Inner Horizon: exploration of hybrid reflective VR systems through symbolic interaction and embodied immersion

1. Ala Leresteux *
Self, Berlin, Germany
alaleresteux@gmail.com

2. Jeremy Leresteux
Self, Berlin, Germany
jeremyleresteux@gmail.com

3. Dr. Prateep Beed
Self, Berlin, Germany
prateep.beed@gmail.com

4. Dr. José R. Donoso
Self, Berlin, Germany
j.r.donoso77@gmail.com

This paper presents "Inner Horizon", an interdisciplinary immersive art project situated at the intersection of contemporary artistic practice, virtual reality, and psychologically informed interaction design. Originating from analog artworks and philosophical inquiry into consciousness, the project translates symbolic visual compositions into interactive VR environments, drawing on concepts from Acceptance and Commitment Therapy (ACT), psychological flexibility research, and embodied cognition. Developed through collaboration across artistic practice, immersive technology development, and neuroscientific consultation, the project investigates how hybrid immersive systems may support emotionally meaningful self-reflection and value-oriented engagement.

The project does not function as a clinical intervention. Instead, it investigates how psychologically informed concepts may influence the design of immersive artistic environments situated at the intersection of immersive installation, human–computer interaction, and hybrid physical–virtual experiential design. Particular attention is given to the relationship between artistic symbolism, embodied interaction, and reflective cognition.

Preliminary findings were obtained from 17 participants aged 24-64 years, with a balanced gender distribution, representing diverse demographic and cultural backgrounds and varying levels of prior experience with reflective practices. Participants were recruited in the context of art exhibitions, and informed consent was obtained verbally prior to participation. Data was collected through a post-experience questionnaire combining Likert-scale ratings, multiple choice items, and open-ended questions. Analysis of responses indicated consistently high levels of emotional engagement and perceived meaningfulness, with recurring themes of self-compassion, trust, hope, authenticity, and value-oriented reflection. These findings suggest promising potential for future interdisciplinary research into hybrid reflective-immersive systems that bridge art, technology, and psychologically informed experiential design.

CCS CONCEPTS • Human-centered computing ~ Interaction design • Applied computing ~ Arts and humanities • Human-centered computing ~ Human computer interaction (HCI) ~ Empirical studies in HCI • Applied computing ~ Arts and humanities ~ Media arts • Human-centered computing ~ Human computer interaction (HCI) ~ Interaction paradigms ~ Virtual reality

Additional Keywords and Phrases: Virtual Reality, Hybrid Systems, Human–Computer Interaction, Reflective Technologies, Immersive Art, Symbolic Interaction, Embodied Interaction, Interactive Installations, Experimental VR.

* Corresponding author

1 INTRODUCTION

Recent developments in immersive technologies have increasingly expanded beyond entertainment into fields connected with emotional experience, reflective interaction, hybrid exhibition design, and psychologically informed digital systems [6, 7]. Simultaneously, contemporary human–computer interaction research has shown growing interest in systems that combine physical and virtual interaction, embodied cognition, emotional engagement, and reflective participation [1, 2]. Hybrid immersive environments integrating tactile interaction and symbolic spatial design create possibilities for forms of engagement that move beyond passive spectatorship or gamified interaction.

"Inner Horizon" emerges within this interdisciplinary context as an experimental hybrid immersive system combining VR immersion, symbolic physical interaction, analog artistic practice, and psychologically informed reflective structures. The project is the result of an interdisciplinary collaboration between an artist, neuroscientists, and a developer to explore how immersive symbolic environments may support emotionally meaningful experiential engagement.

"Inner Horizon" investigates VR immersion as a contemplative medium that supports self-reflection, emotional processing, and symbolic interpretation. The project additionally explores hybrid interaction between physical and virtual spaces. During the experience, some participants interact not only with virtual environments but also with symbolic physical objects introduced by facilitators. These objects correspond directly to abstract values and symbolic concepts represented within the VR environment itself, creating continuity between embodied tactile interaction and immersive virtual symbolism.

