [43]'s definition of "Meditation with Movement" which emphasizes physical involvement and a focus on bodily experience.

Dance meditation centers on free, unstructured movement [36], where actions emerge spontaneously from internal impulses rather than following predefined choreography [40, 44]. This improvisational nature strictly distinguishes it from other movement-based approaches such as yoga, tai chi, and qigong, which rely on specific forms, alignment, and postural control [77]. Instead of mastering a form, practitioners focus on nonjudgmental acceptance [21, 54] and authentic self-expression [36, 77], aiming for a state of deep absorption and reduced self-consciousness [36].

Dance meditation is practiced in both individual and group formats [41] and spans diverse genres, including 5Rhythms, Ecstatic

Dance, Sufi-inspired movement, and contemporary improvisation [36, 77]. It often incorporates complementary mindfulness techniques such as breathwork and body-awareness exercises [41, 49], enriching its methodological depth and diversity through intersections with broader body-centered disciplines [13].

Dance-based mindful interventions, including dance meditation, have been associated with a range of psychological and physical benefits. Studies reported reduced anxiety and depression, enhanced emotional well-being and body awareness, decreased physical pain, and more positive self-perceptions [6, 36, 41, 52]. Despite these benefits, broader adoption is constrained by distinctive barriers. The term "dance" itself can create psychological barriers by implying the need for specialized skills, leading to hesitation among newcomers [63]. Even for experienced practitioners, maintaining sustained immersion while letting go of self-consciousness about movement remains a persistent challenge [54]. The fear of external judgment or awkwardness in physical expression can further disrupt the meditative state [63], underscoring the need for supports that foster psychological safety and uninhibited expression.

2.3 Meditation and Dance in Virtual Reality

As an embodied, immersive medium, VR has the potential to address the psychological and experiential barriers to dance meditation. Regarding the challenge of maintaining attention, VR has long been recognized as a promising medium for supporting concentration by blocking external distractions [4] and creating a separate, dedicated space for meditation [19]. Moreover, immersive sensory stimulation and interactivity can further enhance focus, engagement, and emotional stability [60, 74]. This suggests VR's potential to facilitate practitioners' concentration.

Furthermore, VR could provide a psychologically safe space by mitigating concerns about how one's movements appear to others [57]. Its quasi-anonymity can reduce social anxiety, allowing users to attend more fully to movement itself. Additionally, the partial or abstracted representation of the body in VR can soften concerns about bodily appearance, as movements are perceived less as exact performances and more as expressive traces [38]. Beyond these psychological effects, prior studies have shown how VR could augment body-centered and movement-driven practices through embodied avatars, body-tracking, and movement-responsive interactions. For example, Liu [38] identified opportunities for lowering barriers to somatic practices through embodied representation, while multisensory environments and responsive visual feedback have been shown to encourage expressive movement [64, 66]. Moreover, VR interactions that transcend physical constraints, such as moving without gravity, can further expand bodily experience [2, 65]. Taken together, these characteristics suggest that VR may help ease performance-related concerns and, in some contexts, enable deeper immersion and bodily exploration in dance meditation.

Despite these possibilities, most VR research has primarily focused on structured instruction for relatively static meditation practices, leaving more dynamic forms of meditative engagement underexplored [12, 70]. For instance, several VR applications have focused on supporting breathing meditation [46, 53, 59, 67] or attentional focus [34, 48], while practices involving more active bodily movement remain comparatively underexplored [18].

In the domain of VR-supported dance, prior work has concentrated on skill acquisition and choreographed movement. For example, Laattala et al. [35] leveraged VR's visual immersiveness and real-time interactivity to help users follow choreography more accurately. Meanwhile, Choi et al. [7] developed a ballet training system that incorporates viewpoint transitions and muscle visualization. Consequently, VR's potential to support dance not as an instructional tool for performance, but as a medium for mindfulness, remains largely unexamined. Building on these gaps, our study aims to investigate how VR could support dance meditation grounded in unstructured, spontaneous bodily movement.

3 DESIGN WORKSHOP

As somatic and meditative practices are personal and subjective, body-centered HCI emphasizes engaging with practitioners with rich first-person experiences [27, 68]. Our research team, however, primarily consisted of members with backgrounds in performance fields (e.g., ballet, competitive sports) and VR research focused on structured training and simulation, which differ from dance meditation that foregrounds mindful awareness and free-form exploration.

Recognizing this gap, we sought to learn from individuals with lived experience in dance meditation, focusing on their daily practices and relationships with their bodies. We therefore conducted design workshops with 17 practitioners, drawing on their personal experience to collaboratively explore how VR could support dance meditation.

3.1 Participants

Considering that dance meditation often intersects with other body-centered practices [13, 41], we recruited 17 participants who had experience practicing or instructing dance meditation and related fields (e.g., Somatics, improvisational dance). Recruitment began by identifying potential participants through online channels such as personal blogs, dance communities, and news articles, and by reaching out to them directly. We then used the snowball sampling to further expand the participant pool. This process resulted in a diverse group (see Table 1), varying in age (average=38.59, SD=14.00, range=21-71), gender (4 male, 13 female), nationality (e.g., South Korean, British, Canadian), and expertise (e.g., practitioner, instructor). Regarding VR familiarity, ten participants had prior experience with VR devices, ranging from one-time use to owning a personal VR headset, while the remaining seven were first-time users.

3.2 Procedure

The workshops were conducted in person at a location convenient for the participants (e.g., participant's dance studio) or via Zoom for approximately an hour. Facilitated by two researchers, each workshop was conducted either individually or as a group for participants from the same meditation group or dance club (7 individual sessions and 3 group sessions as shown in Table 1). Each workshop consisted of an in-depth interview (30 min) where participants shared their dance meditation experiences, followed by a brainstorming activity (30 min) where they discussed ideas on how to design VR for dance meditation. For participants with a background in related fields but not specifically in dance meditation, we provided additional verbal explanations of its definition

Table 1: Demographics of design workshop participants

Participant	Gender	Age	Nationality	Dance Meditation Expertise	Primary Field	Prior VR Experience
D1	Male	30	Korean	Practitioner	Dance meditation	Yes
D2	Female	42	UK	Instructor	Dance meditation	Yes
D3 (Group A)	Female	59	Korean	Instructor	Dance meditation	No
D4	Male	32	Korean	Instructor	Somatics	Yes
D5 (Group B)	Female	29	Korean	Practitioner	Contemporary Dance	Yes
D6 (Group C)	Male	22	Korean	Practitioner	Contemporary Dance	Yes
D7 (Group C)	Female	23	Korean	Practitioner	Contemporary Dance	Yes
D8	Female	29	Korean	Practitioner	Somatics	Yes
D9	Male	28	Canadian	Instructor	Dance meditation	Yes
D10	Female	46	UK	Instructor	Dance meditation	Yes
D11	Female	39	Korean	Practitioner	Dance meditation	Yes
D12 (Group A)	Female	58	Korean	Practitioner	Dance meditation	No
D13 (Group A)	Female	44	Korean	Practitioner	Dance meditation	No
D14 (Group B)	Female	24	Korean	Practitioner	Contemporary Dance	No
D15 (Group A)	Female	35	Korean	Practitioner	Dance meditation	No
D16 (Group A)	Female	45	Korean	Practitioner	Dance meditation	No
D17 (Group A)	Female	71	Korean	Practitioner	Dance meditation	No

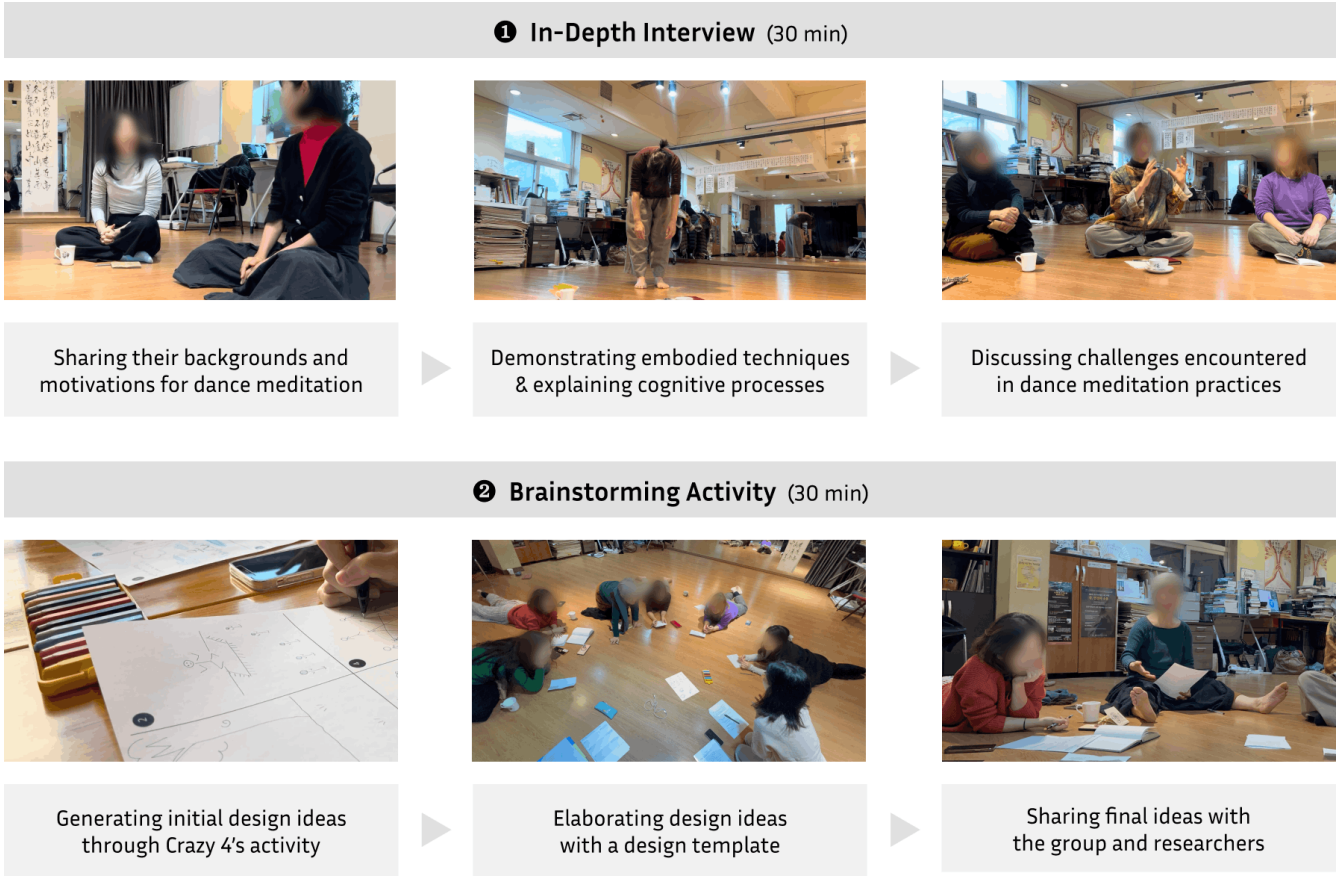

Figure 2: The procedure of the design workshop

and key characteristics. All procedures received approval from the Institutional Review Board (IRB) of the hosting university. Before the workshop, participants were informed of the study's purpose and procedures and provided their informed consent.

