VNIVERSITAT DE VALÈNCIA

Facultat de Psicologia i Logopèdia

Programa de Doctorado en Investigación en Psicología

Código del programa: 3133

Regulación: RD 99/2011

Toward a Science of Selflessness: From Contemplative Practice to Virtual Reality in Experimental and Clinical Contexts

TESIS DOCTORAL

Presentada por

Joana Vidal Santamaria

Dirigida por

Dr. Ausiàs Josep Cebolla Martí

Dra. Catherine Iris Andreu Cafati

Marzo 2026

The completion of this Doctoral Thesis has been possible thanks to the grant FPU21/03164 supported by MCIN/AEI/10.13039/501100011033

Per a la iaia Fina,
que em va ensenyar, sense paraules,
què és el *selflessness*
i és la inspiració d'aquesta tesi.

ACKNOWLEDGEMENTS / AGRAÏMENTS

M’agrada pensar en aquesta tesi com una xicoteta mostra de la interdependència que forma part de la vida. És un treball col·lectiu que no hauria sigut possible sense el suport, la presència i l’acompanyament de moltes persones, a qui em sent profundament agraïda. Totes elles han format part d’un procés de quatre anys d’aprenentatge intens, acadèmic però sobretot personal, i han contribuït de manera decisiva a fer-la possible.

Gràcies, Ausiàs, per la confiança des del primer moment i per haver-me acompanyat durant aquestos quatre anys amb enorme generositat, amabilitat, i saviesa. Gràcies per guiar-me amb fermesa però amb una cura infinita, respectant els meus ritmes i necessitats, i fent possible un espai segur des d’on he pogut aprendre i créixer molt més del que hauria imaginat. Eres un gran Mestre, precisament perquè encarnes plenament allò que investigues.

Cathy, tu calidez, bondad y cercanía han sido un verdadero sostén a lo largo de todo este proceso. Gracias por estar siempre; te he sentido muy cerca en cada etapa, incluso en la distancia. No solo me has guiado en lo académico, sino que me has mostrado una forma de ser y de trabajar profundamente compasiva. Gracias a ti, este camino se ha vuelto más fácil, permitiéndome recorrerlo con mayor confianza y serenidad.

Gracias a todos/as mis compañeros/as de Ipsitec. Ha sido un privilegio formar parte de este grupo, donde el compañerismo, la cercanía y la calidad humana están siempre presentes. Cada uno de vosotros contribuís a hacer de este un lugar especial, capaz de sacar lo mejor de quienes lo formamos, tanto en lo profesional como en lo personal. En especial, gracias Peter y Mireia por estar a mi lado desde el comienzo; vuestro apoyo, consejos y amistad han sido fundamentales a lo largo de estos años.

A mis amigos chilenos, gracias por regalarme una de las experiencias más bonitas y significativas de esta etapa. Aprendí de cada uno de vosotros, y me llevo algo de todos. Anto, siempre es un regalo estar contigo, ya sea caminando por las montañas de Chile, acampando en Austria, tomando vermús en Valencia, en un retiro en La Rioja o compartiendo aperitivos en Galicia. Aprendo tanto de ti, amiga; has sido un vínculo sanador en mi vida. David y Ale, gracias por vuestra acogida tan cálida: me hicisteis sentir como en casa desde el primer momento.

También quiero agradecer a David Glowacki y a su equipo, por desarrollar y ofrecernos una experiencia tan transformadora, que no solo ha sustentado esta tesis, sino que también ha tenido un profundo impacto personal en mí y, sin duda, en muchas otras personas. Gracias también a todos los participantes que, de forma desinteresada, han contribuido con su tiempo y esfuerzo a los estudios de este trabajo. Y a Reiner, Anto, Ale y David, por vuestra generosa colaboración en su realización: sin vuestro tiempo, implicación y apoyo, esta tesis no habría sido posible.

Gràcies a les meues amigues, que sou arrel i ompliu la meua vida d'alegria, de llum i de suport. En especial, a les meues imprescindibles, Júli i Mery. Sou casa, i un refugi on sé que sempre trobaré estima i felicitat. Gràcies per estar sempre al meu costat, compartint tant les alegries com els moments de tristor i vulnerabilitat. Amb vosaltres, la vida pesa menys i és infinitament més bonica.

A la meua família. Gràcies, Josep, per estar sempre i per cuidar-me tant, fins i tot des d'abans que puga recordar. Gràcies, papà, pel teu suport incondicional, per ajudar-me sense límits i pel teu coratge i la teua perspectiva; has sigut un motor essencial perquè haja pogut arribar fins ací. Mamà, no hi ha paraules que puguen expressar com d'important eres per a mi, ni prou agraïment per tot l'amor i l'acceptació incondicionals, pel teu suport constant i per tot el que has fet i continues fent per mi. Eres l'amor i el *selflessness* fets persona. Tu i la iaia sou les meues grans referents; tant de bo algun dia puga semblar-me a vosaltres, ni que siga un poc. Vos estime infinitament.

Per últim, Alex, amor meu, soc profundament afortunada de compartir la vida amb tu. Gràcies per haver-me sostingut amb tant d'amor durant aquest procés, que no sempre ha sigut fàcil. La teua alegria natural i immensa generositat, junt amb l'empatia, la paciència i la tendresa amb què sempre m'aculls, són un regal immens que tinc la sort de viure cada dia. Gràcies per fer la meua vida més senzilla, més plena i més bonica. T'estime moltíssim, hui i sempre.

TABLE OF CONTENTS

CHAPTER I. INTRODUCTION 1

1. The Self 2

2. The Concept of Selflessness 5

3. The Assessment of Selflessness 14

4. The Induction of Selflessness 17

5. The Therapeutic Potential of Selflessness 27

CHAPTER II. OBJECTIVES 32

CHAPTER III. METHODS 35

Study 1. Transcending Self-Focus: A Mixed-Methods Randomized Controlled Trial of Tonglen Meditation in Healthcare Professionals 36

1. Background 36

2. Method 38

3. Results 43

4. Discussion 52

Study 2. Toward a Science of Selflessness: A Scoping Review of Assessment Methods and Theoretical Perspectives 56

1. Background 56

2. Method 58

3. Results 62

4. Discussion 78

Study 3. Inducing Selflessness Through a Virtual Reality Experience: A Preliminary Study 82

1. Background 82

2. Method 84

3. Results 92

4. Discussion 100

Study 4. Virtual Reality-Induced Selflessness and Its Effects on Meditative Experience: A Preliminary Multiple Case Series Study 104
1. Background 104
2. Method 107
3. Results 112
4. Discussion 119
Study 5. A Comprehensive Characterization of Selflessness in Virtual Reality: Phenomenology, Temporal Dynamics, and Clinical Relevance in Cancer Patients 123
1. Background 123
2. Method 126
3. Results 138
4. Discussion 163
CHAPTER IV. RESULTS 168
1. Main Results Study 1 169
2. Main Results Study 2 170
3. Main Results Study 3 172
4. Main Results Study 4 173
5. Main Results Study 5 175
CHAPTER V. CONCLUSIONS 178
1. Summary of the Main Findings 180
2. Strengths 187
3. Limitations 189
4. Potential Implications and Future Directions 190
5. General Conclusions 194
CHAPTER VI. SUMMARY IN VALENCIAN / RESUM EN VALENCIÀ 197
1. Introducció 198
2. Objectius 207
3. Mètodes i Resultats 208

4. Conclusions 222
CHAPTER VII. REFERENCES 228
APPENDICES 257
A. Appendices Study 2 258
B. Appendices Study 3 271
C. Appendices Study 4 273
D. Appendices Study 5 276

PREFACE

This Doctoral Thesis is based on the following five studies:

Vidal, J., Troncoso, A., Andreu, C. I., Martínez-Pernía, D., Cebolla, A. (2026). Transcending self-focus: A mixed-methods randomized controlled trial of tonglen meditation in healthcare professionals. *Under review.* (**Study 1**).

Vidal, J., Andreu, C. I., Fuentes-Ferrada, R., Cebolla, A. (2026). Toward a science of selflessness: A scoping review of assessment methods and theoretical perspectives. *Under review.* (**Study 2**).

Vidal, J., Andreu, C. I., Wrzesien, M., Colombo, D., Wall, J., Glowacki, D. R., Hardy, J. L., & Cebolla, A. (2025). Inducing selflessness through a numadelic virtual reality experience: A preliminary study. *Virtual Reality*, *30*(1). https://doi.org/10.1007/s10055-025-01293-z (**Study 3**).

Vidal, J., Zepeda, A., Andreu, C. I., Wall, J., Glowacki, D. R., Hardy, J. L., & Cebolla, A. (2026). Virtual reality-induced selflessness and its effects on meditative experience: A preliminary multiple case series study. *Under review.* (**Study 4**).

Vidal, J., Zepeda, A., Fuentes-Ferrada, R., Andreu, C. I., Wall, J., Glowacki, D. R., Hardy, J. L., & Cebolla, A. (2026). A comprehensive characterization of selflessness in virtual reality: Phenomenology, temporal dynamics, and clinical relevance in cancer patients. *Under review.* (**Study 5**)

CHAPTER I. INTRODUCTION

1. The Self

Who am I?

This question has accompanied the history of human thought across philosophical, religious, and contemplative traditions. Its historical and cross-cultural persistence suggests that it expresses a fundamental and transversal concern that touches the core of human existence. From ancient metaphysical systems to contemporary cognitive science, diverse and often conflicting responses to this question have been advanced.

At a theoretical level, these responses can be organized into several dominant conceptions of the self (Zahavi, 2008). Substantialist accounts, exemplified by Cartesian philosophy, conceive of the self as a persisting substance (e.g., Robinson, 2018; Olson, 1999). On this view, the self is an independent and enduring entity that maintains its identity over time despite changes in mental states or bodily conditions. In contrast, bundle theories, classically articulated by Hume and reformulated in contemporary philosophy (e.g., Parfit, 1984; Dainton, 2011), reject the idea of a substantial self. According to this position, the self is nothing more than a bundle of perceptions – sensations, thoughts, and emotions – connected through associative relations such as resemblance and causation. Narrative theories, for their part, emphasize the interpretative and constructive dimensions of personal identity (Ricoeur, 1992; Dennett, 1992). From this perspective, the self is constituted through diachronic self-interpretation: personal identity emerges as individuals integrate past experiences, present concerns, and future aspirations into a relatively coherent autobiographical narrative.

More recently, processual, phenomenological, and enactive approaches (e.g., Zahavi, 2005; Varela, 1999; Thompson, 2010; Gallagher, 2000, 2013; Metzinger, 2004, 2024) have advanced non-substantialist and non-reductionist frameworks that reconceptualize the self as a dynamically enacted and multidimensional process. Although these perspectives differ in their ontological commitments and explanatory strategies, they converge in rejecting both metaphysical substantialism and reductionist accounts. Rather than an independent entity, the self is understood as an embodied and experientially structured organization of processes, articulated across minimal, narrative, affective, and relational dimensions.

Among these contemporary integrative models, the framework proposed by Shaun Gallagher is particularly influential. In its initial formulation, Gallagher (2000)

distinguishes two interrelated dimensions of selfhood: the minimal self (MS) and the narrative self (NS). The MS refers to the immediate, pre-reflective, and present-centered sense of subjectivity. It consists of the implicit awareness of oneself as the agent and owner of ongoing mental processes and is thus primarily defined by experiences of ownership and agency. In contrast, the NS denotes a temporally extended aspect of selfhood that encompasses personal identity, autobiographical memory, and future-oriented aspirations. This dimension is constituted through narrative processes that organize experience into coherent accounts of who one is across time. Accordingly, the NS is profoundly shaped by social, linguistic, and cultural influences, relies on autobiographical memory and imaginative processes, and has been empirically associated with activity in the default mode network (Raichle et al., 2001; Buckner et al., 2008).

The strength of this two-dimensional model is supported by similar distinctions found across different scientific traditions. The NS corresponds to the *me*-self (James, 1890), the extended or conceptual self (Neisser, 1988), and the autobiographical self (Damasio, 1999). Conversely, the MS aligns with the *I*-self (James, 1890), the ecological self (Neisser, 1988), and the core self (Damasio, 1999). Taken together, these converging frameworks suggest that the self is not a unitary phenomenon but a multidimensional construct that integrates immediate experiential selfhood with temporally extended narrative identity.

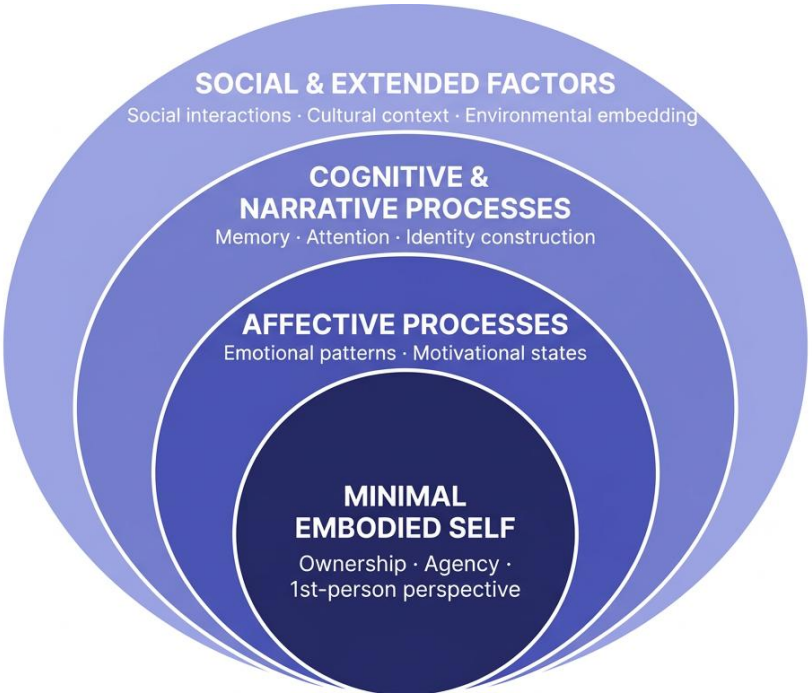
This multidimensional understanding is further elaborated in Gallagher's later development of the pattern theory of self (Gallagher, 2013; Gallagher et al., 2024). Moving beyond the idea that the minimal and narrative selves exhaustively define selfhood, the pattern-based framework reconceptualizes the self as a dynamic configuration of multiple contributory dimensions. Within this model, both the minimal and narrative aspects are retained as integral but non-exhaustive components. The self is thus theorized as an emergent and dynamically organized pattern arising from the ongoing interaction of heterogeneous processes operating at experiential, embodied, cognitive, affective, and social levels.

These contributory processes include: (1) minimal embodied and pre-reflective experiential structures, which sustain first-person perspective and a basic sense of ownership and agency; (2) affective dispositions and emotional patterns, which shape the qualitative tone of experience and motivational orientation; (3) psychological and cognitive capacities, such as memory and attention, supporting psychological continuity

and goal-directed action; (4) narrative forms of self-interpretation, which organize experience into temporally extended accounts of identity; (5) intersubjective and socially embedded relations, through which social interaction and recognition contribute to self-formation; and (6) extended and situated factors, grounded in material, cultural, and environmental contexts that structure action possibilities and self-understanding. This organization is schematically illustrated in Figure 1. On this account, selfhood is neither reducible to any single domain nor fixed in its internal organization; rather, it is inherently context-sensitive, developmentally variable, and dynamically modifiable over time.

Figure 1

Multidimensional organization of the self as proposed by Gallagher (2013)



The establishment of a coherent model of the self is essential for any systematic attempt to understand selflessness, which constitutes the central focus of the present doctoral thesis. Accordingly, Gallagher's model (Gallagher, 2000, 2013; Gallagher et al., 2023) is adopted as the principal theoretical framework guiding this work, given its conceptual influence and integrative capacity within contemporary debates on selfhood.

2. The Concept of Selflessness

Despite the central role of the self in structuring ordinary conscious experience, numerous accounts across different traditions and disciplines have described experiences in which the sense of self is significantly reduced, altered, or even temporarily absent (e.g., Anālayo, 2003; Albahari, 2010; Siderits et al., 2011). From classical contemplative traditions such as Buddhism or Advaita Vedānta (e.g., Ekman et al., 2005; Fasching, 2008) to contemporary phenomenological, neuroscientific, and cognitive models (e.g., Metzinger, 2024; Berkovich-Ohana et al., 2024), these accounts converge on a shared claim: the sense of self is not an immutable feature of experience, but a dynamic structure open to modulation under specific conditions.

Within this context, the concept of *selflessness* has emerged as a central construct for characterizing experiences that involve the attenuation, dissolution, or qualitative transformation of the ordinary sense of self (e.g., Canby et al., 2024; Berkovich-Ohana et al., 2024). In recent years, empirical and theoretical research on selflessness has expanded substantially, giving rise to multiple models aimed at clarifying its underlying mechanisms and delineating its experiential dimensions. Selflessness has been conceptualized both as a trait – referring to an enduring mode of psychological functioning (Dambrun & Ricard, 2011) or a set of psychological capacities (Wayment & Bauer, 2018; Soler et al., 2021) – and as a state, involving narrative models (Leary et al., 2006; Hadash et al., 2016) and consciousness-based frameworks (Dor-Ziderman et al., 2013; Tagini & Raffone, 2010; Dunne, 2011; Hanley et al., 2018; Millière et al., 2018; Yaden et al., 2017; Metzinger, 2024). Table 1 provides a comprehensive overview of these theoretical models, which are examined in detail in the following sections.

Table 1

Overview of trait and state theoretical models of selflessness

Status	Conceptualization	Authors	Type	Definition
Trait	Selflessness	Dambrun & Ricard (2011)	A mode of psychological functioning	Dispositional mode grounded in perceiving the self as impermanent and interdependent
Trait	Quiet ego	Wayment & Bauer (2018)	A set of psychological capacities	Self-related orientation characterized by inclusive identity, perspective-taking, detached awareness and growth
Trait	Delusion of me	Soler et al. (2021)	A set of psychological capacities	Higher-order factor including acceptance, decentering and non-attachment
State	Hypo-egoic state	Leary et al. (2006)	Narrative model	Temporary decrease in self-referential thought and a shift toward present-focused cognition
State	Experiential selfless processing	Hadash et al. (2016)	Narrative model	Present-focused cognitive processing devoid of self-referentiality
State	Selfless mode of awareness	Dor-Ziderman et al. (2013)	Consciousness-based model	Mode of awareness in which identification with a fixed self dissolves into ongoing experience
State	Non-referential awareness	Tagini & Raffone (2010)	Consciousness-based model	Mode of awareness not directed toward internal or external contents, resting as an open and inclusive field
State	Non-dual awareness	Dunne (2011); Hanley et al. (2018)	Consciousness-based model	Mode of awareness in which the subject-object distinction is absent
State	Ego dissolution	Millière et al. (2018)	Consciousness-based model	Dimensional disruption of self-consciousness involving narrative and multisensory components of the self
State	Self-transcendent experience	Yaden et al. (2017)	Consciousness-based model	State of consciousness characterized by decreased self-salience and increased feelings of connectedness
State	Minimal phenomenal experience	Metzinger (2004, 2024)	Consciousness-based model	State of consciousness in which core components of the phenomenal self-model are attenuated or absent

2.1. Selflessness as a Trait

One of the most influential models, developed by Dambrun & Ricard (2011), conceptualizes *selflessness* as a relatively stable mode of psychological functioning grounded in how the self is perceived. In this framework, selflessness emerges when the self is understood not as a permanent, independent, and clearly bounded entity, but as an impermanent and fundamentally interdependent process – a dynamic flow of moment-to-moment experience embedded in a broader relational context. Selflessness is thus positioned along a continuum opposed to self-centeredness. At one end lies a constricted, ego-focused mode of functioning; at the other, a more open and relational mode of being. Importantly, the model proposes that selflessness underlies what the authors term authentic-durable happiness – a stable form of well-being that is relatively independent of external circumstances and rooted in emotional balance and inner coherence. Given the theoretical influence of this account, the present doctoral dissertation adopts the term selflessness in conceptual continuity with this framework.

Building on this trait-oriented conceptualization, subsequent theoretical developments have framed selflessness not only as a dispositional mode of functioning, but also as a set of psychological abilities that can be intentionally cultivated. Within this perspective, two influential models warrant particular attention. First, Wayment and Bauer (2018) introduced the construct of the *quiet ego*, which describes a self-related orientation characterized by four core capacities: (1) inclusive identity, referring to the extent to which individuals identify with others and perceive reduced self-other distinction; (2) perspective-taking, defined as the ability to decenter attention from the self and adopt others' viewpoints; (3) detached awareness, a non-judgmental and accepting mode of attention toward internal experience; and (4) growth, understood as the prioritization of long-term humanistic and eudaimonic values over immediate self-centered goals such as material success or social status.

A closely related approach is proposed by Soler et al. (2021), who conceptualize selflessness in terms of three interrelated psychological skills: (1) acceptance, defined as open awareness and embrace of thoughts, emotions, and situations without resistance or judgment; (2) decentering, largely equivalent to detached awareness (Wayment & Bauer, 2018); and (3) non-attachment, referring to the absence of internal pressure to obtain, maintain, avoid, or modify circumstances or subjective experiences. Importantly, these processes show strong psychometric overlap, leading the authors to propose a higher-

order factor termed the *delusion of me*, which is conceptually comparable to selflessness. Across both models, selflessness is portrayed as a trainable set of skills systematically associated with enhanced psychological well-being and reduced psychopathological symptoms (Wayment & Bauer, 2018; Soler et al., 2021).

2.2. Selflessness as a State

Beyond its conceptualization as a dispositional trait, selflessness has also been described as a state-dependent phenomenon involving transient alterations in the ordinary sense of self. For heuristic purposes, and based on their shared theoretical features, the models reviewed here can be broadly grouped into two approaches: narrative models, which frame selflessness as alterations in self-referential processing, and consciousness-based models, which describe it as a qualitatively distinct mode of awareness.

In narrative models, selflessness is primarily understood as a reduction in self-referential processing. One influential account is the *hypo-egoic state* proposed by Leary et al. (2006), characterized by a temporary decrease in self-focused thought and a shift toward concrete, present-centered cognition rather than abstract or evaluative self-reflection. Such states may arise spontaneously – for example, during flow experiences (Csikszentmihalyi, 1990) – or may be intentionally facilitated through hypo-egoic self-regulation, which involves relinquishing deliberate attempts to control one's thoughts, emotions, and behavior, as in certain forms of meditation. A second account, developed by Hadash et al. (2016), conceptualizes selflessness as *experiential selfless processing* (ESLP), defined as engagement with present-moment experience in the absence of self-referentiality. Drawing on Gallagher's (2000) distinction between the minimal and the narrative self, this model proposes that ESLP gives rise to a state in which both dimensions are attenuated or absent. In such states, there is no sense of the self as the immediate subject of experience; instead, the conventional sense of self is replaced by the phenomenological experience of pure awareness (Dor-Ziderman et al., 2013; Tagini & Raffone, 2010).

By contrast, consciousness-based models conceptualize selflessness as a transient modification in the structure of consciousness itself. In this view, it is not merely the absence of narrative self-focus, but a qualitatively distinct mode of awareness in which the sense of being a bounded and individuated subject temporarily diminishes or dissolves. From this perspective, Dor-Ziderman et al. (2013) introduce the notion of a

selfless mode of awareness, defined as "a selfless, boundless mode of experience where identification with a static sense of self is replaced by identification with the phenomenon of experiencing itself" (p. 2). Related constructs include *non-referential awareness* (Tagini & Raffone, 2010), which refers to a state in which consciousness is not structured around specific intentional objects, and *non-dual awareness* (Dunne, 2011; Hanley et al., 2018), characterized by a reduced or absent distinction between subject and object. Taken together, these approaches converge in describing selflessness as a distinct state of consciousness marked not only by diminished self-referential cognition, but also by a weakening of self-world boundaries and the emergence of an open, non-dual mode of awareness.

Another consciousness-based account of state selflessness arises from psychedelic research, particularly through the construct of *ego dissolution* (Millière et al., 2018). Building on Gallagher's (2000) distinction between narrative and minimal selfhood, this model advances a two-dimensional framework comprising narrative self-loss – referring to attenuations in self-referential cognition – and multisensory self-loss, involving disruptions in embodied self-consciousness, such as alterations in body ownership and spatial self-location. Ego dissolution is thus understood not as a discrete experiential category, but as a graded alteration in the structure of self-consciousness across these two dimensions.

A related perspective that likewise emphasizes the dimensional nature of selflessness is offered by Yaden et al. (2017) in their account of *self-transcendent experiences* (STEs). STEs are defined as transient states characterized by decreased self-salience and increased feelings of connectedness. In this framework, such experiences unfold along a continuum of intensity and comprise two analytically distinct components: an annihilational dimension, involving the attenuation or dissolution of self-boundaries, and a relational dimension, referring to the experiential sense of connection or unity with others, the environment, or reality more broadly. Although elements of connectedness and unity are present in other influential models of selflessness (e.g., Dambrun & Ricard, 2011; Hanley et al., 2018), Yaden et al. (2017) render this relational dimension theoretically explicit and conceptually central, rather than treating it as a secondary consequence of selflessness.

Recently, a particularly systematic and philosophically rigorous account of selflessness has been developed by Metzinger (2004, 2024). Situated at the intersection

of philosophy of mind and cognitive science, his model reconceptualizes the self as a complex representational process generated by the brain rather than as an entity or substance. Multiple processes – including interoceptive and bodily signals, affective states, perceptual inputs, memories, and higher-order cognitive operations – are dynamically integrated into a unified and coherent model of the organism. Crucially, this integrated self-model is phenomenally transparent: it is not experienced as a constructed representation, but as a real and enduring "I". This transparency creates a strong sense of a stable, enduring self, even though it is actually a dynamically maintained model. On this basis, Metzinger offers a coherent explanatory account of selfless states, conceptualized as *minimal phenomenal experiences*. Typically reported in advanced meditation, these states involve a marked attenuation or complete absence of core dimensions of the self-model – such as agency, ownership, self-location, and narrative identity. Nevertheless, a minimal form of tonic alertness or content-poor awareness may persist, suggesting that conscious experience can continue even when central features of the ordinary self-model are temporarily deactivated.

2.3. Lack of Epistemological and Terminological Consensus

As noted above, a wide range of terms and theoretical frameworks are currently used to describe experiences that share core phenomenological features. This diversity points to a persistent lack of epistemological and terminological consensus surrounding the concept of selflessness. Constructs discussed above (e.g., selflessness, ego dissolution, self-transcendence, non-dual awareness) refer to experiences involving an attenuation, transformation, or temporary loss of the sense of self. However, each concept highlights different facets of this experience, reflecting distinct epistemological assumptions, methodological priorities, and disciplinary traditions. In this sense, as previously argued by other authors (Britton et al., 2021; Canby et al., 2024), these constructs may be understood as partial and complementary articulations of a single underlying phenomenon, rather than as mutually exclusive categories. At the same time, this plurality of perspectives has generated a parallel proliferation of terminology, with multiple labels applied to substantially overlapping experiential features and single terms used to denote qualitatively distinct phenomena, exemplifying the jingle-jangle fallacy described by Britton et al. (2021).

At a more fundamental level, these terminological inconsistencies are further complicated by conceptual vagueness surrounding many definitions of selflessness,

particularly with respect to their phenomenological referents (e.g., Lindström et al., 2022). Terms such as *unity* or *dissolution* are frequently used without explicit clarification, and even theoretical frameworks explicitly concerned with selflessness often fail to articulate a coherent or sufficiently specified conception of the self. In the absence of such conceptual grounding, references to the loss or attenuation of the self lack a stable referent, thereby undermining both theoretical interpretability and empirical operationalization (Canby et al., 2024).

Adding further complexity, experiences of selflessness are frequently described as components of broader experiential categories, such as mystical experiences (Hood, 1975; MacLean et al., 2012), altered states of consciousness (Dittrich, 1998), or awe experiences (Yaden et al., 2019). These are inherently complex, multidimensional phenomena in which selflessness constitutes only one among several experiential dimensions. As a result, selflessness is often studied indirectly, embedded within composite constructs rather than examined as a phenomenon in its own right, thereby further obscuring its precise phenomenological structure and theoretical boundaries.

2.4. Recent Integrative Models of Selflessness

In light of this epistemological and terminological fragmentation, clarifying the construct of selflessness is essential to establish a coherent framework for empirical investigation. To address this need, two recent models offer complementary integrative approaches. The pattern theory of selflessness proposed by Berkovich-Ohana et al. (2024) synthesizes prior conceptualizations of selflessness, whereas the framework developed by Canby et al. (2024) emphasizes the empirical delineation and operationalization of its core dimensions.

First, the pattern theory of selflessness can be understood as an extension of the pattern theory of self (PTS; Gallagher, 2013; Gallagher et al., 2024). As outlined earlier in the introduction of this doctoral thesis, the PTS conceptualizes the self not as a unitary entity, but as a dynamically integrated pattern of heterogeneous processes spanning embodied, affective, cognitive, narrative, social and ecological domains. Within this framework, the self is neither reducible to any single component nor dependent on the continuous presence of all of them; rather, it consists of a temporally extended, self-organizing pattern sustained by ongoing interactions across multiple timescales.

Building on this foundation, Berkovich-Ohana et al. (2024) extend the PTS to articulate the pattern theory of selflessness (PTSL), which reconceptualizes selflessness not as the absolute absence or annihilation of the self, but as a systematic reorganization of the self-pattern characterized by shifts in the relative weighting, interrelations, and dominance of its constituent processes. From this perspective, experiences commonly described as ego dissolution or self-transcendence are understood as states in which narrative, reflective, and self-reifying processes are attenuated, decentered, or temporarily suspended, while other aspects of the self-pattern – such as pre-reflective awareness, embodied functioning, and basic experiential coherence – remain operative. The PTSL further proposes that meditation practices can induce such reconfigurations through iterative and nonlinear transformations that progressively increase self-pattern flexibility, reduce rigid identification with narrative and evaluative structures, and weaken habitual self-world boundaries. Taken together, the PTSL reduces conceptual ambiguity by providing a unified account in which all the key dimensions previously identified as central to experiences of selflessness are explicitly integrated.