Although "Inner Horizon" draws inspiration from concepts associated with Acceptance and Commitment Therapy, psychological flexibility research, embodied cognition, and reflective practice, the project does not function as a therapeutic intervention. Instead, it translates selected concepts into an artistic and experiential framework concerned with meaning-making, values, symbolic interaction, and emotional engagement.

Preliminary participant findings already indicate emotional and reflective engagement. Across 17 collected responses, participants frequently described connection to self, emotional openness, increased clarity, self-compassion, trust, discipline, hope, and value-oriented reflection. The project therefore contributes to ongoing discussions surrounding hybrid immersive systems, reflective technologies, embodied interaction, immersive exhibition design, and psychologically informed HCI practices.

2 METHODS

2.1 Scientific foundation

The scientific framework of the project draws inspiration from Acceptance and Commitment Therapy (ACT), theories of psychological flexibility, embodied cognition, and contemporary research concerning immersive therapeutic environments. Rather than reproducing therapeutic protocols directly, the project translates selected conceptual principles from these fields into an artistic and experiential framework concerned with reflection, values, perception, and emotional engagement. Hayes [5] conceptualizes psychological flexibility as the capacity to remain in contact with present-moment experience while acting in accordance with personally meaningful values. This principle constitutes a central structural element of the "Inner Horizon" experience and informs the project's focus on values-based reflection and integration.

Research concerning VR-based psychological interventions further informs the project's development. Emmelkamp and Meyerbröker [3] demonstrate the growing relevance of immersive systems in mental health contexts, particularly regarding exposure, emotion regulation, embodiment, and experiential learning. Slater and Sanchez-Vives [7] further argue that VR environments can generate powerful perceptual and emotional responses through presence and embodiment, enabling forms of experiential engagement not accessible through traditional media.

The project is additionally informed by work concerning embodied cognition and situated interaction. Dourish [2] emphasizes the importance of embodiment within human–computer interaction, suggesting that meaning emerges not only cognitively but also through situated bodily engagement with environments and objects. This perspective is particularly relevant to "Inner Horizon", where physical tactile objects are intentionally incorporated into the experience as embodied anchors for abstract psychological values.

ACT-related meta-analytical works, such as Gloster et al. [4] and Twohig and Levin [8], support the relevance of value-oriented reflective processes within emotionally significant contexts. Emerging research concerning psychedelic-assisted therapy and post-experience integration further contextualizes the project's focus on emotionally heightened states, psychological flexibility, and meaning-making processes as seen in Watts and Luoma [9].

The project is also informed by research on presence, embodiment, immersive art, and human–computer interaction. Rather than emphasizing gamification or narrative progression, the system positions symbolic interaction and reflective engagement as the primary mechanisms of experience.

2.2 System design

"Inner Horizon" is the first operational prototype in a larger planned trilogy of immersive, reflective environments. The project combines immersive VR environments, symbolic object interaction, facilitated integration dialogue, and psychologically informed experiential structures.

Participants navigate abstract symbolic spaces inspired by analog paintings developed specifically for the project. These environments contain symbolic objects, shifting environmental states, and emotionally suggestive visual compositions intended to encourage reflection and immersion.

The experience incorporates physical symbolic objects provided by facilitators during the session. Participants interact with the objects while immersed in the virtual environment, creating continuity between embodied physical interaction and virtual symbolic meaning.

2.3 Development process

The development process begins with analog artistic creation. Symbolic paintings and conceptual structures informed by philosophical, emotional, and psychological themes serve as the foundation for immersive environments.

The conceptual framework emerged through interdisciplinary collaboration between artistic, technological, and neuroscientific perspectives investigating immersive reflective systems. This collaboration informed the project's reflective architecture and participant experience design.

The immersive environments were developed using a workflow that combined Blender-based environmental modeling and Unity implementation for Meta Quest platforms. Attention was given to preserving continuity between the analog visual language and the interactive spatial experience.

2.4 Participants and procedure

The project was evaluated through exploratory, exhibition-based testing sessions involving voluntary participants. Informed consent was obtained verbally prior to participation. The interaction with the immersive VR environment was followed by a structured post-experience questionnaire. It included 17 items combining Likert-scale ratings, multiple-choice selections, and open-ended responses, addressing emotional engagement, perceived meaningfulness, value resonance, sense of connection, perspective shifts, emergent insights, and intended future actions. The complete questionnaire is provided in Appendix A.