The in-depth interview was conducted in a semi-structured format (see Appendix A.1 for a full interview script). To facilitate richer expression, participants were encouraged to use body gestures and movements at any time. They were first asked to introduce their backgrounds, motivations, and expertise in dance meditation, then describe their personal practice in detail, including the environment (e.g., *"How do you prepare and utilize music or space?"*), body parts and movements (e.g., *"What body parts or movement patterns do you primarily use?"*), and cognitive effects (e.g., *"What internal states or emotions do you experience during the meditation session?"*). To gain a deeper, embodied understanding, the researchers occasionally learned participants' practices through physical demonstrations. Each interview concluded with a discussion of the challenges they encountered during their practice.

After the interviews, participants engaged in a brainstorming activity to generate ideas for VR-supported mindful movements. To facilitate participation regardless of prior VR experience, the session began with a 2-minute introductory video about the definition of VR, commonly used devices (i.e., head-mounted displays, controllers), and examples of VR interactions (e.g., walking in a virtual room, picking up objects with hand gestures, full-body motion tracked avatars). Participants could ask questions at any time.

Following an introduction to VR, participants were asked to generate design ideas through Crazy 4's activity (adapted from [23]), an ideation method in which four ideas are briefly sketched in four minutes. They were encouraged to generate ideas without considering technical feasibility, then presented their ideas to the researchers and other participants (in case of group sessions).

In the final step, participants were asked to pick one idea to further develop using the template that researchers provided (adapted from [74]; see Appendix A.2) The template included prompting questions on (1) user movements (i.e., *"What kind of movements comes up in your mind? What body parts are you using?"*), (2) VR effects and interactions (i.e., *"What VR effects do you envision? What do you see, hear, or feel?"*), (3) VR environment (i.e., *"What does the background look like? Can you interact with the things around you?"*), and (4) soundscape (i.e., *"Is there background music? Do you want to incorporate a narrated guidance?"*). After developing their ideas, participants shared them. Upon completion, participants received 50,000 KRW (equivalent to 35 USD) as compensation.

3.3 Data Analysis

We analyzed the interview data using thematic analysis [5]. After transcribing the interviews, three authors individually coded the entire transcripts. Through a series of group discussions, the codes were compared, refined, and organized into an affinity diagram, which highlighted three overarching dimensions: the context of the practice (e.g., environment, soundscape), the embodied journey (e.g., physical movements, inner work), and the challenges encountered.

To analyze participants' ideation outcomes, their initial design ideas were compiled into a card format featuring a conceptual sketch and summary (see Appendix A.3). Then, building on insights from the interview analysis, researchers collaboratively grouped the cards on a Figjam board [20] to identify recurring design directions. This process resulted in four design approaches for VR-supported somatic meditation.

4 FOUR MODES IN DANCE MEDITATION AND OPPORTUNITIES FOR VR DESIGN

Insights from the design workshops revealed that, while each participant's meditative journey was unique, dance meditation sessions generally unfolded through four sequential modes—Bodily Awareness, Movement Exploration, Emotional Release, and Physical Relaxation—forming the overall meditative flow (see Figure 3). Each mode involved different yet interconnected mindful bodily experiences, offering unique opportunities for VR integration. The following sections outline this progression and present VR design ideas for each mode (see Figure 4).

4.1 Bodily Awareness

Participants' dance meditation sessions typically began with a 'grounding' process that gradually awakened bodily awareness. Some participants used mindful breathing by *"closing [their] eyes, taking three deep breaths, centering [themselves], and letting the music ground [them]"* (D10). Other participants, especially those with Somatics backgrounds (D4, D8, D11), engaged in 'body scanning,' attending closely to sensations in one body part at a time. Meanwhile, some participants grounded themselves by physically interacting with their surroundings. For instance, D5 and D14 mentioned placing their ears close to the floor or tapping the wall, while D10 described moving slowly through water to connect with its energy. While a few participants (D1, D4) described achieving bodily awareness almost immediately, others noted that it took several minutes to settle into the meditative state.

Participants described this phase as bringing *"awareness to different body parts and their connections, helping [them] sense internal states"* (D2). This heightened attention allowed them to feel more connected to their bodies. D8 reflected: *"Sometimes when I lie down, my shoulders feel tight or my right leg feels like floating. My body feels a little different each time, and noticing those changes is interesting."*

4.1.1 Design Ideas for Bodily Awareness. To support bodily awareness, participants suggested leveraging haptic feedback and tactile forms of interaction. Those with Somatics backgrounds (D4, D8) envisioned localized vibrations on specific body parts to draw attention to bodily sensations and guide movement. Moreover, others emphasized that haptic interaction could also foster a sense of physical grounding in the virtual environment. For instance, D11 imagined touching virtual trees or soil, while D14 suggested mindful contact with natural elements such as flowers, grass, or water.

4.2 Movement Exploration

Once participants established a sense of bodily awareness, they described transitioning into a freer, more fluid exploration of their movements. This movement exploration often began with a focus on specific body parts (D1, D5, D7-10, D14) or familiar areas like the hands or arms (D7-8, D10, D14), and gradually expanded into other parts of the body. Without fixed techniques or choreography,

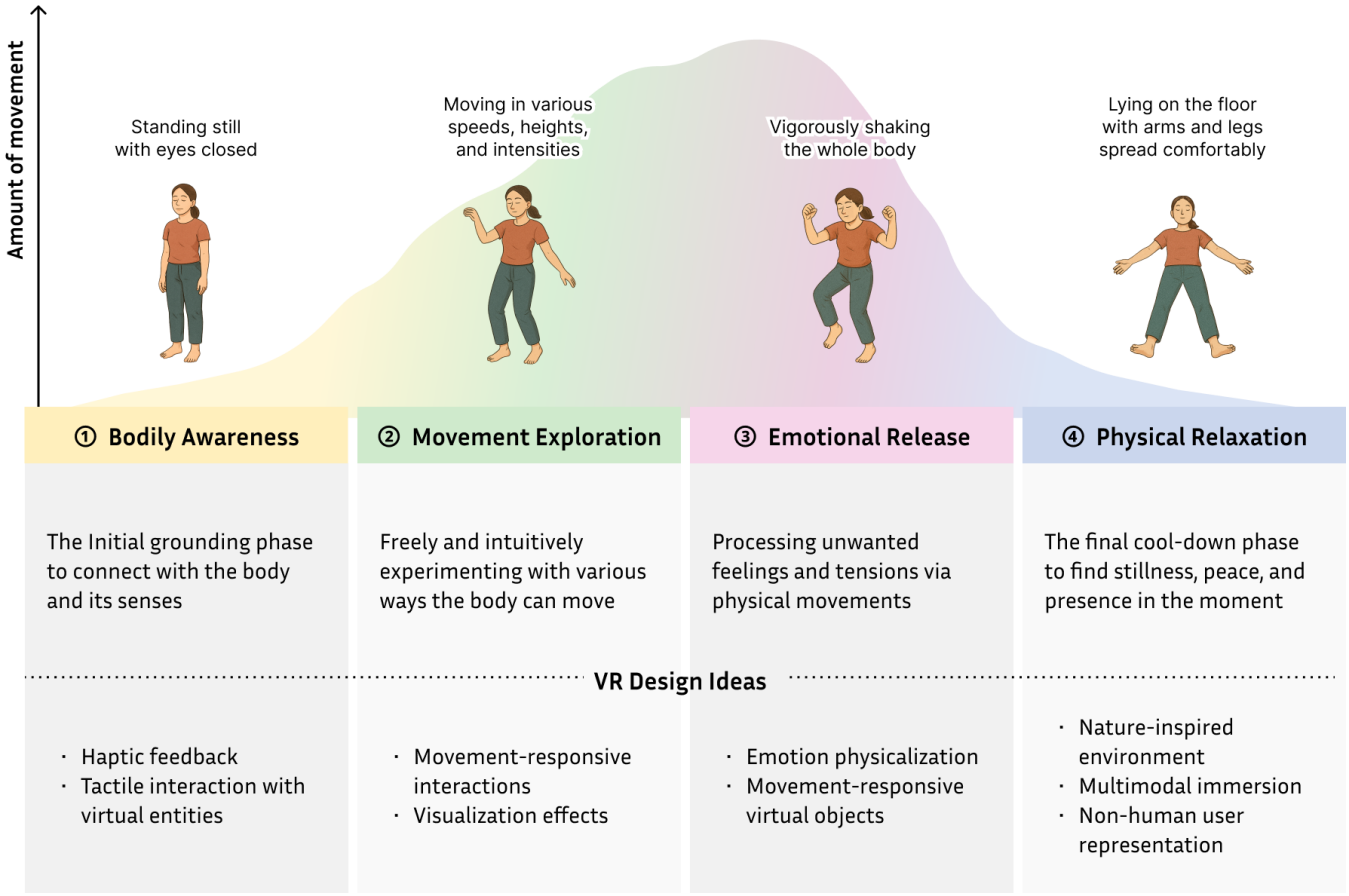

Figure 3: An overall process of dance meditation with four modes and corresponding VR design ideas

they let their bodies move intuitively, guided by natural impulses. D9's account illustrates this process:

> "All movements are always improvised, never choreographed. Stretching and moving, you start to feel the opposition in your body, and then that's my kind of gateway into feeling where to move next. It's just moving intuitively with what feels right to the music or to that moment."

This improvisational approach manifested in a wide spectrum of movements: from slow, gentle movements (D4, D8-9) to fast, intense movements (D6-7, D10); from non-linear gestures like waving or curling (D9-10) to straight, stretching motions (D1); from lying down (D4, D8) and walking (D3) to running (D1, D9) and jumping (D10); from small, contracted movements (D1) to large, expansive movements (D1, D8).

Participants noted that such movement exploration enabled them to form more honest relationships with their bodies by "*respecting [their] body without judgments or analytical thinking*" (D4). Several participants reflected that moving beyond rules and attempting unfamiliar gestures allowed them to rediscover the joy of movement and connect more truthfully with themselves (D15).

4.2.1 Design Ideas for Movement Exploration. To encourage exploration of a wide range of movements, participants proposed interactive effects that dynamically respond to bodily actions. D7, for example, envisioned petals falling and wind blowing in response to raised arms, while D11 imagined rainfall sounds shifting from a drizzle to a downpour as movement speed increased. Another idea that resonated strongly in one of the group sessions was D15's concept of visualizing movements as colorful traces in three-dimensional space. With colors mapped to movement speed, height, and intensity, these visual traces were envisioned to invite broader bodily exploration while supporting reflection on movement patterns.

4.3 Emotional Release

As participants grew more attuned to their bodies and movements, their practice often deepened into emotional experiences expressed through physical movement. One common approach was to spot "*dense or uncomfortable energy in [their] body*" and "*move the parts that feel sticky or tense until the energy releases*" (D2). For example, D16 shook her body to physically release negative thoughts and feelings. Some participants described experiencing "*a state of catharsis with freedom and lightness*" (D10) after moving passionately.