Importantly, the PTSL overcomes the state-trait dichotomy by conceptualizing selflessness along a continuum of self-pattern reorganization, ranging from transient experiential states to enduring traits. Rather than treating state and trait selflessness as categorically distinct, the model differentiates them in terms of the depth, stability, and recurrence of specific configurational changes. At one end of this continuum, state selflessness involves short-lived attenuations of self-related processes under particular experiential conditions, without fundamentally altering overall self-organization. At the other end, trait selflessness reflects the progressive stabilization of these reconfigurations, such that increased self-pattern flexibility and reduced identification with narrative and evaluative structures become characteristic of ongoing functioning across contexts. Within this framework, the transition from state to trait does not imply the elimination of the self, but a gradual reorganization of self-constitutive processes, resulting in more enduring patterns of reduced self-centeredness and enhanced connectedness.

Regarding the second integrative model, Canby et al. (2024) proposed an empirical framework to identify the experiential dimensions of selfless experience, based on a mixed-methods approach combining large-scale self-report data with qualitative phenomenological analysis. Data were collected from participants who reported experiences involving a loss of self or a dissolution of self-boundaries, drawing on both

established questionnaires and newly developed items informed by prior theoretical work. Recruitment deliberately encompassed a wide range of experiential contexts – including meditation, psychedelic use, everyday life, and psychological disorders – in order to overcome valence- and context-specific limitations that have characterized earlier research. Survey items were adapted from existing instruments and complemented by novel measures grounded in phenomenological psychopathology and philosophy of mind. In parallel, a thematic analysis of open-ended survey responses was conducted to identify recurring experiential patterns, enabling the integration of quantitative and qualitative findings into a more nuanced and phenomenologically precise account of selflessness.

The final model identified five higher-order domains comprising sixteen distinct characteristics that together constitute experiences of selflessness, thereby empirically supporting the multidimensional structure proposed by the PTSL (Berkovich-Ohana et al., 2024). First, alterations in self-boundaries and sense of unity were identified, comprising three factors: unity with all things, reduced boundaries with other people, and reduced boundaries with physical objects. Second, disruptions in core self-related processes were observed, including diminished ownership of thoughts and feelings and a weakened or lost sense of agency. Third, more diffuse or non-specific forms of self-loss were identified, such as changes in spatial framing. Fourth, these experiences could be accompanied by phenomenological and appraisal-related features, including voluntary surrender, spiritual insight, heightened confidence or sense of power, temporal and spatial distortions, and ineffability. Finally, affective components encompassed both positive and negative valence, varying systematically across experiential contexts and phenomenological profiles. Taken together, these findings delineate heterogeneous configurations of phenomenological, cognitive, and affective components that may co-occur across multiple expressions of selflessness.

In conclusion, while the PTSL provides a theoretically grounded account of selflessness as a dynamic reorganization of self-related processes (Berkovich-Ohana et al., 2024), the model proposed by Canby et al. (2024) captures the empirical manifestation of these processes in distinct experiential dimensions. Together, these approaches clarify the internal structure of selflessness and address key sources of conceptual ambiguity in the literature.

3. The Assessment of Selflessness

The rigorous scientific investigation of selflessness requires not only conceptual clarity but also the development of robust and methodologically appropriate strategies for its systematic assessment. In this context, the assessment of selflessness raises several fundamental questions, including which dimensions of experience can be meaningfully operationalized, how such experiences can be validly accessed, and which measurement approaches are most suitable for capturing phenomena that are inherently transient, context-sensitive, and only partially accessible to reflective awareness.

Accordingly, the assessment of selflessness entails substantial methodological challenges. A primary difficulty arises from its frequent characterization as an ineffable phenomenon – namely, as an experience that resists verbal articulation or proves difficult to express in language (Dambrun, 2016; Hanley & Garland, 2019; Canby et al., 2024). This ineffability may stem from the fact that selflessness involves non-conceptual or pre-reflective dimensions of experience, specifically modulations of experiential selfhood that occur prior to reflective awareness. Such modulations may include, for example, alterations in felt bodily boundaries, senses of ownership, and experiences of agency, which are lived directly rather than thematically apprehended or conceptually structured. Consequently, conventional assessment strategies – particularly those based on retrospective narrative self-report – face intrinsic limitations, as they assume that individuals can reliably translate such lived dimensions into stable linguistic and conceptual forms.

Second, as outlined in the preceding section, selflessness is increasingly conceptualized as a fundamentally multidimensional phenomenon, involving coordinated alterations across multiple domains of self-related functioning rather than changes along a single experiential dimension (Berkovich-Ohana et al., 2024; Canby et al., 2024). These domains may include experiential selfhood, bodily self-awareness, agency, self-world boundaries, affective tone, and modes of self-related cognition. Consequently, instruments designed to assess selflessness must adequately capture its multidimensional and process-based structure, rather than reducing it to isolated components or a single global score. Taken together, the ineffable and multidimensional character of selflessness defines the central methodological constraints underlying its empirical assessment.

Despite these challenges, a range of methodological approaches has been developed to assess selflessness, drawing on both quantitative and qualitative strategies. Within the quantitative domain, several self-report questionnaires have been specifically designed to capture experiences related to selflessness, including the Ego Dissolution Inventory (EDI; Nour et al., 2016), the Ego Dissolution Scale (EDS; Sleight et al., 2023), and the Nondual Awareness Dimensional Assessment (NADA; Hanley et al., 2018), among others. Beyond these dedicated instruments, specific dimensions of selflessness are also assessed through subscales embedded within broader measures targeting related constructs. Notable examples include the Dread of Ego Dissolution subscale of the Five-Dimensional Altered States of Consciousness Rating Scale (5D-ASC; Dittrich, 1998) and the Self-Diminishment subscale of the Awe Experience Scale (AWE-S; Yaden et al., 2019). Collectively, these questionnaires provide structured and standardized approaches to measurement, facilitating the quantification of selflessness-related experiences and enhancing the comparability of findings across empirical studies (Baumeister et al., 2007).

However, as discussed earlier, experiences of selflessness are frequently reported as ineffable, which poses substantive limitations for narrative self-report measures. In response to these constraints, a number of pictographic and visually based assessment tools have been developed as complementary approaches. By reducing reliance on explicit verbalization, these instruments allow participants to represent aspects of their experience through images or symbolic figures rather than linguistic descriptions. Examples include single-item pictographic measures such as the Dissolution of Perceived Body Boundaries item (Dambrun, 2016), the Inclusion of Other in the Self item (Aron et al., 1992), and the Spatial Frame of Reference Continuum (Hanley & Garland, 2019). Nevertheless, these items target specific experiential dimensions – namely bodily boundary dissolution, interpersonal connectedness, and spatial self-location – rather than selflessness as an integrated phenomenon. As a result, they capture selected aspects of the construct without encompassing its full multidimensional scope.

In this context, our research group recently developed the Meditation Pictographic Inventory (MPI; Delia et al., 2025), a 23-item pictographic self-report instrument designed to assess a broad range of subjective experiences associated with meditation practice. Grounded in a first-person, phenomenologically informed framework, the MPI was iteratively developed and refined through qualitative and empirical procedures to

capture experiential variation across cognitive, affective, embodied, relational, temporal, and self-related domains. Each item consists of a pictogram representing a specific experiential dimension, informed by phenomenological descriptions reported by meditation practitioners, and is rated on a 7-point Likert scale. By inviting participants to select the image that best corresponds to their lived experience rather than to articulate it narratively, the MPI reduces reliance on verbalization and conceptual mediation. Therefore, this pictographic response format facilitates the quantitative assessment of experiential states – such as selflessness – that are difficult to express linguistically within standardized measurement frameworks.

Crucially, the MPI is particularly well suited to capturing the multidimensional nature of selflessness-related phenomena. The inventory includes one dedicated pictographic item per experiential dimension, encompassing a broad range of alterations that have been theoretically and empirically associated with selflessness. These include changes in bodily boundaries, shifts in spatial self-location, variations in connectedness with others and with nature, explicit self-related indices reflecting hypo-egoic and hyper-egoic functioning, as well as temporal distortions, experiences of timelessness, and ineffability. Therefore, although the MPI was developed to assess a wide spectrum of meditation-related experiences, its pictographic and multidimensional structure makes it particularly suitable for the empirical investigation of selflessness.

Beyond self-report measures, a limited number of experimental approaches have been employed to investigate selflessness under controlled laboratory conditions (Hadash et al., 2016; Kelley et al., 2002; Sui et al., 2012). These approaches typically rely on behavioral tasks designed to assess implicit aspects of self-related processing, using indicators such as reaction times or attentional biases rather than explicit introspective reports (Greenwald et al., 1998; Hadash & Bernstein, 2019). One such example is the Single Experience–Self Implicit Association Test (SES-IAT; Hadash et al., 2016), which is grounded in the classical Implicit Association Test paradigm. Although these methods reduce reliance on verbal articulation, they tend to operationalize selflessness in relatively narrow terms, focusing primarily on self-referential processing. Consequently, while behavioral measures provide valuable insights into implicit, non-narrative dimensions of the self, they capture only a limited subset of the multidimensional characteristics commonly associated with selflessness.

Finally, within qualitative approaches, phenomenological interviews have been proposed as a particularly relevant method for investigating selflessness (Dor-Ziderman et al., 2013; Berkovich-Ohana, 2017; Nave et al., 2021; Lindström et al., 2023). These interviews aim to elicit detailed descriptions of lived experience as it is enacted, prior to abstract interpretation or narrative reconstruction (Petitmengin, 2006; Giorgi et al., 2017; Olivares et al., 2015). By relying on first-person descriptions, this approach enables the examination of the fine-grained unfolding of experience across perceptual, bodily, emotional, attentional, intentional, and visuospatial dimensions (Petitmengin, 2006). Such rich and dynamic experiential complexity often remains inaccessible when assessed through self-report questionnaires or other qualitative methods that rely on more generalized or reflective accounts.

In sum, the empirical assessment of selflessness is challenged by its ineffable and multidimensional nature. While quantitative, pictographic, behavioral, and qualitative approaches each provide partial access to this phenomenon, no single method can capture its full experiential complexity. These considerations highlight the need for integrative, methodologically plural frameworks that combine complementary strategies to investigate selflessness as a dynamic, multidimensional process.

4. The Induction of Selflessness

In addition to its conceptualization and measurement, the empirical investigation of selflessness depends on the availability of reliable induction methods. Historically, a range of spiritual and philosophical traditions have developed techniques aimed at cultivating this state, most notably meditation practices and the use of psychedelic substances. More recently, virtual reality has been proposed as a novel experimental tool for inducing selflessness-related states under controlled conditions.

4.1. Meditation

Meditation can be defined as a form of mental training aimed at enhancing core psychological capacities, particularly attentional control and emotional self-regulation (Tang et al., 2015). Originating from diverse contemplative traditions, meditation encompasses a heterogeneous set of practices that can be systematically classified according to their underlying cognitive mechanisms. A widely adopted framework distinguishes three broad families of meditation practices: attentional, constructive, and deconstructive (Dahl et al., 2015). Attentional practices primarily cultivate sustained

attention and meta-awareness; constructive practices aim to foster adaptive cognitive and affective patterns by actively modifying the content of thoughts, emotions, and self-related schemas; and deconstructive practices emphasize self-inquiry as a means of investigating the dynamics of conscious experience and generating insight into the constructed nature of perception, cognition, and the self. Importantly, all three families have been described as capable of facilitating experiences associated with selflessness (Lutz et al., 2015; Fredrickson et al., 2008).

Empirical findings further support the relevance of meditation as a method for inducing alterations in self-experience. In a large-scale qualitative investigation, Lindahl and Britton (2019) reported that 72% of meditators experienced changes in their sense of self during meditation, encompassing alterations in narrative self, ownership, agency, embodiment, self-world boundaries, and basic selfhood. Among these, shifts in perceived boundaries between the self and others, or between the self and the world, were the most frequently reported (Lindahl & Britton, 2019; Lindahl et al., 2017). These findings illustrate how meditation practice can give rise to experiential configurations that closely align with contemporary phenomenological accounts of selflessness.

Within this broader landscape, the present doctoral dissertation focuses on Tonglen, a compassion-based meditation situated within the category of constructive practices and selected for its potential to induce states of selflessness. The following section introduces compassion-based meditation practices, with particular emphasis on Tonglen, and outlines its role as a method for the experimental induction of selflessness.

4.1.1. Compassion-Based Meditations

Within the category of constructive practices, compassion-based meditations constitute one of the most theoretically grounded and empirically studied approaches.

Compassion is commonly defined as the response that arises upon witnessing suffering and motivates a desire to alleviate it (Goetz et al., 2010). Contemporary psychological accounts conceptualize it as a cognitive, affective, and behavioral process encompassing five core elements applicable to both other- and self-directed compassion (Strauss et al., 2016): (1) recognizing the presence of suffering; (2) understanding suffering as a universal aspect of human experience; (3) experiencing emotional resonance with the person who is suffering; (4) tolerating the uncomfortable emotions elicited by suffering without avoidance or disengagement; and (5) being motivated to act,

or acting, to alleviate suffering. Compassion-based practices are explicitly designed to cultivate these components by engaging processes such as perspective taking, emotional regulation, and prosocial motivation.

Importantly, compassion and selflessness are closely intertwined constructs, both central to contemplative traditions. Rather than existing in a hierarchical sequence, they appear to operate in a reciprocal and mutually reinforcing manner: as compassion deepens, the perceived separation between self and others diminishes, accompanied by a softening of self–other boundaries that may give rise to selfless states; while experiences of selflessness can, in turn, expand the capacity for more inclusive and unconditional compassion (Gilbert & Van Gordon, 2023). Empirical evidence further supports this bidirectional relationship, indicating that selflessness mediates the association between mindfulness, well-being, and prosocial motivation (Hanley et al., 2017), and that selfless modes of experience are associated with broader, less selective forms of compassion (Condon & Makransky, 2020). From this perspective, compassion and selflessness can be understood as parallel expressions of a more fundamental transformation in how individuals relate to suffering, to others, and to the self.

4.1.2. Tonglen Meditation

Among compassion-based meditations, Tonglen was selected for the present work due to its relevance for inducing selflessness. It is a traditional Buddhist meditation with historical origins dating back to the 10th century CE (Chödrön, 1994). The term *Tonglen* derives from the Tibetan words *tong* ("to give or send") and *len* ("to receive or take"), together meaning "giving and receiving" (Drolma, 2019). In its classical formulation, the practice integrates breath-based attentional regulation with visualization: the practitioner receives the suffering of another being on the in-breath – often symbolized as dark smoke or clouds – and, on the out-breath, sends relief and well-being, typically imagined as light or fresh air (Jinpa, 2011).

Recent research has begun to characterize the experiential structure of Tonglen in greater detail. A micro-phenomenological study by Andreu et al. (2025a) investigated the lived experience of Tonglen meditation in expert practitioners using micro-phenomenological interviews, with the aim of identifying its fine-grained temporal dynamics. Based on first-person reports, the authors described a coherent experiential structure comprising four phases: (1) a preparation phase involving attentional

stabilization; (2) a generation phase characterized by vivid visualization of another being and an embodied empathic connection with their suffering; (3) a taking-and-giving phase constituting the core of the practice, in which suffering is intentionally received, transformed, and released through breath-synchronized imagery; and (4) a closure phase in which the visualization is gradually dissolved and the meditation is concluded.

Beyond its experiential organization, preliminary empirical findings suggest that Tonglen practice may yield meaningful psychological and interpersonal benefits. For instance, Pardy (2016) conducted a grounded theory study with experienced meditators to explore subjective changes following 28 days of Tonglen practice. Participants reported a variety of positive outcomes, including an enhanced sense of interconnectedness with others and, for some, profound insights into the nature of the self. Complementing these qualitative findings, two experimental studies (McKnight, 2012; Gilbert et al., 2023) showed that Tonglen training was associated with significant increases in compassion, positive affect, social safeness, and overall well-being. In terms of acceptability, participants frequently described the practice as energizing and inspiring, and reported substantial positive carryover effects in their daily lives (Gilbert et al., 2023; Mah et al., 2020).

More recently, a randomized controlled study examined the acute effects of a single session of Tonglen meditation in healthcare workers, a population routinely exposed to others' suffering (Andreu et al., 2025b). Compared to an active control condition, Tonglen practice resulted in significant increases in state compassion, particularly in the dimensions of recognizing suffering and motivation to alleviate it. During an experimental task involving exposure to videos depicting human suffering (Socio-Affective Video Task; Klimecki et al., 2013, 2014), participants who engaged in Tonglen meditation also demonstrated heightened empathic engagement, as reflected by increased empathy, sensitivity to suffering, positive affect, and willingness to help. At the physiological level, the intervention was associated with increased vagally mediated heart rate variability, indicative of enhanced parasympathetic regulation. Notably, this pattern corresponds to physiological states linked to social engagement and compassion. Taken together, these findings suggest that even brief Tonglen meditation can acutely enhance compassionate responding across subjective, behavioral, and autonomic domains, underscoring its relevance for healthcare contexts characterized by sustained exposure to others' suffering.

4.1.3. Tonglen Meditation to Induce Selflessness

Tonglen has been explicitly conceptualized as a contemplative practice aimed at reducing self-centeredness and cultivating selflessness (Chödrön, 1994). More specifically, this meditation was developed to foster the courage to engage directly with suffering while attenuating habitual self-focused tendencies (Drolma, 2019). By intentionally opening to the suffering of others, Tonglen is designed to reverse habitual self-protective and avoidance-oriented patterns, encouraging practitioners to remain with distress rather than withdraw from it. This deliberate reversal – receiving others' suffering and offering relief and well-being – gradually softens self-centered modes of experience, enabling practitioners to apprehend the shared nature of suffering and to recognize the fundamental interdependence between self and other. Such an experiential reconfiguration ultimately facilitates a direct, embodied understanding of selflessness (Jinpa, 2011). As Chödrön (1994, p. 89) observes, "When you practice Tonglen, you begin to dissolve the barriers that separate you from others." In this sense, Tonglen extends beyond the cultivation of compassion and is often presented as a practice aimed at transforming the structure of self-experience, thereby resonating with phenomenological accounts of selflessness.

Recent micro-phenomenological research provides robust empirical grounding for this account. In particular, Andreu et al. (2025a) demonstrated that, among expert practitioners, sustained engagement with Tonglen can engender a non-dual mode of compassionate experience marked by a pronounced attenuation of self-other boundaries, a significant reduction in effortful or agentic control, and the emergence of an expansive, open attentional field. In this experiential mode, compassion arises spontaneously rather than through deliberate intention or effort, while attention shifts from an intentional, object-centered mode to a broad, non-referential, and inclusive field of awareness. Taken together, these findings suggest that Tonglen may support advanced experiential reconfigurations in which compassion is no longer grounded in a self-referential stance but becomes inseparable from a transformed experience of self.

Overall, these conceptual and phenomenological accounts position Tonglen as a contemplative practice capable of fostering selflessness not only through the cultivation of compassion, but through a direct transformation of self-related experience. This dual capacity makes Tonglen particularly well suited for the empirical investigation and experimental induction of selflessness.

4.2. Psychedelic Substances

In addition to contemplative practices, psychedelic substances have been both historically and scientifically investigated as means of inducing states of selflessness. The acute effects of psychedelics are phenomenologically rich and highly heterogeneous, encompassing alterations in perception, affect, cognition, and bodily awareness, as well as profound transformations of self-consciousness (Griffiths et al., 2008, 2011; Johnson et al., 2008, 2014). One of the most salient of these transformations is drug-induced ego dissolution (DIED; Millière, 2017), characterized by a pronounced attenuation or temporary loss of the sense of self as a distinct and bounded entity.

In recent years, scientific interest in psychedelic substances and their effects has intensified (Ko et al., 2022). Empirical research indicates that so-called classical psychedelics – including psilocybin (Griffiths et al., 2008, 2011), lysergic acid diethylamide (LSD; Lyvers & Meester, 2012), and dimethyltryptamine (DMT; Trichter et al., 2009) – can reliably elicit experiences characterized by reduced self-referential awareness and a loosening of the boundaries between self and world. Comparable alterations in self-experience have also been reported with other psychoactive substances, such as nitrous oxide (James, 1882) and ketamine (Vollenweider & Kometer, 2010).

From a scientific perspective, drug-induced states of selflessness provide a valuable opportunity to investigate alterations in self-experience under controlled experimental conditions. Unlike endogenous changes in the sense of self – such as those occurring in psychiatric or neurological disorders or arising spontaneously – psychedelic-induced states can be systematically manipulated and measured, enabling the study of both their phenomenology and neurophysiology (Millière, 2017). For instance, recent neurophysiological evidence not only supports the link between psychedelics and experiences of selflessness but also provides insight into their underlying neural dynamics. EEG studies involving DMT (e.g., Irrmischer et al., 2026; Timmermann, 2025) indicate that the intensity of drug-induced selflessness correlates with reductions in long-range temporal correlations in alpha and theta oscillations, suggesting a destabilization of the large-scale brain dynamics associated with the sense of self. Notably, similar alterations in large-scale neural activity have also been reported during states of deep meditative absorption, pointing to a potential convergence in the neural mechanisms underlying different forms of selflessness (e.g., Lutz et al., 2004; Josipovic, 2014).

Beyond their experimental relevance, these substances have also been associated with therapeutic potential when administered in controlled and supportive settings. Early work laid the foundations for psychedelic-assisted psychotherapy (Leary et al., 1964; Grof, 1980), an approach that has received renewed empirical support in recent decades (Griffiths et al., 2008, 2011; Johnson et al., 2008, 2014; Lewis et al., 2023).

4.3. Limitations of Traditional Methods of Induction

Despite the longstanding use of meditation and psychedelic substances as methods for inducing selflessness, both approaches present important limitations for empirical research. First, although meditation has been shown to facilitate profound alterations in self-experience, the emergence of stable or pronounced states of selflessness through contemplative practice typically requires sustained, long-term training and high levels of practitioner expertise (Lindahl & Britton, 2019; Lindahl et al., 2017; Dor-Ziderman et al., 2013). Such experiences tend to unfold gradually and in a highly heterogeneous manner across individuals and practice histories, which makes them difficult to reliably induce, standardize, and temporally constrain within experimental settings (Lutz et al., 2007; Ataria et al., 2015). Moreover, these demands limit the generalizability of selfless experiences to non-meditating or novice populations, thereby constraining their applicability in experimental research designs.

Psychedelic substances, by contrast, can induce rapid and robust alterations in self-experience. However, despite a growing body of evidence supporting their safety and tolerability when administered within regulated medical and research contexts (Schlag et al., 2022), psychedelics remain pharmacological agents and, like all drugs, carry a risk of adverse effects in certain individuals. Controlled studies indicate that such effects may include affective (e.g., panic, depressed mood), cognitive (e.g., confusion, feelings of loss of control or sanity), and somatic symptoms (e.g., nausea, heart palpitations), occurring both during the acute phase and in the days following administration (Studerus et al., 2010; Barrett et al., 2016; Breeksema et al., 2022). These potential risks, together with the intensity and unpredictability of subjective effects, have contributed to the strict regulation or prohibition of many psychedelic substances across jurisdictions, thereby limiting their accessibility and scalability in both research and applied settings.

Taken together, these limitations highlight the need for alternative approaches that are both experimentally feasible and ethically robust. Within this context, virtual reality (VR) has emerged as a promising non-pharmacological and cost-effective method for the induction and investigation of altered self-experiences. By enabling the controlled simulation of experiences that may be difficult, risky, or otherwise inaccessible in real-world contexts (Mado & Bailenson, 2022), VR expands the methodological resources available for the empirical study of selflessness and serves as a valuable alternative to established contemplative and pharmacological methods.

4.4. Virtual Reality as a Novel Approach

VR possesses a set of distinctive technological features that make it particularly well suited to induce selflessness-related states. Through its capacity to reshape bodily self-representation and to elicit self-transcendent emotions, VR constitutes a highly relevant methodological tool for achieving a temporary attenuation of the ordinary sense of self under controlled laboratory conditions.

First, VR provides a powerful platform for modulating bodily self-experience by enabling the substitution of the physical body with a virtual representation. Within immersive virtual environments, users do not merely observe this representation from an external perspective; rather, they often experience a robust sense of embodiment, such that the virtual body is experienced as one's own (Slater et al., 2009). This sense of embodiment is commonly conceptualized as comprising three interrelated dimensions: self-location or presence, referring to the felt sense of being spatially situated within the virtual body; body ownership, defined as the experience of the virtual body as the source of one's sensations; and agency, understood as the feeling of initiating and controlling the virtual body's actions (Longo et al., 2008; Kilteni et al., 2012). These dimensions closely correspond to the embodied and experiential components of selfhood described in Gallagher's (2000, 2013, 2024) pattern theory of self, particularly those sustaining the minimal sense of ownership, agency, and first-person perspective. By systematically manipulating these components, VR enables the induction of powerful full-body illusions (Blanke & Metzinger, 2009; Turbyne et al., 2021). Empirical studies have accordingly documented the elicitation of out-of-body experiences (Amato et al., 2019), alterations in body ownership (Knibbe et al., 2018), shifts in spatial presence and self-location (Chirico

et al., 2018; Knibbe et al., 2018), and disruptions in the sense of agency or motor control (Knibbe et al., 2018).

Beyond its capacity to modulate bodily self-consciousness, VR has emerged as an effective means for eliciting self-transcendent emotions. These affective states (e.g., awe, compassion, and gratitude) involve a temporary attenuation of self-focused awareness and an experiential expansion toward others and the surrounding world (Pizarro et al., 2021; Stellar et al., 2017). A growing body of research has linked such emotions to experiences of selflessness, with awe occupying a particularly central position within this literature. Awe is a complex emotional state typically elicited by perceptions of vastness or novelty and has been shown to produce the *small self* effect (Piff et al., 2015), whereby individuals experience a diminished sense of personal significance when confronted with phenomena perceived as larger or more expansive than themselves (Shiota et al., 2007; Song et al., 2023). Within this framework, Chirico et al. (2018) developed an immersive VR scenario specifically designed to elicit awe, thereby demonstrating the capacity of virtual environments to reliably induce this self-transcendent emotion under controlled experimental conditions.

In addition to awe, VR also shows considerable potential for inducing compassionate states (Halim et al., 2023; Žilinský & Halamová, 2023), which constitute another pathway to selflessness, as discussed earlier in this doctoral thesis. This potential is largely mediated by embodied VR paradigms that allow users to experientially adopt and inhabit the body of another individual. By inducing full-body illusions and body-swapping experiences, immersive VR can intensify affective engagement and promote a direct, first-person encounter with another's vulnerability or suffering, thereby facilitating the emergence of compassion in an experientially grounded manner (Navarrete et al., 2021). Empirical evidence further suggests that such embodied VR experiences can effectively support compassion-oriented practices, particularly by overcoming limitations associated with abstract perspective-taking or imagery-based techniques (Cebolla et al., 2019). Taken together, these findings underscore the central role of embodiment as a key mechanism through which VR can reliably induce compassionate, self-transcendent states under controlled experimental conditions.

Against this background, recent researchers, most notably Glowacki and colleagues (2020, 2022), have sought to design immersive environments explicitly aimed to elicit selflessness. To this end, they developed a paradigm of bodily representation

known as *numadelic aesthetics*, specifically conceived to give rise to an illusory form of embodiment that softens ordinary bodily boundaries and promotes self attenuation. Derived from the Greek *pneuma* (spirit) and *delein* (to reveal), this aesthetic framework is grounded in phenomenological descriptions of near-death experiences and psychedelic states, as well as in theoretical insights drawn from neuroscience and quantum physics (Glowacki, 2024). Within numadelic environments, virtual bodies are rendered as dynamic, luminous fields of energy with diffuse and permeable boundaries, rather than as discrete, materially bounded entities. This representational mode attenuates the sense of bodily solidity, fostering experiential openness and facilitating alterations in self-experience.

This representation has been implemented in a VR experience known as *Isness* (Glowacki et al., 2020, 2022), a multi-person environment in which participants collectively experience the emergence, transformation, and dissolution of themselves as energetic bodies. Within this shared virtual space, bodies are rendered as luminous, dynamic fields with diffuse boundaries, enabling moments of overlap and coalescence that blur conventional self-other distinctions. Crucially, *Isness* was shown to reliably induce self attenuation and to foster a pronounced sense of interpersonal connectedness, suggesting that alterations in embodied self-representation can give rise to self-transcendent phenomenology.

More recently, a novel immersive VR experience termed *Ripple* has been developed by Glowacki and colleagues as an extension of prior work. In addition to adopting a numadelic mode of bodily representation, Ripple uniquely integrates the contemplative practice of Tonglen meditation within the immersive VR context. As discussed earlier in this doctoral thesis, Tonglen is particularly well suited for the cultivation of selflessness, as it explicitly involves the attenuation of self-focused concern through the embodied exchange of suffering and compassion. Embedding this practice within an immersive virtual environment is hypothesized to further amplify its transformative potential through the distinctive technological affordances of VR, particularly its capacity to modulate bodily self-representation and to reliably elicit self-transcendent emotions. The empirical investigation and clinical application of Ripple constitute the central focus of the present doctoral thesis; accordingly, a detailed account of its conceptual rationale, experiential design, and technical implementation is provided in Chapter III (Methods), with particular emphasis on Study 3.