The preliminary dataset consisted of 17 participants' responses collected during exhibition demonstrations and facilitated sessions. Figure 1 illustrates participants experiencing the VR environment individually using Meta Quest systems, both with symbolic physical objects introduced during the immersive session (a) and without them (b). Following the experience, participants completed questionnaires designed to evaluate emotional engagement, meaningfulness, perspective shifts, symbolic resonance, perceived helpfulness, and post-experience reflection.



(a) (b)

Figure 1. Participants experiencing the VR environment (a) with and (b) without symbolic physical objects.

Participants represented diverse demographic and cultural backgrounds. Figure 2 shows the age and gender distribution of participants, corresponding to questions Q2 and Q3. In question Q5, many reported previous engagements with meditation, mindfulness, therapy, coaching, or personal development practices, although prior experience with reflective practices varied considerably across the sample.

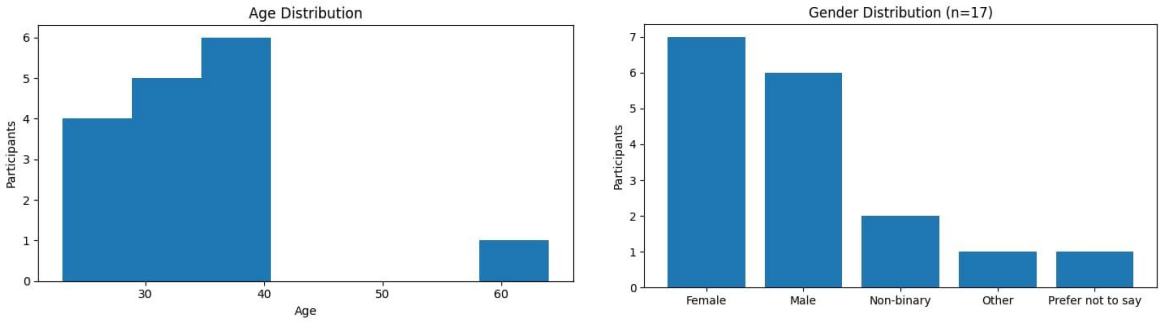


Figure 2. Age and gender distributions of participants.

2.5 Data analysis

The collected data was analyzed using a mixed qualitative and quantitative approach. Quantitative responses were used to identify recurring emotional and reflective patterns, while qualitative responses were reviewed through thematic analysis focusing on recurring concepts, values, emotional responses, and behavioral intentions.

The analysis was not intended to establish clinical efficacy but rather to examine whether the system successfully facilitated meaningful reflective engagement and emotionally resonant interaction.

3 RESULTS

3.1 Emotional engagement

Participants generally reported high emotional engagement throughout the experience. Most responses to question Q7 were clustered between 4 and 5 on a 5-point scale.

As depicted in Figure 3, the most frequently reported emotional states included:

- curiosity and openness,
- calmness and groundedness,
- emotional warmth,
- connection,
- and reflective awareness.