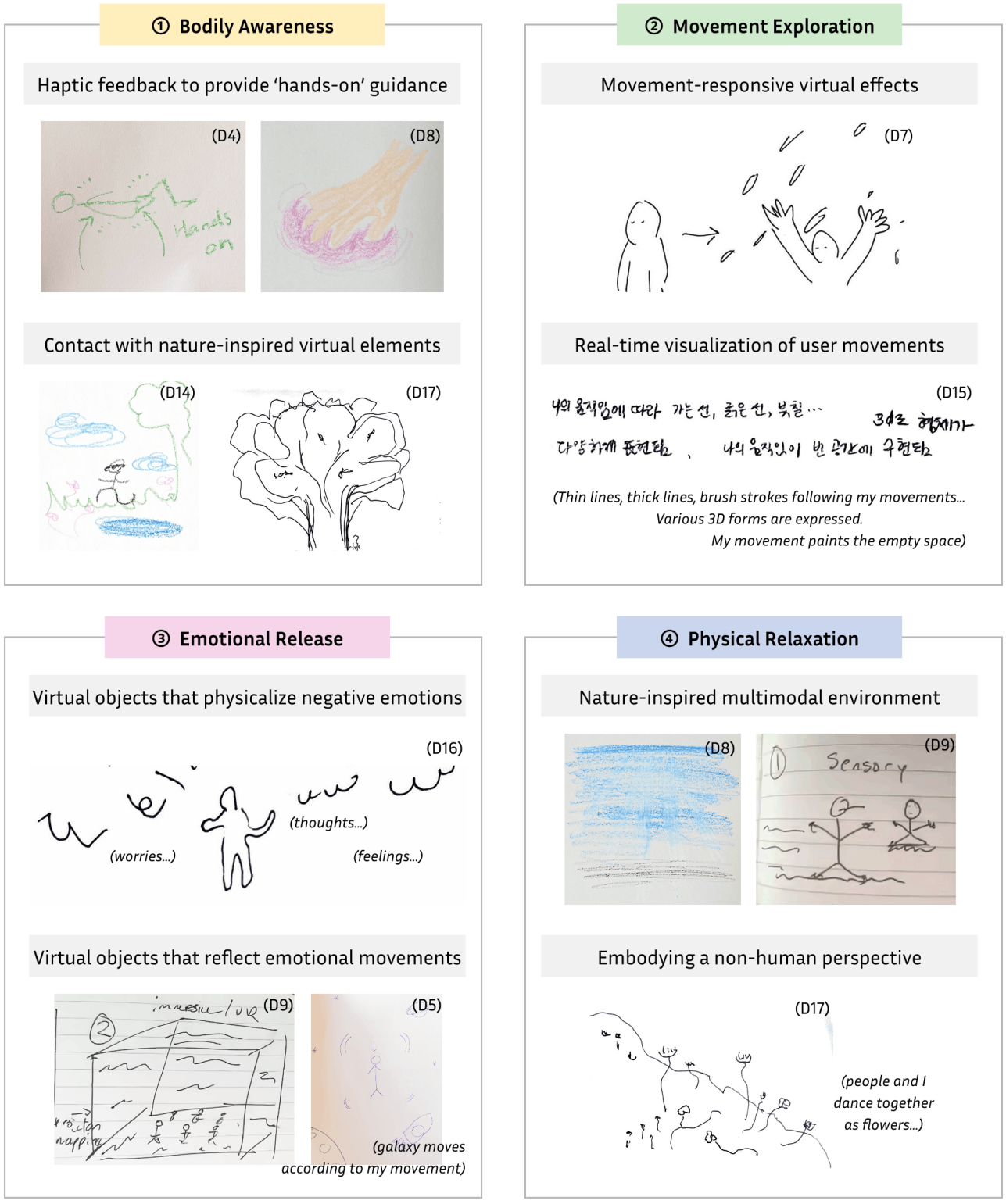

Figure 4: Participants' design sketches for (1) Bodily Awareness, highlighting haptic guidance and interaction with nature-inspired virtual elements; (2) Movement Exploration, illustrating movement-responsive effects and real-time visualizations of movement paths; (3) Emotional Release, depicting virtual objects and environments that externalize or reflect emotional movements; and (4) Physical Relaxation, featuring nature-inspired multimodal environments and non-human embodiment.

Across participants, these emotional movements transformed their negative feelings into positive states such as tranquility (D4), liberation (D5, D14), refreshment (D11), and courage (D12). Several participants also emphasized that this practice fostered a closer link between internal emotions and bodily experiences. For example, D10 reflected that dance meditation offered a way of "*getting in touch with [her] emotions and into [her] body.*"

4.3.1 Design Ideas for Emotional Release. Many participants suggested that VR could augment somatic emotional release by making emotions visible as interactive objects. For instance, D3 and D16 proposed physicalizing unwanted emotions as "*clutters of dust*" that could be shaken off through movement, allowing users "*see it all being released as it happens during the shaking dance*" (D3). In addition, some participants envisioned responsive virtual objects that reflect users' emotional states and movements. D9, for example, envisioned "*a soul visualized as a particle system or a mood ring-like object that changes color and form based on emotions.*"

4.4 Physical Relaxation

Participants usually concluded their meditative journey with a 'cool-down' phase of physical relaxation. Most described gradually easing into stillness by "*allowing the energy to work through, returning to breath and heart, and grounding to the earth*" (D10). To enter a state of complete relaxation without judgment or intention, they often sat quietly or lay down on the floor (D2, D9). Afterward, participants usually reflected on the condition of their body and mind.

In this phase, participants reported a heightened sense of presence, fully focusing on their bodies in the moment. D3 shared, "*My body naturally relaxes, and I enter a state of being here and now.*" This embodied presence helped D7 to "*stop thinking about little worries and distracting thoughts*" such as struggling to "*be good*" (D5) and "*worrying about how I'd look*" (D14). Others emphasized that they could listen to their bodies' needs without pressure or self-consciousness (F5, F14), while D1 experienced a sense of "*liberation, being freed and moving beyond discomfort.*"

4.4.1 Design Ideas for Physical Relaxation. Several participants suggested supporting the physical relaxation phase with nature-inspired virtual environments (D8-9, D13). For example, D8 proposed an underwater setting where users could drift along the seafloor, accompanied by the muffled sounds of the deep ocean, as a calming space to "*empty their minds.*" Participants also emphasized the importance of multisensory elements in promoting immersive relaxation. D9 imagined feeling wind on the skin, while D13 envisioned sensations of being surrounded by air or water.

Others suggested representing users as non-human entities in a virtual setting to help suspend human judgments and foster unconditional acceptance of the body. D3 and D17 imagined embodying animals, plants, or elements like water or fire to transcend the human form, while D8 proposed becoming a jellyfish to "*move as if my body has no bones*" to achieve deeper physical relaxation.

5 BODYFULNESS VR

Through the design workshops, we learned that dance meditation generally unfolds across four interrelated orientations of practice. Building on participants' ideas, we designed Bodyfulness VR (see Figure 5), an interactive prototype intended to support exploratory engagement with VR-supported dance meditation for the subsequent user study. The prototype was intended for speculative exploration of user engagement, rather than for evaluating its effectiveness. This section outlines our design process and presents the key features and design rationales of the prototype.

5.1 Design Process

The development of the prototype spanned approximately six months, beginning with an initial ideation phase. Inspired by participants' ideas, researchers individually sketched VR concepts aligned with the four recurring modes of dance meditation. These sketches were then shared and clustered in team meetings to identify design directions. This process was also enriched by prior research (e.g., [22, 39]), commercial VR applications (e.g., [24, 28, 75]), and inspirational reference images. From this, we distilled four design concepts, each mapped to one mode of dance meditation, and elaborated them into storyboards with user scenarios, visual sketches, and accompanying audio guidance scripts (see Appendix A.4).

Based on these storyboards, the technical implementation of the prototype was led by the fourth author, who is also a media artist, using the Unity engine [71] and Meta Quest platforms [45]. The prototype was iteratively tested and refined through weekly in-person meetings, each involving one novice dance meditator for initial feedback. In addition, three expert instructors (D3, D9-10) from the design workshops reviewed the virtual environments, interactions, and audio scripts—one through an in-person session and two via written feedback after reviewing storyboards and video demonstrations. Incorporating feedback from both novice pilot testers and expert instructors, we iteratively refined the design and implementation of Bodyfulness VR.

5.2 Prototype Overview

Bodyfulness VR is a single-player VR program that invites users on a dance meditation journey in a virtual environment. Accompanied by audio instructions and background music, the program was designed to foster a deeper connection with the body through mindful movements and bodily engagement, rather than to prescribe specific techniques. A complete session consists of four modules (5–10 minutes each), inspired by the four recurring modes of dance meditation flow (see Section 4). Due to safety concerns related to fatigue and motion sickness from prolonged use, we adopted a modular structure with shorter, self-contained modules. While each module was initially designed around one of the four modes, these boundaries and ordering were not strict: users could engage with modules individually or in combination, enabling flexible and open-ended engagement.

5.3 Luminous Awakening: Dancing with Fireflies to Promote Bodily Awareness

The first module, *Luminous Awakening*, aimed to invite users to slowly awaken bodily awareness by following and touching virtual fireflies with hand-held controllers. Inspired by our workshop participants' ideas (D4, D8, D11, D14), the fireflies were designed as interactive cues that emit subtle vibration upon contact. By appearing and responding at a measured tempo, these interactions

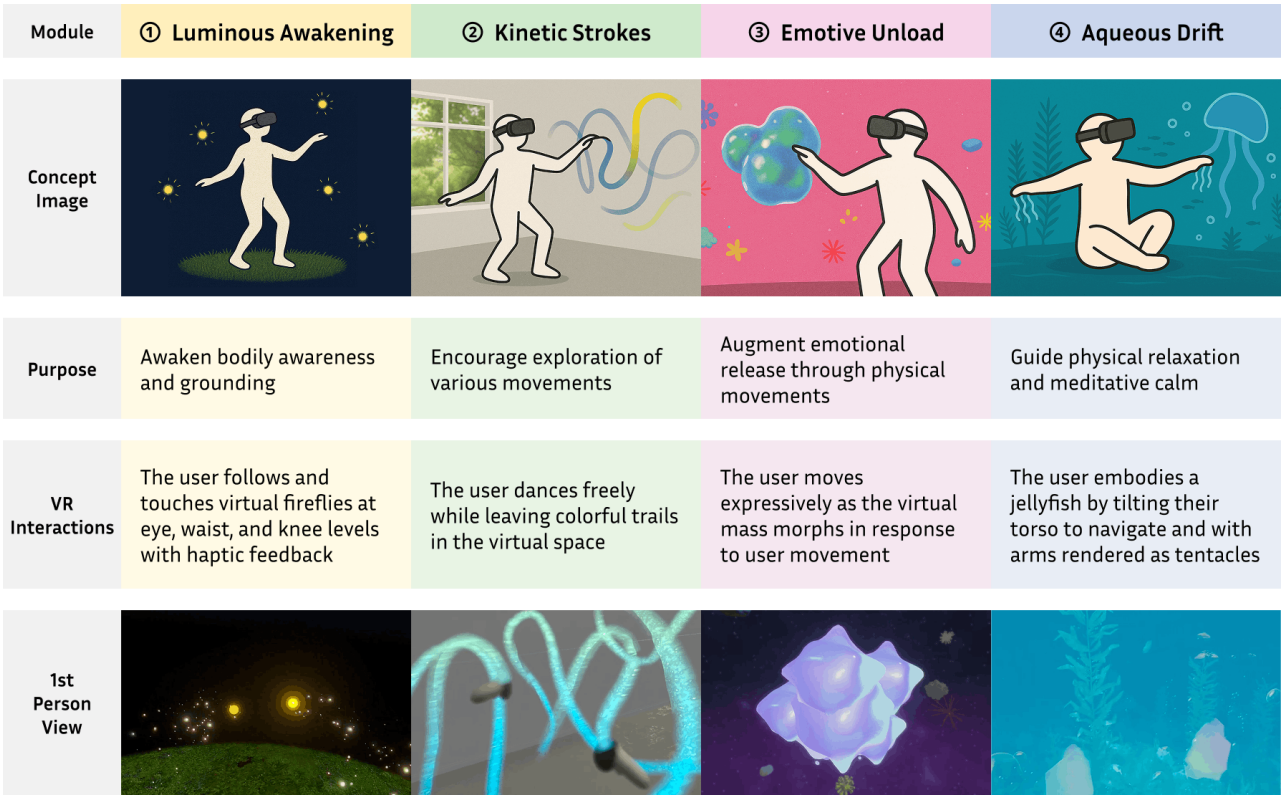

Figure 5: An overview of the four modules of Bodyfulness VR

were intended to prompt users to move and attend to different body parts, and ground themselves in the physical space through haptic contact. Based on feedback from the iterative design process, we carefully designed the visual and haptic affordances of the fireflies to sustain a calm interaction rhythm and discourage game-like, goal-driven behavior.