5. The Therapeutic Potential of Selflessness

The preceding sections have provided a comprehensive review of the conceptualization, measurement, and induction of selflessness, with the aim of situating this construct within the broader scientific literature. This effort is grounded in the assumption that selfless experiences may possess therapeutic value and yield clinically meaningful outcomes. Building on this premise, the present section examines the therapeutic potential of selflessness by synthesizing empirical evidence from clinical psychology and contemplative science.

5.1. Affective Correlates of Selflessness

The immediate experiential effects of induced selflessness remain under debate. On the one hand, a growing body of empirical research suggests that selfless states are often accompanied by increases in positive affect. Experimental studies have reported heightened positive emotions following the induction of selflessness (Dambrun, 2016; Dambrun et al., 2019; Glowacki et al., 2022; Vidal et al., 2025), and phenomenological investigations similarly describe these experiences as predominantly positive in tone (Dor-Ziderman et al., 2013; Hanley & Garland, 2019).

However, converging evidence indicates that these experiences are not uniformly positive. Alterations in self-experience have also been described as unsettling and emotionally distressing (Hood et al., 2001; Yaden et al., 2017). For instance, Lindahl and Britton (2019) reported that among meditators undergoing pronounced changes in their sense of self, approximately 55% appraised these experiences as distressing. Similarly, research on the adverse effects of intensive meditation retreats indicates that a substantial proportion of participants (30.3%) reported dissociative experiences accompanied by negative affect (Ataria, 2014; Hadash et al., 2024). Comparable distressing states have also been documented in the context of psychedelic use, where experiences of selflessness have at times been associated with acute anxiety, fear, or depressed mood (Barrett et al., 2016; Carbonaro et al., 2016).

Taken together, these findings indicate that selflessness cannot be understood as an inherently positive psychological state. Rather, its affective valence appears to be contingent upon contextual factors and individual differences. In particular, the affective appraisal of selfless experiences has been shown to be shaped by personal beliefs about the self, which are themselves informed by cultural frameworks, prior expectations, and

individual meaning-making processes (Hanley et al., 2018; Hadash et al., 2024). Moreover, several authors emphasize the importance of the relational dimension of selflessness – namely, a felt sense of interconnectedness or unity with others and/or the surrounding world – for its association with positive affect. Therefore, experiences of selflessness that incorporate this relational dimension are more likely to be affectively positive (Dambrun & Ricard, 2011; Hanley et al., 2018; Yaden et al., 2017; Stinus & Berjot, 2026). By contrast, alterations in self-experience that primarily involve an attenuation of the sense of self in the absence of relational connectedness are more likely to manifest as dissociative states accompanied by negative affect (Hadash et al., 2024).

5.2. Selflessness and Psychological Well-Being

Although the emotional valence of selfless experiences varies depending on personal, contextual, and cultural factors, converging evidence suggests that they can provide meaningful psychological benefits. Beyond their immediate experiential or emotional effects, selfless states have been consistently associated with more enduring aspects of psychological well-being, highlighting their potential therapeutic relevance.

Across diverse philosophical, contemplative, and spiritual traditions, the cultivation of selflessness has long been regarded as a central pathway to human flourishing and enduring happiness (Anālayo, 2003; Olendzki, 2006; Gallagher et al., 2024). These perspectives converge with a growing body of empirical research indicating that psychological states characterized by reduced self-centrality are associated with a wide range of beneficial outcomes. As outlined in the theoretical models discussed earlier in this thesis, several contemporary frameworks explicitly posit a close relationship between selflessness and psychological well-being (Dambrun & Ricard, 2011; Wayment & Bauer, 2018; Soler et al., 2021; Dunne, 2011; Hanley et al., 2018; Yaden et al., 2017). Among these, the model proposed by Dambrun and Ricard (2011) is particularly influential, as it conceptualizes selflessness as a mode of psychological functioning associated with authentic–durable happiness: a stable and enduring form of well-being that is relatively independent of external circumstances (Dambrun, 2016).

In addition, experimental studies of meditation consistently suggest that the attenuation of self-related processes constitutes a central mechanism underlying the beneficial effects of contemplative practices (e.g., Britton et al., 2021; Lin et al., 2018). Within the parallel domain of psychedelic science, a rapidly expanding body of research

has likewise identified selflessness-related experiences as key predictors of positive psychological outcomes (e.g., Griffiths et al., 2008; Orłowski et al., 2022; Kałużna et al., 2022; Zeifman et al., 2025). Taken together, these converging findings suggest that, despite their distinct modes of induction, selflessness may constitute a cross-contextual pathway to psychological well-being.

Although empirical research directly examining the clinical application of selflessness remains at an early stage, converging theoretical and preliminary empirical evidence suggests that the cultivation of transient, well-regulated forms of selflessness may constitute a clinically relevant therapeutic mechanism (Van Gordon et al., 2015; Giommi et al., 2023; Sys et al., 2024; Lamas-Morales et al., 2025). Such approaches have been associated with improvements in emotion regulation, psychological flexibility, and overall well-being across diagnostic categories, supporting their transdiagnostic relevance (Van Gordon et al., 2015; Giommi et al., 2023). At the applied level, emerging therapeutic interventions are increasingly integrating principles derived from selflessness-related frameworks into contemporary psychotherapeutic models, emphasizing the importance of embedding self-deconstructive processes within ethically grounded, value-oriented, and clearly structured intervention contexts to maximize therapeutic benefit (Lamas-Morales et al., 2025).

5.3. Therapeutic Benefits of Selflessness for Oncology Patients

One population that may be particularly well suited to benefit from such interventions is individuals living with cancer. A cancer diagnosis constitutes a highly stressful life event, with profound consequences not only for physical health but also for patients' mental health and broader psychological and spiritual well-being (Zare et al., 2019). This substantial emotional burden is reflected in the high prevalence of mental disorders among oncology patients, with evidence indicating that over 40% meet diagnostic criteria for at least one mental disorder (Mitchell et al., 2011; Amiri, 2024).

Modern medicine has traditionally focused on treating physical symptoms, while interventions aimed at improving psychological, social, and spiritual well-being remain limited and often difficult to access (Carr & Steel, 2013; Stripp et al., 2025). In patients with severe medical conditions, psychological distress is primarily managed with pharmacological treatments such as antidepressants and anxiolytics, although evidence for their effectiveness is mixed and inconclusive (Ostuzzi et al., 2015; Grassi et al., 2014).

Psychological interventions show small to moderate benefits in reducing distress and improving quality of life, but many studies present methodological limitations (Faller et al., 2013; Riba et al., 2019). Interventions specifically targeting social and spiritual well-being are even less common, despite increasing evidence that these dimensions are central to adjustment, meaning-making, and overall quality of life in oncology populations (Puchalski et al., 2019; McLouth et al., 2024; Riba et al., 2019).

In this context, recent years have seen increasing efforts to develop innovative treatments aimed at improving the mental health of individuals living with cancer. In particular, growing interest has emerged in the therapeutic use of psychedelics within oncology settings (Griffiths et al., 2008, 2011; Johnson et al., 2008, 2014). Psychedelic-assisted therapies have demonstrated significant and sustained reductions in depressive and anxiety symptoms (Agin-Liebes et al., 2020; Griffiths et al., 2016; Lewis et al., 2023), alongside marked improvements in psychological and spiritual well-being (Ross, 2018; Ross et al., 2016, 2022; Shnayder et al., 2023). Although the mechanisms underlying these therapeutic effects remain under active investigation, converging theoretical and empirical evidence suggests that selfless experiences constitute a central mediating process (Millière, 2017; Roseman et al., 2018). From this perspective, selflessness constitutes a primary experiential pathway through which psychedelic experiences give rise to enduring therapeutic outcomes.

Despite these promising findings, the large-scale implementation of psychedelic-based interventions in oncology populations remains constrained by legal, medical, and practical limitations, including regulatory barriers and contraindications in medically vulnerable patients (Barrett et al., 2016; Breeksema et al., 2022; Kettner et al., 2025). Consequently, there is a growing need to develop alternative approaches capable of delivering key therapeutic benefits – particularly those associated with experiences of selflessness – while avoiding these constraints. In this context, immersive VR emerges as a promising non-pharmacological platform for the induction of selflessness-related states.

Notably, preliminary empirical support for this approach is provided by prior work employing a VR intervention developed within the numadelic aesthetic in individuals living with life-threatening illnesses, including cancer (Kettner et al., 2025). This intervention was found to be feasible and well tolerated, and was associated with significant improvements in anxiety, depression, connectedness, and spiritual well-being, alongside reductions in demoralization. Although these findings derive from an

observational cohort design and therefore warrant cautious interpretation, they nonetheless offer initial evidence that VR-based selflessness-inducing experiences may deliver clinically meaningful psychological benefits in oncology settings.

Within this context, the VR experience Ripple, previously described in this doctoral dissertation, is particularly relevant, as it was explicitly designed to reliably induce experiences of selflessness through controlled, immersive, and ethically grounded means. As such, Ripple constitutes a scalable and clinically viable therapeutic tool for translating the therapeutic potential of selflessness into a safe and implementable intervention framework.

CHAPTER II. OBJECTIVES

Building on the theoretical and empirical background presented in Chapter I, the current state of research reveals significant gaps in the scientific investigation of selflessness. Specifically, although recent years have seen important advances, existing studies remain characterized by limited conceptual clarity, methodological constraints in the assessment and induction of selflessness, and a lack of systematic evidence regarding its potential clinical relevance. Accordingly, the general objective of this doctoral dissertation is to advance a comprehensive scientific understanding of selflessness. To this end, the dissertation examines the induction of selflessness through the traditional contemplative practice of Tonglen, refines its conceptualization and assessment, and investigates an innovative immersive VR experience (Ripple), which integrates Tonglen, as a novel methodological approach to support the controlled induction and systematic scientific study of selflessness in both contemplative and clinical contexts. To achieve this overarching aim, the following specific objectives are established:

1. To deepen the understanding of Tonglen meditation and its effects on healthcare professionals' responses to suffering, with particular emphasis on changes in pre-reflective experiential dimensions associated with selflessness.

2. To identify, systematize, and critically synthesize the main theoretical approaches and assessment methods currently used to study selflessness – including self-report measures, behavioral tasks, and phenomenological interview techniques – in order to propose a coherent multimethod framework for its scientific investigation.

3. To evaluate the efficacy, feasibility, and acceptability of an immersive VR experience (Ripple), grounded in the contemplative practice of Tonglen and specifically designed to induce selflessness under controlled experimental conditions.

4. To examine the application of Ripple within a contemplative context, assessing its effects on participants' meditative experience within the naturalistic context of a contemplative retreat.

5. To examine the application of Ripple within a clinical context, developing an in-depth understanding of VR-induced selflessness in an oncology population, including its phenomenological characteristics, temporal dynamics, and potential clinical relevance.

To address these objectives, five interrelated studies were conducted. Chapter III describes the methodology of each study, including their theoretical rationale, methods, results, and main discussions. Chapter IV presents an integrated summary of the principal findings obtained across the studies. Finally, Chapter V offers a comprehensive discussion that synthesizes the results in relation to the specific objectives of the dissertation, highlights their theoretical and clinical implications, discusses methodological strengths and limitations, and outlines directions for future research.

Through this series of studies, the present dissertation aims to advance the scientific understanding of selflessness in terms of its conceptualization, assessment, induction, and clinical application, while also contributing to the development and use of innovative technologies that bridge contemplative traditions, experimental psychology, and immersive methodologies.

CHAPTER III. METHODS

Study 1. Transcending Self-Focus: A Mixed-Methods Randomized Controlled Trial of Tonglen Meditation in Healthcare Professionals

1. Background

Across contemplative traditions, various practices have been developed to transform habitual emotional responses to suffering. Among these, Tonglen – a traditional compassion-based Buddhist meditation – appears particularly relevant (Chödrön, 1994; Drolma, 2019). Tonglen integrates breath-based attentional regulation with structured visualization (Jinpa, 2011). During the in-breath, practitioners intentionally receive the suffering of another being, often symbolized as dark smoke or clouds. During the out-breath, they send relief and well-being, typically imagined as light or fresh air. Through this rhythmic process of "taking and giving", the practice directly engages with the experience of suffering rather than avoiding or suppressing it.

Recent research has begun to characterize the experiential structure of Tonglen in greater detail. Drawing on micro-phenomenological interviews with expert practitioners, Andreu et al. (2025a) identified a coherent four-phase experiential structure: (1) a preparation phase involving attentional stabilization; (2) a generation phase in which the presence and suffering of another are vividly evoked; (3) a taking-and-giving phase, in which suffering is visualized as dark smoke that is absorbed, transformed, and released as light; and (4) a closure phase, during which the visualization gradually dissolves and the mind settles. Beyond clarifying its experiential characteristics, preliminary empirical findings suggest that Tonglen practice may foster compassion for others and self-compassion, as well as meaningful psychological and interpersonal benefits (McKnight, 2012; Pardy, 2016; Mah et al., 2020; Gilbert et al., 2023; Andreu et al., 2025b). However, despite these promising results, little is known about how Tonglen is perceived and subjectively experienced by non-expert practitioners.

Importantly, Tonglen has been explicitly conceptualized as a contemplative method aimed at reducing self-centeredness and cultivating selflessness (Drolma, 2019). By deliberately opening to others' suffering, the practice counteracts habitual self-protective tendencies and fosters an experiential recognition of the shared and interdependent nature of suffering (Chödrön, 1994; Jinpa, 2011). Recent findings further suggest that, in expert practitioners, repeated cycles of taking and giving may culminate

in a non-dual compassionate state characterized by a softening of self–other boundaries, diminished effortful agency, and an expanded, open attentional field (Andreu et al., 2025a). These observations raise the question of whether similar processes may emerge in non-expert populations following structured training.

In this context, Tonglen appears particularly relevant in professional environments characterized by frequent exposure to suffering, such as healthcare. Healthcare workers (HCWs) are routinely confronted with patients' distress, and their responses to this suffering significantly shape therapeutic relationships, influence their own psychological well-being, and ultimately affect clinical outcomes (Nembhard et al., 2023). Despite this practical and theoretical relevance, little is known about how HCWs experience others' suffering from a first-person perspective, or how these experiential responses may change following compassion-based training such as Tonglen.

A central challenge is that responses to suffering are shaped by phenomenological, often pre-reflective processes (Martínez-Pernía et al., 2023, 2025; Troncoso et al., 2024; Zepeda et al., 2025). Such processes are frequently overlooked by standardized self-report measures, which reduce complex and context-dependent experiences to numerical ratings (Petitmengin, 2017). To address this limitation, integrative methodological approaches are increasingly needed. Phenomenology, in particular, offers a systematic framework for examining first-person accounts and tracing changes in lived experience, including embodied and pre-reflective dimensions that remain largely inaccessible to conventional instruments (Giorgi, 1997; Petitmengin, 2006). In addition, combining phenomenological interviews with behavioral tasks and standardized questionnaires can strengthen both the reliability and interpretative depth of the findings (Teddlie & Tashakkori, 2009; Shaw et al., 2018; Branney et al., 2023; Toraman Turk et al., 2025).

Against this background, the present study implemented a randomized controlled trial with a mixed-methods design to examine the effects of a two-week Tonglen training on HCWs responses to suffering. Specificcaly: (1) it investigated how Tonglen shapes emotional responses to others' suffering at the experiential level, using a behavioral task with embedded self-report ratings, followed by in-depth phenomenological interviews; (2) it assessed whether this brief training was associated with changes in trait compassion, as measured by self-report instruments; and (3) it sought to deepen understanding of Tonglen practice by examining participants' subjective experiences during meditation through a semi-structured interview conducted at the end of the training period.

2. Method

2.1. Participants

Participants were HCWs, including nurses, physicians, medical assistants, physical therapists, clinical social workers, and clinical psychologists. Participation was voluntary, and recruitment was conducted through social media platforms and announcements disseminated across hospitals, healthcare centers, and institutions affiliated with the University of Valencia. Inclusion criteria were: (1) being 18 years of age or older; (2) proficiency in Spanish sufficient to understand the meditation audio recordings, the informed consent, and the full study protocol; and (3) current employment as a HCW. Exclusion criteria comprised the presence of moderately severe or severe depressive symptoms, as indicated by scores on the Patient Health Questionnaire-9 (PHQ-9; Kroenke et al., 2001).

All procedures involving human participants were conducted in accordance with the principles of the Declaration of Helsinki and its later amendments or comparable ethical standards. The study protocol was approved by the Ethics Committee of the University of Valencia (registration number: 2016902) and was preregistered on the Open Science Framework (https://doi.org/10.17605/OSF.IO/X7YH4).

2.2. Procedure

A total of 159 individuals completed an initial online screening. Of these, 60 met the inclusion and exclusion criteria and provided informed consent. Forty-seven participants ultimately completed the two-week protocol and all assessments. Participants attended two laboratory sessions at the University of Valencia, scheduled two weeks apart. They were randomly assigned to either the Tonglen group (n = 25) or the control group (n = 22). Participants were blinded to group allocation, including the existence of different study conditions and the fact that one condition involved meditation practice.

During the first laboratory session, participants provided written informed consent and completed self-report questionnaires assessing trait-level compassion. They then completed a video-based task designed to elicit emotional responses to human suffering, which included self-report measures. This was followed by a phenomenological interview exploring their subjective experiences in response to the video stimuli. After these assessments, participants were exposed to their assigned condition. The Tonglen group

listened to a 15-minute guided Tonglen meditation, whereas the control group listened to a neutral narrative and were instructed to visualize its content. The first session lasted approximately 90 minutes.

Following this session, participants in the Tonglen group were instructed to practice daily using the same 15-minute audio recording over the subsequent two weeks. The control group received no practice instructions. Adherence in the Tonglen group was monitored through a daily online report indicating whether the practice had been completed. When practice was reported, participants rated the perceived quality of that session on a single-item scale ranging from 0 to 100.

Two weeks later, participants returned for the second laboratory session, which followed the same procedure as the first. In addition, a semi-structured interview explored participants' experiences with the Tonglen practice during the training period. At the end of the session, participants were debriefed regarding the study design. Those in the control group were then offered access to the Tonglen meditation audio used in the experimental condition.

2.3. Measures

2.3.1. Responses to Human Suffering

Socio-Affective Video Task with Self-Report Measures. A modified version of the Socio-Affective Video Task (SoVT; Klimecki et al., 2013, 2014) was employed to assess affective responses to video stimuli depicting human suffering. The videos, sourced from news reports and documentary footage, had a duration ranging from 10 to 18 seconds. Each assessment session comprised two sets of stimuli: nine high-emotion (HE) videos portraying individuals in distress, and nine low-emotion (LE) videos depicting emotionally neutral, everyday activities. Thus, a total of 18 videos were presented per session. The videos were organized into six blocks, each containing three videos of the same emotional category (HE or LE). Consistent with the original SoVT protocol, different video sets were used at each measurement time point to minimize habituation effects. Following each block, participants rated their subjective experience on a 10-point Likert scale (0 = not at all; 10 = very much) across five dimensions: empathy, sadness, anger, positive affect, and willingness to help. While the original SoVT includes measures of empathy, positive affect, and negative affect, the present study expanded the assessment to include sadness, anger, and willingness to help. These

additional items were intended to capture a broader and more differentiated emotional profile, including nuanced affective reactions elicited by exposure to human suffering. The order of the self-report items was randomized across blocks. Stimulus presentation and data collection were administered using iMotions software (version 10; iMotions A/S, 2022). The complete SoVT procedure had an approximate duration of 10 minutes.

Phenomenological Interview. Following completion of the SoVT, participants engaged in a phenomenological interview exploring their lived emotional experience, with particular attention to moments of greatest emotional intensity during the videos. Interviews were audio-recorded and later transcribed for analysis. The aim of this approach was to access pre-reflective dimensions of experience – such as bodily sensations, affective states, sensory impressions, and shifts in attention or thought – that are typically not captured by standardized self-report measures. In doing so, it enabled a more fine-grained examination of subjective experience (Petitmengin et al., 2019). Participants were invited to describe their lived experience during specific moments of the videos using open-ended prompts (e.g., "How did you feel in that moment?" or "How did the sadness manifest in your experience?"). To ensure methodological consistency, interviews followed an adapted procedure based on micro-phenomenological guidelines (Petitmengin, 2006), with uniform interviewing practices across participants. All transcripts were anonymized by assigning participant codes and removing any information that could reveal group allocation.

2.3.2. Trait Compassion Questionnaires

In addition to socio-demographic information and data on prior meditation experience, trait-level compassion was assessed using the following self-report questionnaires.

Sussex-Oxford Compassion for Others Scale (SOCS-O; Gu et al., 2020; García-Campayo et al., 2024). The SOCS-O is a 20-item self-report instrument designed to assess compassion toward others. It comprises five theoretically grounded dimensions: (1) recognizing suffering, (2) understanding the universality of suffering, (3) empathizing with the person who is suffering, (4) tolerating uncomfortable feelings elicited by others' suffering, and (5) motivation to act to alleviate others' suffering. Items are rated on a 5-point Likert scale ranging from 1 (never true) to 5 (always true). The scale has demonstrated robust psychometric properties in previous research, which were replicated

in the present sample: recognizing suffering (α = 0.80), understanding the universality of suffering (α = 0.80), empathizing with suffering (α = 0.82), tolerating uncomfortable feelings (α = 0.79), and acting to relieve suffering (α = 0.79).

Compassion Motivation and Action Scales (CMAS; Steindl et al., 2021). The CMAS is a 30-item self-report measure assessing compassion-related motivations and behaviors across two domains: compassion toward others and self-compassion. For the purposes of the present study, only the compassion toward others scale was administered. This scale consists of 12 items capturing three components: (1) compassionate intention, (2) compassion distress tolerance, and (3) compassionate action. Items are rated on a 7-point Likert scale ranging from completely disagree to completely agree. The CMAS has demonstrated excellent reliability in prior studies, and comparable psychometric properties were observed in the current sample: compassionate intention (α = 0.81), compassion distress tolerance (α = 0.81), and compassionate action (α = 0.83).

2.3.3. Semi-Structured Interview

A semi-structured interview was conducted to advance understanding of Tonglen practice by exploring participants' subjective experiences of engaging in this meditation. This interview aimed to explore perceived effects of the training, as well as any difficulties, adverse experiences, or challenges encountered during the intervention period. These interviews were administered exclusively to participants in the Tonglen group during the second assessment session, following completion of the two-week training program. All interviews were audio-recorded and subsequently transcribed verbatim for analysis.

2.4. Data analysis

2.4.1. Responses to Human Suffering

SoVT with Self-Report Measures. Data derived from the SoVT self-report measures were analyzed using a 2 × 2 repeated-measures ANOVA. Prior to analysis, assumptions of normality and homogeneity of variances were verified and found to be satisfactory. The ANOVA tested the interaction between group (control vs. Tonglen) as a between-subjects factor and time (pre- vs. post-intervention) as a within-subjects factor. When significant interaction effects were observed, post-hoc pairwise comparisons were conducted using Bonferroni correction to control for multiple testing. This analytic strategy allowed for a precise examination of intervention-related changes over time and

between groups, ensuring a robust assessment of the effects of the Tonglen training on self-reported emotional responses.

Phenomenological Interview Analysis. The analysis proceeded in three stages: (1) descriptive phenomenological coding, (2) intercoder triangulation and agreement, and (3) quantitative comparison of category distributions.

First, the qualitative analysis followed Giorgi's descriptive method (Giorgi, 1997) to identify the structure of participants' lived experience. Interview transcripts were segmented into meaning units, which were then grouped into subcategories (e.g., bodily sensations) and higher-order experiential categories (e.g., bodily resonance). An initial subset of interviews was independently analyzed by four researchers to develop a shared coding framework. After consensus was reached on the categories and structural descriptions, this framework was applied to the full dataset.

All 94 interviews were independently coded by randomized, blinded pairs of evaluators unaware of group allocation, ensuring full double coding. Coding was conducted in ATLAS.ti 9, and intercoder agreement was calculated in R (Martínez-Pernía et al., 2023, 2025; Troncoso et al., 2024). Overall agreement across coded segments was 92%, ranging from 79.2% to 99% across coder pairs (M = 93.4%). Agreement was consistently high across the main experiential categories, and full agreement was reached for the identification of experiential structures. Only codes with complete consensus were retained in the final dataset.

Finally, based on the finalized coding, the proportion of participants associated with each experiential category and subcategory was calculated. Pre–post changes within each group (control vs. Tonglen) were examined using Fisher's exact tests for differences in proportions. Standardized residuals were computed to identify the categories contributing most strongly to significant group differences.

2.4.2. Trait Compassion Questionnaires

Data from the trait compassion questionnaires were analyzed using the same statistical approach as that applied to the SoVT self-report measures. Specifically, 2 × 2 repeated-measures ANOVAs were conducted to examine the effects of group and time, including their interaction. Assumptions of normality and homogeneity of variances were assessed prior to analysis, and Bonferroni-corrected post-hoc tests were performed when appropriate.

2.4.3. Semi-Structured Interview

Data from the semi-structured interviews were analyzed using Straussian grounded theory, following the three stages outlined by Corbin & Strauss (2014). The analysis was conducted by two researchers with expertise in qualitative methods.

In the first stage (open coding), both researchers independently conducted a line-by-line analysis of each transcript. Codes were assigned to meaningful segments of text and compared across interviews using the constant comparative method. After coding approximately half of the transcripts independently, the researchers met to discuss discrepancies, align coding decisions, and develop a shared coding framework, which was then applied to the remaining data. In the second stage (axial coding), relationships between codes were examined to group them into broader categories and themes. The coding framework was refined iteratively as new interviews were analyzed. In the final stage (selective coding), categories were integrated to identify a core variable representing the central phenomenon under study. Analysis continued until theoretical saturation was reached. All analyses were conducted using ATLAS.ti 9.

3. Results

3.1. Sample

The final sample consisted of 47 participants, who were randomized into either the Tonglen group (n = 25) or the control group (n = 22). Of these, 80.9% of the participants were female, with ages ranging from 26 to 63 years (M = 39.81, SD = 9.75). Additionally, 85.1% reported previous meditation experience, and 61.7% maintained a regular meditation practice. No significant differences were observed between the groups in all the previous variables (all $ps > .05$). On average, participants in the Tonglen group completed 13.4 practice sessions (M = 13.40, SD = 5.40) during the intervention period, and rated the quality of their practice at 70/100 (SD = 13).

3.2. Responses to Human Suffering

3.2.1. SoVT with Self-Report Measures

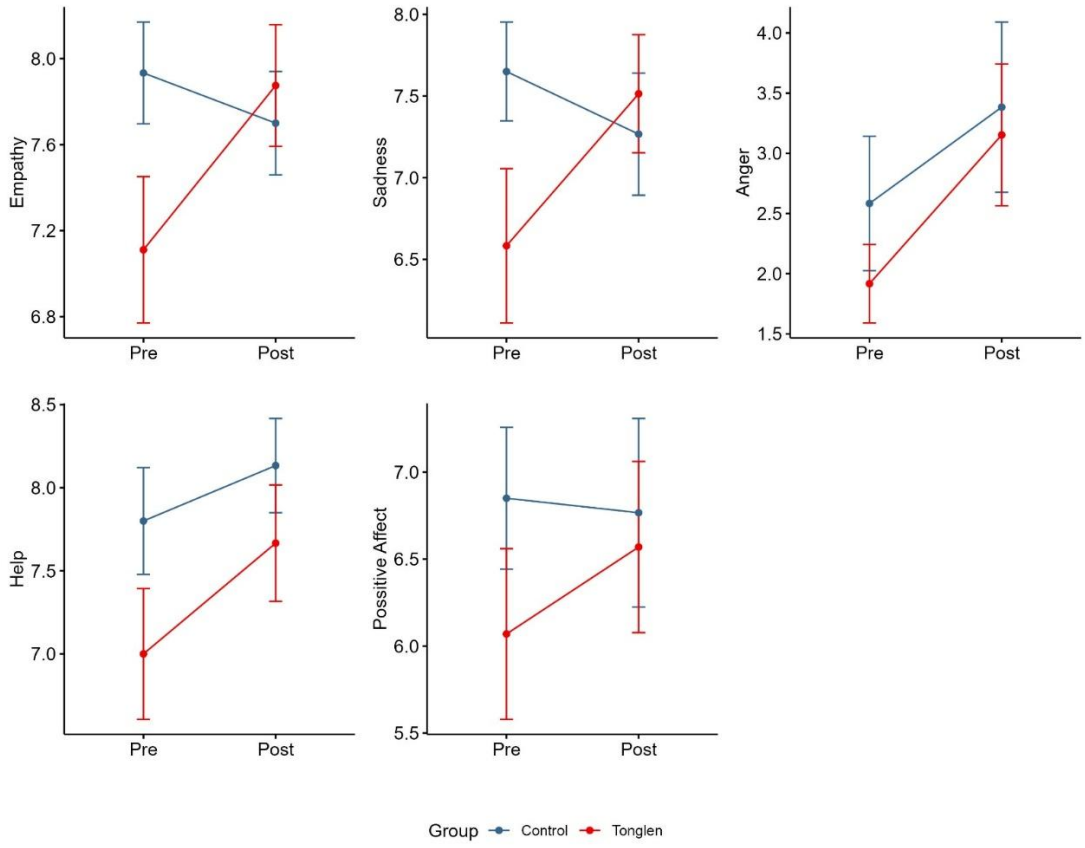
Mean scores for the control and Tonglen groups before and after the intervention are presented in Figure 2. For empathy, the Group × Time interaction was significant (F(1, 42) = 8.52, p = .01, ges = .04), indicating that changes over time differed between groups. Follow-up comparisons showed a significant increase in empathy from pre- to post-

intervention in the Tonglen group (*p*adj = .01), whereas no significant change was observed in the control group. A similar Group × Time interaction was found for sadness ($F(1, 42) = 6.08$, $p = .02$, *ges* = .03). Sadness increased significantly from pre- to post-intervention in the Tonglen group (*p*adj = .04) and remained stable in the control group.