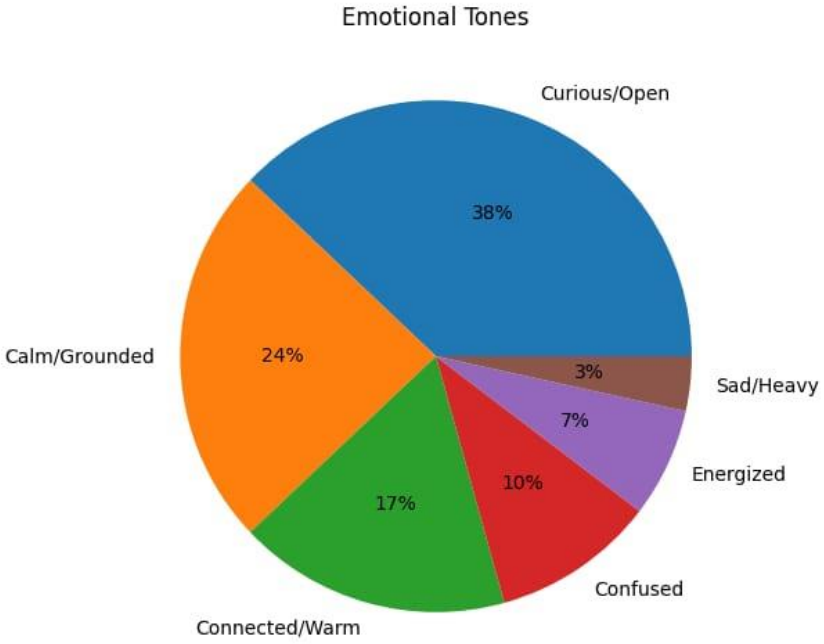


Figure 3. Dominant emotional tones reported by participants.

Fewer participants reported confusion or uncertainty, suggesting that the experience occasionally generated ambiguity alongside reflection. This variability is important because it indicates that symbolic immersive environments may be interpreted differently depending on individual expectations, emotional readiness, and previous experience with reflective practices.

3.2 Meaningfulness and perspective shift

Most participants evaluated the experience as meaningful or significant, as Figure 4 suggests. Across the questionnaires, recurring reports included:

- increased self-awareness,
- greater emotional clarity,
- increased self-compassion,
- emotional distance from intrusive thoughts,
- and stronger awareness of personal values.

Several participants additionally described intentions connected to future behavioral change.

One participant described the experience as helping them:

> "get the discipline to continue to work for my goals while staying relaxed and gentle with myself."

Another participant emphasized:

> "love, kindness, self-respect, trust, hope."

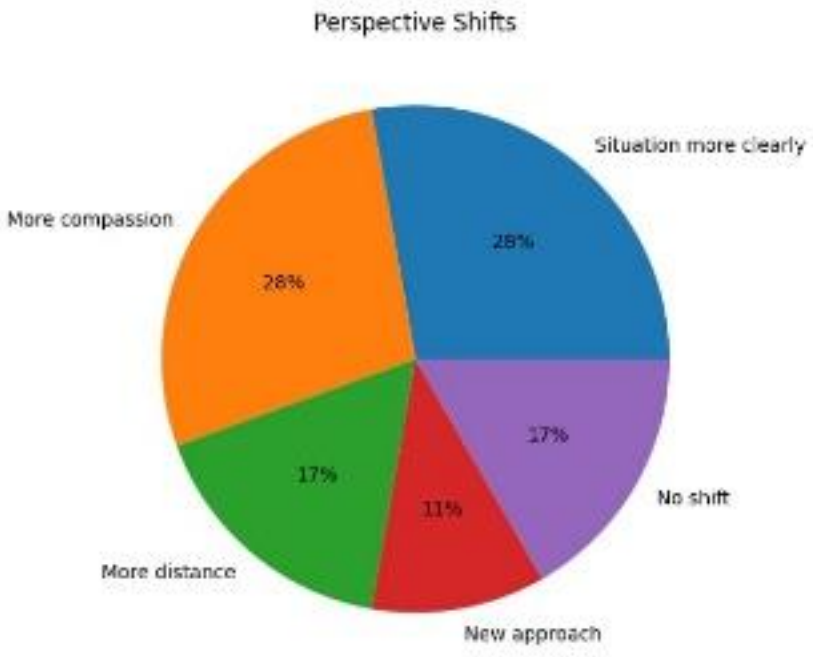


Figure 4. Reported perspective shifts.

The findings suggest that participants frequently interpreted the experience not merely as a virtual environment but as an opportunity for reflection on personal situations, values, relationships, and future actions.

3.3 Sense of connection

Figure 5 shows the reported type of connection, with “Connection to self” emerging as the dominant category throughout the dataset.

Participants additionally reported:

- connection to others,
- connection to life or the world,
- connection to personal values,
- and connection to something larger than themselves.

Only a minority of participants reported no significant sense of connection.