5.3.1 User Flow. The module begins in a virtual meadow with soft ambient music to establish a calm, focused atmosphere. Guided by virtual fireflies, users undergo a 'body scanning' process from head to toe. The fireflies gently appear at eye, waist, and knee levels sequentially, to elicit users to engage with and recognize their bodily sensations in their upper, middle, and lower bodies. Upon touch, the fireflies respond with subtle vibrations, a soft glow, and calming sounds. After the body scanning, the fireflies appear at all three heights, slowly orbiting around the user to foster free, mindful movements. After a few minutes, they gradually fade away, signaling the module's end.

5.4 Kinetic Strokes: Motion Drawing for Movement Exploration

The second module, *Kinetic Strokes*, was designed to encourage users to experiment with their bodies more actively and explore a wide range of movements. Drawing on D15's idea from the design workshops, its design centers on visualizing user movements as colorful lines in the virtual space. Feedback from the iterative design process informed us to combine audio instruction that gently nudges toward diverse movements, with sufficient pauses for users' independent exploration.

5.4.1 User Flow. This module unfolds in a spacious virtual room with the audio guidance greeting, *"This is your stage. A place where no eyes follow, only your own presence. There's no right or wrong way to move,"* establishing a safe and open space for movement exploration. With melodic music, users are guided to explore various movements with specific prompts from the audio instruction (e.g., *"Experiment with gentle, flowing movements, like the motion of a wave"*). In between the prompts, sufficient time is provided for them to dance freely, while the hand-held controllers generate colorful trails that vary in color with hand height (i.e., bright yellow for higher positions and deep blue for lower) and in thickness with movement speed (i.e., the faster the movement, the thicker the trail). The module ends with users stepping back to reflect on the movement traces they created.

5.5 Emotive Unload: Physicalizing Negative Emotions for Release

The third module, *Emotive Unload*, was designed to support users' emotional release through bodily movements by physicalizing their negative emotions as a slime-like mass that morphs and dissipates

in response to their expressive movements. This design was inspired by our workshop participants' suggestions of virtual objects that either directly physicalize or subtly reflect the user's emotional states (D3, D9, D16). In the iterative design process, users' emotional attunement with the virtual mass was further refined by introducing audio instruction that gently invited users to reflect on their emotional state, along with strengthening the interaction mapping between users' bodily movements and the virtual mass.

5.5.1 User Flow. This module unfolds in a galaxy-like virtual environment intended to evoke an inward, reflective atmosphere. The audio instruction guides users to close their eyes and focus on the negative emotions they wish to release, after which a virtual mass representing those emotions appears. Accompanied by rhythmic background music, users are guided to move freely at their own pace to process unwanted feelings. The virtual mass was designed to mirror the intensity and tempo of users' movements, gradually morphing in response. Larger and more forceful movements lead to more pronounced transformations, sometimes culminating in fragmentation, while gentler movements produce subtler changes. Over time, the mass progressively diminishes, eventually melting away completely as the module concludes.

5.6 Aqueous Drift: Embodying a Jellyfish for Physical Relaxation

The final module, *Aqueous Drift*, was designed to conclude the meditation flow by guiding users to a state of physical relaxation. Inspired by D8's ideas from the workshops, we designed this module for users to embody a jellyfish drifting in a virtual ocean. The nature-inspired setting (D9, D13) and adoption of a non-human perspective (D3, D17) were intended to shift attention away from human-centered judgments, fostering unconditional acceptance and deeper bodily relaxation. Feedback from the iterative design process led us to emphasize a slower interaction pace and audio guidance that engages sensory imagination, supporting a more immersive experience.

5.6.1 User Flow. Users begin this module seated on the floor. In an undersea environment, users are guided to drift as a jellyfish, whose gentle, low-effort movements encourage gradual physical relaxation. Users' movements and virtual representation were designed to reinforce a sense of buoyancy and reduce muscular effort. Movement through the environment is slow and continuous, shaped by subtle shifts in the body rather than discrete steps. By gently tilting their torso, users influence their drifting direction, while remaining still allows them to float upward weightlessly. While then, their arms are rendered as jellyfish tentacles, swaying fluidly in the virtual space. Moreover, audio instructions that evoke sensory imagination, such as *"Quietly attend to the temperature of the water embracing your body,"* invite attention to bodily sensation. Towards the end, users are guided to gradually slow their movements and focus on their breath, easing into complete stillness.

6 USER STUDY

After implementing the Bodyfulness VR program, we conducted an exploratory user study with 12 participants of varying dance, meditation, and VR experience. This user study aimed to (1) explore how individuals with diverse backgrounds interacted with the system and how these interactions shaped their somatic experiences, while (2) attending to moments where VR interactions meaningfully engaged or complicated mindful bodily experiences, and (3) remaining open to uncovering unexpected narratives and usage patterns that could inform future design. For this purpose, the study was conducted in a workshop format where participants shared personal body narratives and freely engaged with the system, allowing us to surface experiential responses to VR-supported dance meditation.

6.1 Participants

We recruited 12 participants with diverse backgrounds through online announcements. Our participants varied across age (average=32.00, SD=11.91, Range=21-62), gender (4 male, 8 female), and dance, meditation, and VR experience (see Table 2). Participants self-reported their dance and meditation experience on a 5-point Likert scale (1=Not familiar, 5=Very familiar), categorized as Low (1–2), Moderate (3), or High (4–5). VR experience was self-reported as None, Limited, or Familiar. Two participants (P3, P10) from earlier design workshops also joined, interested in how their ideas were realized in the system.

6.2 Procedure

The user study was conducted in person, with one participant and two researchers per session. To mitigate novelty effects of VR and dance meditation, each participant attended two workshops one week apart. In the first session, participants experienced the four modules individually and provided immediate reflections, allowing for detailed feedback on module-specific experiences. In the second session, participants engaged with the modules consecutively in a single flow, pausing or resuming at their own pace. This approach aimed to capture reflections on the overall meditative journey, rather than on individual modules in isolation. All procedures were approved by the IRB of the hosting university, and participants provided informed consent for their participation and video and audio recording.

6.2.1 Workshop Environment. The workshop environment was divided into two areas: a meditation area for dance meditation and interviews, and a monitoring area for researchers. Following prior meditation research [55], the meditation area was arranged to foster calm and mindfulness. The space was furnished with mandala-patterned curtains, calming aromas, warm tea, and a soft carpet to allow for barefoot practice. The monitoring area was connected to the meditation area via Zoom, allowing researchers to observe participants in real time. This separation ensured that participants had a private space to explore their movements without feeling directly observed or evaluated.

6.2.2 First Workshop. Before the session, participants received introductory materials explaining the definition, purpose, and methods of dance meditation, accompanied by illustrations and an example video. The packet also included reflection questions (e.g., *"How do you imagine yourself trying dance meditation?"*) to prompt

Table 2: Demographics of user study participants

Participant	Age	Gender	Mindfulness Experience	Dance Experience	VR Experience
P1	26	Female	Low familiarity	Low familiarity	Limited
P2	27	Female	Low familiarity	High familiarity	Familiar
P3 (=D6)	22	Male	Moderate familiarity	Moderate familiarity	None
P4	21	Female	Low familiarity	High familiarity	Limited
P5	24	Female	High familiarity	Moderate familiarity	Limited
P6	23	Male	Low familiarity	Low familiarity	Limited
P7	28	Female	Low familiarity	Moderate familiarity	Familiar
P8	35	Male	Moderate familiarity	Moderate familiarity	Familiar
P9	49	Female	High familiarity	High familiarity	None
P10 (=D1)	29	Male	High familiarity	High familiarity	Limited
P11	52	Female	Low familiarity	Low familiarity	None
P12	62	Female	Moderate familiarity	Moderate familiarity	Limited

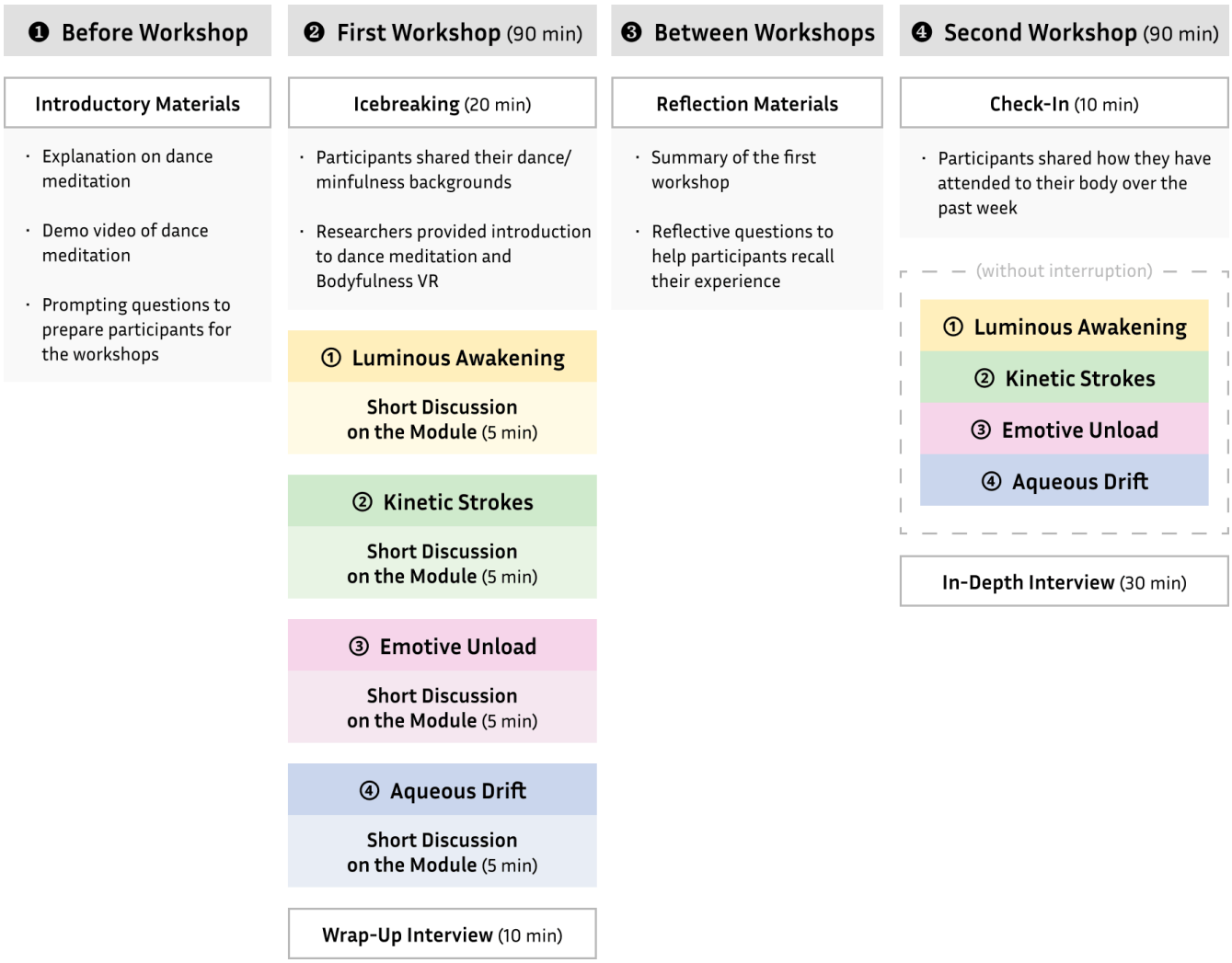

Figure 6: The procedure of the user study

personal engagement. Participants were also asked to wear comfortable clothing for the workshop.