No significant Group × Time interaction emerged for anger ($F(1, 42) = 0.38$, $p = .54$, *ges* = .00), indicating comparable trajectories across groups. Likewise, the interaction was not significant for willingness to help ($F(1, 42) = 0.63$, $p = .43$, *ges* = .00) or positive affect ($F(1, 42) = 1.10$, $p = .30$, *ges* = .00), suggesting no differential pre–post changes between conditions.

Figure 2

Changes in self-reported emotional responses during the SoVT from pre- to post-intervention in the Tonglen and control groups



3.2.2. Phenomenological Results

Phenomenological results are presented at three complementary levels: (a) phenomenological categories, (b) structures of experience, and (c) temporal shifts in these experiential structures from pre- to post-intervention.

A) Phenomenological Categories. Phenomenological categories are analytically derived themes that capture recurrent and meaningful features of participants' lived experience. Through an iterative inductive analysis, three overarching experiential dimensions were identified: bodily resonance, perspective on internal dialogue, and prosocial motivation. Each dimension comprised several subcategories, allowing for a more fine-grained characterization of how participants experienced and responded to the videos depicting human suffering.

To complement these qualitative findings, Fisher's exact tests were conducted to compare pre- and post-intervention distributions across the control and Tonglen groups. Figure 3 displays the proportion of participants associated with each subcategory in both groups before and after the intervention.

Figure 3

Radar plots of phenomenological subcategories before and after the intervention in the control and Tonglen groups

Note. Radar plots display the proportion of participants associated with each phenomenological subcategory before and after the intervention in the control and Tonglen groups. Significant pre–post differences in the Tonglen group are marked with asterisks ($p < .05$). No significant differences were observed in the control group.

Bodily Resonance. During the video task, participants described an embodied and affective response to others' suffering, reporting that the distress depicted was experienced both physically and emotionally in their own bodies. Reported experiences included sensations such as pressure in the chest or throat, abdominal discomfort, ocular sensations, and concomitant feelings (e.g., sadness, anger, or tenderness). Importantly, the intensity of these embodied reactions was coded along a continuum ranging from low-intensity (subtle, diffuse, or weakly differentiated sensations) to high-intensity (clear, localized, and vividly experienced sensations).

In the control group, the distribution of bodily resonance intensities showed no significant changes from pre- to post-intervention. In contrast, the Tonglen group exhibited a marked redistribution across intensity levels. Reports classified as low-intensity significantly decreased from 48% at pre-intervention to 8% at post-intervention ($p = .002$), whereas reports classified as high-intensity significantly increased from 8% to 48% ($p = .002$). This pattern indicates a shift from attenuated or weakly articulated bodily responses toward more clearly embodied and experientially salient forms of resonance following the training.

> "This does not impact me or doesn't call my attention. I had more thoughts than something that impacted my body." (S47 pre-intervention).

> "In several videos my stomach turned very unpleasantly, very strongly feelings." (S47 post-intervention).

Perspective of Internal Dialogue. Participants reported the presence of an ongoing internal dialogue while viewing the videos. This dialogue co-occurred with bodily and emotional responses and reflected how participants cognitively framed what they were witnessing. Analytically, it was categorized according to its primary orientation: toward the suffering of the individuals depicted, toward the broader social context, or toward the participants' own experience (self-referential focus).

In the control group, no significant pre–post changes were observed in the orientation of internal dialogue. Post-intervention reports indicated that the dialogue remained predominantly focused on the social context (68%), followed by the suffering of the other (41%), with minimal attention directed toward the self (9.1%).

In contrast, the Tonglen group showed a significant shift in the perspective of internal dialogue. Most notably, self-referential dialogue decreased significantly following the intervention (pre-intervention: 32%; post-intervention: 8%; $p = .034$). The proportion of dialogue oriented toward the social context remained relatively stable (pre-intervention: 52%; post-intervention: 48%). Additionally, there was a non-significant increase in dialogue focused directly on the suffering depicted in the videos (pre-intervention: 28%; post-intervention: 48%; $p = .20$).

Taken together, these findings indicate that Tonglen training was associated with a reduction in self-focused cognitive processing during exposure to suffering, suggesting a shift away from self-referential appraisal toward a more other-oriented mode of engagement.

> "I feel like it makes me sad…I have a very close case in the family… I feel very identified with that situation." (S59 pre-intervention)

> "I felt like helplessness, like tenderness at the same time, but yes, like an impression, like helplessness. The thought appeared as of rage, as of poor little baby and it was a bad baby, that it was going through a lot of pain. I felt it in the pit of my stomach." (S59 post-intervention)

Prosocial Motivation. Prosocial motivation was described as a pre-reflective impulse to act in response to the situations depicted in the videos. This dimension included two distinct motivational orientations, reflecting participants' spontaneous inclinations about how they wished to respond while viewing specific moments.

First, some participants reported a direct impulse to help others. They described an immediate desire to intervene and provide assistance to the individuals shown in the videos. The proportion of participants reporting this helping impulse remained stable across time in both the control group (pre-intervention: 31%; post-intervention: 36%; $p = .80$) and the Tonglen group (pre-intervention: 32%; post-intervention: 28%; $p = .80$).

> "I felt sad side, also a little angry and also… And yes also with a feeling of wanting to be able to support." (S8 post-intervention)

Second, some participants reported an inhibited impulse to help. Although they initially experienced a desire to assist, this impulse was restrained by the recognition that

no effective action was possible in the situation depicted. In the control group, the proportion of participants reporting this inhibited response increased from 4% to 18%, although this change was not significant (p = .30). A similar non-significant pattern was observed in the Tonglen group (pre-intervention: 0%; post-intervention: 16%; p = .11).

B) Structures of Experience. The three phenomenological categories and their variations served as the basis for identifying distinct structures of experience. Three structures emerged from the analysis: low sensitivity to suffering, high sensitivity to suffering, and compassionate support for suffering. Each structure was defined by a specific configuration across the experiential categories, forming coherent and distinguishable patterns.

Low Sensitivity to Suffering. This structure was characterized by reduced bodily resonance. Participants described weak, diffuse, or barely noticeable bodily sensations of low intensity. At the affective level, this reduced bodily engagement was accompanied by emotional distance and limited involvement with the other's suffering. The situation was experienced as remote or abstract, with low personal salience. At the motivational level, this configuration was associated with little or no impulse to intervene or offer support, reflecting a general pattern of disengagement.

> "I had more thought than feeling. Just a very little feeling. Like sadness, yeah. And tension. I felt distant." (S42 pre-intervention).

High Sensitivity to Suffering. This structure was characterized by heightened bodily resonance. Participants described intense, vivid, and clearly localized bodily sensations that mirrored the suffering of the other. At the affective level, this strong embodied response was accompanied by pronounced empathic feelings and emotional attunement to the other's distress. The situation was experienced as immediate and personally salient.

> "The sensations that I managed to connect, it's like sadness, a feeling that squeezes my chest like this." (S42 post-intervention).

Compassionate Support for Suffering. This structure was characterized by sustained bodily engagement. Participants described a stable and present bodily resonance directed toward the other's suffering. At the affective level, this embodied

response was accompanied by clear feelings of sadness and emotional pain that resonated with the other, without leading to withdrawal or overwhelm. At the motivational level, this configuration was associated with a willingness to approach, remain with, and support the other, including intentions oriented toward alleviating suffering.

> "I felt that sadness, yes, I felt like I wanted to take care of her, like I wanted to be able to solve that" (S17 post-intervention).

C) Temporal Shift of the Structures of Experience. We next examined changes in experiential structures from pre- to post-intervention. Based on these transitions, participants were classified into four temporal meta-structures. Participants who shifted from high sensitivity to suffering to low sensitivity to suffering were categorized as *Loss of sensitivity*. Those who remained stable within either low or high sensitivity across time were classified as *Non-responders*. Participants who maintained a compassionate support structure at both time points were labeled *Persistent compassionate*. Finally, *Responders* were defined as those who moved from low sensitivity to a more engaged structure, either high sensitivity to suffering or compassionate support for suffering.

As shown in Table 2, Fisher's exact test indicated a significant difference in the distribution of temporal meta-structures between the control and Tonglen groups (p = .02). Examination of standardized residuals showed that this effect was primarily driven by the *Responders* category, which was more frequent in the Tonglen group (40%) than in the control group (9.1%). The Tonglen group also showed a lower proportion of *Non-responders* (36% vs. 59%) and a slightly higher proportion of *Persistent compassionate* participants (24% vs. 18%); however, these differences were not statistically significant. No participants in the Tonglen group showed a *Loss of sensitivity*, whereas this pattern was observed in 14% of the control group.

Overall, a higher proportion of participants in the Tonglen group transitioned toward more engaged experiential structures compared to the control group.

Table 2

Distribution of temporal meta-structures across control and tonglen groups

Temporal meta-structures	Control (N=22)	Tonglen (N=25)
Loss of sensitivity	3 (14%)	0 (0%)
Non-responders	13 (59%)	9 (36%)
Persistent compassionate	4 (18%)	6 (24%)
Responders	2 (9.1%)*	10 (40%)*

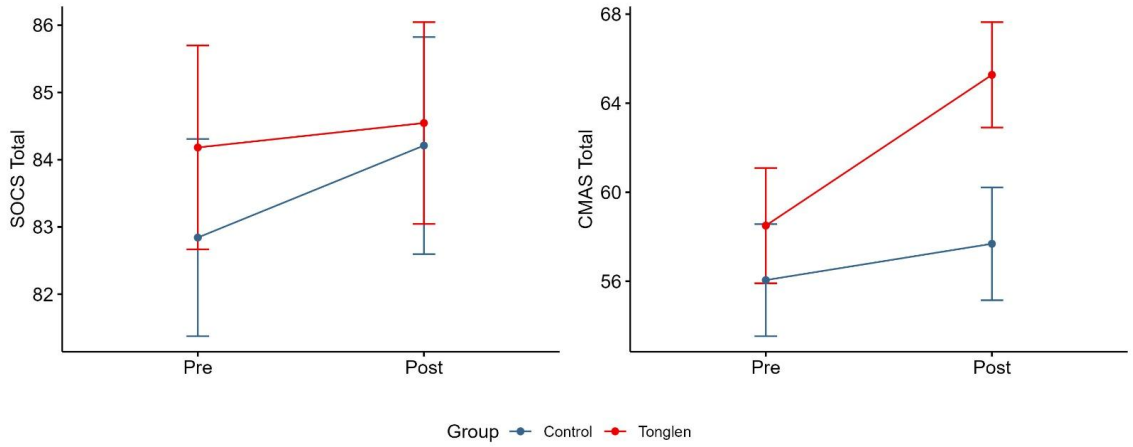
Note. Temporal meta-structures reflect participants' transitions between experiential structures from pre- to post-intervention. Fisher's exact test indicated a significant group difference (p = .02). * Significant difference based on analysis of standardized residuals.

3.3. Trait Compassion Questionnaires

For the SOCS, the Group × Time interaction was not significant (F(1, 39) = 0.62, p = .44, *ges* = .00), indicating that changes over time did not differ between groups. This pattern was consistent across all SOCS subscales, with no significant interactions observed. Similarly, for the CMAS, the Group × Time interaction was not significant (F(1, 39) = 1.55, p = .22, *ges* = .01), suggesting comparable pre–post changes in both groups. No significant interactions were found for any CMAS subscales. Pre- and post-intervention mean scores for both groups are presented in Figure 4.

Figure 4

Changes in trait compassion (SOCS and CMAS total scores) from pre- to post-intervention in the Tonglen and control groups



Note. The figure shows the mean scores for control and Tonglen groups before (pre) and after (post) the intervention on Sussex-Oxford Compassion for Others Scale (SOCS) and Compassion Motivation and Action Scales (CMAS).

3.4. Semi-Structured Interview

To explore participants' subjective experiences of engaging Tonglen meditation, semi-structured interviews were analyzed, revealing two main categories and six associated themes. The core variable, which describes the phenomenon of interest and links the categories together, is: *practicing Tonglen improves the connection with others' suffering and with oneself.*

Connecting with the Suffering of Others

Participants described an enhanced attunement to others' distress, characterized by *increased consciousness and embodiment of the suffering of others, non-judgmental acceptance of it, and social-emotional responses*.

Being Sensitive to the Suffering. Participants (N=24) reported increased awareness or sensitivity to the suffering of others, understanding it as *being conscious and attuning to the suffering of others through an embodiment of their distress experiences*:

> "I have found it easy to connect with others' feelings and truly put myself in their place." (S48).

Accepting the Suffering. Many participants (N=18) also reported that Tonglen enabled them to embrace others' suffering and remain present with it, which they described as *the ability to tolerate and accept suffering with a non-judgmental attitude*.

> "When I connected with the suffering of the person I was thinking about, it was as if the idea always came to me that it is normal for them to suffer, that this is part of their life." (S33).

Feeling Tenderness to the Others. Participants (N=18) described a third theme involving *the experience of emotions elicited because of the exposure to the suffering of others, such as compassion, tenderness, kindness, or warmth*.

"I felt a lot of love and compassion. Everything was very manageable." (S47).

Connecting with Oneself

In addition to the increase in connection with others, the participants expressed that the practice of Tonglen allowed them to create a space to connect with themselves, specifically *to engage with their bodily sensations and practice self-compassion, which led to an increase in psychological well-being after the Tonglen intervention*.

Being Aware of Body Sensations. During the study, participants (N=12) expressed experiencing *a notable development in their ability to identify and become aware of their bodily sensations*.

> "I feel that the identification [of the sensations] was clearer, as if the emotion or the level of emotion I felt was more precise." (S16).

Creating a Space of Self-care. Many participants (N=10) indicated that the practice led them to greater self-care, *treating themselves with more kindness and understanding, recognizing their own vulnerability, and experiencing feelings of compassion and love towards themselves*.

> "I have always tended to be very self-critical (…) I've been really hard on myself. So, this [Tonglen] has helped me to have more compassion for myself." (S48).

Experiencing Serenity. After engaging in Tonglen practice, several participants (n=16) reported experiencing *positive affect characterized by feelings of peace, tranquility, or contentment*.

> "At the end of the practice, there is only a feeling of relief (...). I believe that after the practices, I felt better than before doing them." (S12).

4. Discussion

This randomized controlled trial investigated the effects of a brief, two-week Tonglen meditation training on HCWs' experiential responses to others' suffering. To address this aim, a mixed-methods design was implemented, combining a behavioral video-based task, in-depth phenomenological interviews, and standardized self-report questionnaires. In addition, the study sought to advance current understanding of Tonglen

practice by examining participants' subjective experiences of engaging in this meditation through semi-structured interviews. This integrative methodological framework allowed for a comprehensive examination of the intervention, capturing both its experiential dimensions and measurable outcomes.

Self-report data from the SoVT indicated significant post-intervention increases in empathy and sadness in response to others' suffering following the Tonglen practice, effects that were not observed in the control group. Converging with these quantitative findings, the phenomenological analysis revealed marked experiential shifts among participants in the Tonglen group. These shifts were characterized by heightened bodily resonance with others' suffering and a concomitant reduction in self-centered attentional focus. In addition, a higher proportion of participants in the Tonglen group transitioned from low-sensitivity experiential structures toward more advanced configurations, whereas the control group was characterized by a predominance of non-responders who remained within low-sensitivity structures. The convergence of quantitative and qualitative evidence underscores the value of methodological triangulation in enhancing the coherence, reliability, and interpretive depth of the findings (Teddlie & Tashakkori, 2009; Shaw et al., 2018; Branney et al., 2023; Toraman Turk et al., 2025)

Overall, the findings suggest that Tonglen enhances sensitivity to suffering by increasing embodied awareness and emotional attunement to others' distress. This interpretation aligns with enactive (Halifax, 2012), neuroscientific (Singer & Klimecki, 2014), evolutionary (Gilbert, 2015), and Buddhist perspectives (Jinpa, 2011), all of which emphasize the central role of embodied resonance in compassion. However, the two-week Tonglen intervention was insufficient to elicit full compassion, understood as the integration of emotional attunement with active engagement in alleviating distress (Strauss et al., 2016). Accordingly, no significant changes were observed in trait-level compassion (SOCS, CMAS), nor in positive affect or willingness to help in the SoVT task. These results indicate that heightened sensitivity to suffering may represent an early stage in the development of compassion, rather than its full expression. More sustained practice may be necessary for this sensitivity to consolidate into stable, action-oriented compassion.

Importantly, the phenomenological interviews enabled access to pre-reflective dimensions of experience that are more difficult to capture through other assessment

approaches (Petitmengin, 2006). In this regard, the phenomenological findings – specifically increased bodily resonance with others' suffering and a reduction in self-referential inner dialogue – revealed experiential aspects suggestive of the emergence of selflessness-related dimensions. Heightened bodily resonance may reflect a softening of self–other boundaries and greater openness to others' distress, whereas reduced self-referential dialogue indicates diminished narrative self-salience. Taken together, these shifts are consistent with theoretical accounts that conceptualize selflessness as a dynamic and relational configuration of selfhood characterized by inclusive and decentered awareness (Dambrun & Ricard, 2011; Berkovich-Ohana et al., 2024), as well as with empirical models describing it as a multidimensional transformation encompassing both embodied and narrative aspects of experience (Canby et al., 2024). Although selflessness comprises additional facets, the present findings highlight the emergence of two experiential tendencies that contribute meaningfully to this construct.

Moreover, the semi-structured interviews offered valuable insight into how Tonglen practice is subjectively experienced by participants with no prior experience with this meditation, thereby advancing current understanding of this contemplative practice. The findings indicate that engaging in Tonglen promotes a dual process of connection, involving both increased attunement to the suffering of others and a deeper connection with oneself. Participants described heightened sensitivity and embodied awareness of others' distress, alongside a non-judgmental acceptance of suffering and the emergence of compassionate emotional responses such as tenderness and warmth. In parallel, the practice facilitated greater awareness of bodily sensations, the development of self-care and self-compassion, and experiences of serenity and psychological relief. Importantly, these qualitative results are consistent with the self-report data from the SoVT, as well as the phenomenological interviews, which also indicate an increase in sensitivity to and connection with others' suffering.

Finally, several limitations should be considered when interpreting the present findings. First, the Tonglen training was relatively brief, lasting only two weeks, which may have limited the magnitude and stability of the observed effects. Second, the modest sample size may have reduced statistical power and constrained the generalizability of the results. Another important limitation concerns the use of a passive control group. Participants in the control condition did not engage in an active training matched in structure, time, and expectancy. As a result, it is not possible to fully disentangle the

specific effects of Tonglen practice from non-specific factors such as attention, repeated exposure to the task or expectancy effects.

In conclusion, Study 1 of the present doctoral thesis contributed to a more nuanced understanding of Tonglen practice and its associated experiential patterns in a population particularly exposed to others' suffering. The findings indicate that Tonglen was associated with changes across several experiential dimensions central to selflessness, suggesting its potential relevance for cultivating this state. However, given that selflessness is a complex and multidimensional construct, Study 2 sought to clarify its conceptual underpinnings and to identify appropriate approaches for its assessment, thereby establishing a robust theoretical and methodological foundation for subsequent investigations. Building on this foundation, the remaining studies of this dissertation examine the integration of Tonglen practice within a virtual reality–based intervention, with the aim of evaluating its capacity to elicit selflessness by leveraging both the immersive affordances of virtual reality and the contemplative potential of this meditation technique.

Study 2. Toward a Science of Selflessness: A Scoping Review of Assessment Methods and Theoretical Perspectives

1. Background

The concept of selflessness has been present in psychology since its early foundations (James, 1890). In recent decades, it has received increasing scholarly attention, leading to the development of multiple theoretical models aimed at clarifying the phenomenon. Despite this progress, the literature remains marked by partially overlapping terms and frameworks used to describe experiences with similar phenomenological features. As a result, there is still no clear epistemological or terminological consensus on how selflessness should be defined.

Early theoretical accounts, such as Leary et al.'s (2006) concept of *hypo-egoic states*, describe reduced self-awareness and a present-centered mode of cognition. Later formulations include *experiential selfless processing* (Hadash et al., 2016), defined as present-moment engagement without self-referential content, and *non-referential awareness* (Tagini & Raffone, 2010), referring to a non-dual, objectless mode of consciousness. Related constructs, such as the *selfless mode of awareness* (Dor-Ziderman et al., 2013), *non-dual awareness* (Dunne, 2011; Hanley et al., 2018), *self-transcendent experiences* (Yaden et al., 2017), *minimal phenomenal experience* (Metzinger, 2004, 2024), and *ego dissolution* (Millière et al., 2018), reflect converging attempts to describe experiences characterized by a diminished or absent sense of self. More recently, selflessness has been conceptualized as arising from dynamic reconfigurations within the multidimensional network that constitutes the self, including embodied, affective, cognitive, and intersubjective dimensions (Berkovich-Ohana et al., 2024).

Although selflessness can be conceptualized either as a trait or a state, previous authors have placed greater emphasis on its state-like nature, while others have referred to it more as a trait. For instance, Dambrun and Ricard (2011) propose that selflessness involves experiencing the self as impermanent and interdependent rather than as a stable, autonomous entity. Complementarily, the *quiet ego* framework (Wayment & Bauer, 2008) and the *delusion of me* model (Soler et al., 2021) conceptualize it as a set of psychological abilities that can be intentionally cultivated.

However, as noted by several authors (Canby et al., 2024; Britton et al., 2021), this conceptual ambiguity can give rise to erroneous assumptions – a phenomenon known as the jingle-jangle fallacy, wherein the same term is applied to distinct phenomena or different terms are used to describe similar concepts (Britton et al., 2021). Further compounding this issue is the lack of clear phenomenological referents in many definitions of selflessness, which complicates efforts to operationalize and study the construct with precision (e.g., Lindström et al., 2022). Concepts such as *oneness* or *dissolution* are frequently employed without clear definitions, and even frameworks that attempt to investigate selflessness often fail to provide a clear definition of *self* or *ego*, discussing its loss without first articulating a precise understanding of its meaning (Canby et al., 2024). This significant conceptual overlap underscores the urgent need to clarify this construct.

In this regard, a clear conceptualization of selflessness is essential for its systematic investigation. Addressing this need, Canby et al. (2024) developed a comprehensive model using a mixed-methods approach that integrates prior theoretical work with empirical data from individuals reporting experiences of selflessness. Their analysis identified 16 interrelated factors that jointly characterize the phenomenology of selflessness experiences, organized into five conceptual domains: alterations in self-boundaries (e.g., unity with all things, boundary diminishment with others, and boundary diminishment with objects); disruptions in core self-related processes (such as self-loss, diminished ownership of thoughts and feelings, and reduced agency); more diffuse or non-specific dimensions of self-loss (e.g., changes in spatial framing and perceived bodily boundaries); phenomenological and appraisal-related features (e.g., voluntary surrender, spiritual insight, heightened power or confidence, temporal and spatial distortion, and ineffability); and affective components reflecting both positive and negative emotional valence.

Moreover, the rigorous scientific study of selflessness requires not only precise conceptualization but also the development of reliable methods for its systematic assessment. To this end, a range of methodological approaches has been employed, encompassing both quantitative and qualitative strategies. Within the quantitative domain, self-report instruments have been developed to measure selflessness directly, as well as subscales within broader questionnaires assessing related constructs such as mystical experiences (Hood, 1975; MacLean et al., 2012) and altered states of

consciousness (Dittrich, 1998). These standardized measures allow structured assessment and comparability across studies (Baumeister et al., 2007). More recently, pictographic scales have been introduced to reduce reliance on verbal language, enabling participants to represent their experiences visually and potentially capture aspects of selflessness that are difficult to articulate (Dambrun, 2016; Hanley & Garland, 2019).

Beyond self-report measures, a range of experimental methodologies has been developed to assess selflessness under controlled conditions. Behavioral paradigms, for example, have been designed to capture implicit manifestations of selflessness through participants' responses in structured experimental contexts (Greenwald et al., 1998; Hadash & Bernstein, 2019). In parallel, qualitative methodologies – particularly phenomenological interviews – have gained increasing attention. The neurophenomenological approach integrates first-person reports with neuroscientific data to advance the study of conscious experience (Varela, 1996; Lutz & Thompson, 2003), whereas the micro-phenomenological method focuses on eliciting the pre-reflective attentional, affective, and sensory dimensions of lived experience (Petitmengin, 2006). Both approaches rely on open-ended, evocation-based interviews that prioritize detailed experiential descriptions over predefined theoretical categories.

Despite the availability of diverse methods to assess selflessness, no study has systematically examined the range of existing approaches or their methodological quality. To address this gap, the present study conducts a scoping review of selflessness assessment methods, encompassing self-report scales, behavioral tasks, and phenomenological interviews, while also examining the conceptualization of selflessness underlying each instrument. A scoping review was deemed appropriate given the construct's conceptual heterogeneity and the exploratory nature of the research question. By mapping the current assessment landscape, this study establishes a methodological and conceptual foundation for subsequent studies within this thesis.

2. Method

2.1. Eligibility Criteria

Studies were included if they addressed the development and psychometric validation of complete or partial scales, behavioral tasks, or phenomenological interviews designed to measure selflessness or adjacent constructs. Papers were excluded if the full-

text article was not available in English, or did not specifically report on the development of measures for selflessness.

This scoping review was conducted and reported in accordance with the PRISMA-ScR (Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews) guidelines (Tricco et al., 2018). The review protocol was registered in the International Prospective Register of Systematic Reviews (PROSPERO; registration number: CRD42023446740).

2.2. Search Strategy

To identify peer-reviewed literature on measures assessing selflessness, searches were conducted in Web of Science, Scopus, PubMed, and PsycINFO. The search strategy focused on two main elements:

Selflessness: *selfless*, "quiet ego", "hypo egoic", "hypo-egoic", "delusion of me", "ego attenuation", "self-transcenden*", "self transcenden*", "ego transcenden*", "transcendence of the ego" "non-duality", "non-self", "non-dual awareness", "non-dual state*", "non-referential awareness", "ego-dissolution", "ego dissolution", "ego-loss"*.

AND

Measurements: *measure*, assess*, questionnaire*, scale*, instrument*, evaluat*, inventor*, "behavior* task", "behavior* measure", "implicit measure", "implicit task", "neuropheno*"*.

The specific terms were combined using Boolean operators and tailored to the syntax of each database (see complete search strategy in Appendix 1 of Study 2). The initial search was conducted in July 2023 and updated in November 2024. To mitigate publication bias, the search scope was extended to include grey literature, such as theses and dissertations.

2.3. Selection Process

Titles and abstracts identified through the search were first screened, followed by a detailed review of the full texts of remaining articles to determine eligibility. Two reviewers independently screened each article, resolving any discrepancies through team discussions until a 90% agreement was achieved. The article selection process was

conducted using Hubmeta, a web-based collaboration platform designed to optimize systematic and other literature reviews.

2.4. Data Extraction

Data extraction was structured around three main categories: (1) general study characteristics; (2) the conceptualization of selflessness operationalized by each assessment instrument, and the specific dimensions assessed, in accordance with the model proposed by Canby et al. (2024); and (3) detailed descriptions of the assessment instruments, including self-report measures, behavioral tasks, and phenomenological interviews. For self-report measures specifically, instrument properties (e.g., number of factors and items, response options, and score ranges) and psychometric data were systematically extracted. Two independent reviewers recorded all information, with discrepancies resolved through discussion and consensus. If agreement could not be reached, a third reviewer provided input.

Psychometric data were extracted and reported across the following domains: content validity, structural validity, criterion validity, internal consistency, and reliability. The quality of each measurement property was rated as sufficient (+), insufficient (−), or indeterminate (?) in accordance with the criteria outlined in the Consensus-based Standards for the Selection of Health Measurement Instruments (COSMIN) guidelines (Mokkink et al., 2010; Terwee et al., 2018). Definitions of the measurement properties and the specific criteria applied in this review are presented in Table 3.

Table 3

Quality criteria for measurement properties assessed using COSMIN.

Property	Definition		Quality criteria
Structural validity	The degree to which the scores of a measure are an adequate reflection of the dimensionality of the construct to be measured	+	CFA: CFI or TLI or comparable measure >0.95 OR RMSEA <0.06 OR SRMR <0.08
		?	Not all information for '+' reported
		-	Criteria for '+' not met
Criterion validity	The degree to which the scores of a measure are an adequate reflection of a gold standard*	+	Correlation with gold standard* ≥ 0.70 OR AUC ≥ 0.70
		?	Not all information for '+' reported
		-	Correlation with gold standard* < 0.70 OR AUC < 0.70
Internal consistency	The degree of the interrelatedness among the items	+	At least low evidence for sufficient structural validity AND Cronbach's alpha ≥ 0.70 for each subscale
		?	Criteria for "At least low evidence for sufficient structural validity" not met
		-	Cronbach's alpha < 0.70 for each subscale
Reliability (test-retest)	The extent to which scores for participants who have not changed are the same for repeated measures over time	+	ICC or weighted Kappa ≥ 0.70
		?	ICC or weighted Kappa not reported
		-	ICC or weighted Kappa < 0.70

Note. The information here is simplified, for a more detailed information see Terwee et al. (2018). *As there is no gold standard for the construct of selflessness, measures of related constructs (e.g., mystical experiences, depersonalization, unusual experiences, decentering, etc.) were accepted. AUC = area under the curve, CFA = confirmatory factor analysis, CFI = comparative fit index, ICC = intraclass correlation coefficient, RMSEA: Root Mean Square Error of Approximation, SRMR: Standardized Root Mean Residuals, TLI = Tucker-Lewis index

The COSMIN guidelines (Terwee et al., 2018) provide detailed and rigorous criteria for evaluating content validity, defined as the degree to which the content of an instrument adequately reflects the construct being measured. Three core aspects were assessed: (1) relevance, examining whether all items are appropriate for the construct, target population, and context of use; (2) comprehensiveness, determining whether all essential elements of the construct are sufficiently represented; and (3) comprehensibility, assessing whether the items are understood by respondents as intended. These aspects were evaluated using ten specific criteria, independently reviewed by two experts in accordance with COSMIN recommendations, and subsequently synthesized into an

overall content validity rating (for detailed information about the questions and their rating, please refer to Appendix 2 of Study 2). For access to the complete Excel file containing the full evaluation of each study conducted by both raters, please refer to Supplementary Material 3 available on the OSF repository (osf.io/26gdj).