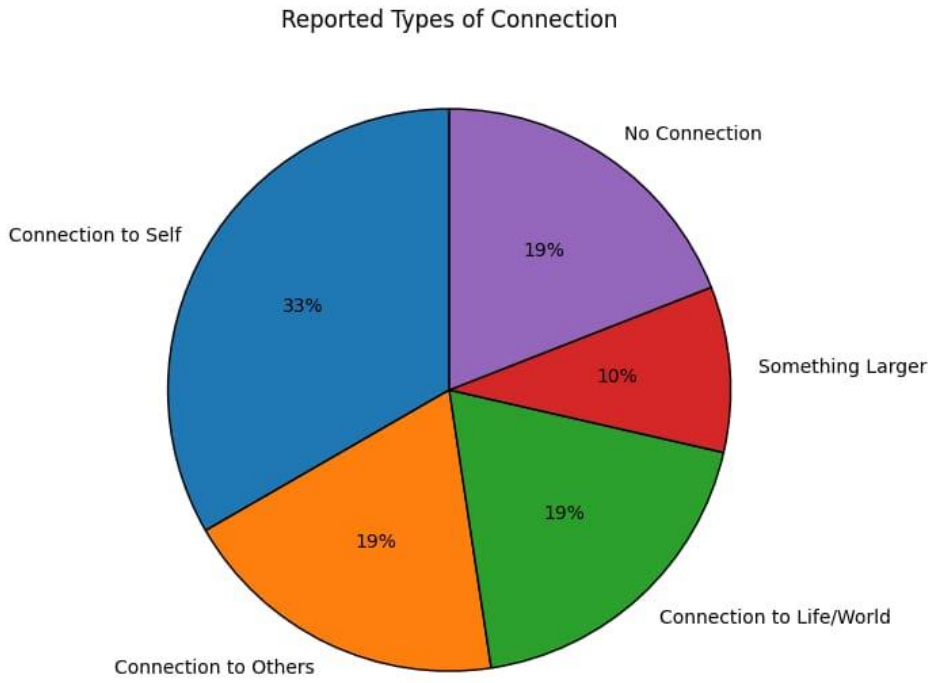


Figure 5. Reported types of connection during the experience by the participants.

These findings suggest that the combination of immersive symbolic environments and embodied interaction may facilitate forms of reflection that participants interpret relationally rather than solely cognitively.

3.4 Helpfulness ratings

Participants evaluated the overall helpfulness of the experience on a 10-point scale in question Q17.

As shown in Figure 6, across the full dataset of 17 participants, the average helpfulness score was approximately 7.6 out of 10.

Ratings between 8 and 10 were dominant within the sample, while low ratings remained limited. Several participants additionally connected the experience to future intentions involving communication, honesty, accountability, self-compassion, discipline, and personal growth.

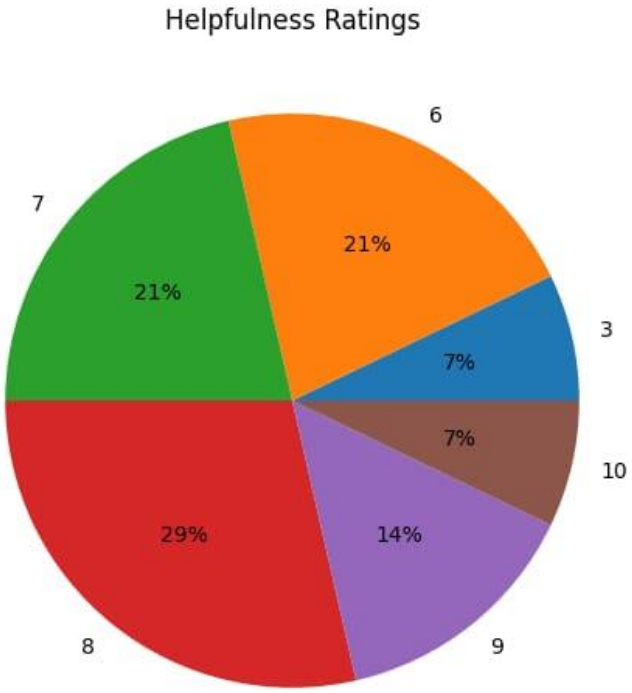


Figure 6. Overall helpfulness ratings distribution.

These findings indicate that although individual experiences varied, most participants perceived the experience as personally valuable or emotionally meaningful.