The workshop began with an icebreaker where the participant shared their prior experience with mindfulness and body-related activities. We then reintroduced dance meditation, emphasizing that the workshop's goal was not to assess proficiency but to encourage free exploration of VR-integrated somatic meditation. For those unfamiliar with dance, a brief 3-minute free-form dance session with the researchers was offered to build rapport and ease them into the practice.

Next, researchers provided an overview of the Bodyfulness VR program and its four modules. Participants then began the meditation session. Before each module, a brief orientation to its focus and interaction flow was provided. Once the participant was equipped with the headset and controllers, researchers moved to the monitoring room. After completing each module, participants took part in a short interview about their initial impressions and any experiences that stood out during the module. Breaks were provided as needed between modules. After completing all four modules, the first workshop concluded with a wrap-up discussion in which participants reflected on their overall experience.

6.2.3 Second Workshop. Between the two workshops, participants received reflective materials that included a summary of their first session with screenshots from each module, and prompts to recall their experience (e.g., *"In the past few days, has anything in your daily life made you reflect on your body or movements?"*).

The second workshop began with a brief reflective conversation about participants' bodily awareness over the past week. Unlike the first workshop, participants proceeded to experience all four modules continuously and at their own pace, with the option to take breaks between modules. The researchers remained in the monitoring room throughout this uninterrupted process.

After completing all four modules, we conducted an in-depth interview in which participants reflected on differences in their experiences across the two workshops, including changes in bodily awareness, the overall meditative flow, and how different modules were experienced within the continuous sequence. Participants also discussed how the Bodyfulness VR experience might shape their future mindfulness practices, as well as perceived opportunities and limitations of VR-supported somatic meditation. Upon completion, participants received 60,000 KRW (equivalent to 45 USD).

6.3 Data Analysis

We analyzed the user study data using thematic analysis [5]. After transcribing the interviews across two workshops, researchers collaboratively open-coded the data, documenting codes alongside illustrative excerpts (e.g., quotes, video segments) in a shared document. Codes were iteratively reviewed in weekly meetings to identify recurring patterns, which were then clustered using an affinity diagram. Through this process, several key dimensions of participants' experience emerged, including changes observed across the two workshops, differences between novices and experienced practitioners, the role of VR familiarity, and the broader impact on how participants described shifts in their relationships with their bodies, mindfulness, and VR.

7 FINDINGS

In the user study, we explored how participants with diverse dance, meditation, and VR backgrounds interacted with the Bodyfulness VR system and how these interactions shaped their somatic experiences. Consistent with the exploratory aims of the study, our analysis attended to moments where VR interactions meaningfully engaged or complicated somatic meditative experiences, while remaining open to unexpected narratives and usage patterns that emerged through participants' engagement. In this section, we first illustrate participants' initial interactions with each module during the first workshop. We then turn to their experiences of engaging with the modules as a continuous, uninterrupted meditative flow in the second workshop, highlighting how these experiences shifted and accumulated across repeated encounters.

7.1 First Workshop: Initial Experiences with Each Module

In the first workshop, participants experienced each module separately. This section details their initial encounters, focusing on how participants responded to virtual guidance, visualization effects, emotional bodily engagement, and the surrounding environment.

7.1.1 Virtual Fireflies Provided Guidance but Induced Outward Attention. For participants with limited dance experience, the concept of dance meditation initially triggered apprehension. As P1 admitted, *"I have no confidence. I know I'm a born bad dancer."* This sentiment carried into the first module, where these participants reported feeling *"awkward"* (P6) and *"pressured"* (P8) to move their bodies freely. In this context, they noted that the virtual fireflies provided intuitive physical guidance that helped initiate movement (P4, P6-8). P6 reflected, *"I was really awkward at first, but I started trying some movements, like touching the fireflies with just one arm, or reaching the ones to the side. It felt like they were guiding me the way."* Participants explained that these interactions lowered the initial barrier to dance meditation by reframing it into a *"fun quest where [they] just had to hit a target"* (P7).

However, some participants reported that the fireflies redirected their attention away from internal bodily awareness toward external stimuli. The novelty and interactivity of the VR environment drew attention outward for some participants (P1–3, P8). As P3 described, *"Since I haven't tried VR much before, I was mostly just amazed by everything. I kept thinking, 'Wow, the fireflies lit up. This is cool!'"* Some participants pointed out that the haptic and auditory feedback of the fireflies came to function as a form of reward, prompting them to focus on *"chasing after them"* (P8). As attention increasingly oriented toward these external cues, the experience became more task-oriented and game-like, with participants focusing on hitting targets rather than attending to their own somatic sensations (P1, P5–7, P12). As P1 critiqued, *"Dance meditation is supposed to be about paying attention to my own movements, but instead, I was so focused on the fireflies that I couldn't feel my body."* This external focus often narrowed movements to simple, repetitive gestures such as raising their hands to follow and touch the fireflies (P1; see Figure 7), which some participants with dance experience found frustrating (P2, P10, P12) due to limited freedom for expressive movements.

Figure 7: A novice dance meditator's limited movements (P1)

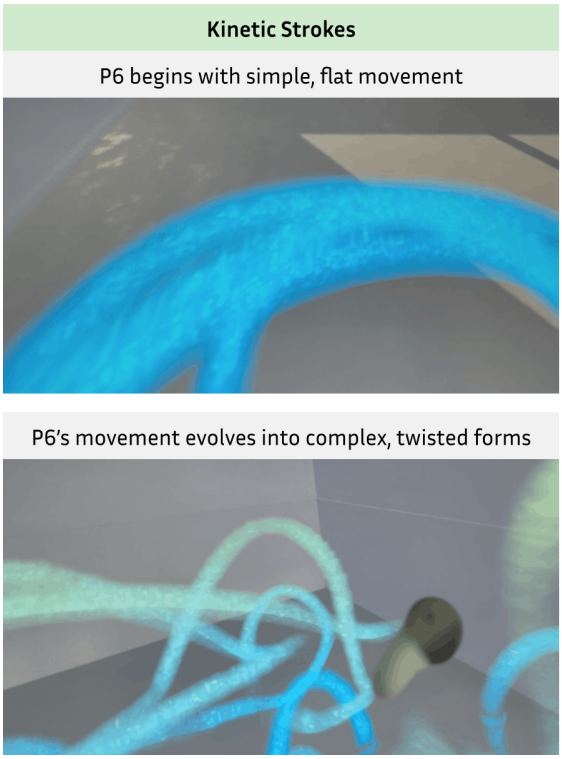

Figure 8: P6's movement progression from simple (top) to complex (bottom) in Kinetic Strokes of the first workshop

In sum, while the virtual fireflies helped novices overcome initial hesitation and initiate movement, they also redirected attention outward, shifting focus from internal bodily awareness to task-oriented interactions and external stimuli. This contrast points to a recurring design tension between supportive guidance and attentional redirection: interactive elements that lower barriers for newcomers may simultaneously undermine the inward focus essential to meditative practice.

7.1.2 Visualization Effects Elicited Self-Directed Movement Exploration. Compared to the first module, the majority of participants reported feeling less task-oriented and more self-directed in the second module. P2 reported that *"it felt like [she] was actively leading"* her own movements. This increased sense of agency led to more expansive, fluid movements, with many participants favoring the second module as the *"one with more freedom"* (P8).

Participants emphasized that real-time visualization effects were central to this experience. In particular, they noted that the visualized trails helped them become more aware of their movements. P5 commented, *"The trajectory really helped me notice how I was twisting my body and bending my hand."* Building on this awareness, participants began extending and varying their movements by *"layering new gestures on top of [their] past trajectories"* (P3). For instance, after noticing that his motion trajectories were *"flat"*, P6 *"added more gestures"*, creating more complex, twisted patterns (see Figure 8). Moreover, some participants further experimented with their movements by *"mingling with the trails,"* using their entire body as if *"moving through them, touching them, and being surrounded by them"* (P7). During these moments of immersive exploration, some participants described a diminished sense of bodily boundaries. P7 reflected: *"it felt as if my body's boundaries were fading. It was truly meditative."*

As colorful trails filled the space, participants experienced a sense of completion and satisfaction. P4 expressed, *"Just seeing the visuals felt calming, and I felt proud to have created something so substantial."* Some perceived these visualizations as embodied extensions of themselves. P10 reflected, *"It felt like I was co-present with my virtual self."* This process supported moments of self-discovery, as P12 noted, *"I got to understand myself a bit better. Looking at the lines I'd drawn, I realized I am quite timid."*

However, while this freedom facilitated a meditative state for some, the absence of explicit guidance was overwhelming for participants new to dance, eliciting self-consciousness and performance-related pressure. P11 shared, *"It felt awkward and somewhat embarrassing to move on my own. The word 'dance' made me feel like I had to do something beautiful or professional."*

In summary, the visualization effects supported self-directed and reflective engagement for many participants, while the same openness intensified feelings of self-consciousness and pressure for those with limited dance experience.

7.1.3 Lack of Emotional and Kinetic Connection with the Virtual Mass Caused Disengagement. In the third module, the majority of participants (P1-3, P7, P10, P12) reported difficulties in achieving emotional release due to a limited sense of emotional and bodily

connection with the virtual mass. Many noted having "insufficient time" (P1) to form a connection with the mass as a representation of their emotions. As P7 explained, *"I didn't really feel like I became one with the emotion"* (P7). As a result, the process was described as *"forced and awkward"* (P12).

In addition, some noted that their movements were not consistently reflected in how the virtual mass morphed or burst (P8, P10). This perceived mismatch between bodily movement and system response made the experience feel *"frustrating rather than liberating"* (P3). Consequently, for most participants, this module became a mechanical task of melting and bursting the mass, rather than serving as a somatic channel for emotional release. As P7 shared, *"It was more like figuring out how to burst the lump, almost like playing a game rather than dancing."*

In summary, limited emotional resonance, combined with mismatches in movement responsiveness, led participants to experience the module as task-oriented rather than reflective, thereby constraining its potential as a meditative experience.

7.1.4 Virtual Embodiment and Immersive Environment Facilitated Meditative Focus. In the fourth module, most participants reported quickly orienting themselves toward the experience of embodying a floating jellyfish. P11 described, *"I lifted my arms and they really looked like jellyfish tentacles. So, my movements started to flow out naturally. I just flowed with the waves, without any stiffness, carried by the sound of water."* Mirroring the jellyfish, most participants engaged in slow, fluid movements, such as gently waving their arms (see Figure 9) or lying down completely in a relaxed posture. Participants described these movements as soothing, helping them *"calm down"* (P10) and *"empty [their] mind"* (P6). Furthermore, some participants described a feeling of *"becoming one with nature"* (P1) as if *"[they were] part of the vast ocean"* (P9).