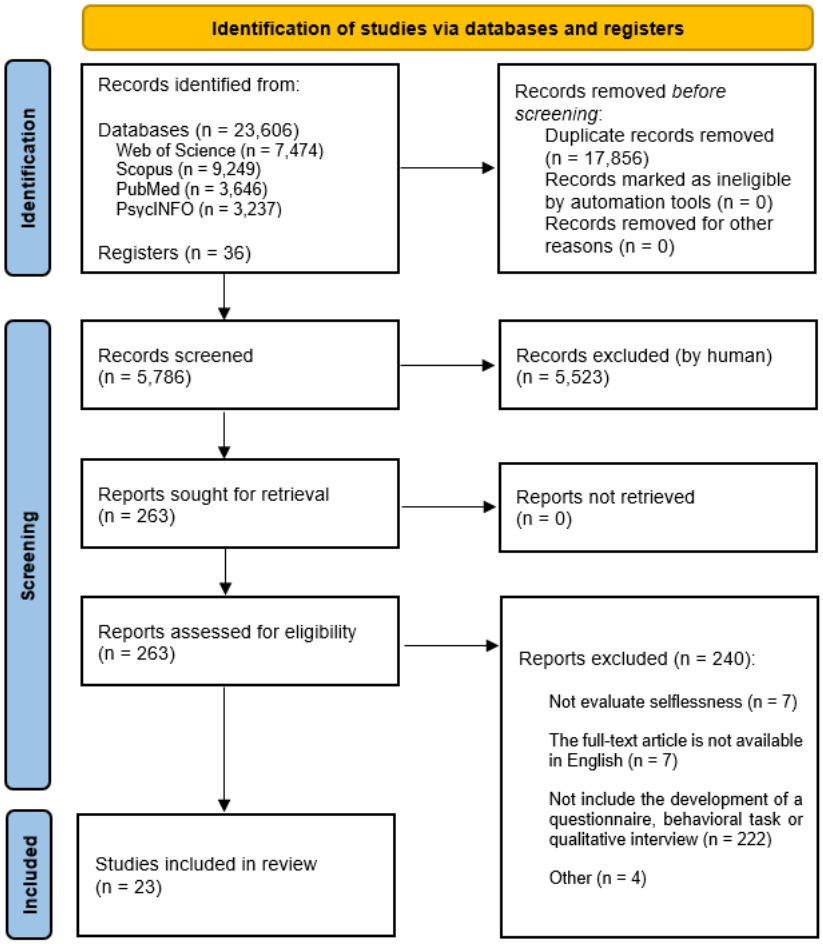
3. Results

3.1. Literature Search

Figure 5 presents the PRISMA flow chart illustrating the study selection process. The initial database search identified 23,606 articles, with an additional 36 records obtained through manual searches, including grey literature, reference checking, and citation tracking. After removing duplicates, 5,786 titles and abstracts were screened, resulting in the exclusion of 5,523 records. Subsequently, 263 full-text articles were assessed for eligibility based on predefined criteria, leading to the exclusion of 240 articles due to the following reasons: not evaluating selflessness (n = 7), lack of availability in English (n = 7), not involving the development of a questionnaire, behavioral task, or phenomenological interview (n = 222), and other reasons (n = 4). Ultimately, 23 articles were included in the final sample.

Figure 5

PRISMA flow diagram illustrating the study selection process



3.2. General Study Characteristics

Among the included articles, twelve focused on the development of self-report instruments, comprising four complete questionnaires, five subscales and three pictographic scales. The complete questionnaires include the Ego Dissolution Inventory (EDI; Nour et al., 2016), the Ego Dissolution Scale (Sleight et al., 2023), the Nondual Awareness Dimensional Assessment (NADA; Hanley et al., 2018), and the Nondual Embodiment Thematic Inventory (NETI; Butlein, 2006). The subscales, on the other hand, include the Dead of Ego Dissolution from the Altered States of Consciousness Scale (5D-ASC; Dittrich et al., 2010); Experiences of Ego Deconstruction from the Exceptional Experiences Questionnaire (EEQ; Kohls & Walach, 2006); Ego Quality and Unifying Quality from The Mysticism Scale (MS; Hood, 1975); Mystical from the Mystical Experience Questionnaire (MEQ-30; MacLean et al., 2012); and Self-Diminishment and

Connectedness from the Awe Experiences Scale (AWE-S; Yaden et al., 2019). Additionally, three articles described the creation of pictographic scales (Dambrun, 2016; Aron et al., 1992; Hanley & Garland, 2019).

Moreover, three studies developed behavioral tasks (Hadash et al., 2016; Kelley et al., 2002; Sui et al., 2012), and eight utilized phenomenological interviews (Dor-Ziderman et al., 2013; Ataria et al., 2015; Berkovich-Ohana, 2017; Fingelkurts et al., 2020, 2022; Nave et al., 2021; Lindström et al., 2022, 2023).

Table 4 provides an overview of the general characteristics of the included studies. Most were conducted after 2010 (n = 18), spanning from 1975 (Hood, 1975) to 2023 (Sleight et al., 2023; Lindström et al., 2023). The majority were conducted in the United States (n = 9) and Israel (n = 5), with additional studies from the United Kingdom (n = 2), Switzerland (n = 2), Finland (n = 2), Sweden (n = 2) and France (n = 1). Sample sizes ranged widely, from a single participant (Ataria et al., 2015) to 1,602 participants (Maclean et al., 2012). Study populations included university students (n = 7), general population samples (n = 7), long-term meditators (n = 6), adults with prior psychedelic experience (n = 2), and clinical populations (n = 1). Participant ages spanned from a mean of 18.76 years (Sui et al., 2012) to 64 years (Ataria et al., 2015), with women constituting the majority in most studies (n = 12).

Table 4

General characteristics of the included studies

Type of assessment	Name	Authors and year	Country	Sample size (N)	Type of population	Age	Gender (% female)
Complete questionnaires	Ego Dissolution Inventory (EDI)	Nour et al., 2016	United Kingdom	691	Adults with prior psychedelic experience (LSD, psilocybin, DMT, ayahuasca or mescaline), cocaine, and/or alcohol	Median = 28 (inter-quartile range = 13)	34.44%
	Ego Dissolution Scale (EDS)	Sleight et al., 2023	United States	572	University students	Mean = 18.90 (*SD* = 1.17)	61.60%
	Nondual Awareness Dimensional Assessment (NADA)	Hanley et al., 2018	United States	Study 1: 528 Study 2: 338 Study 3: 221	Study 1: University students (n=321) and general population (n=207) Study 2: General population Study 3: General population	Study 1: Mean = 27 (*SD* = 11.36) Study 2: Mean = 38 (*SD* = 12.47) Study 3: Mean = 38 (*SD* = 13.29)	Study 1: 70% Study 2: 63% Study 3: 64%
	Nondual Embodiment Thematic Inventory (NETI)	Butlein, 2006	United States	15	University students		37.5%
Subscales	Dread of Ego Dissolution (subscale from 5D-ASC)	Dittrich et al., 2010	Switzerland	Study 1: 393 Study 2: 1133	General population		
	Experiences of Deconstruction (subscale from EEQ)	Kohls & Walach, 2006	Germany and Switzerland	Study 1: 350 Study 2: 299 Study 3: 56	Study 1: Spiritually practicing participants Study 2: Participants who do not do spiritual practices Study 3: Clinical population	Study 1: Mean = 44.9 (*SD* = 12.3) Study 2: Mean = 34.1 (*SD* = 13.1) Study 3: Mean = 43.1 (*SD* = 10.3)	Study 1: 71% Study 2: 69% Study 3: 73%
	Ego Quality and Unifying Quality (subscale from MS)	Hood, 1975	United States	300	University students	Males: Mean = 21.2 (*SD* = 4.2) Females: Mean = 20.1 (*SD* = 4.2)	
	Mystical (subscale from MEQ-30)	Maclean et al., 2012	United States	Study 1: 1602 Study 2: 440	Adults with prior psychedelic experience (psilocybin) who had a meaningful experience	Study 1: Mean = 32 Study 2: Mean = 28	Study 1: 50% Study 2: 50%
	Self-diminishment and Connectedness (subscale from AWE-S)	Yaden et al., 2019	United States	Study 1: 501 Study 2: 636	General population		Study 1: 48.3% Study 2: 48.7%

Pictographic scales	Dissolution of perceived body boundaries	Dambrun, 2016	France	53	University students	Mean = 19.2 (*SD* = 1.3)	92.45%
	Inclusion of Other in the Self Scale	Aron et al., 1992	United States	Study 1: 208 Study 2: 88	University students	Study 1: Mean = 19.7 Study 2: Mean = 20.92	Study 1: 72% Study 2: 76%
	Spatial Frame of Reference Continuum	Hanley & Garland, 2019	United States	Study 1: 226 Study 2: 221	General population	Study 1: Mean = 37.89 (*SD* = 12.02) Study 2: Mean = 38.00 (*SD* = 13.29)	Study 1: 66% Study 2: 64%
Behavioral tasks	Single Experience & Self Implicit Association Test (SES-IAT)	Hadash et al., 2016	Israel	138	General population	Mean = 24.76 (SD = 3.44)	80%
	Self-Reference Task (SRT)	Kelley et al., 2002	United States	24	General population	Mean = 20	45.83 %
	Self-prioritization Task	Sui et al., 2012	United Kingdom	Study 1: 18 Study 2: 17 Study 3: 18	University students	Study 1: Mean = 21.78 (*SD* = 5.80) Study 2: Mean = 18.76 (*SD* = 0.83) Study 3: Mean = 18.89 (*SD* = 0.83)	Study 1: 77% Study 2: 94% Study 3: 94%
Phenomenological Interview	Neurophenomenological approach	Dor-Ziderman et al., 2013	Israel	12	Long-term meditators (11225 hours)	Mean = 45.2 (*SD* = 11.3)	25%
	Phenomenological interview	Ataria et al., 2015	Israel	1	Long-term meditator (20000 hours)	64 years	0%
	Neurophenomenological approach	Berkovich-Ohana, 2017	Israel	2	Long-term meditators (23000 and 4200 hours)	44 and 31 years	50%
	Neurophenomenological approach	Fingelkurts et al., 2020	Finland	8	Long-term meditators (4400 hours)	Mean = 54.5 (*SD* = 14.8)	50%
	Phenomenological interview	Nave et al., 2021	Israel	46	Long-term meditators (3832 hours)	Mean = 39.8 (*SD* = 10.9)	41.3 %
	Semi-structured phenomenological interview	Lindström et al., 2022	Sweden	15	General population		
	Neurophenomenological approach	Fingelkurts et al., 2022	Finland	6	Long-term meditators (3397 hours)	Mean = 54.3 (*SD* = 16.9)	66.66%
	Phenomenological interview	Lindström et al., 2023	Sweden	32	General population	Mean = 43.1 (*SD*=13.1)	41%

3.3. Conceptualization of Selflessness

Table 5 presents an overview of the conceptual and operational definitions of selflessness across the included studies, indicating whether it is examined as a trait or a state and delineating the specific dimensions assessed according to the framework proposed by Canby et al. (2024). Overall, selflessness is most frequently operationalized as a state (n = 18), encompassing all pictographic instruments and behavioral tasks. In contrast, only three self-report questionnaires (Sleight et al., 2023; Butlein, 2006; Kohls & Walach, 2006) and one phenomenological interview study (Lindström et al., 2023) conceptualize selflessness as a dispositional trait. The Nondual Awareness Dimensional Assessment (NADA; Hanley et al., 2018) occupies an intermediate position, as it includes both state- and trait-oriented versions.

Regarding the dimensions specified by Canby et al. (2024), most self-report questionnaires and subscales emphasize unity with all things (n = 8) and self-loss (n = 7). A substantial proportion also address body diminishment in relation to others (n = 6) and objects (n = 6). By comparison, pictographic measures – such as the Dissolution of Perceived Body Boundaries (Dambrun, 2016) and the Spatial Frame of Reference Continuum (SFoRC; Hanley & Garland, 2019) – capture more specialized or visually mediated dimensions of self-experience, while the Inclusion of Other in the Self Scale (Aron et al., 1992) is primarily concerned with body diminishment involving others.

All behavioral tasks specifically target two core dimensions of selflessness proposed by Canby et al. (2024): loss of ownership of thoughts and feelings and disconnectedness or loss of agency. Phenomenological studies (n = 8) assess largely overlapping dimensions, including body diminishment involving others (n = 7) and objects (n = 7), loss of ownership of thoughts and feelings (n = 6), loss of agency (n = 5), and self-loss (n = 5). Notably, four phenomenological investigations uniquely examine loss of time and space, a dimension not captured by other assessment methods.

Table 5

The definition and conceptualization of selflessness in the included studies based on the Canby et al. (2024) model

Instruments	Conceptualization of selflessness	State/Trait	Unity with All Things	Boundary Diminish. with Others	Boundary Diminish. with Objects	Self-Loss	Loss of Ownership of Thoughts and Feelings	Disconnect. Loss of Agency	Non-Specific Self-Loss	Perceived Body Boundary Scale	Spatial Frame of Reference Contin.	Voluntary Surrender	Spiritual Insight	Power Confid.	Loss of Time and Space	Ineffab.	Positive Affect	Negative Affect
Ego Dissolution Inventory (EDI; Nour et al., 2016)	**Ego dissolution**: a reduction in self-referential awareness, marked by the disruption of ego-boundaries, which blurs distinctions between self and others, fostering experiences of unity with surroundings and an altered state of consciousness	State	X	X		X	X											
Ego Dissolution Scale (EDS; Sleight et al., 2023)	**Ego dissolution**: involves two main components: the annihilational component, where the sense of self is diminished or dissolved; and the relational component, which fosters unity and connection with the environment	Trait	X	X	X	X			X									
Nondual Awareness Dimensional Assessment (NADA; Hanley et al., 2018)	**Non-dual Awareness**: a state of consciousness that rests in the background of all conscious experiencing – a background field of awareness that is unified, immutable, and empty of mental content. NDA emphasizes experiences of unity with the environment or dissolution of self-boundaries	State (NADA-S) and Trait (NADA-T)	X	X	X	X					X						X	
Nondual Embodiment Thematic Inventory (NETI; Butlein, 2006)	**Non-dual Awareness**: a state of consciousness characterized by the absence of subject-object duality, where individuals perceive all phenomena as interconnected aspects of a unified reality.	Trait	X				X						X	X			X	X
Dread of Ego Dissolution (subscale from 5D-ASC; Dittrich et al., 2010)	**Ego Dissolution**: a distressing experience marked by a loss of self-control, feelings of fear and isolation, and cognitive disruptions	State	X	X	X		X	X										X
Experiences of Deconstruction (subscale from EEQ; Kohls & Walach, 2006)	**Ego Deconstruction**: a phenomenological experience characterized by the breakdown of established self-concepts and worldviews, often accompanied by sensations of detachment, dissociation, or isolation	Trait			X	X	X			X								X
Ego Quality and Unifying Quality (subscale from MS; Hood, 1975)	**Loss of self**: experienced as an absorption into something greater than the mere empirical ego, along with experience of the multiplicity of objects of perception as nevertheless united	State	X			X												
Mystical (subscale from MEQ-30; Maclean et al., 2012)	**Ego loss**: dissolution of self-identity and boundaries, leading to a sense of unity or merging with a greater whole	State	X	X	X	X							X	X				

Self-diminishment and Connectedness (subscale from AWE-S; Yaden et al., 2019)	**Self-diminishment**: a reduced sense of personal significance or importance in the face of vastness or grandeur, along with a profound sense of unity and interconnectedness with others, nature, or a greater entity	State	X		X		X		X											
Dissolution of perceived body boundaries (Dambrun, 2016)	**Selflessness**: a psychological state marked by a diminished sense of separation between the self and the external world, characterized by reduced self-referential mental activity	State												X						
Inclusion of Other in the Self Scale (Aron et al., 1992)	**Interconnectedness**: the perceived overlap or unity between self and others, reflecting the extent to which individuals integrate aspects of others into their self-concept	State			X															
Spatial Frame of Reference Continuum (SFoRC; Hanley & Garland, 2019)	**Non-dual Awareness**: a psychological state characterized by a decreased sense of self-salience and increased feelings of connection with a broader reality, including other people, nature, or the universe. It often involves shifts in spatial frames of reference, moving from an egocentric to an allocentric perspective	State													X					
Single Experience & Self Implicit Association Test (SES-IAT; Hadash et al., 2016)	**Experiential Selfless Processing**: the processing of present-moment subjective experiences (e.g., sensations, emotions, thoughts) without associating them with the self, devoid of self-referential evaluation, identification, or ownership	State						X		X										
Self-Reference Task (SRT; Kelley et al., 2002)	**Non-self-referential processing**: the cognitive encoding and evaluation of information unrelated to the individual's self-schema	State						X		X										
Self-prioritization Task (Sui et al., 2012).	**Non-self-prioritization**: involves assigning less cognitive or perceptual importance to self-relevant stimuli compared to other-relevant stimuli	State						X		X										
Neurophenomenological approach (Dor-Ziderman et al., 2013)	**Selfless mode of awareness**: a state where identification with a static sense of self is replaced by identification with the phenomenon of experiencing itself	State					X	X			X						X			
Phenomenological interview (Ataria et al., 2015)	**Selfless mode of awareness**: a state where identification with a static sense of self is replaced by identification with the phenomenon of experiencing itself	State			X		X	X		X					X				X	
Neurophenomenological approach (Berkovich-Ohana, 2017)	**Fruition**: involves a direct experiential realization of the nature of reality, including impermanence, suffering, and no-self (anatta). It is described phenomenologically as a "void," with an absence of subjectivity, perception, bodily awareness, and conceptual thought	State			X		X		X											
Neurophenomenological approach (Fingelkurts et al., 2020)	**Selfless state**: the reduction or absence of self-referential processing and the first-person perspective	State			X		X		X	X										

Phenomenological interview (Nave et al., 2021)	**Self-boundary dissolution**: the attenuation or complete dissolution of the perceived boundaries between the self and the external world	State		X	X			X			X		X	X
Semi-structured phenomenological interview (Lindström et al., 2022)	**Selflessness**: a salient, transient change in the sense of self, where identification with the self and the contents of consciousness cease and self-consciousness and self-monitoring dissipates	State		X	X	X	X	X			X			
Neurophenomenological approach (Fingelkurts et al., 2022)	**Selfless state**: alterations in the self-referential processes, including changes in embodiment, self-location, agency, and narrative identity.	State		X	X		X	X			X			
Phenomenological interview (Lindström et al., 2023)	**Selflessness**: the boundaries between the self and the external world dissolve or become less distinct. This state involves a reduced sense of individual identity and personal agency, often characterized by an expanded sense of interconnectedness or unity with the environment.	Trait	X	X	X		X	X						

3.4. Characteristics of the Assessment Instruments

3.4.1. Self-Report Scales

Table 6 presents the characteristics of the full questionnaires, subscales, and pictographic scales developed to assess selflessness. Specifically, it details the number of factors and items, response options, score ranges, and the psychometric properties reported for each measure.

Content Validity. The following self-report measures meet all the criteria of relevance, comprehensiveness, and comprehensibility, indicating sufficient content validity: the Ego Dissolution Scale (EDS; Sleight et al., 2023), the Nondual Awareness Dimensional Assessment (NADA; Hanley et al., 2018), and the subscales Ego Quality and Unifying Quality (from the MS; Hood, 1975), Mystical (from the MEQ-30; MacLean et al., 2012), and Self-diminishment and Connectedness (from the AWE-S; Yaden et al., 2019). Additionally, the pictorial scale Spatial Frame of Reference Continuum (SFoRC; Hanley & Garland, 2019) also demonstrated sufficient content validity. Conversely, the Nondual Embodiment Thematic Inventory (NETI; Butlein, 2006) scored insufficiently, indicating poor content validity. The remaining subscales yielded mixed scores (±), as they failed to meet certain criteria, specifically relevance (Nour et al., 2016; Dittrich et al., 2010), comprehensiveness (Kohls & Walach, 2006), and comprehensibility (Dambrun, 2016; Aron et al., 1992).

Structural Validity. Among self-report scales, only the Nondual Awareness Dimensional Assessment (NADA; Hanley et al., 2018), the Mystical subscale from the MEQ-30 (Maclean et al., 2012), and the Self-diminishment and Connectedness subscales from the AWE-S (Yaden et al., 2019) provide evidence regarding this psychometric property, with adequate values reported. The remaining self-report scales were classified as indeterminate. Similarly, no information on structural validity was available for the pictographic scales, which were also deemed indeterminate.

Criterion Validity. In the absence of a gold standard for assessing the construct of selflessness, measures of related constructs (e.g., mysticism, depersonalization, unitive experience, or metapersonal self-construal) were accepted as valid proxies. The Ego Dissolution Inventory (EDI; Nour et al., 2016), Ego Dissolution Scale (EDS; Sleight et al., 2023), Nondual Awareness Dimensional Assessment (NADA; Hanley et al., 2018), the Mystical subscale from the MEQ-30 (Maclean et al., 2012), and the pictographic

Spatial Frame of Reference Continuum (SFoRC; Hanley & Garland, 2019) demonstrated sufficient criterion validity. In contrast, other measures (Dittrich et al., 2010; Kohls & Walach, 2006; Aron et al., 1992) were rated as insufficient for failing to meet the COSMIN-recommended correlation threshold of 0.70; while additional tools (Butlein, 2006; Hood, 1975; Yaden et al., 2019; Dambrun, 2016) were classified as indeterminate due to insufficient data.

Internal Consistency. Most scales (Nour et al., 2016; Sleight et al., 2023; Hanley et al., 2018; Butlein, 2006; Dittrich et al., 2010; Kohls & Walach, 2006; Maclean et al., 2012; Yaden et al., 2019; Aron et al., 1992) demonstrated adequate internal consistency and were rated as sufficient. Only three scales were classified as insufficient (Hood, 1975) or indeterminate (Dambrun, 2016; Hanley & Garland, 2019).

Reliability (Test-Retest). Test-retest reliability has been analyzed only for the Experiences of Deconstruction subscale of the EEQ (Kohls & Walach, 2006) and the Inclusion of Other in the Self Scale (Aron et al., 1992), both of which demonstrated adequate results and were rated as sufficient. No data on this psychometric property were reported in the remaining studies.

Table 6

Characteristics of the full questionnaires, subscales, and pictographic scales developed to assess selflessness

Instruments	Factors	N items	Response options	Range of scores	Content validity	Structural validity	Criterion validity	Internal consistency (Alfa de Cronbach)	Reliability
Ego Dissolution Inventory (EDI; Nour et al., 2016)	1	8	100-point visual analogue scale (from 0: No, not more than usually; to 100: Yes, entirely or completely)	0-100	±	NI (?)	Correlation with unitive experience (MEQ subscale) = 0.735 (+)	0.93 (+)	NI (?)
Ego Dissolution Scale (EDS; Sleight et al., 2023)	2 (Ego-Loss and Unity)	10	The percentage of time each item occurs in their daily life from 0% (never) to 100% (always)	0-100	+	NI (?)	Correlation with depersonalization (DES-II Depersonalization/Derealization subscale) = 0.71 (+)	Total = 0.80 Subfactors of Ego-Loss (0.84) and Unity (0.75) (+)	NI (?)
Nondual Awareness Dimensional Assessment (NADA; Hanley et al., 2018)	2 (Self-transcendence and Bliss)	NADA-T: 13 NADA-S: 3	5-point Likert scale (from 0: Never or very rarely; to 5: Very often or always)	NADA-T: 0-65 NADA-S: 0-30	+	CFI = 0.966; TLI = 0.938 (+)	Correlation with the metapersonal self-construal = 0.70 (+)	Total = 0.93 Subfactors of Self-transcendence (0.94) and Bliss (0.81) (+)	NI (?)
Nondual Embodiment Thematic Inventory (NETI; Butlein, 2006)	1	20	5-point Likert scale (from 1: Never; to 5: All of the time)	20-100	-	NI (?)	NI (?)	0.91 (+)	NI (?)
Dread of Ego Dissolution (subscale from 5D-ASC; Dittrich et al., 2010)		22	100-point visual analogue scale (from 0: No, not more than usually; to 100: Yes, much more than usually)	0-100	±	NI (?)	Correlation with psychoticism = 0.19 Correlation with neuroticism = - 0.19 (-)	0.87 (+)	NI (?)
Experiences of Deconstruction (subscale from EEQ; Kohls & Walach, 2006)		7 (short version)	5-point Likert scale. Two assessments: Frequency (0: Never; to 4: Very often); Evaluation (0: Very positive; to 4: Very negative)	0-100	±	NI (?)	Correlation with transpersonal trust = 0.31 Correlation with social support = −0.25 Correlation with sense of coherence = −0.36 Correlation with mental distress = 0.40 (-)	0.81 (+)	Test-retest (6 months) = 0.75 (+)

Ego Quality and Unifying Quality (subscale from MS; Hood, 1975)	Ego Quality: 4 Unifying Quality: 4	5-point Likert scale (from -2: This description is definitely not true of my own experience or experiences; to 2: This description is definitely true of my own experience or experiences)	4-20 (each subscale)	+	NI (?)	NI (?)	Ego Quality: 0.64 Unifying Quality: 0.60 (-)	NI (?)
Mystical (subscale from MEQ-30; Maclean et al., 2012)	15	6-point Likert scale (from 0: None, not at all; to 5: Extreme, more than ever before in my life and stronger than 4)	0-75	+	RMSEA = 0.074; CFI = 0.95; TLI = 0.94 (+)	Correlation with mysticim (the MS) = 0.79 (+)	0.946 (+)	NI (?)
Self-diminishment and Connectedness (subscale from AWE-S; Yaden et al., 2019)	Self-diminishment: 5 Connectedness: 5	7-point Likert scale (from 1: Strongly disagree; to 7: Strongly agree)	5-35 (each subscale)	+	CFI = 0.905; RMSEA = 0.054 (+)	NI (?)	Self-diminishment: 0.89 Connectedness: 0.87 (+)	NI (?)
Dissolution of perceived body boundaries (Dambrun, 2016)	1	7-point Likert item (depicting seven human bodies with varying degrees of body boundaries, ranging from 1: Almost imperceptible; to 7: Extremely salient)	from 1 to 7	±	NI (?)	NI (?)	NI (?)	NI (?)
Inclusion of Other in the Self Scale (Aron et al., 1992)	1	7-point Likert item (which includes a sequence of seven images depicting two circles, one representing the self and the other representing the other, whose overlap varies from none to almost all)	from 1 to 7	±	NI (?)	Correlation with Relationship Closeness Inventory = 0.22 Correlation with Subjective Closeness Index = 0.34 Correlation with Sternberg Intimacy Scale = 0.45 (-)	0.93 (+)	Test-retest (2-week) = 0.83 (+)
Spatial Frame of Reference Continuum (SFoRC; Hanley & Garland, 2019)	1	8-point Likert scale (from 1: An egocentric frame of reference; to 8: An allocentric frame of reference)	from 1 to 8	+	NI (?)	Correlation with various scales mesuring self-constructs, mindfulness constructs and well-being constructs (+)	NI (?)	NI (?)

3.4.2. Behavioral Tasks

The behavioral tasks are designed to experimentally elicit or assess disruptions in ownership and agency over thoughts and feelings within controlled settings, thereby providing observable indicators of alterations in the sense of self associated with selflessness. A detailed description of each task is presented below.

Single Experience & Self Implicit Association Test (SES-IAT; Hadash et al., 2016). The SES-IAT is designed to assess implicit cognitive associations between the self and a specific, experimentally elicited subjective experience, such as fear. Adapted from the Single Category Implicit Association Test (SC-IAT; Karpinski & Steinman, 2006), the task measures response latencies while participants categorize words related to the self (e.g., *I*, *me*), the target experience (e.g., *anxiety*, *horror*), and a neutral category (e.g., office equipment). The target experience (fear) is induced through visual and auditory stimuli, including frightening video clips and background sounds, which are presented immediately before and during task performance. The degree of identification with the experience is inferred from differences in response times between congruent pairings (e.g., *self* and *fear* mapped to the same response key) and incongruent pairings. Faster responses in congruent conditions indicate stronger self-identification with fear. D-scores derived from response latencies reflect distinct modes of experiential processing: positive scores indicate identification with fear (e.g., "I am afraid"), negative scores reflect negative self-referential evaluation (e.g., "I should not be afraid"), and scores near zero are interpreted as experiential selfless processing, characterized by the presence of fear without a sense of ownership (e.g., "there is fear"). Overall, the SES-IAT provides an implicit measure of self-referential versus selfless modes of experiential processing.

Self-Reference Task (SRT; Kelley et al., 2002). The SRT evaluates the cognitive and mnemonic advantages of processing self-relevant information relative to information related to others or to neutral, non-personal contexts. The task consists of two phases: an encoding phase and a subsequent recognition phase.

During the encoding phase, participants judge personality trait adjectives under three conditions: self-reference (e.g., "Does this adjective describe you?"), other-reference (e.g., "Does this adjective describe George Bush?"), and case judgment (e.g., "Is this adjective written in uppercase letters?"). Each trial presents a cue word (e.g., *self*, *Bush*, or *case*) above a central fixation point, followed by a single adjective (e.g., *polite*)

displayed below. Participants respond via left- or right-hand key presses. A total of 270 unique adjectives are used, balanced for word length, syllable count, and emotional valence (50% positive, 50% negative), drawn from a standardized database (Anderson, 1968) and rotated across conditions to control for item-specific effects.