3.5 Values and symbolic resonance

Frequently recurring values reported throughout the questionnaires included:

- empathy,
- honesty,
- mindfulness,
- trust,
- discipline,
- compassion,
- creativity,
- authenticity,
- hope,
- and love.

Participants often connected these values to specific symbolic moments within the VR experience. Several responses suggested that the relationship between symbolic interaction and physical object handling strengthened emotional resonance and helped participants translate abstract concepts into personally meaningful experiences.

3.6 Public presentation and audience response

The project has been developed for both gallery presentations and public science communication events. Exhibition-based testing and public demonstrations provided opportunities to observe participant interactions, emotional engagement, symbolic interpretations, and audience responses.

Public presentations combine immersive installation, live demonstrations, scientific communication, and audience discussion. In this format, visitors encounter a hybrid environment where contemporary art, virtual reality, psychology, and human–computer interaction intersect.

These presentations have functioned as important research environments. Beyond questionnaire data, discussions with participants and audiences revealed strong interest in the relationship between immersive technology, emotional reflection, and mental well-being. The public setting also highlighted the potential of immersive artistic systems to serve as platforms for interdisciplinary dialogue between artists, researchers, technologists, therapists, and broader audiences.

The project therefore operates simultaneously within the domains of artistic research, immersive media design, hybrid exhibition practice, and human–computer interaction.

4 DISCUSSION AND LIMITATIONS

The consistency of participant responses across emotional engagement, meaningfulness, and value resonance suggests that hybrid immersive systems of this kind can facilitate forms of reflective engagement that participants interpret as personally significant. Recurring themes of self-compassion, trust, hope, empathy, and emotional openness indicate that the experience supported not only momentary emotional states but also reflection on personal values and future behavior. This points toward a capacity for immersive symbolic environments to support future-oriented meaning-making rather than functioning solely as temporary affective experiences.

Particularly relevant to the development of the project was the preliminary observation that the strongest responses emerged when the full hybrid methodology was implemented, specifically, using facilitator-provided physical objects corresponding to abstract values represented in the virtual environment. However, the number of participants who experienced this full hybrid condition was too small to support a systematic comparison with participants who experienced the VR component without tactile objects. Nevertheless, participant responses from sessions with implemented interaction between tactile embodiment and immersive symbolism appear to strengthen continuity between virtual experience and real-world meaning, supporting theoretical perspectives on embodied interaction and situated cognition [2]. This finding warrants further systematic investigation and future studies will explicitly distinguish between tactile and non-tactile conditions.

From an HCI perspective, the project contributes to discussions concerning embodied interaction, symbolic interaction systems, and hybrid physical–virtual environments. Unlike immersive systems that prioritize spectacle or gamification, “Inner Horizon” approaches immersion as a contemplative medium that supports introspection and reflective engagement, occupying an interdisciplinary space among immersive art, reflective technologies, and psychologically informed experiential design.

Several limitations should be acknowledged. The participant sample remains small, and data collection occurred primarily in exhibition contexts, introducing variability in environmental conditions and participant expectations. The facilitator's role during the hybrid sessions represents an uncontrolled variable; the quality and nature of facilitation likely influenced participant responses in ways that have not yet been systematically measured. Additionally, no longitudinal follow-up has been conducted, meaning the durability of reported insights and behavioral intentions remains unknown. Consequently, the findings should not be interpreted as evidence of therapeutic effectiveness.

5 CONCLUSION

Preliminary findings from “Inner Horizon” suggest that hybrid immersive systems combining virtual reality environments, symbolic physical interaction, and psychologically informed reflective structures can support emotionally meaningful engagement and value-oriented self-reflection. Preliminary findings from 17 participants indicate that such systems may facilitate processes of emotional clarification, increased self-awareness, and future-oriented meaning-making.

The project contributes to ongoing discussions in HCI, immersive art, and experiential design by positioning immersion as a contemplative medium rather than a primarily entertainment-oriented one. Future work will focus on expanding the system, increasing the participant sample size, and further investigating the relationship among embodiment, symbolic interaction, and reflective engagement.

REFERENCES

[1] David Benyon. 2014. *Designing Interactive Systems: A Comprehensive Guide to HCI, UX and Interaction Design (3rd ed.).* Pearson.