Figure 9: Relaxed swaying in the first workshop (P11)

Some participants highlighted that VR's visual imagery induced immersion more intuitively than verbal instructions. As P7 noted, *"Telling someone, 'Imagine you're a jellyfish in the ocean,' is less effective than actually showing it. Visualizing makes immersion much easier and more intuitive."* In this way, several participants (P2, P4-5, P7-8, P12) reported that the immersive environment helped them sustain attentional focus, particularly when they had found traditional static, seated meditation difficult due to "*distracting thoughts*" (P5), "*external stimuli*" (P7), or "*drowsiness*" (P8). As P5 explained, *"It was much easier to clear my mind in VR because I could simply focus on the immersive environment to block out many things that could trigger unwanted thoughts."*

However, participants with prior VR experience faced unexpected friction in adapting to the unconventional navigation mechanics of the virtual jellyfish. P8 explained his confusion: *"At first, it felt a bit frustrating. I wasn't sure whether to follow it with my gaze or move my arms. So it felt like I had little control."*

In summary, the immersive VR environment and virtual embodiment enabled participants to enter a meditative state and sustain focused attention, though some initially struggled with unfamiliar navigation mechanics.

7.2 Second Workshop: Deepening Experiences in Continuous Meditative Flow

The first workshop elicited a range of initial responses when participants engaged with individual modules. In the second workshop, participants experienced the four modules consecutively as a continuous meditative flow. This shift allowed us to examine how participants experienced our modular VR program as a whole, how familiarity shaped their bodily engagement, and where tensions persisted even within a continuous flow.

7.2.1 Participants Established a Cumulative, Self-Directed Meditative Flow Across Modules. Experiencing the modules in a continuous sequence shifted how participants engaged with the system, allowing them to approach the session as an unfolding meditative journey rather than a series of discrete activities. In the second workshop, many participants (P1, P3-4, P6-7, P9-10) reported that the uninterrupted flow enabled them to regulate their own pacing and intensity of movements. For instance, P10 reflected that, unlike the first workshop where he followed each module as a discrete step, the uninterrupted sequence allowed him to attune to his bodily state and movement flow, drawing on narration and VR elements selectively, only when they felt relevant in the moment. This change led participants to describe Bodyfulness VR less as a directive guide and more as a background that supported self-led practice, as P6 commented: *"The movement was entirely mine. The narration was helpful but not essential. I could use it or just move the way I wanted."*

With greater control over pacing and transitions, participants were able to build a cumulative flow across the four modules. As a result, participants who had struggled with emotional release in the

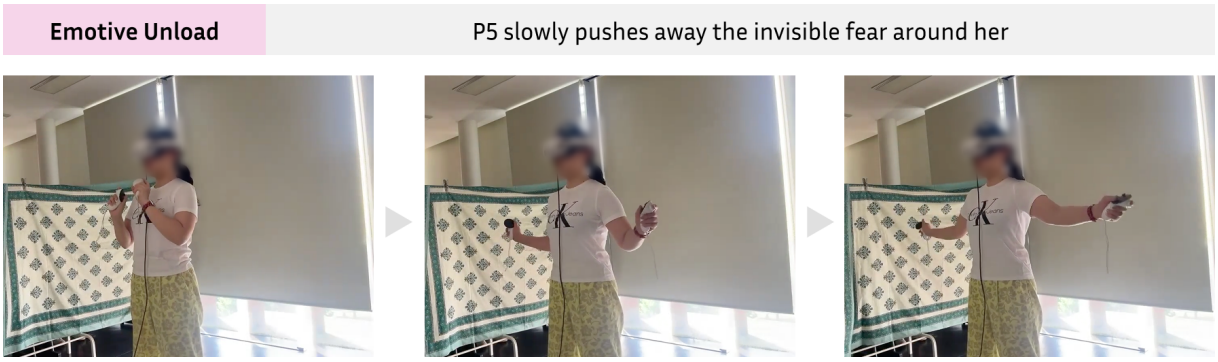

Figure 10: P5's slow, deliberate gesture of pushing away fear in the second workshop

third module reported processing their emotions more effectively in the second workshop. P7 shared, *"Experiencing the modules without interruption helped things to build up. The preceding modules with the fireflies and movement brush created a natural flow. So by the third module, this emotional build-up made the intense movements feel much smoother."*

Consequently, interactions became more authentic, guided increasingly by internal sensations accumulated across the modules rather than by immediate system cues. For example, P5 shared that facing her fear in the third module, she *"felt heaviness in [her] body, as if the fear was wrapping around [her] body like a chain."* To address this, she began *"pushing away"* the invisible weight (see Figure 10). After the *"fear loosened a bit,"* her movements shifted to throwing, as she began to see the mass as *"the emotion of fear, and felt like [she] could burst it."* As the mass melted away over time, her body *"felt lighter"* as if *"the emotion was released."* For some (P6, P10–11), these moments foregrounded a closer awareness of how bodily movement and emotional experience became intertwined.

However, a few participants suggested that the VR experience could further adapt to the personalized meditative rhythms of each meditator. As P3 commented, *"The fireflies encouraged me to wake my body up, but I wasn't ready yet. I had just entered the space and needed more time to settle in. It felt a bit fast for me."*

Overall, the uninterrupted sequence enabled participants to establish a self-directed flow, in which movements and emotions accumulated across modules rather than being repeatedly reset. This finding supports the value of the modular yet temporal structure.

7.2.2 Familiarity with VR-Supported Dance Meditation Enabled Deeper Movement Experimentation. Within this continuous flow, most participants reported heightened focus on their bodies as the novelty of VR faded, interaction mechanics became familiar, and repeated practice reduced self-consciousness and awkwardness. P1 reflected, *"Last time, I was captivated by the spectacle and felt frustrated because my movements didn't translate as I expected. This time, I already knew what to expect, so it was easier to focus inward on my body's movements. Since it was my second time, I could focus more on moving. I didn't overthink. I just expressed through my body."*

This heightened bodily focus opened space for many participants to further experiment with movement and sensation. P3 described his playful sensory exploration with the unique physics of the virtual ocean in the fourth module, such as rising to the surface and *"dropping down, like on a roller coaster."* Such exploration deepened immersion for many participants. P3 felt his body *"gently rising, as if floating,"* while P7 felt *"swimming through currents, with seaweed brushing against [her] face."* Engaging with these sensations prompted deeper bodily awareness. As P10, a professional dancer, reflected: *"I could feel which body parts were stiff and which were more flexible than I expected. The feeling of my body was so new. I was shocked and asked myself, 'Did I really know my body so little?'"*

Furthermore, most participants exhibited a wider range of expressive movements in the second workshop. For instance, P6 shared how he expanded expressive movements using the virtual fireflies: *"Last time I just swiped the fireflies with one hand, but today I scooped them with both hands, bounced on my knees, and tried moving differently."* Engaging in these new movements shifted how some participants related to their bodies, moving away from viewing the body as *"something that needs constant management"* (P7) toward appreciating spontaneous movement. P7 remarked, *"Rather than analyzing [my] movements, the feeling of just moving without thinking was really good."* P11 added, *"I realized I've never really danced. But VR experience today made me think that I need to be more flexible, both physically and mentally."*

As participants grew more confident in their movements, they expressed a desire for greater agency and more flexible interactions. For instance, in the third module, P3 imagined *"touching [the virtual mass] directly and bursting it with a tap,"* while P7 envisioned *"being inside the lump or having it stick to [her] body."* Similarly, some participants looked for more room for bodily exploration, commenting that the guided instructions felt *"repetitive and boring"* (P4) as their proficiency increased. P3 critiqued, *"In the first workshop, the narration was helpful, but during the second workshop, I just wanted to spend more time doing the meditative activities myself."*

Accordingly, some participants suggested that VR should initially support beginners' engagement, then gradually recede to allow more self-directed exploration as users become familiar with the experience, echoing principles of scaffolding, in which initial support gradually recedes as users gain confidence and familiarity [72]. P8 described VR as a *"stepping stone"* to lower the initial barriers to dance meditation, with the ultimate goal of helping people to *"move freely on their own."* Similarly, P3 recommended, *"It would be better to have a brief tutorial for beginners and additional sessions for returning users, with less guidance."*

In summary, repeated practice and increased familiarity with VR-supported dance meditation enabled participants to focus on their bodies and explore a wider range of movements and sensations. This progression—from external fascination to internal awareness, and from constrained gestures to expansive exploration—highlights the value of adaptive support that gradually recedes as users develop confidence and skill.

7.2.3 Effortful Movements Increased Unwanted Self-Consciousness. Despite the sense of continuity and increased familiarity described above, several participants reported moving with greater intentionality in the second workshop, engaging their bodies more actively. For example, P11 reflected, *"This time I tried to pay more attention. Last week I tended to use smooth movements, so this week I focused on twisted and ragged movements."* This intentionality was particularly evident in the second module, where participants aimed to produce varied movement trajectories, drawing on their memory of the visualized trails from the first workshop. P4 shared, *"Last time the trails felt sparse, which left me unsatisfied. So this time I moved around more, using my legs and lower body. Trails were packed in more densely, like proof of how much I had moved."*

However, this deliberate effort sometimes heightened self-consciousness and interfered with immersive engagement. P4 reflected, *"The first workshop felt more meditative because I was just following along. This time I actively managed the experience, which made it feel less immersive."* Similarly, P5 noted that effortful movements created a sense of artificiality: *"I tried to focus more on how I was moving, but I was doing it with this mindset of 'I have to feel this' instead of just feeling it naturally. It ended up feeling less immersive."*

To summarize, conscious efforts to control and diversify movement—often shaped by attending to recorded and remembered visual traces of prior actions—sometimes heightened self-consciousness and disrupted immersion. This tendency became more noticeable as participants revisited the experience and drew on prior sessions to guide their movements. This paradox—where intentional engagement could undermine meditative quality—reflects a core tension in designing for dance meditation, grounded in attending to bodily experience without judgment: while visualizing bodily movement may support awareness and reflection, their accumulation over time can also invite evaluative thinking that shifts attention toward monitoring and managing performance.

8 DISCUSSION

In this study, we explored how VR could be engaged as a medium for dance meditation—a practice characterized by spontaneous movement, present-moment awareness, and non-judgmental bodily engagement. Through design workshops with experienced practitioners, we surfaced four recurring modes in dance meditation—bodily awareness, movement exploration, emotional release, and physical relaxation—that commonly appeared across practitioners' meditative journeys. Rather than functioning as a fixed sequence, these modes reflected recurring forms of somatic engagement that practitioners moved between over time.

Building on this understanding, we developed Bodyfulness VR as a design probe to examine how dance meditation might be encountered, supported, or complicated when enacted through VR and investigated participants' experiences through a user study. Across the study, participants' accounts revealed a range of tensions and possibilities that emerged through repeated and continuous engagement with the system.

In the following sections, we interpret and synthesize our findings into design implications organized around three recurring considerations that emerged in supporting dance mediation in VR: (1) creating environments that support active bodily exploration, (2) designing interactions that encourage movement without compromising mindful bodily engagement, and (3) accommodating individual differences in proficiency and meditative flow.

8.1 Designing VR as a Playground for Mindful Bodily Exploration

Prior studies on VR-supported meditation have focused on teaching specific mindfulness skills through guided sessions. As a result, users often remained passive, with environments serving primarily as calming backdrops and virtual objects functioning as static anchors of focus or visual representations of physiological states [18]. While research on VR exergames and social dance has demonstrated VR's capacity to support bodily activity and reduce self-consciousness [57], supporting meditative movement presents distinct challenges: the goal is not performance, exertion, or social interaction, but sustaining mindful awareness through bodily movement. This requires design strategies that encourage active bodily engagement without pulling attention toward external goals or evaluative outcomes.