In the recognition phase, participants are presented with the 90 adjectives previously encountered during encoding, intermixed with 90 novel adjectives, and are asked to indicate whether each word is "old" or "new" using left- or right-hand key presses. Consistent findings show superior memory performance for adjectives processed in the self-referential condition relative to both other-referential and case judgment conditions. Importantly, this task is also sensitive to reduced self-referential processing: individuals with low self-referentiality tend to show comparable memory performance across self- and other-referential conditions, reflecting diminished differentiation and impaired encoding of self-relevant information.

Self-prioritization Task (Sui et al., 2012). The SPT is a perceptual matching paradigm designed to examine how associations between stimuli and the self influence cognitive processing. Participants first learn arbitrary associations between abstract geometric shapes (e.g., triangle, square, circle) and labels denoting the *self*, a *familiar other* (e.g., a best friend), or an *unfamiliar other* (e.g., a stranger). In the subsequent task phase, participants are required to determine whether presented shape–label pairings correspond to the previously learned associations. Task performance is assessed using response times and accuracy. Across studies, the task reliably demonstrates a self-prioritization effect, reflected in faster and more accurate responses to self-associated stimuli compared to those associated with others, including familiar individuals. In contexts characterized by selflessness, this effect is attenuated, manifesting as reduced differences in response times and accuracy between self-related and other-related stimuli.

3.4.3. Phenomenological Interviews

Across the included studies, qualitative methods were employed to elicit detailed experiential reports of selflessness, which were subsequently analyzed either in their own right or in relation to neurophysiological measures. Three main methodological approaches can be distinguished: neurophenomenological designs, micro-phenomenological interviews, and a semi-structured phenomenological interview.

Neurophenomenological Approach. Four studies examined selflessness using a neurophenomenological framework (Dor-Ziderman et al., 2013; Berkovich-Ohana, 2017; Fingelkurts et al., 2020, 2022). In these investigations, qualitative experiential data were collected immediately following the induction of a selflessness-related state through open-ended questioning. Participants were instructed to describe their experiences while suspending personal beliefs, metaphysical interpretations, and theoretical assumptions. Instructions emphasized non-judgmental and unguided reporting, such as describing experience "without reflection or judgment" (Dor-Ziderman et al., 2013), "without guiding their answers" (Berkovich-Ohana, 2017), or with no constraints on the content of reporting (Fingelkurts et al., 2020, 2022). In some cases, participants were additionally prompted to attend to specific experiential domains, including internal processes, bodily sensations, vigilance, internal speech, and the sense of witnessing.

Qualitative reports were transcribed, systematically analyzed, and categorized to extract recurring experiential themes. These phenomenological findings were then examined in relation to third-person neurophysiological data, including magnetoencephalography (MEG; Dor-Ziderman et al., 2013) and electroencephalography (EEG; Berkovich-Ohana, 2017; Fingelkurts et al., 2020, 2022), enabling integrative analyses linking subjective experience with neural dynamics.

Micro-Phenomenological Interview. Three studies employed phenomenological interviews grounded in micro-phenomenological principles to investigate lived experiences of selflessness (Ataria et al., 2015; Nave et al., 2021; Lindström et al., 2023). This approach is designed to facilitate detailed access to experiential structures through second-person guided inquiry (Petitmengin, 2006). Notably, Lindström et al. (2023) adapted the method to examine trait-level, everyday experiences of self-boundaries and perspectival ownership, departing from the conventional focus on the detailed reconstruction of discrete experiential episodes. Their approach relied on a semi-structured format with open-ended questions (e.g., "Do you have a sense of being a self?"), complemented by second-person probing to support reflective introspection.

Analytical strategies varied across studies. Ataria et al. (2015) employed a Grounded Theory approach to derive conceptual categories from the interview material. Nave et al. (2021) conducted a three-stage qualitative analysis using micro-phenomenological tools, involving thematic categorization, subcategory development, and phenomenological quantification. Lindström et al. (2023) sought to transform rich

qualitative material into simplified quantitative indices. Interviews were first rated along a continuum of trait-level boundarylessness, ranging from a clearly bounded sense of self to an absence of perceived separation from the environment. Perspectival ownership was subsequently categorized through an iterative, collaborative process involving cross-comparison of responses and the identification of recurrent themes across participants.

Semi-structured Phenomenological Interview. Lindström et al. (2022) employed semi-structured interviews with a phenomenological orientation to elicit detailed first-person accounts of participants' lived experiences. While the study was informed by a theoretical framework highlighting fundamental experiential dimensions of the self – particularly those perceived as diminished or absent during episodes of selflessness – this framework was used as a sensitizing reference rather than as a set of a priori categories guiding data collection. The coding process was systematically guided by the research questions, with a targeted analysis of the eight dimensions of self and the three categories of consciousness content central to the conceptual framework, while remaining grounded in participants' experiential descriptions.

4. Discussion

The aim of this study was to conduct a scoping review of assessment methods developed to evaluate selflessness and to examine how this construct had been conceptualized across empirical research. The review identified three main approaches: self-report instruments (including four full questionnaires, five subscales, and three pictographic measures), three behavioral tasks, and eight studies using phenomenological interviews.

Regarding conceptualization, this review confirmed the absence of a consensual epistemological and terminological definition of selflessness, as previously noted in the literature (Canby et al., 2024; Britton et al., 2021). Progress in this field therefore requires a clearer and more integrative conceptual framework, together with greater consistency in terminology and definitions. In this context, Canby et al. (2024) proposed a comprehensive integrative model that synthesized prior theoretical and empirical work, identifying 16 distinct features that characterize selflessness as a multifaceted experiential construct. Drawing on this framework, our review indicated that several dimensions were consistently represented across all the assessment instruments analyzed, suggesting that experiences of selflessness were reliably defined by two core components: (1) a reduction

or dissolution of the sense of self, encompassing self-loss, decreased ownership of mental processes, and attenuated agency; and (2) an increased sense of connectedness or unity with others and/or the world, reflected in boundary dissolution and feelings of oneness. These components likely represented the primary experiential features of selflessness and were consistent with prominent theoretical models (Yaden et al., 2017; Hanley et al., 2018), which distinguish between an annihilational dimension – marked by reduced self-salience – and a relational dimension characterized by heightened connectedness.

A central challenge in this field concerns whether selflessness is conceptualized as a transient state or a stable trait. The literature reflects this distinction, describing selflessness both as a dispositional characteristic and as a state-dependent experience. Findings from the present review indicated a clear predominance of state-based conceptualizations and measures. Only four self-report instruments (Sleight et al., 2023; Butlein, 2006; Kohls & Walach, 2006; Hanley et al., 2018) and one phenomenological interview study (Lindström et al., 2023) operationalized selflessness as a trait, whereas most studies focused on momentary or context-dependent experiences. This imbalance highlighted a gap in the literature and underscored the need for greater conceptual clarity, as well as for assessment tools capable of capturing both state-like and trait-like dimensions of selflessness.

Regarding assessment, our findings indicated that existing approaches were marked by substantial methodological and psychometric limitations. Most notably, self-report measures – including full questionnaires (Nour et al., 2016; Sleight et al., 2023; Hanley et al., 2018; Butlein, 2006), subscales (Dittrich et al., 2010; Kohls & Walach, 2006; Hood, 1975; MacLean et al., 2012; Yaden et al., 2019), and pictographic scales (Dambrun, 2016; Aron et al., 1992; Hanley & Garland, 2019) – generally failed to meet established psychometric standards as outlined by the COSMIN guidelines (Mokkink et al., 2010; Terwee et al., 2018). Although acceptable levels of internal consistency were frequently reported, other essential measurement properties, such as content validity, structural validity, criterion validity, and test–retest reliability, were often insufficiently examined or not reported.

Behavioral tasks (Hadash et al., 2016; Kelley et al., 2002; Sui et al., 2012) were similarly underdeveloped in this field, with only a limited number of studies available. Moreover, these paradigms typically operationalized selflessness in a highly restricted manner, often equating it with alterations in self-referential cognition. As a result, they

captured only a narrow facet of the construct and did not reflect its multidimensional character. Phenomenological approaches to the assessment of selflessness were likewise scarce. Most existing studies relied primarily on open-ended questions within a neurophenomenological framework (Dor-Ziderman et al., 2013; Berkovich-Ohana, 2017; Fingelkurts et al., 2020, 2022), offering limited methodological structure and depth. Only three studies employed more systematic qualitative methodologies, such as micro-phenomenological interviews (Ataria et al., 2015; Nave et al., 2021; Lindström et al., 2023).

Despite these limitations, the findings of this review allow for several recommendations regarding appropriate methods for assessing selflessness. Among comprehensive self-report questionnaires, the Nondual Awareness Dimensional Assessment (NADA; Hanley et al., 2018) and the Ego Dissolution Scale (EDS; Sleight et al., 2023) demonstrated comparatively stronger psychometric support. At the subscale level, the Mystical subscale of the MEQ-30 (MacLean et al., 2012), as well as the Self-Diminishment and Connectedness subscales of the AWE-S (Yaden et al., 2019), also showed robust psychometric evidence.

Among pictographic measures, the Spatial Frame of Reference Continuum (SFoRC; Hanley & Garland, 2019) emerged as the most psychometrically sound option identified in this review. Given the complex and often ineffable nature of selflessness (Dambrun, 2016; Hanley & Garland, 2019; Canby et al., 2024), pictographic instruments appear particularly well suited to its assessment. By relying on spatial and visual representations rather than purely verbal descriptions, such measures may reduce conceptual ambiguity and facilitate access to experiential dimensions that are difficult to articulate linguistically. When supported by adequate psychometric evaluation, pictographic scales therefore represent a promising and conceptually coherent avenue for advancing the measurement of selflessness.

Beyond standardized quantitative measures, we strongly advocate for the inclusion of phenomenological interviews as a complementary assessment strategy. Although this approach remains insufficiently developed in the current literature, it enables fine-grained exploration of subjective experience and facilitates the identification of subtle experiential transformations that are unlikely to be captured by conventional self-report instruments (Petitmengin, 2006; Giorgi et al., 2017; Olivares et al., 2015). In particular, micro-phenomenological methods are well suited to accessing the pre-

reflective attentional, affective, and sensory dimensions of selflessness, which are central to a phenomenon that is inherently complex (Petitmengin, 2006).

Finally, we emphasize the importance of integrating multiple assessment modalities to adequately capture the multidimensional nature of selflessness. Given its conceptual and experiential complexity, a comprehensive evaluation benefits from combining quantitative measures with qualitative approaches. This integrative strategy enhances the validity and interpretability of research on complex psychological constructs (Levitt et al., 2018; Shaw et al., 2018; Branney et al., 2023). Accordingly, diversified and complementary methods – such as self-report questionnaires, pictographic scales, and phenomenological interviews – are required to achieve a more comprehensive characterization of selflessness.

This study has several limitations that should be acknowledged. First, the substantial heterogeneity of the included studies – both in their conceptualizations of selflessness and in their methodological approaches – limits the possibility of a fully coherent epistemological synthesis. Additionally, this review may be subject to selection bias, as reliance on specific search terms could have led to the exclusion of relevant studies employing alternative terminology. Finally, as a scoping review designed to map and systematize the field rather than to perform a formal quality assessment or meta-analytic synthesis, its conclusions remain primarily descriptive and integrative in nature.

In conclusion, the findings of this study provided a guiding framework for the investigation of selflessness in the subsequent studies of this thesis, informing both the conceptual approach to the construct and the selection of appropriate assessment methods.

Study 3. Inducing Selflessness Through a Virtual Reality Experience: A Preliminary Study

1. Background

Selflessness has been consistently associated with psychological well-being, increased prosocial behavior, and enhanced social connectedness (Van Gordon et al., 2015; Giommi et al., 2023; Lamas-Morales et al., 2025). In light of these documented benefits, a variety of methods have been developed to induce or cultivate states of selflessness.

Among the approaches examined to date, meditation and psychedelic substances have been the most extensively studied and commonly employed. Meditation, in particular, has demonstrated robust and replicable effects in eliciting alterations in self-related experience (e.g., Dambrun, 2016; Dor-Ziderman et al., 2013). For instance, Lindahl and Britton (2019) reported that 72% of meditators experienced changes in their sense of self during meditation practice. Comparable findings were observed in Study 1 of the present doctoral thesis, in which the practice of Tonglen meditation induced changes across multiple dimensions constitutive of the construct of selflessness. Similarly, psychedelic substances – including psilocybin (Griffiths et al., 2008, 2011), lysergic acid diethylamide (LSD; Lyvers & Meester, 2012), and N,N-dimethyltryptamine (DMT; Trichter et al., 2009) – have shown considerable potential in this domain. These experiences are frequently conceptualized under the construct of drug-induced ego dissolution (Millière, 2017).

The therapeutic effects of meditation and psychedelic substances have been closely linked to Mystical-Type Experiences (MTEs). These are ineffable states marked by a strong sense of unity, transcendence of time and space, intense positive emotions, perceived sacredness, and a noetic quality – a feeling of gaining deep insight (Stace, 1960). In a large study of over 4,000 participants, Griffiths et al. (2018) found that MTEs were often rated among the most meaningful and spiritually significant experiences in people's lives, and were associated with lasting increases in well-being, life satisfaction, and sense of purpose. Importantly, several studies have also connected MTEs with experiences of selflessness, including reduced self-boundaries and decreased self-referential processing (e.g., MacLean et al., 2012; Nour et al., 2016; Sleight et al., 2023).

A related set of phenomena linked to positive psychological outcomes are Peak Experiences (PEs), defined as intense, meaningful, and relatively rare events that stand out from everyday life (Timmermann et al., 2022; Vieten et al., 2018). PEs can involve strong emotions (both positive and negative), dissociative features such as feelings of unreality or detachment, and sudden moments of insight or clarity (Anderson et al., 2019; Lindahl et al., 2017). These experiences have received growing attention because of their potential role in psychological integration and personal transformation (Cummins & Lyke, 2013; Majić et al., 2015; Anālayo, 2003; Sedlmeier, 2018).

However, the induction of selflessness through meditation typically requires sustained and long-term practice, which limits the accessibility and generalizability of such experiences to non-meditating populations (Dor-Ziderman et al., 2013; Ataria et al., 2015). Psychedelic substances, by contrast, are prohibited in many legal jurisdictions and may carry risks of adverse psychological effects for certain individuals (Breeksema et al., 2022). These constraints underscore the need for alternative, scalable, and non-pharmacological methods capable of overcoming the limitations associated with both meditation and psychedelics. Within this context, virtual reality (VR) has emerged as a promising technological platform for simulating or eliciting experiential states that may otherwise be risky, costly, or difficult to access (Mado & Bailenson, 2022).

In this context, VR has already demonstrated efficacy in modulating bodily self-experience, including the elicitation of out-of-body experiences (Amato et al., 2019), alterations in body ownership (Knibbe et al., 2018), shifts in spatial presence (Chirico et al., 2018; Knibbe et al., 2018), and disruptions in the sense of agency or motor control (Knibbe et al., 2018). Beyond these bodily dimensions, VR has also been employed to elicit self-transcendent emotions such as awe, compassion, and gratitude (Halim et al., 2023; Cebolla et al., 2019; Navarrete et al., 2021; Chirico et al., 2018). Notably, awe has been robustly linked to selflessness through the *small self* effect, which is characterized by a diminished sense of self in response to perceived vastness or novelty (Piff et al., 2015; Shiota et al., 2007).

In light of this background, we propose that VR is a promising tool for eliciting experiences of selflessness. Recent work has highlighted the potential of multi-person VR environments designed according to the so-called *numadelic aesthetic* (Glowacki et al., 2020, 2022; Glowacki, 2024). Derived from the Greek *pneuma* (spirit) and *delein* (to reveal), the numadelic aesthetic is a representational framework for immersive VR

informed by phenomenological accounts of near-death and psychedelic experiences, as well as insights from neuroscience and quantum physics. Rather than depicting bodies as discrete, bounded entities, this approach renders avatars as dynamic, luminous energy fields with diffuse and permeable boundaries. This framework was implemented in the VR experience *Isness* (Glowacki et al., 2020, 2022), in which participants collectively experienced the emergence, fluctuation, and dissolution of their energetic bodies. Notably, *Isness* demonstrated the capacity to attenuate ego boundaries and enhance a sense of interconnectedness.

Building on this work, the present study examines a multi-user VR experience called Ripple. Adapted from *Isness* and grounded in a similar aesthetic, Ripple introduces a key innovation: the integration of Tonglen, a traditional compassion-based meditation examined in depth in Study 1. Tonglen is a visualization practice in which practitioners symbolically take in the suffering of others, transform it, and offer compassion in return, thereby shifting attention away from habitual self-focus (Chödron, 1994; Jinpa, 2011). As shown in Study 1, this practice can induce experiential shifts associated with selflessness. In Ripple, the breathing and visualization elements of Tonglen are translated into embodied, multisensory interactions, using immersive VR technology to strengthen its potential to elicit selfless states.

Accordingly, Ripple was designed to induce states of selflessness while addressing limitations of traditional approaches and advancing empirical research in this area. The present study provides a preliminary evaluation of the acceptability and effects of a single Ripple session on selflessness, related affective states, and the occurrence of mystical and peak experiences.

2. Method

2.1. Participants

A total of 56 volunteers were recruited through advertisements at the University of Valencia. Inclusion criteria were: (1) being 18 years of age or older; (2) having a native or proficient level of Spanish to ensure full comprehension of the study instructions and evaluation protocol; and (3) having sufficient comprehension of spoken English to engage with the Ripple VR experience, as all audio content in the virtual environment was delivered in English. Exclusion criteria included: (1) a self-reported history of

neurological or psychiatric conditions that could interfere with immersive VR exposure; and (2) prior experience with the Ripple VR environment.

The study was approved by the Ethics Committee of the University of Valencia (registration number: 3349305). All procedures involving human participants were conducted in accordance with the ethical standards of the institutional research committee and with the principles of the Declaration of Helsinki (1964) and its subsequent revisions, or comparable ethical standards.

2.2. Procedure

Experimental sessions were conducted in a laboratory at the University of Valencia and followed a group-based format. Each session included four participants and one trained facilitator who guided the Ripple VR experience. Sessions lasted approximately 90 minutes and consisted of three phases: baseline assessment, VR experience, and post-experience assessment.

Upon arrival, participants received detailed information about the study and provided written informed consent. They then completed baseline self-report questionnaires administered online via Qualtrics.

After the baseline assessment, the VR session began. Participants were individually fitted with Meta Quest 2 head-mounted displays, and the facilitator provided standardized instructions and technical support when needed. Participants then completed the full Ripple VR experience.

Immediately after the session, the headsets were removed and participants completed the post-experience questionnaires via Qualtrics. One week later, they received an email with a link to complete the follow-up questionnaires online.

2.2.1 Ripple Experience Design

Participants engaged in the Ripple experience as a 50-minute immersive journey structured into three sequential phases: (1) a preparatory phase, (2) the core Ripple VR session, and (3) a final phase focused on integration and reflection. Each session involved one trained facilitator and four participants, who were co-located in the same physical laboratory space while occupying individual room-scale VR areas. Within the virtual environment, participants were spatially oriented toward a shared central point, enabling coordinated interaction and collective engagement.

Pre-Experience Technical Checks. Because Ripple was conducted in a co-located multi-user setting within the same physical space, all head-mounted displays, Wi-Fi connectivity, and room-scale spatial boundaries were configured in advance to ensure technical compatibility, safety, and ease of entry into the virtual environment.

Phase 1: Preparation. Once the facilitator confirmed that all headsets were functioning correctly, participants were invited to put on the head-mounted displays and take a seat in a comfortable chair. Over approximately 15 minutes, the facilitator guided an introductory process that included: (1) welcoming participants and introducing themselves; (2) inviting participants to briefly introduce themselves and share their current emotional state; (3) establishing confidentiality norms to promote psychological safety; and (4) informing participants that the experience could involve moments of virtual bodily overlap, while explicitly emphasizing their right to opt out of any element that caused discomfort.

The facilitator then introduced Ripple as a contemplative experience inspired by the meditation practice of Tonglen. Participants were encouraged to approach the environment as an opportunity to explore alternatives to ingrained assumptions about reality. Specifically, they were invited to consider: (1) experiencing their bodies and surrounding phenomena as spacious, permeable, and non-solid rather than fixed and material; (2) perceiving both self and environment as dynamic, impermanent processes rather than static entities; and (3) relating to themselves and others as fundamentally interconnected and interdependent rather than separate and discrete. The facilitator then transitioned into spectate mode, after which a pre-recorded English-language narrative guide led participants through the remainder of the experience.

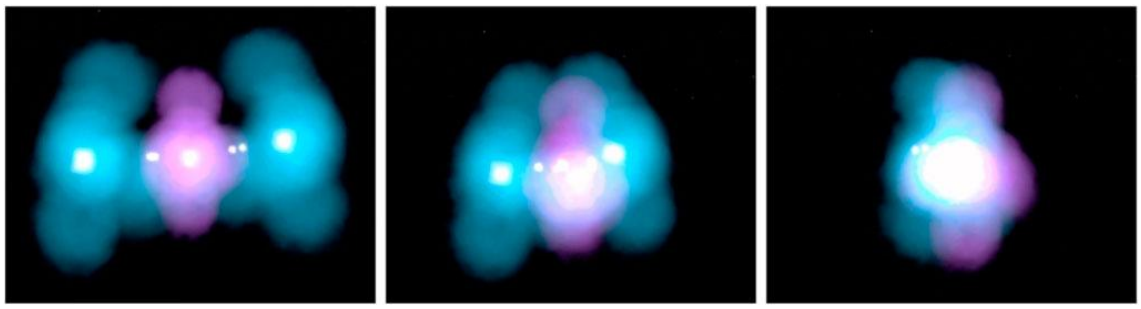
Phase 2: Guided Choreography. For approximately 25 minutes, participants were guided through a pre-recorded narrative and meditation sequence composed of seven distinct experiential segments. For a clearer understanding of these phases, please refer to Supplementary Material 2 of the published article by Vidal et al. (2025), which provides short video excerpts illustrating each of the stages described below.

1. Mirroring. The experience began with a dyadic mirroring exercise designed to foster interpersonal attunement. Participants synchronized gestures and breathing with a partner, establishing a shared rhythm that functioned as a self-regulatory, breath-based meditation.

2. Facing out. Participants reoriented outward into the virtual space, engaging in a breath-focused meditation that symbolically dissolved their “heart light” into the surrounding environment. This contemplative practice temporarily suspended self-referential awareness and, drawing on open-awareness traditions, evoked experiences of spaciousness, non-attachment, and perceptual decentering, preparing participants for collective engagement.
3. Sharing hearts. Turning back toward the group, participants engaged in synchronized group breathing while visualizing their heart lights merging into a shared luminous field. This collective convergence fostered emotional resonance and deepened the sense of interconnectedness among participants.
4. Coalescence. Participants moved together toward the center of the virtual environment in a symbolic gesture of unity. Holding hands and advancing in synchrony, they enacted a ritual of collective convergence. This phase represented the culmination of interpersonal alignment, transforming the space into a co-constructed field of mutual presence and shared becoming (see Figure 6).
5. Tonglen. Re-engaging in pairs, participants practiced an adapted form of Tonglen meditation (see the Introduction for a detailed description of the practice).
6. Fading. Participants sat across from their partners and observed a visual dissolution and reappearance of the other. By destabilizing fixed perceptual boundaries between self and other, this phase subtly induced experiences of selflessness, allowing the self to be perceived as transient, permeable, and relationally co-constituted.
7. Return. The guided sequence concluded with a gradual reintegration into individual awareness. Participants were invited to re-anchor attention in their own breath and bodily sensations, gently closing the shared experiential space.

Figure 6

Coalescence: collective synchronization and symbolic convergence within the virtual environment



Note. Figure 6 is reproduced from Glowacki (2024) with permission.

Phase 3: Integration and Discussion. Following the conclusion of the pre-recorded narrative, the facilitator re-emerged from spectate mode and gently addressed the group. Participants were guided to attune to their bodily sensations and current mental state, after which the facilitator led a brief dedication to formally close the experience. Participants were then invited to share reflections, emotions, or impressions that arose during the session. This integration phase emphasized open, participant-led dialogue, with the facilitator primarily adopting a supportive and attentive listening role rather than imposing a structured discussion format. In instances where participants did not feel immediately ready to speak, periods of respectful silence were maintained. Once the discussion concluded, participants were guided on how to gently exit the virtual environment.

2.3. Measures

In addition to socio-demographic information, the following self-report measures were administered before and after the VR experience:

2.3.1. Pictographic Items

As noted in Study 2 of this doctoral thesis, selflessness is a complex and often ineffable experience, making it essential to employ assessment tools capable of capturing its subtle experiential dimensions in a non-narrative format (Dambrun, 2016; Hanley & Garland, 2019; Canby et al., 2024). Accordingly, the following pictographic instruments

were selected to assess the different dimensions constituting selflessness (for visual representations of the pictograms, see the Appendix of Study 3).

Perceived Body Boundaries Scale (PBBS; Dambrun, 2016). This scale comprises a single pictographic item assessing the perceived salience of bodily boundaries. It presents seven human figures with varying degrees of boundary definition, rated on a 7-point Likert-type scale ranging from 1 (extremely salient body boundaries) to 7 (almost imperceptible body boundaries). Higher scores reflect a greater dissolution of perceived body boundaries. For consistency with the visual orientation of the other pictographic measures used in the study, this item was reverse-coded prior to analysis.

Spatial Frame of Reference Continuum (SFoRC; Hanley & Garland, 2019). The SFoRC is a single-item pictographic measure assessing the perceived spatial extent of awareness. It evaluates whether awareness is experienced as confined within the physical body or as extending beyond it. The scale uses an 8-point continuum ranging from 1 (egocentric frame of reference) to 8 (allocentric frame of reference), with higher scores indicating a broader, more expansive field of awareness.

Furthermore, four additional ad hoc pictographic items were developed to assess complementary dimensions of selflessness, informed by established theoretical frameworks in contemplative science (Berkovich-Ohana et al., 2024; Canby et al., 2024).

Fusion with VR-partner. This 7-point Likert-type item assessed perceived interpersonal fusion. It depicted two human figures – one representing the self and the other representing the Ripple partner – with increasing degrees of bodily overlap. Lower scores (1 = no overlap) indicated complete disconnection, whereas higher scores (7 = complete overlap) reflected a full integration or fusion with the partner.

Small Self Effect. This 7-point Likert-type item assessed perceived self-diminishment. It presented a human figure containing a smaller inner figure representing the self, which progressively decreased in size across response options (1 = prominent self; 7 = minimal self). Higher scores indicated greater perceived reduction of self-salience.

Self-Referential Inner Dialogue. Self-referential processing was assessed using two complementary items measuring both the intensity and temporal prevalence of self-

focused inner dialogue. The first item used a 7-point Likert scale ranging from 1 (high intensity of self-referential inner discourse) to 7 (absence of self-referential inner dialogue). The second item employed an 11-point Likert-type scale assessing the proportion of time engaged in self-referential thinking, ranging from 100% to 0%. Higher scores on both items indicated lower levels of self-referential processing.

In addition, the following pictographic item was used to assess interpersonal connectedness with VR-group:

Inclusion of Other in the Self Scale (IOS; Aron et al., 1992). The IOS is a single-item measure of perceived interpersonal closeness. In this study, it was used to assess the degree of connectedness participants felt toward the other Ripple participants. The scale consists of seven pairs of circles – one representing the self and the other representing the group – with increasing levels of overlap. Higher scores reflect greater perceived connectedness.

2.3.2. Self-Report Questionnaires

In addition to the pictographic measures, the following standardized and ad hoc questionnaires were administered.

Hedonic and Arousal Affect Scale (HAAS; Roca et al., 2023). The HAAS is a 30-item self-report measure of affective experience. Grounded in the bi-dimensional model of affect (valence and arousal) (Kuppens et al., 2013), it yields five subscales: negative affect–high arousal, negative affect–low arousal, positive affect–high arousal, positive affect–low arousal, and warmth-related affect. The HAAS has demonstrated good internal consistency (Roca et al., 2023). In the present sample, reliability was acceptable to excellent: negative affect–high arousal ($\alpha = 0.70$, $\omega = 0.75$), negative affect–low arousal ($\alpha = 0.86$, $\omega = 0.87$), positive affect–high arousal ($\alpha = 0.89$, $\omega = 0.90$), positive affect–low arousal ($\alpha = 0.72$, $\omega = 0.82$), and warmth ($\alpha = 0.86$, $\omega = 0.86$).

Mystical Experiences Questionnaire (MEQ-30; MacLean et al., 2012; Cabral-Juan et al., 2024). The MEQ-30 is a 30-item self-report instrument derived from the State of Consciousness Questionnaire (SOCQ; Pahnke, 1963) that assesses mystical-type experiences. It comprises four subscales: mystical (e.g., unity, noetic quality, sacredness), positive mood (e.g., joy, awe), transcendence of time and space, and ineffability.

Participants rate the extent to which each statement applied to their experience on a 6-point scale ranging from 0 (none/not at all) to 5 (extreme). The MEQ-30 has demonstrated strong psychometric properties, including excellent internal consistency and construct validity (Barrett et al., 2015; MacLean et al., 2012). In the present sample, internal consistency was excellent ($\alpha = 0.97$, $\omega = 0.97$).

Satisfaction with the Experience (Adapted from Wrzesien & Alcañiz, 2010). To assess overall satisfaction with the Ripple experience, seven items adapted from Wrzesien and Alcañiz (2010) were administered. These items assessed perceived usefulness, intention to participate again, perceived therapeutic value, engagement, and intrinsic motivation. Participants rated their agreement on a 10-point Likert scale ranging from 1 (totally disagree) to 10 (totally agree).