[2] Paul Dourish. 2001. *Where the action is: The foundations of embodied interaction.* MIT Press.

[3] Paul M. J. Emmelkamp and Katharina Meyerbröker. 2021. *Virtual reality therapy in mental health.* Annual Review of Clinical Psychology, 17(1), 495–519. https://doi.org/10.1146/annurev-clinpsy-081219-115923

[4] Andrew T. Gloster, Noemi Walder, Michael E. Levin, Michael P. Twohig and Maria Karekla. 2020. *The empirical status of acceptance and commitment therapy: A review of meta-analyses.* Journal of Contextual Behavioral Science, 18, 181–192. https://doi.org/10.1016/j.jcbs.2020.09.009

[5] Steven C. Hayes. 2004. *Acceptance and commitment therapy, relational frame theory, and the third wave of behavioral and cognitive therapies.* Behavior Therapy, 35(4), 639–665. https://doi.org/10.1016/S0005-7894(04)80013-3

[6] Giuseppe Riva, Brenda K. Wiederhold and Fabricia Mantovani. 2019. *Neuroscience of virtual reality: From virtual exposure to embodied medicine. Cyberpsychology, Behavior, and Social Networking,* 22(1), 82–96. https://doi.org/10.1089/cyber.2017.29099.gri

[7] Mel Slater and Maria V. Sanchez-Vives. 2016. *Enhancing our lives with immersive virtual reality.* Frontiers in Robotics and AI, 3, 74. https://doi.org/10.3389/frobt.2016.00074

[8] Michael P. Twohig and Michael E. Levin. 2017. *Acceptance and commitment therapy as a treatment for anxiety and depression: A review.* Psychiatric Clinics, 40(4), 751–770. https://doi.org/10.1016/j.psc.2017.08.009

[9] Rosalind Watts and Jason B. Luoma. 2020. *The use of the psychological flexibility model to support psychedelic assisted therapy.* Journal of Contextual Behavioral Science, 15, 92–102. https://doi.org/10.1016/j.jcbs.2019.12.004

A. SURVEY QUESTIONNAIRE

Q1. Email Address

Q2. Age

Q3. Gender
Male
Female
Non-binary
Prefer not to say
Other

Q4. Country of Residence

Q5. Have you previously practiced any of the following?
Meditation / mindfulness
Therapy or coaching
Personal development workshops
Psychedelic-assisted therapy or retreat
None of the above

Q6. What personal question, challenge, or life theme were you holding during the experience? (In one or two sentences, describe the situation or question you were reflecting on.)

Q7. How emotionally engaged did you feel during the experience?
1 Very low
2
3
4
5 Very high

Q8. Which emotional tones were most present? (select up to 2)
Calm / grounded
Curious / open
Anxious / tense
Sad / heavy
Energized / motivated
Connected / warm
Confused / uncertain
Inspired / uplifted

Q9. Did the experience feel meaningful or significant?
1. Not meaningful
2
3
4
5. Deeply meaningful

Q10. Did your perspective shift in any of the following ways?
I saw my situation more clearly
I felt more distance from my thoughts or emotions
I felt more compassion toward myself

I discovered a new way of approaching the problem
No noticeable shift

Q11. How strongly did the values you selected resonate with you?
1. Not at all
2
3
4
5. Deeply true

Q12. Which five values or archetypes felt most important during the experience?
(Please list up to five values or archetypes that guided you.)

Q13. Which statement best describes your inner stance during the experience?
I mostly tried to fix or control the situation
I moved back and forth between control and acceptance
I mostly allowed thoughts and emotions to be present
I actively embraced discomfort as part of the process

Q14. Did you feel a sense of connection during the experience?
Connection to myself
Connection to others
Connection to life or the world
Connection to something larger or timeless
No sense of connection

Q15. Did any insight or realization emerge during or after the experience?
(This can be subtle, emotional, symbolic, or difficult to explain.)

Q16. Is there one small action you feel willing to take that reflects what matters most to you now?
(A small, realistic step aligned with your values.)

Q17. How helpful was this experience overall?
1. Not at all
2
3
4
5
6
7
8
9
10. Very helpful