Below, we outline design considerations for leveraging VR as an open-ended space for mindful bodily exploration—one that invites movement while preserving the inward, non-judgmental orientation central to dance meditation.

8.1.1 Encouraging Sensory Exploration Through Immersive Environments. In the Aqueous Drift module, participants' engagement was strongly shaped by the immersive qualities of the virtual environment. In particular, the underwater setting—with its slow movement, enveloping soundscape, and altered sense of gravity—encouraged participants to attend to subtle bodily sensations. Several participants described exploring buoyant, drifting, or weightless movements that felt qualitatively different from their everyday bodily experience, and reported that these sensations supported relaxation and sustained meditative focus. This aligns with ideas raised in the design workshops, where dance meditators emphasized environments that evoke felt sensory experiences rather than relying on visual immersion alone. Prior work similarly suggests that unfamiliar or altered physics in VR can open up novel bodily sensations that are difficult to access in everyday contexts [2, 65].

These findings suggest that immersive environments can play an active role in shaping somatic attention during dance meditation. Rather than serving as visual backdrops, sensory-rich environments may function as experiential conditions that invite users to notice, explore, and dwell in bodily sensations. Importantly, the distinction from entertainment-oriented VR lies in intentionality: environments should be designed to direct attention inward rather than toward external spectacle.

8.1.2 Fostering Meaningful Connections with Interactive Virtual Objects. In the Emotive Unload module, participants' engagement

Table 3: A summary of the design implications for VR-integrated somatic meditative experiences

Implication	Guidelines	Strategies
VR as a playground for mindful bodily exploration	Encourage sensory exploration through immersive environments	• Provide multisensory environments to elicit embodied immersion beyond visual spectacles. • Introduce unfamiliar physics to encourage bodily experimentation in virtual space.
	Foster meaningful connections with interactive virtual objects	• Use virtual objects that users can actively interact with to facilitate physical movement and somatic expression. • Allow users to form affective and somatic connections with virtual objects.
	Leverage alternative embodiment to elicit movement exploration	• Use unfamiliar or non-human embodiment to prompt new movement qualities.
Active movement without compromising mindfulness	Balance between interactive guidance and task-oriented gamification	• Adopt slower interaction tempo to allow sufficient time for mindful bodily exploration. • Use soft, gradual, and subtle feedback to avoid competitive interactions.
	Adopt non-evaluative interaction design to avoid self-consciousness	• Use soft, abstract feedback and avoid elaborate visual effects that resemble performance metrics. • Use fading effects instead of persistent visualizations to emphasize process over outcome.
Accommodation to users' proficiency and meditative flow	Support a shift from guided engagement to self-directed exploration	• Provide structured guidance for beginners. • Gradually reduce intervention to allow freer exploration for experienced users.
	Unfold the session according to users' meditative flow	• Support users to move at their own rhythm rather than imposing a rigid structure. • Allow users to adjust the pacing and progression of their dance meditation sessions.

with the virtual mass revealed both the potential and the limitations of interactive virtual objects in dance meditation. During initial encounters, many participants struggled to relate the mass to their own bodily or emotional experience, often treating it as an unfamiliar object rather than an extension of their movement. Furthermore, some participants even became strongly focused on the act of bursting the mass, approaching the interaction in a clearly purpose-driven manner.

However, with repeated exposure in the second workshop—after bodily engagement had already been built up through preceding modules—some participants began to form a more meaningful connection with the mass. After participants had become more familiar with the system and had built up bodily engagement through the preceding modules, some participants began to relate to the mass differently. Rather than focusing solely on bursting it, they described attending to how the mass responded to the intensity, rhythm, or quality of their movements. In these moments, the interaction shifted away from a purely purpose-driven action toward a more exploratory and expressive engagement, where the mass functioned as a material presence that moved with the body rather than an object to be controlled. This transition resonates with ideas raised in the design workshops, where dance meditators envisioned virtual objects as elements to move with or physically relate to during meditation.

Taken together, these findings suggest that interactive virtual objects can expand beyond passive feedback to support somatic exploration [74], but meaningful connections do not arise immediately. Instead, such connections tend to emerge gradually as users move beyond goal-oriented interaction and develop familiarity with how objects respond over time. Crucially, this shift depends on whether interactions foster a sense of relational connection, rather than merely providing reactive behavior. In doing so, designers should attend to how virtual objects invite users to feel affected by them, move with them, and gradually build familiarity through repeated bodily engagement. Without such relational qualities, interactive objects risk turning embodied expression into task-oriented interaction and undermining their role in supporting meditative engagement [18].

8.1.3 Leveraging Alternative Embodiment to Elicit Movement Experimentation. In the Aqueous Drift module, participants' movements were strongly shaped by the form of embodiment they inhabited. Embodiment as a jellyfish, with arms rendered as tentacles, encouraged slower, fluid, and wave-like movements that differed from participants' habitual movements. Several participants reported that these movements emerged naturally, without deliberate effort

or instruction, and supported a relaxed, immersive meditative state. Compared to earlier modules, this form of embodiment appeared to reduce self-consciousness and performance-related concerns, allowing participants to move with less evaluative attention.

These observations align with prior work showing that virtual embodiment influences body perception and behavior [18], including the well-documented Proteus effect [14]. Consistent with related findings, adopting unfamiliar or non-human embodiments appeared to help participants detach from everyday bodily habits and explore new movement qualities [38, 57].

These findings suggest that alternative embodiment can serve as a powerful design resource for encouraging movement experimentation in dance meditation. Rather than simply representing the user's body, non-human embodiments may help loosen normative expectations about how one should move, shifting attention away from appearance or correctness and toward felt experience. Designing embodiment that departs from human-centered forms may therefore support meditative movement by enabling users to explore unfamiliar sensations and movement qualities with reduced self-judgment.

8.2 Designing Interactions for Active Movement without Compromising Mindfulness

While VR's interactive and embodied affordances enable rich forms of movement engagement, our findings show that not all forms of interaction are equally compatible with dance meditation. In contrast to immersive environments that shape bodily sensation, interaction mechanics can easily reframe movement as something to be achieved, triggered, or evaluated. In our study, moments of explicit interaction—such as touching objects or leaving visible traces—sometimes redirected participants' attention away from felt bodily experience toward managing outcomes or performance.

This observation extends prior concerns that VR's novelty and interactivity can externalize attention in meditative contexts [4]. In movement-based meditation, this challenge becomes especially pronounced: when interactions foreground responsiveness or visible results, users may drift from mindful movement into task-oriented engagement. As Terzimehi'c [70] notes, designing VR for meditation requires careful calibration, as an external system must guide engagement without becoming the object of attention itself.

Building on these observations, this section focuses specifically on how interaction design can support active movement while preserving inward, non-judgmental awareness.

8.2.1 Balancing between Interactive Guidance and Task-Oriented Gamification. Although interactive instruction can be helpful for novices, overly explicit or salient interaction risks reframing mindful movement as goal-oriented gameplay. For example, in the Luminous Awakening module, several participants exhibited competitive behaviors, actively chasing and touching the fireflies rather than calmly attending to their sensations and movements. In these moments, attention shifted outward toward interaction targets and outcomes rather than inward toward somatic experience.

A core characteristic of meditative practice is the temporary suspension of intention and striving, with attention directed toward the present moment [8]. When interactions foreground external goals or implicit success conditions, inward bodily awareness can be weakened, as attention becomes oriented toward achieving interaction outcomes rather than sensing the body [46].

These observations suggest that, in VR-supported dance meditation, the pacing and salience of guidance require careful calibration. One strategy would be to provide sufficient temporal space between instructions for users to internalize them and practice movements autonomously. Prior studies similarly suggested that slower tempos and reduced interaction density can create room for non-judgmental bodily awareness while reducing task-oriented behavior [10].

Moreover, immediate or explicit reinforcement may inadvertently function as a gamified reward system, encouraging users to seek interaction outcomes rather than attend to experience. To counter this, feedback can be designed in soft, gradual, and temporally diffuse ways [11, 18]. For instance, instead of lighting up instantly upon touch, virtual fireflies in the Luminous Awakening module could glow slowly after a gentle delay, shifting the interaction from reward-seeking to non-striving presence. This approach aligns with prior work on subtle interactions, in which guidance takes the form of gentle nudges rather than salient cues [58].

8.2.2 Adopting Non-Evaluative Design to Avoid Self-Consciousness. Our study also revealed that certain forms of real-time visualization can heighten self-consciousness during repeated engagement. In the Kinetic Strokes module, some participants recalled the motion trails from the first workshop and intentionally attempted to create denser or more visually striking patterns in the second. This shift introduced evaluative and analytical thinking, drawing attention away from immersion and bodily sensation.

While reflective awareness can sometimes enrich somatic exploration, excessive self-monitoring risks undermining the central aim of dance meditation: non-judgmental acceptance of bodily experience. This tension arises when interactions implicitly suggest what counts as a "successful" or "better" movement, encouraging comparison, accumulation, or achievement-oriented thinking [11].

These observations suggest that VR interactions for mindful movement should emphasize process over outcome. Rather than employing explicit, persistent, or visually elaborate representations that resemble performance metrics, designers may consider softer, abstract, and transient visual effects [16, 18]. Such designs may support awareness without inviting evaluation or comparison [19]. Furthermore, allowing visual traces to fade rather than accumulate can reinforce the impermanent, moment-to-moment nature of meditative movement, helping users remain oriented toward lived experience rather than toward producing a lasting visual result.

8.3 Accommodating to the User's Dance Meditation Proficiency and Flow

In our user study, engagement with Bodyfulness VR varied widely in how individuals entered, navigated, and sustained dance meditation over time. While participants interacted with the same set of modules, their experiences diverged depending on prior dance and meditation experience, familiarity with VR and somatic meditative practices, and moment-to-moment bodily states.

Based on these observations, we discuss how VR could be designed to accommodate individual differences and support users'

evolving flow in somatic meditative practices over repeated and continuous use.

8.3.1 Supporting a Shift from Guided Engagement to Self-Directed Exploration. Across the user study, we observed how participants' prior dance experience influenced their engagement with VR-supported dance meditation. Participants with limited dance experience often initially associated "dance" with skill and performance, creating psychological hesitation. In these cases, structured yet embodied guidance lowered entry barriers by enabling movement without having to decide how to move. For example, interacting with virtual fireflies intuitively initiated movement, while the immersive oceanic environment elicited bodily relaxation without requiring explicit technique. These findings suggest that VR may reduce newcomers' barriers by offering interactive and intuitive guidance that redirects attention away from performance concerns and toward embodied engagement.

Meanwhile, experienced dancers favored modules with greater freedom than prescribed guidance, such as the movement-responsive interaction in the Kinetic Strokes module that supported free-form exploration of a wider range of movements. Moreover, across the two workshops, as participants became more comfortable with both the practice and the VR system, they expressed a growing desire for agency, seeking more flexible, less directive interactions and increasingly treating guidance as optional while foregrounding their own bodily sensations and impulses.

These observations suggest that VR-supported dance meditation benefits from a gradual rebalancing of guidance and user agency over time, which reflects a pattern often described as scaffolding [72]: initial support enables engagement, but its role diminishes as users gain confidence and familiarity. In the context of VR-supported dance meditation, this implies designing interactions that initially provide more explicit guidance, then recede into the background for freer exploration as users appropriate the experience [12, 19, 46]. By shifting its role from an active guide to a more supportive medium for open-ended, self-directed exploration, VR could foster users' capacity to practice independently rather than rely on continuous external guidance.