Adverse Effects of the Experience (Ad Hoc). A 13-item ad hoc scale was developed to assess potential adverse effects of the Ripple experience. Participants rated the extent to which they experienced undesirable reactions (e.g., "I felt fear or resistance during some moments of the experience"; "I experienced headaches and/or bodily discomfort") on a 7-point Likert scale ranging from 1 (not at all) to 7 (very much). The specific items included in this scale can be consulted in Table 11 of the present study.

2.3.3. Follow-Up Assessment

Peak Meditative Experience Scale (PMES; Hadash et al., 2024). The PMES is a 32-item checklist designed to assess the occurrence of peak meditative experiences. Participants were presented with a list of 32 potential experiential indicators and asked to indicate whether each had occurred (yes/no) during the week following the Ripple experience, as well as the associated affective valence (pleasant vs. unpleasant).

2.4. Data Analysis

All statistical analyses were performed using the SPSS v.28 and JASP 0.19.3.0. Firstly, descriptive statistics of the variables under study were calculated, including means, standard deviations, and minimum and maximum scores on pre- and post-Ripple assessments. In order to determine whether Ripple induces a state of selflessness, histograms of each of the pictographic scales were represented.

Next, six repeated-measures ANOVAs were conducted, with time (before and after the VR experience) as the within-subjects factor. One of them was conducted to examine whether there were significant differences between pre- to post-IOS scores, and the others to assess if there was a significant change in affect, as measured by the five subscales of the HAAS. Effect sizes were assessed using partial eta-squared following Cohen's criteria (Cohen, 1988), and post-hoc pairwise comparisons with a Bonferroni adjustment were utilized. All assumptions were examined, revealing no evidence of any significant problems.

Subsequently, the percentage of participants that achieved a Mystical-Type Experience (MTE) was calculated, as well as the percentage of the maximum possible score for the MEQ-30 subscales. In addition, to determine the impact of selflessness on MTEs, zero-order Pearson correlations between the selflessness pictographic scales and the MEQ-30 subscales were computed. Following this, four multiple linear regressions were used to identify possible predictors of MTEs among the variables associated with selflessness. Age, gender, prior meditation experience, and engagement in spirituality reading were also included as independent variables. The dependent variables consisted of the four MEQ-30 subscales: mystical, positive mood, transcendence of time/space and ineffability. All assumptions were also checked, and we did not find evidence of serious problems with any of them.

Finally, the percentage of participants who experienced the most frequently reported PEs was calculated, along with the affective valence associated with them.

3. Results

3.1. Sample

The final sample consisted of 56 participants, with an equal gender distribution (50% female), and an age range of 23 to 53 years (M = 33.13, SD = 8.64). With respect to prior contemplative practices, 67.9% of participants reported previous experience with meditation, and 37.5% indicated frequent engagement in spiritual reading. Descriptive statistics (means, standard deviations, and minimum and maximum values) for post-Ripple assessments are presented in Table 7.

Table 7

Means (M), standard deviations (SD), and minimum (Min) and maximum (Max) scores on post-Ripple assessments (pictographic items, HAAS, MEQ-30)

Variable	N	M	SD	Min	Max
Pictographic items					
Fusion with VR-partner	56	4.77	1.44	1.00	7.00
Dissolution of perceived body boundaries (PBBS)	56	3.21	1.56	1.00	7.00
Small self effect	56	4.36	1.86	1.00	7.00
Self-referential inner dialogue (intensity)	56	5.38	1.31	2.00	7.00
Self-referential inner dialogue (percentage of time)	56	2.45	1.96	0.00	7.00
Spatial frame of reference (SFoRC)	56	5.09	1.73	1.00	8.00
Interpersonal connectedness with VR-group (IOS)	54	4.54	1.74	1.00	7.00
HAAS					
Negative affect high arousal	51	4.27	2.15	1.00	12.00
Negative affect low arousal	51	3.58	3.32	0.00	14.00
Positive affect high arousal	51	12.90	5.52	1.00	23.00
Positive affect low arousal	51	14.58	4.30	1.00	21.00
Warmth	51	16.49	5.24	3.00	24.00
MEQ-30					
Mystical	53	35.03	16.37	7.00	61.00
Positive mood	53	13.18	5.45	2.00	22.00
Transcendence of time and space	53	15.90	7.71	0.00	30.00
Ineffability	53	7.86	4.33	0.00	15.00

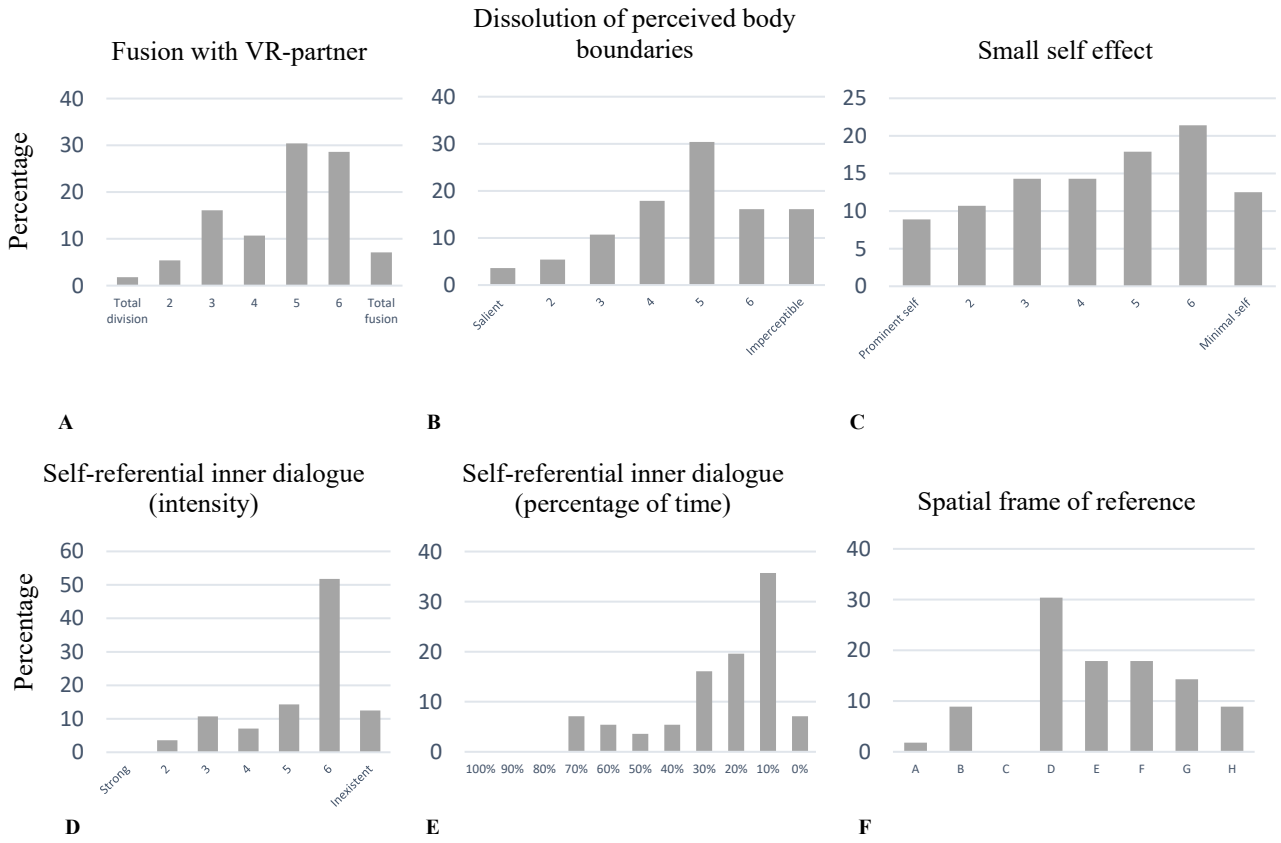
Note. PBBS = Perceived Body Boundaries Scale; SFoRC = Spatial Frame of Reference Continuum; IOS = Inclusion of Other in the Self Scale; HAAS = Hedonic and Arousal Affect Scale; MEQ-30 = Mystical Experiences Questionnaire.

3.2. Changes in Selflessness and Interpersonal Connectedness

Visual inspection of the histograms revealed a consistent pattern in the distribution of post-experience scores across the different dimensions of selflessness (Figure 7). Specifically, the majority of participants reported high ratings of fusion with their partner, dissolution of perceived body boundaries, self-diminishment, reduced intensity and duration of self-referential inner dialogue, and an expanded spatial frame of self-awareness following the Ripple experience.

Figure 7

Histograms of selflessness pictographic items

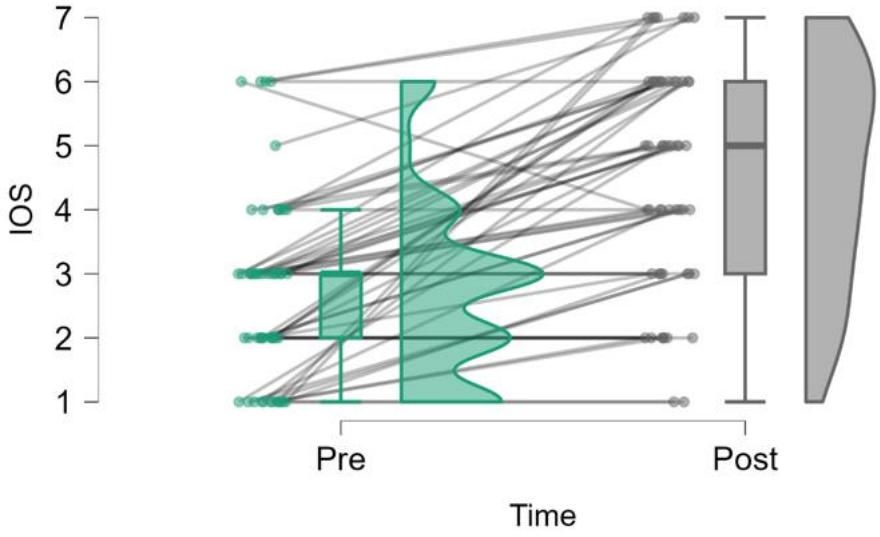


Note. Panels A through F display histograms of the different pictographic scales used to assess selflessness.

Additionally, Figure 8 presents a Raincloud plot illustrating visible shift in the distribution of IOS scores following Ripple, with participants indicating higher degrees of interpersonal connectedness with the VR-group. A repeated-measures ANOVA, that can be consulted in Table 8, showed that the difference between the pre- and post-values was statistically significant ($F(1, 53) = 66.11$, $p < .001$, $\eta^2 = .55$), with the mean IOS rating of 2.70 ± 1.39 (SD) pre-Ripple increasing to 4.54 ± 1.74 (SD) post-Ripple.

Figure 8

Raincloud plot of the IOS scores



Note. Raincloud plot of the IOS scores for all participants before and after Ripple.

Table 8

Means (M) and standard deviations (SD) on pre- and post-Ripple assessments (IOS and HAAS) and repeated-measures ANOVAs

Variables	Pre N	Pre M (SD)	Post N	Post M (SD)	df_{effect}	df_{error}	F-test	p value	η2
Connectedness	54	2.70 (1.39)	54	4.54 (1.74)	1	53	66.11	< .001	0.55
NA HA	52	5.76 (2.75)	51	4.27 (2.15)	1	47	28.25	< .001	0.37
NA LA	52	5.05 (4.72)	51	3.58 (3.32)	1	47	5.86	.019	0.11
PA HA	52	14.32 (5.27)	51	12.90 (5.52)	1	47	9.62	.003	0.17
PA LA	52	12.80 (3.85)	51	14.58 (4.30)	1	47	13.59	< .001	0.22
Warmth	52	14.55 (4.95)	51	16.49 (5.24)	1	47	13.05	< .001	0.21

Note. IOS = Inclusion of Other in the Self scale; HAAS = Hedonic and Arousal Affect Scale; Connectedness = Interpersonal connectedness with VR-group; NA HA = Negative Affect High Arousal; NA LA = Negative Affect Low Arousal; PA HA = Positive Affect High Arousal; PA LA = Positive Affect Low Arousal; *df* = degrees of freedom. Bonferroni corrections were applied.

3.3. Changes in Affective States

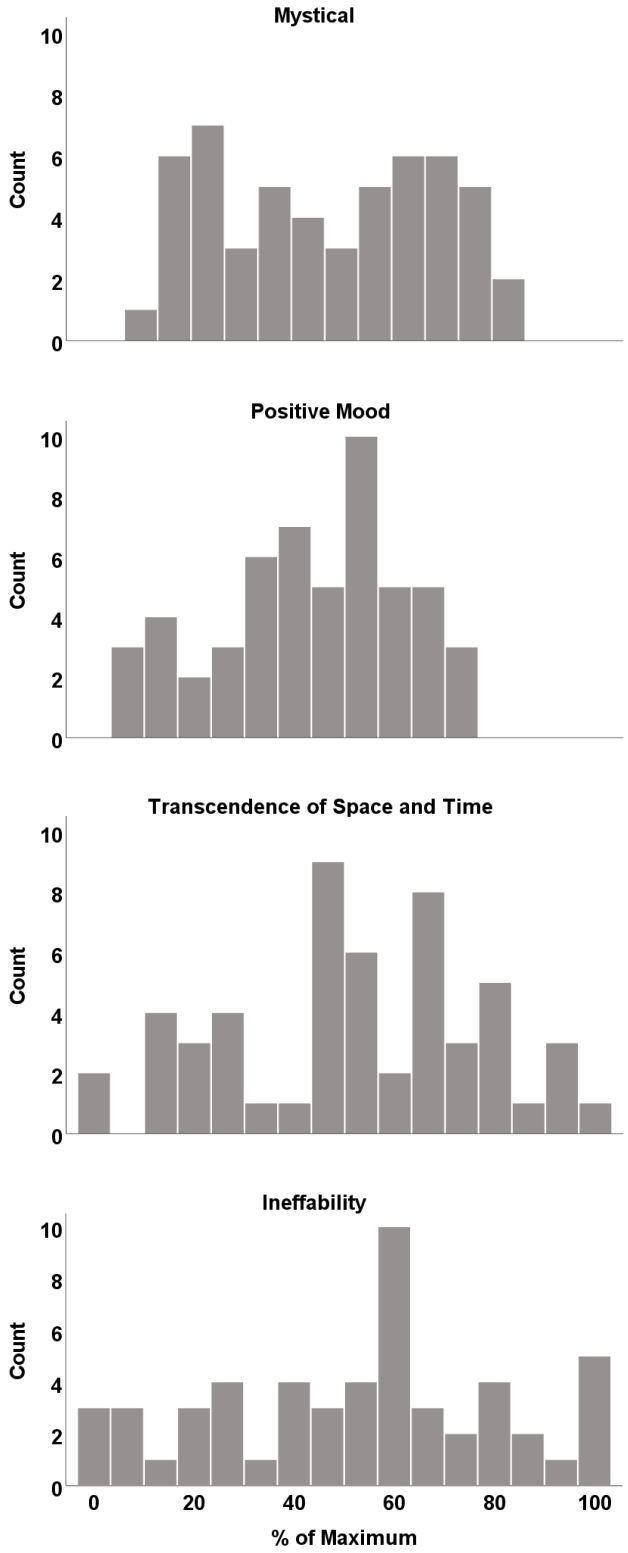
Subsequently, it was examined whether there was a substantial change in affect following the VR experience. Five repeated-measures ANOVAs were performed to evaluate the effect of time (pre- to post-Ripple) on affective experiences as measured with each of the HAAS subscales. The means and standard deviations on pre- and post-Ripple assessments (IOS and HAAS) and the within-subjects ANOVA results are presented in Table 8. The effect of time on affect was significant at the 0.05 alpha level for all subscales: negative affect high arousal ($F(1, 47) = 28.25$, $p < .001$, $\eta^2 = .37$) and low arousal ($F(1, 47) = 5.86$, $p = .019$, $\eta^2 = .11$), positive affect high arousal ($F(1, 47) = 9.62$, $p = .003$, $\eta^2 = .17$) and low arousal ($F(1, 47) = 13.59$, $p < .001$, $\eta^2 = .22$), and warmth ($F(1, 47) = 13.05$, $p < .001$, $\eta^2 = .21$). Post-hoc pairwise comparisons with a Bonferroni adjustment indicated that negative affect high arousal ($p < .001$) and low arousal (p=0.019), as well as positive affect high arousal ($p = .003$) were significantly lower at post-assessment than at pre-assessment. On the contrary, positive affect low arousal ($p < .001$) and warmth ($p < .001$) were significantly higher at post-assessment than at pre-assessment.

3.4. Mystical-Type Experiences

According to the MEQ-30, a "complete" MTE is characterized by scores of 60% or higher on all four subscales (Barrett et al., 2015). Our results indicate that 35.8% of participants exceeded this cut-off point in the mystical subscale, 24.5% did so in positive mood, 43.4% in transcendence of time and space, and up to 50.9% scored more than 60% in ineffability. Finally, 13.2% of Ripple participants achieved a complete MTE. Participant responses for each subscale have been averaged and are reported as a percentage of the maximum possible score in Figure 9.

Figure 9

Percentage of the maximum score for the MEQ-30 subscales



Moreover, to assess the influence of selflessness on MTEs, zero-order Pearson correlations between the selflessness pictographic scales and the MEQ-30 subscales (mystical, positive mood, transcendence of time/space, and ineffability) were computed and are presented in Table 9. The results indicate that variables such as fusion with the partner and self-diminishment are positively correlated with all MEQ-30 subscales ($p < .01$). Furthermore, dissolution of perceived body boundaries shows a positive association with all MEQ-30 subscales ($p < .01$), except for positive mood. Additionally, there is a positive correlation between expansion of self-awareness and the mystical subscale ($p < .01$).

Afterwards, to uncover potential predictors of MTEs among variables related to selflessness, four multiple linear regression models were constructed using the MEQ-30 subscales as dependent variables. The six selflessness pictographic scales, along with age, gender, prior meditation experience, and engagement in spirituality reading, were included as independent variables. Only the mystical subscale ($F(10, 42) = 4.58$, $p < .001$, $R^2 = .52$) and the transcendence of time and space subscale ($F(10, 42) = 2.86$, $p = .008$, $R^2 = .40$) resulted in significant models. Further examination of individual predictors revealed that self-diminishment emerged as a significant predictor for both the mystical subscale ($t = 2.71$, $p = .01$) and the transcendence of time and space subscale ($t = 2.45$, $p = .018$).

Table 9

Zero-order Pearson correlations between the selflessness pictographic scales and the MEQ-30 subscales

Selflessness items	MEQ subscales			
	Mystical	**Positive mood**	**Transcendence**	**Ineffability**
Fusion with VR-partner	0.584*	0.457*	0.493*	0.432*
Dissolution of perceived body boundaries	0.434*	0.243	0.480*	0.357*
Small self effect	0.648*	0.483*	0.529*	0.438*
Self-referential inner dialogue (intensity)	0.154	0.083	0.141	0.057
Self-referential inner dialogue (percentage of time)	0.083	0.030	0.029	0.005
Spatial frame of reference	0.377*	0.217	0.201	0.263

Note. *Indicates $p < .01$

3.5. Follow-Up Peak Experiences

Regarding the follow-up assessments (N = 39), the most reported PEs from the PMES are the following (% of participants that experienced it): Aha! Moment (28.2%), strong gratitude (25.6%), intense longing for a person/s (20.5%), and extraordinary love and compassion for others (17.9%). All of these experiences exhibited a pleasant hedonic tone, except for intense longing for a person/s, which a subset of participants who experienced it (33%) regarded as unpleasant.

3.6. Acceptability and Tolerability

Table 10 and Table 11 provide the means, standard deviations, and minimum and maximum scores of the items of the satisfaction and adverse effects scales. Ripple showed high acceptance, as reflected by the satisfaction item scores showing consistently high means (ranging from M = 6.56 to M = 8.38 on a 1-10 scale). Additionally, the adverse effects items register remarkably low scores (ranging from M = 1.36 to M = 2.98 on a 1 to 7 scale).

Table 10

Means (M), standard deviations (SD), and minimum (Min) and maximum (Max) scores on satisfaction scale items

Item	N	M	SD	Min	Max
I think this type of experience is useful to improve my knowledge about myself.	48	7.23	1,92	3.00	10.00
In case you meditate: I think this type of experience is useful to improve my knowledge about my meditative practice.	48	7.27	2,62	1.00	10.00
I believe this type of experience is useful in improving my knowledge of non-ordinary states of consciousness.	48	7.92	2,19	2.00	10.00
If possible, I would like to participate in this type of experiences soon.	48	7.85	2,51	2.00	10.00
I believe that participating in this type of experience can provide therapeutic knowledge to people.	48	8.38	1.72	2.00	10.00
I forgot how time passed while participating in this experience.	48	7.52	2.44	2.00	10.00
After this experience I want to learn much more about meditation.	48	6.56	2.66	1.00	10.00

Table 11

Means (M), standard deviations (SD), and minimum (Min) and maximum (Max) scores on adverse effects scale items

Item	N	M	SD	Min	Max
I have boycotted the experience.	47	2.13	1.48	1.00	6.00
I have felt fear or resistance to the experience at times.	47	2.09	1.48	1.00	7.00
I have had unpleasant feelings about my body representation.	47	1.47	1.17	1.00	7.00
I have had unpleasant feelings about merging bodies.	47	1.36	1.07	1.00	7.00
I felt anxious.	47	1.91	1.26	1.00	5.00
I experienced repeated and disturbing memories, thoughts, or images of a stressful experience from the past.	47	1.40	1.21	1.00	7.00
I had trouble thinking clearly and/or making decisions.	47	1.66	1.04	1.00	5.00
Anything bothered me.	47	1.47	0.85	1.00	5.00
I felt distant or isolated from other people.	47	1.57	0.97	1.00	5.00
I experienced headaches and/or body aches.	47	2.87	2.06	1.00	7.00
My hearing has become very sensitive.	47	1.17	0.38	1.00	2.00
I felt disconnected from the experience.	47	2.23	1.49	1.00	7.00
I have felt lost with the instructions.	47	2.98	1.66	1.00	7.00

4. Discussion

The primary objective of the present study was to examine whether Ripple, a multi-person VR experience, could induce a state of selflessness, and to explore its effects on affect, as well as on mystical and peak experiences. The preliminary findings suggest that Ripple may facilitate experiences of selflessness and enhanced interpersonal connectedness. In addition, it increases positive affect of low arousal and warmth, and generates MTEs in a notable subset of participants, which appears to be associated with selflessness. Moreover, one week after the experience, participants reported PEs such as personal insights and feelings of gratitude, longing, and love, indicating that the impact of the intervention may extend beyond the immediate session.

Over decades of scientific inquiry, researchers have explored various methods for inducing experiences of selflessness, most prominently meditation (Anālayo, 2003; Olendzki, 2006; Tang et al., 2015) and psychedelic substances (Griffiths et al., 2008, 2011; Millière, 2017). The present findings suggest that Ripple represent an additional pathway for eliciting such experiences through immersive VR. In this respect, the results are consistent with previous work by Glowacki et al. (2020, 2022), who demonstrated that a comparable VR environment (Issnes) can induce ego attenuation and feelings of connectedness. Inducing selflessness through VR may offer several advantages over

existing approaches. Unlike meditation-based practices, VR does not require extensive prior training or long-term practice (Lindahl & Britton, 2019; Lindahl et al., 2017). Moreover, it avoids the use of psychedelic substances, which remain illegal in many jurisdictions and may produce adverse effects in some individuals (Breeksema et al., 2022; Barrett et al., 2016). From this perspective, VR provides a controlled experimental context in which the phenomenological features associated with selflessness can be selectively elicited and examined. This methodological advantage enables systematic investigation of the experience through experimental paradigms, neurophysiological measures, and structured phenomenological inquiry.

In the present study, we adopted dimensional models of affect, which conceptualize affective experiences along two core dimensions – valence, referring to the hedonic quality; and arousal, indicating the level of activation (Larsen & Diener, 1992; Kuppens et al., 2013). The results suggest that participation in Ripple was associated with increases in low-arousal positive affect (e.g., calm, peaceful, content) and feelings of warmth (e.g., bondedness, security, or protection). These findings align with previous studies identifying increases in positive affect during selflessness experiences (Dor-Ziderman et al., 2013; Dambrun, 2016; Hanley & Garland, 2019; Dambrun et al., 2019). The contrasting patterns observed between high- and low-arousal positive emotions underscore the importance of assessing affect not only in terms of the traditional positive-negative dichotomy, but also with respect to levels of activation. Accordingly, future research may benefit from systematically evaluating affective responses within this dimensional framework (Kuppens et al., 2013; Roca et al., 2023).

In the present study, 13.2% of participants met criteria for a complete MTE during the VR session. Given the extensive use of the MEQ-30 in psychedelic research, these results allow for comparison with prior pharmacological studies. Overall, the VR-based intervention produced MEQ-30 scores that were comparable to, and in some cases higher than, those reported in studies involving ketamine (Vlisides et al., 2018), MDMA, LSD, and methylphenidate (Liechti et al., 2017), as well as moderate doses of psilocybin (Griffiths et al., 2016; Carbonaro et al., 2018). As expected, substantially higher MEQ-30 scores have been consistently reported following higher doses of classic psychedelics, particularly psilocybin (Carbonaro et al., 2018; Griffiths et al., 2011, 2016, 2018; Nicholas et al., 2018).

Regarding meditation, empirical research examining its relationship with MTEs remains limited, which restricts direct comparison with Ripple. Although MTEs are frequently reported by meditators, they have rarely been assessed using standardized instruments such as the MEQ-30. In a retrospective study, Vieten et al. (2018) reported a high frequency of MTEs among meditators, with positive mood emerging as the most prominent dimension. In contrast, in the present study, positive mood was the lowest-rated MEQ-30 subscale. This discrepancy suggests that the phenomenological profile of MTEs may vary depending on the method of induction. However, the limited availability of comparable data precludes firm conclusions and highlights the need for further systematic investigation.

Moreover, we examined the relationship between experiences of selflessness and MTEs, a link frequently suggested in prior research (e.g., MacLean et al., 2012; Nour et al., 2016; Sleight et al., 2023). Our findings indicate that multiple dimensions of selflessness are strongly associated with MTE phenomenology. In particular, fusion with others and self-diminishment showed robust associations with all four MTE components, while dissolution of perceived body boundaries was related to all dimensions except positive mood, and expansion of self-awareness was associated with unity, sacredness, and noetic quality. Importantly, among these dimensions, self-diminishment emerged as a significant predictor of several core MTE components, including transcendence of time and space, unity, sacredness, and noetic quality. Together, these results suggest that experiences of selflessness – especially self-diminishment – play a central role in both the emergence and structure of MTEs.

Subsequently, PEs reported during the week following the VR session were examined. Notably, three of the four most frequently reported PEs – insight moments, strong feelings of gratitude, and extraordinary experiences of love and compassion – corresponded to those identified in a prior investigation conducted during a meditation retreat (Hadash et al., 2024). This convergence suggests that these phenomena may represent recurrent forms of post-experience integration in contemplative contexts. Given that PEs have been closely linked to therapeutic and integrative mechanisms (Timmermann et al., 2022; Hadash et al., 2024), Study 5 of the present doctoral thesis further investigated these processes using ecological momentary assessment to examine short-term integration dynamics following the VR session.

Finally, several limitations of the present investigation should be acknowledged. First, the study did not include a control group, so it is not possible to determine whether the observed effects are attributable to specific features of the Ripple experience or to more general factors, such as participant expectations or the novelty of the VR environment. Second, some participants reported difficulties in fully comprehending the audio guidance, as the majority of the sample consisted of native Spanish speakers. Although a basic level of English proficiency was required for participation, the linguistic complexity of certain instructions may have impeded optimal understanding. Finally, a subset of participants reported physical discomfort, including headaches and pressure-related discomfort associated with prolonged use of the VR headset.

In conclusion, the present study demonstrates that Ripple, a novel multi-person VR experience, effectively induces states of selflessness. Building on these findings, the subsequent studies of this doctoral thesis employ this induction approach to examine selflessness in greater depth, with a focus on its phenomenology and temporal dynamics, as well as its applicability within contemplative (Study 4) and clinical (Study 5) contexts.

Study 4. Virtual Reality-Induced Selflessness and Its Effects on Meditative Experience: A Preliminary Multiple Case Series Study

1. Background

Throughout history, diverse contemplative and experiential practices have been developed to induce or cultivate states of selflessness, including meditation traditions and the use of psychedelic substances (e.g., Anālayo, 2003; Dambrun, 2016; Dor-Ziderman et al., 2013; Millière, 2017). In recent years, selflessness has garnered increasing scientific attention due to its associations with psychological well-being, prosocial behavior, and social connectedness (Van Gordon et al., 2015; Giommi et al., 2023; Lamas-Morales et al., 2025). Despite this growing interest, the established methods for eliciting selflessness remain pharmacological, resource-intensive, or difficult to standardize and scale, underscoring the need for alternative, cost-effective, and non-pharmacological approaches. In this context, VR has emerged as a promising tool for the systematic design and empirical investigation of such transformative experiential states.

Study 3 of the present doctoral thesis demonstrated that Ripple, a multi-person VR experience, reliably induced a state of selflessness and enhanced interpersonal connectedness. In addition, the experience increased low-arousal positive affect (e.g., calmness, peacefulness, and contentment), heightened feelings of interpersonal warmth, and elicited mystical- and peak-type experiences in a substantial subset of participants. Importantly, Ripple showed high acceptability and was associated with few reported adverse effects (Vidal et al., 2025). Nevertheless, this initial study was preliminary in nature and subject to several important limitations. First, because the audio content of the experience was originally developed in English, some participants – native Spanish speakers – reported difficulties fully understanding the auditory instructions embedded in Ripple. Second, a subset of participants reported headaches and physical discomfort at points of contact with the VR headsets. To address these limitations, the audio content of the Ripple VR experience was refined and fully translated into Spanish. In addition, Oculus Quest 3 headsets were acquired; their reduced weight and improved ergonomic design were expected to enhance physical comfort and reduce the incidence of headset-related discomfort during the experience.