8.3.2 Unfolding the Session According to the User's Meditative Flow. Whereas prior studies on VR meditation have typically focused on specific techniques in isolation, such as breathing [15, 46], attending to bodily sensations [10, 34], or physical relaxation [76], our findings highlight the importance of meditative flow as an experience that accumulates and unfolds over time. In Bodyfulness VR, the four recurring modes in dance meditation—bodily awareness, movement exploration, emotional release, and physical relaxation—served as a shared organizing structure, but were experienced as a flexible container rather than a fixed sequence. Participants moved through this structure with distinct personal rhythms and movement patterns. Some followed the audio guidance closely and maintained continuous movement, while others engaged more selectively with the narration, adjusting their pacing, attention, and movement flow as the session progressed. These differences were not deviations from the practice, but reflected individual ways of sustaining meditative engagement.

Together, these observations suggest that, rather than enforcing a uniform meditative progression, VR-supported dance meditation may benefit from accommodating multiple ways of moving through a session, consistent with prior work emphasizing flexibility in meditative guidance [11, 46]. For example, designs might allow adjustment of pacing or transitions between phases, or revisiting certain movement experiences when users feel the need to linger. Such flexibility may help VR-supported dance meditation remain responsive to individual differences while preserving an overall session structure that supports continuity and meditative flow.

8.4 Limitations and Future Work

This study offers insights into the potential of VR as a medium for somatic meditative experiences, while also highlighting several areas that point to directions for future research.

First, our findings are based on two in-person workshop sessions in which participants engaged with our design probe under researcher facilitation. Although we made efforts to create a comfortable and supportive environment, the presence of researchers and participants' awareness of the study's purpose may have shaped their engagement in ways that differ from everyday practice. Future work could extend this investigation through in-the-wild or longitudinal studies to examine how repeated, self-initiated encounters with VR-supported dance meditation unfold in daily life.

Second, our system was designed for head-mount displays and handheld controllers as the primary interaction interfaces. As VR technologies continue to evolve—particularly in motion tracking [26], wearable sensing [33], and multimodal input devices [42]—future systems could support more nuanced bodily interactions and enable fuller engagement of the entire body beyond the hands and upper torso.

Third, participants in the design workshops were introduced to VR through a short explanatory video rather than direct, hands-on experience. While this approach enabled participation from individuals without prior access to VR, it may have limited participants' understanding of VR-specific affordances such as spatial interaction, embodied navigation, and environmental feedback. The video-based introduction likely shaped participants' initial expectations and constrained how concretely they could imagine VR-based interactions. Future studies would benefit from providing hands-on VR experience prior to ideation sessions, allowing participants to ground their design suggestions in felt, embodied interaction rather than abstract representations of VR.

Fourth, our framework of four recurring modes emerged from a specific participant sample with backgrounds in dance meditation and related practices. While participants represented diverse traditions and experience levels, the framework should not be interpreted as a universal model of movement-based meditation. Rather, it is best understood as a provisional construct that proved useful for guiding our design process. Future research could examine how these modes resonate—or fail to resonate—across different cultural contexts, practice traditions, and individual differences.

Finally, while the user study yielded rich qualitative accounts of participants' experiences, it did not incorporate physiological measures or validated mindfulness assessments. Future work could combine experiential data with complementary quantitative measures to further examine how specific VR design choices influence meditative states.

9 CONCLUSION

Inspired by body-centered philosophical approaches, this study investigated the potential of VR as a medium to support and augment somatic meditative practices. Through design workshops with 17 dance meditators, we identified four recurring modes in dance meditation and collaboratively generated VR design ideas to support this practice. Building on these insights, we developed Bodyfulness VR as a design probe and conducted an exploratory user study with 12 participants from diverse dance and meditation backgrounds. Our findings suggest that VR could lower psychological barriers for newcomers while enriching established dance meditation practices for experienced meditators. At the same time, challenges such as task-oriented behaviors and heightened self-consciousness highlight the importance of carefully balancing VR's interactive affordances with the values of mindfulness, and of supporting meditative processes in ways that respect users' agency, pacing, and evolving bodily attention. Overall, this work contributes empirical insights and design considerations for using VR as a medium for somatic meditation.

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A Appendix

A.1 Interview Protocol for Design Workshop

The following questions guided the semi-structured interviews and ideation sessions during the design workshops.

1. Background & Practice

- Could you briefly introduce yourself and describe the primary technique you use for dance meditation?
- How long have you been practicing dance meditation, and how did you get started?
- What is the primary purpose or reason for your practice?

2. Environment & Context

- When and in what kind of environment do you usually practice?
- How do you choose the music or soundscape? (e.g., mood, tempo, genre)
- Do you use any technology (e.g., apps, devices) to support your practice?

3. Process & Flow

- Could you briefly explain the steps of your practice from beginning to end?
- How do you enter a state of immersion, and how do you finish the session?

4. Body & Movement

- Are there specific body parts you frequently use? Why and how do you use them?
- Do you have specific kinds of movements or patterns you enjoy? (e.g., speed, height, width)
- How do you utilize the surrounding space or objects?

5. Cognitive & Emotional Experience

- What happens internally in your mind during dance meditation? (e.g., thoughts, emotions, focus)
- Have you faced any challenges or difficulties during your practice? How did you deal with them?

6. Teaching Practice (For Instructors Only)

- Who is your target audience, and what kind of classes do you offer?
- How is your curriculum structured, and how do you typically facilitate a session?

7. VR Experience & Ideation

- Are you familiar with VR technology? Have you tried it before?
- (After watching the introductory video) Do you have any questions or initial thoughts about VR?
- (Crazy 4 Activity) Please brainstorm four ideas for VR-supported dance meditation.
- (Idea Development) Elaborate on your chosen idea, focusing on movements, VR effects, environment, and soundscape.

A.2 Design Template for VR Idea Elaboration

This section provides the template used in the design workshops to help participants structure and elaborate their design ideas for VR-integrated somatic meditation.

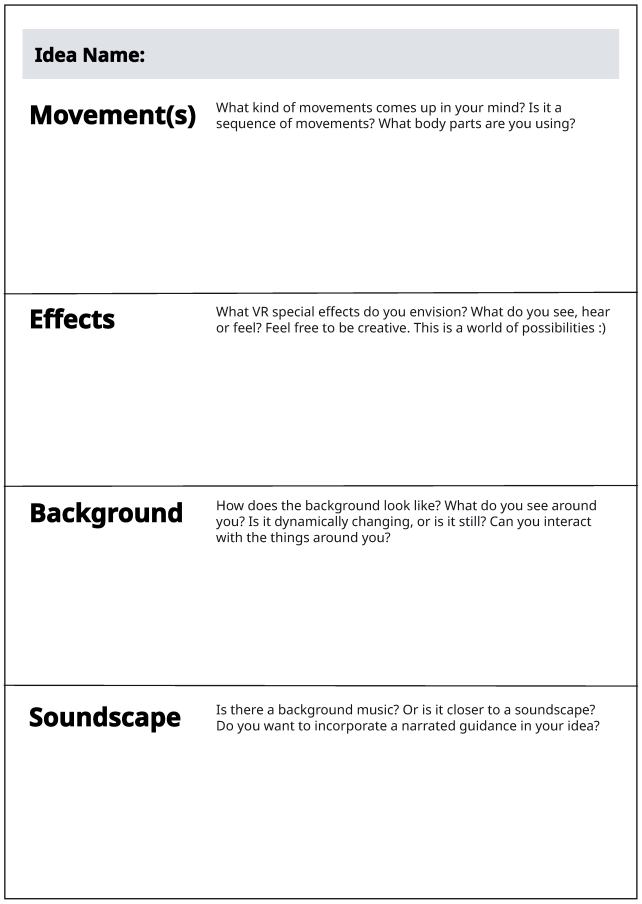


Figure 11: Template for developing VR Idea for dance meditation

A.3 Card Format for VR Design Idea Analysis

This section provides an example of the card format for organizing and analyzing workshop participants' design ideas.

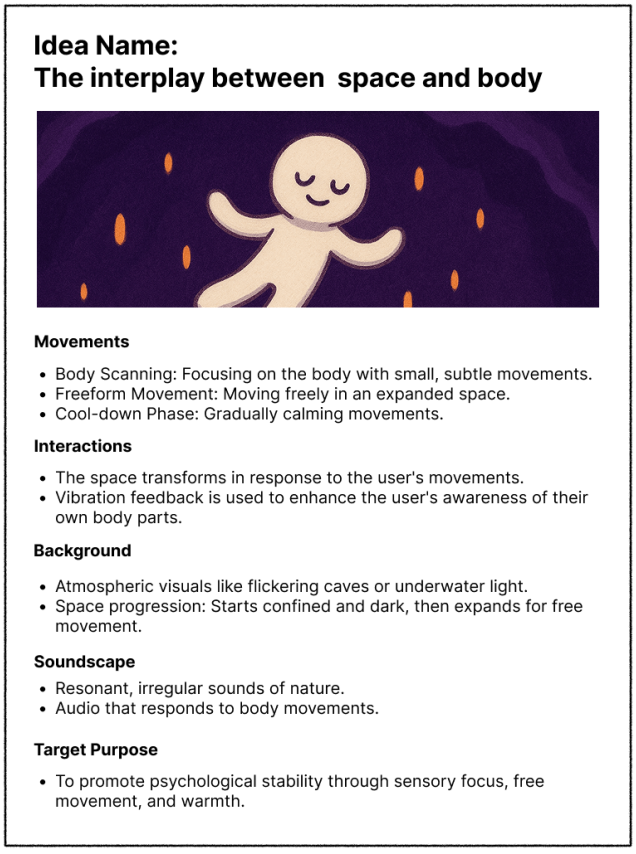


Figure 12: An example of the VR design idea card

A.4 Storyboard from Iterative Design Process

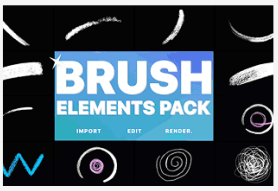
This section provides an example of the storyboard developed during the iterative design process.

Kinetic Strokes: Motion Drawing for Movement Exploration

Main Concept	Visualize movements as colorful strokes; color varies by height, thickness by speed

MVP	Assets
Lines are generated in real time from controller movements. • Faster movements → thicker strokes • Higher movements → brighter/yellow tones • Lower movements → deeper/blue tones	• Brush effects (color, thickness, texture) • Virtual room environment • Music & audio narration

Moodboard

User Scenario

Stage	Pre-stage (30s)	Grounding (1–2min)	Movement (3–5min)	Cool-down (1–2min)	Post-stage (30s)
Visual					
Interaction	Lines are drawn and leave trails based on hand position (trails fade after ~10s) Line thickness varies with hand speed: slower → thinner, faster → thicker Line color varies with hand height: lower → blue tones, higher → yellow tones (with green gradient in between)				
User Action	Breathe deeply and adapt to the virtual environment Settle into presence before movement begins	Slowly open the body (arms, shoulders, waist) Explore gentle, flowing gestures at different heights	Expand gestures into larger, dynamic movements Experiment with torso, legs, and varied qualities	Gradually slow down, reduce movement intensity Pause and look at all the trails in space	Reflect before ending the session
Narration	"Welcome. In this space, express your feelings freely through movement." (...)	"Unfold your body little by little. Raise your arms slowly and draw with your hands." (...)	"Try new movements —bending, twisting, reaching wide." "Let your body ride the rhythm, leaving colorful traces in space." (...)	"Bring your body back to stillness." "Notice the traces you've left—observe them as your movement settles." (...)	"How do you feel now? Relieved, calmed?" "Look back at your movements and reflect on today's emotions." (...)
Sound	Warm ambient sounds				

Figure 13: An example of the storyboard