Moreover, the present pilot study introduced a second key methodological innovation. Given that selflessness is a complex, subtle, and often ineffable phenomenon, participants may have limited capacity to accurately articulate their experiences using conventional verbal self-report measures (Dambrun, 2016; Hanley & Garland, 2019; Canby et al., 2024). As discussed in Study 2, these limitations underscore the need for assessment tools capable of capturing the experiential dimensions of selflessness in a non-narrative format. Although Study 3 incorporated pictographic items to assess specific dimensions of this construct, a comprehensive and psychometrically validated scale was not yet available. To address this gap, our research team developed the Meditation Pictographic Inventory (MPI; Delia et al., 2025), a novel instrument grounded in a first-person phenomenological framework and specifically designed to assess meditation-related experiences through non-verbal, pictographic representations. The MPI operationalizes a broad range of experiential dimensions relevant to selflessness – such as alterations in self–other boundaries, spatial frame of reference, connectedness, affective tone, temporal distortion, and ineffability – using single-item pictograms. Accordingly, its inclusion in the present study enabled a more precise and comprehensive characterization of the selflessness-related experiential qualities elicited by Ripple.

In parallel, this additional pilot study aimed to explore the potential applications of the Ripple VR experience, specifically its effects on the quality of meditation within a contemplative context. Existing literature suggests that combining meditation with VR can enhance the sense of presence, reduce cognitive distraction, and facilitate sustained attentional engagement and absorption (Shaw et al., 2007; Kosunen et al., 2016; Gromala et al., 2015). Importantly, these effects may extend beyond the immediate session and foster continued attentional immersion during subsequent meditation practice, even in the absence of VR (Seabrook et al., 2020; Jo et al., 2024; Xie et al., 2025). Beyond immersion, another dimension that may be enhanced through the integration of VR and meditation is the perceived meaningfulness or subjective significance of the experience. VR-based contemplative environments are often experienced as salient and personally meaningful, partly due to their immersive and affectively evocative qualities. Such experiences may amplify the sense that the practice is relevant, impactful, and personally significant, thereby increasing motivational engagement and supporting reflective integration (Baños et al., 2004; Riva et al., 2019).

Furthermore, recent research suggests that VR also enhances imaginative capacities that are central to many contemplative techniques. Generative forms of meditation rely on the ability to produce, sustain, and transform internal representations; however, substantial interindividual differences in imagery ability can constrain practice quality for some practitioners (Navarrete et al., 2021; Andreu et al., 2022). Immersive VR environments can support these processes by providing perceptually rich and emotionally salient simulations, thereby scaffolding imagery generation and reducing reliance on internally constructed representations (Slater & Sanchez-Vives, 2016; Navarrete et al., 2021; Palacios et al., 2026). Recent evidence further suggests that such VR-supported experiences may strengthen imagery-related capacities beyond the immediate VR session, facilitating greater imagery vividness and absorption during subsequent, non-mediated meditation practice (Palacios et al., 2026). In this way, engagement in VR-based contemplative experiences may recalibrate imaginative skills that continue to support meditation quality over time.

Accordingly, engagement in a VR-based contemplative experience such as Ripple may not only elicit immediate experiential effects, but also give rise to enduring influences on subsequent meditation practice, mediated by enhanced immersion, perceived meaningfulness, imagery absorption, and imagery vividness.

Taken together, this background motivated the implementation of a second pilot study aimed at conducting a preliminary examination of the effects of the Ripple VR induction on participants' meditative experience within the naturalistic context of a contemplative retreat. Specifically, the study had three primary objectives: (1) to replicate prior findings indicating that Ripple elicits states of selflessness and mystical-type experiences, and to determine whether these effects were maintained or enhanced following the refinement and linguistic adaptation of the VR intervention; (2) to characterize and compare the experiential qualities of meditation sessions across three temporal phases—pre-VR meditation, the VR experience itself, and post-VR meditation—using repeated pictographic measures to examine changes across phases; and (3) to examine whether exposure to the VR experience was associated with changes in specific dimensions of meditative experience, namely immersion, perceived meaningfulness, imagery absorption, and imagery vividness, across meditation sessions conducted before and after the induction.

2. Method

2.1. Participants

The sample comprised 27 individuals attending a residential contemplative retreat. Participation in the study was voluntary, and written informed consent was obtained from all participants prior to data collection. Inclusion criteria were: (1) attendance at the retreat for its entire duration; (2) participation in the VR session integrated into the retreat program; and (3) sufficient proficiency in Spanish to understand study procedures and provide informed consent. Exclusion criteria included: (1) self-reported history of neurological or psychiatric conditions that could interfere with immersive VR exposure; and (2) prior experience with the Ripple VR environment.

The study was approved by the Ethics Committee of the University of Valencia (registration number: 3349305), and all procedures complied with the principles outlined in the Declaration of Helsinki.

2.2. Procedure

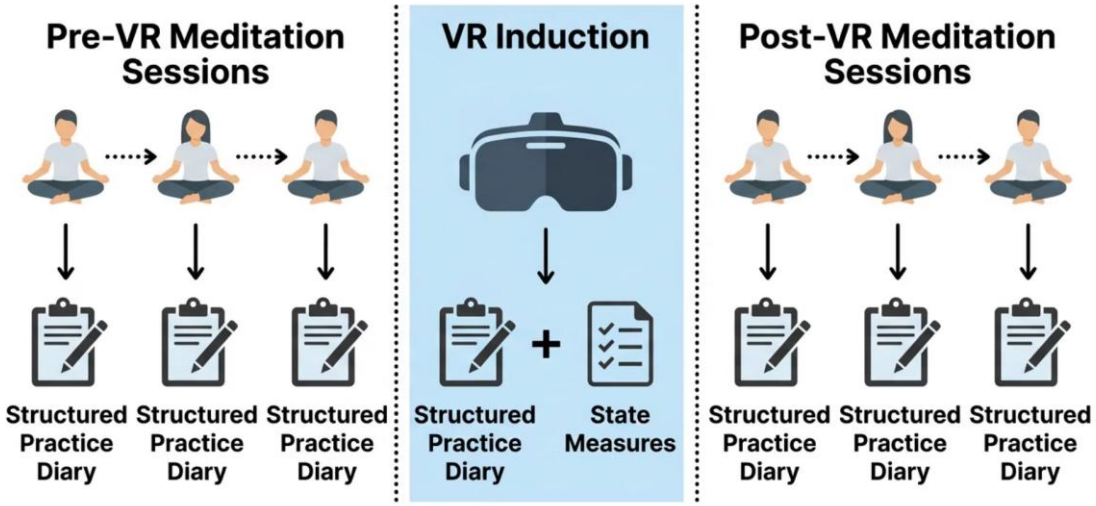
The study was conducted within the naturalistic setting of a residential contemplative retreat held between November 7 and 9, 2025. The retreat was part of the *Contemplative practice-based well-being training* (CBWT) program, a structured intervention integrating contemplative practices with principles derived from positive psychology (Cebolla & Alvear, 2019). Over the three-day retreat, participants engaged in guided meditation sessions encompassing both focused-attention and generative practices aimed at cultivating prosocial and affective qualities, such as compassion and hope.

An exploratory multiple case series design with repeated measures was employed. Data collection was embedded within the retreat schedule and structured into three sequential phases: (1) pre-VR meditation sessions, (2) the VR induction, and (3) post-VR meditation sessions. Participants completed a brief *Structured practice diary* immediately following each meditation session, as well as after the VR experience. This assessment battery included a pictographic self-report instrument designed to capture core experiential characteristics, along with four single-item measures assessing dimensions of meditative experience hypothesized to be particularly sensitive to VR exposure: immersion, perceived meaningfulness, imagery absorption, and imagery vividness.

After completing the meditation sessions constituting the pre-VR phase, participants underwent the Ripple VR experience. The VR induction was administered in a quiet, designated space within the retreat setting using Oculus Quest 3 headsets, with the audio content delivered in Spanish. Immediately following the VR session, participants completed *State measures* assessing selflessness and mystical-type experiences specific to the VR experience, as well as the structured practice diary. Following the VR induction, participants continued engaging in meditation sessions as part of the retreat program. As in the pre-VR phase, all post-VR meditation sessions were followed by the same structured practice diary. Due to the naturalistic organization of the retreat – whose schedule was not modified for research purposes – and logistical constraints, the VR intervention was administered at different time points for different participants, resulting in a variable number of meditation sessions (and corresponding assessments) before and after the VR experience across participants. This repeated-measures procedure enabled examination of both the immediate experiential effects of the VR experience and changes in the phenomenological characteristics of meditation sessions occurring before versus after VR exposure. Figure 10 provides a visual representation of the study procedure.

Figure 10

Overview of the study procedure and data collection phases



2.2.1. Ripple Induction

The Ripple VR experience is a facilitated, multi-user induction involving four participants and a trained facilitator, designed to elicit experiences of selflessness and interpersonal connectedness. It draws on contemplative traditions inspired by Tonglen practice and incorporates guided breathing and visualization exercises to shift attention from an individual-centered perspective toward relational awareness and mutual openness. The induction follows a standardized three-phase structure lasting approximately 45-50 minutes: Preparation, Induction, and Integration. The core induction phase consists of a 25-minute guided immersive sequence organized into seven contemplative segments combining synchronized breathing, shared visual imagery, and coordinated group interactions. A detailed description of the intervention is provided in Study 3 of this doctoral thesis.

2.3. Measures

2.3.1. State Measures (Administered Following the VR Experience)

Nondual Awareness Dimensional Assessment – State (NADA-S; Hanley et al., 2018). The NADA-S is a brief state-level measure consisting of three items rated on a 0-10 Likert-type scale that assesses momentary nondual awareness, which in the present study was operationalized primarily in terms of selflessness. The scale captures two core experiential dimensions – self-transcendence and bliss – and is sensitive to immediate experiential shifts induced by consciousness-modifying procedures. In this study, the NADA-S was administered both prior to and immediately following the VR experience in order to assess changes in nondual awareness attributable to the intervention. The instrument has demonstrated good internal consistency in previous research; in the present sample, internal reliability was high (α = 0.883; ω = 0.907). The NADA-S was selected on the basis of findings from Study 2 of this doctoral thesis, which identified it as exhibiting the strongest psychometric properties among currently available state-level measures of selflessness.

Mystical Experiences Questionnaire (MEQ-30; MacLean et al., 2012; Cabral-Juan et al., 2024). The MEQ-30 is a 30-item self-report measure designed to assess the occurrence and intensity of mystical-type experiences. The instrument comprises four subscales: mystical (e.g., experiences of unity, noetic quality, and sacredness), positive mood (e.g., awe and joy), transcendence of time and space, and ineffability. Participants

indicate the extent to which each item applied to their experience using a scale ranging from 0 (none/not at all) to 5 (extreme). The MEQ-30 has demonstrated strong psychometric properties in previous research, which were also supported in the present sample ($\alpha = 0.972$; $\omega = 0.974$).

2.3.2. Structured Practice Diary (Administered Across Meditation and VR Sessions)

For a detailed overview of the specific items included in the structured practice diary, including both the Meditation Pictographic Inventory and the items assessing dimensions of meditative experience, as presented to participants, see the Appendix (Study 4).

Meditation Pictographic Inventory (MPI; Delia et al., 2025). The MPI is 22-item, state-level pictographic instrument designed to assess momentary meditative experiences using symbolic visual representations. In the present study, only fourteen items were administered to assess warmth, time perception, positive emotions, negative emotions, compassion, self-compassion, ineffability, interpersonal connection, connection with the planet, bodily boundaries, reference continuum, time disappearance, ego attenuation, and ego inflation, covering a broad range of affective, relational, bodily, and temporal experiential domains. For each domain, participants were asked to select the pictorial representation that most closely matched their immediate experience, allowing for a rapid and intuitive assessment of transient phenomenological states while minimizing linguistic mediation. Each item consists of seven pictographic response options mapped onto a 1-7 ordinal scale, with higher values indicating greater intensity of the corresponding experiential dimension.

Dimensions of meditative experience. Four single-item self-report measures were employed to assess core dimensions of the meditation practice hypothesized to be sensitive to modulation following the VR experience. All items were adapted from psychometrically validated instruments. Immersion, derived from the State Mindfulness Scale (SMS; Tanay & Bernstein, 2013), indexed the degree to which participants felt fully engaged and experientially absorbed in the meditation practice. Meaningfulness, adapted from the Meditation Depth Questionnaire (MEDEQ; Piron, 2022), reflected the extent to which the meditation was experienced as personally significant or transformative. Imagery absorption and imagery vividness, derived from the Compassion Practice Quality Scale (CPQS; Campos et al., 2025), captured, respectively, the level of attentional

involvement in internally generated mental imagery and the clarity, richness, and perceptual intensity of such imagery during the practice. Single-item measures were used to reduce participant burden and to maximize sensitivity to transient experiential fluctuations. All items were rated on a 0-10 Likert-type scale, with higher scores indicating greater intensity of the reported experience.

2.4. Data Analysis

2.4.1. Effects of the Ripple VR Experience (Objective 1)

All quantitative analyses were performed using IBM SPSS Statistics (Version 28). Descriptive statistics were first computed to characterize the sample and study variables. Changes in selflessness, as measured by the NADA-S, were examined using paired-sample t-tests. Prior to conducting inferential analyses, key assumptions of the paired-sample t-test – specifically, normality of the difference scores, absence of influential outliers, and adequate scale properties – were evaluated and confirmed. Effect sizes were calculated using Cohen's d to quantify the magnitude of pre-post differences (Cohen, 1988). Finally, the proportion of participants who met established criteria for a mystical-type experience, as assessed by the MEQ-30, was computed.

2.4.2. Experiential Patterns across Phases and Changes in Pictographic Items (Objective 2)

Experiential Patterns across Phases. Descriptive statistics (means, standard deviations, and sample sizes) were computed for each of the fourteen MPI items separately for the pre-VR meditation, VR induction, and post-VR meditation phases. These statistics served to characterize overall experiential patterns across phases and to inform subsequent inferential modeling. In addition, the results were visually summarized using a radar plot to facilitate an integrated cross-phase comparison.

Changes in Pictographic Items. Changes in MPI items across phases were examined using item-level linear mixed-effects models, to account for the multiple evaluations collected per participant. For each of the fourteen MPI dimensions, pictographic ratings were entered as the dependent variable, with time (pre-VR meditations, VR induction, post-VR meditations) specified as a fixed categorical effect. Participant identity was included as a random intercept to account for the non-independence of repeated observations within individuals. Pictographic ratings were

treated as numeric variables, and observations with missing dependent values were excluded at the item level.

Fixed-effect regression coefficients (β) were used to estimate the magnitude and direction of change. For each effect, 95% confidence intervals and two-tailed p-values were computed, with statistical significance evaluated at $\alpha = .05$. Given the exploratory nature of the analyses, no correction for multiple comparisons was applied, and interpretation emphasized effect sizes and confidence intervals. Models were estimated using maximum likelihood, and items with insufficient data or variability were not interpreted.

2.4.3. Changes in Dimensions of Meditative Experience (Objective 3)

To examine pre–post changes in core dimensions of meditative practice, mean trajectories across pre-VR meditation, immediately following the VR induction, and post-VR meditation were plotted to provide a descriptive visualization of temporal patterns across phases. Inferential analyses of pre-post change were conducted using paired-sample *t*-tests comparing pre-VR and post-VR meditation scores for each dimension. Prior to inferential testing, statistical assumptions were examined and found to be satisfactory. Effect sizes were estimated using Cohen's *d* to quantify the magnitude of change associated with VR exposure (Cohen, 1988).

3. Results

3.1. Sample

The final sample comprised 27 participants aged between 28 and 70 years ($M = 50.59$, $SD = 9.14$). With respect to gender identity, 70.4% identified as female, 25.9% as male, and 3.7% as non-binary. Most participants self-identified as Caucasian (92.6%), with the remaining 7.4% identifying as Latino. Regarding civil status, 48.1% were married, 25.9% reported being in a stable partnership, 18.5% were single, and 7.4% were divorced. All participants had completed university-level education. At the time of data collection, 81.5% were employed, while the remainder were unemployed, retired, or on temporary leave.

All participants reported prior meditation experience, with practice duration ranging from 2 to 10 years ($M = 4.48$, $SD = 2.22$). In terms of practice frequency, 29.6% reported meditating daily, 29.6% practiced three to four times per week, and 40.7%

practiced sporadically. The duration of meditation sessions varied from 10 to 90 minutes (M = 28.57, SD = 21.68).

3.2. Effects of the Ripple VR Experience (Objective 1)

Paired-sample t-tests revealed significant increases in all dimensions of the NADA-S following the VR experience (Table 12). Self-transcendence increased from pre-induction levels (M = 2.74, SD = 3.39) to post-induction levels (M = 7.80, SD = 2.05), with a large effect size (Cohen's d = 1.54). Bliss showed a comparable increase (pre: M = 4.11, SD = 3.41; post: M = 8.70, SD = 1.73), also reflecting a large effect (d = 1.37). Consistently, total selflessness scores rose from M = 3.20 (SD = 3.29) to M = 8.10 (SD = 1.84), corresponding to a large effect size (d = 1.56).

Table 12

Pre-post changes in selflessness (NADA-S) assessed before and after the VR induction

Variable	Pre M (SD)	Post M (SD)	t (26)	P-value	Cohen's d
Self-transcendence	2.74 (3.39)	7.80 (2.05)	−7.98	p < .001	1.54
Bliss	4.11 (3.41)	8.70 (1.73)	−7.11	p < .001	1.37
Nondual awareness (Total)	3.20 (3.29)	8.10 (1.84)	−8.10	p < .001	1.56

According to the MEQ-30, a complete mystical experience is defined by scores of 60% or higher on all four subscales (Barrett et al., 2015). In the present sample, 63% of participants exceeded this threshold on the mystical subscale, 59.3% on positive mood, 63% on transcendence of time and space, and 70.4% on ineffability. Overall, 48.1% of participants met the full criteria for a complete mystical experience during the VR session.

3.3. Experiential Patterns across Phases and Changes in Pictographic Items (Objective 2)

Across the three experimental phases, a total of 242 repeated assessments were collected using the MPI. During the pre-VR phase, the 27 participants completed a total of 167 post-meditation assessments, corresponding to a mean of 6.15 measurements per participant (SD = 1.63), with an observed range from 3 to 9 sessions. In the post-VR phase, 50 assessments were obtained, with participants completing an average of 2 post-meditation evaluations each (SD = 1.22), ranging from 1 to 5 sessions. The VR induction phase yielded 25 assessments, as participants completed the MPI only once immediately

following the Ripple VR experience; and two participants did not provide post-VR induction data.

3.3.1. Experiential Patterns across Phases

Table 13 presents the sample size, means, and standard deviations for the fourteen MPI pictographic items assessed across pre-VR meditation, VR induction, and post-VR meditation, covering affective, relational, bodily, and temporal domains. As shown in the table, mean scores were generally higher during the VR induction phase compared to both pre- and post-VR meditation.

Affective dimensions (warmth, positive emotions, compassion, self-compassion), as well as ineffability, showed higher mean values during VR induction relative to baseline meditation and remained descriptively elevated during post-VR sessions. Relational dimensions – including interpersonal connection and connection with the planet – also increased during VR induction and decreased during post-VR meditation, while remaining above baseline levels. A similar pattern was observed for bodily and self-related dimensions, including bodily boundary dissolution and expansion of the reference continuum. Temporal alterations followed the same general tendency, with higher values during VR induction and lower values post-VR.

Ego attenuation remained relatively stable across phases, and negative emotions were consistently low, with only a slight increase during VR induction. Ego inflation showed a modest increase in the post-VR phase; however, this item was based on a smaller number of evaluations than the other MPI dimensions and should therefore be interpreted cautiously.

Table 13

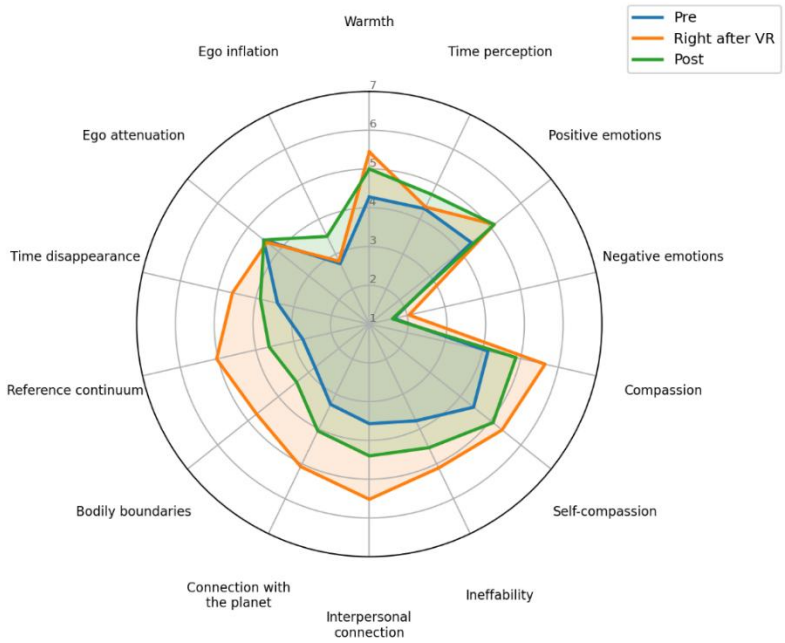
Sample size (N), mean, and standard deviation of MPI items across phases

Variable	Pre-VR		VR Induction		Post-VR	
	N	M (SD)	N	M (SD)	N	M (SD)
Warmth	166	4.28 (0.97)	25	5.44 (1.19)	49	5.00 (1.04)
Time perception	158	4.30 (1.04)	23	4.35 (1.56)	49	4.71 (1.10)
Positive emotions	167	4.37 (1.23)	25	5.12 (1.48)	50	5.12 (1.21)
Negative emotions	153	1.65 (0.92)	21	2.05 (1.80)	44	1.61 (1.04)
Compassion	156	4.14 (1.45)	23	5.65 (1.30)	48	4.88 (1.67)
Self-compassion	162	4.44 (1.36)	24	5.38 (1.50)	49	5.08 (1.27)
Ineffability	158	3.77 (1.37)	24	5.12 (1.90)	48	4.54 (1.41)
Interpersonal connection	161	3.57 (1.49)	25	5.52 (1.23)	50	4.40 (1.54)
Connection with the planet	151	3.30 (1.63)	24	5.08 (1.79)	49	4.06 (1.81)
Bodily boundaries	159	2.79 (1.31)	25	4.72 (1.72)	47	3.40 (1.54)
Reference continuum	148	2.76 (1.42)	23	5.04 (1.74)	48	3.65 (1.73)
Time disappearance	161	3.43 (1.41)	24	4.62 (1.95)	48	3.88 (1.55)
Ego attenuation	142	4.49 (1.30)	21	4.38 (1.99)	44	4.48 (1.36)
Ego inflation	139	2.73 (1.06)	15	2.80 (1.82)	39	3.51 (1.27)

Figure 11 provides a complementary visual representation of these patterns using a radar plot, in which mean scores for each dimension are displayed on a common 1–7 scale for pre-VR meditation, VR induction, and post-VR meditation. Consistent with the tabulated values, the figure shows that scores during VR induction extend further from the center across most dimensions, particularly within affective, relational, bodily, and temporal domains. The post-VR profile generally occupies an intermediate position between pre-VR and VR induction.

Figure 11

Experiential profiles across experimental phases



Taken together, Table 13 and Figure 11 depict a broad increase in mean scores during the VR induction phase across multiple experiential domains, with post-VR meditation frequently showing values between baseline and VR levels. In contrast, dimensions related to negative affect and ego attenuation display comparatively limited variation across phases, while ego inflation shows only modest changes.

3.3.2. Changes in Pictographic Items

Linear Mixed-Effects Models. Changes in pictographic ratings across phases were examined using item-level linear mixed-effects models. Table 14 reports the number of observations contributing to each model, together with the fixed-effect coefficients (β), 95% confidence intervals (CI), and associated p-values for the contrasts between VR induction and pre-VR (VR vs Pre), and between post-VR and pre-VR (Post vs Pre).

Relative to pre-VR, VR induction was associated with statistically significant increases in warmth (β = 1.082, 95% CI [0.711, 1.453], p < .001), positive emotions (β =

0.603, 95% CI [0.186, 1.020], $p = .005$), compassion ($\beta = 1.332$, 95% CI [0.838, 1.826], $p < .001$), self-compassion ($\beta = 0.763$, 95% CI [0.314, 1.212], $p = .001$), and ineffability ($\beta = 1.304$, 95% CI [0.868, 1.739], $p < .001$). Significant increases were also observed for interpersonal connection ($\beta = 1.739$, 95% CI [1.276, 2.201], $p < .001$) and connection with the planet ($\beta = 1.670$, 95% CI [1.164, 2.176], $p < .001$), as well as for bodily boundaries ($\beta = 1.751$, 95% CI [1.336, 2.166], $p < .001$), reference continuum ($\beta = 2.042$, 95% CI [1.520, 2.564], $p < .001$), and time disappearance ($\beta = 1.000$, 95% CI [0.514, 1.486], $p < .001$).

Compared to pre-VR, post-VR showed significant increases in warmth ($\beta = 0.536$, 95% CI [0.238, 0.834], $p < .001$), time perception ($\beta = 0.391$, 95% CI [0.069, 0.713], $p = .017$), positive emotions ($\beta = 0.414$, 95% CI [0.080, 0.748], $p = .015$), compassion ($\beta = 0.410$, 95% CI [0.020, 0.799], $p = .040$), and ineffability ($\beta = 0.597$, 95% CI [0.249, 0.945], $p < .001$). No statistically significant differences were observed for the remaining pictographic items in this contrast.

In summary, VR induction was associated with significant changes across affective, relational, bodily, and temporal variables. Moreover, significant pre–post increases persisted in several variables, particularly in core affective experiences (e.g., warmth, positive emotions, and compassion), temporal perception, and ineffability.

Table 14

Linear mixed-effects model results for changes in pictographic ratings across phases

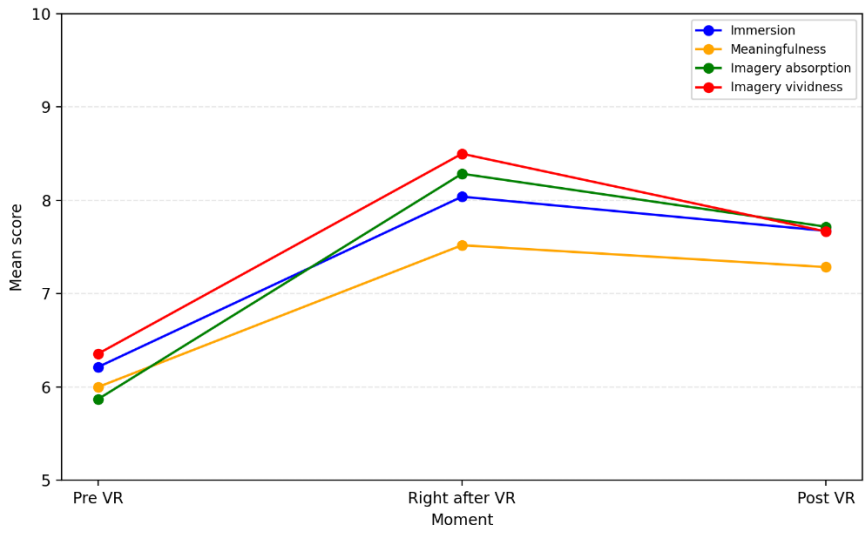
Variable	N obs.	VR vs Pre			Post vs Pre		
		β	95% CI	p-value	β	95% CI	p-value
Warmth	240	1.082	[0.711, 1.453]	< .001	0.536	[0.238, 0.834]	< .001
Time perception	230	0.046	[-0.368, 0.460]	.828	0.391	[0.069, 0.713]	.017
Positive emotions	242	0.603	[0.186, 1.020]	.005	0.414	[0.080, 0.748]	.015
Negative emotions	218	0.356	[-0.074, 0.786]	.105	-0.044	[-0.378, 0.289]	.795
Compassion	227	1.332	[0.838, 1.826]	< .001	0.410	[0.020, 0.799]	.040
Self-compassion	235	0.763	[0.314, 1.212]	.001	0.303	[-0.055, 0.660]	.097
Ineffability	230	1.304	[0.868, 1.739]	< .001	0.597	[0.249, 0.945]	< .001
Interpersonal connection	236	1.739	[1.276, 2.201]	< .001	0.355	[-0.015, 0.726]	.060
Connection with the planet	224	1.670	[1.164, 2.176]	< .001	0.307	[-0.094, 0.708]	.133
Bodily boundaries	231	1.751	[1.336, 2.166]	< .001	0.034	[-0.309, 0.378]	.845
Reference continuum	219	2.042	[1.520, 2.564]	< .001	0.329	[-0.072, 0.729]	.108
Time disappearance	233	1.000	[0.514, 1.486]	< .001	-0.018	[-0.409, 0.373]	.928
Ego attenuation	207	-0.080	[-0.606, 0.447]	.767	0.237	[-0.167, 0.641]	.250
Ego inflation	193	-0.281	[-0.731, 0.170]	.222	0.138	[-0.187, 0.463]	.405

3.4. Changes in Dimensions of Meditative Experience (Objective 3)

Pre-post changes were examined for immersion, perceived meaningfulness, imagery absorption, and imagery vividness. Figure 12 depicts mean trajectories for each dimension across the three measurement moments (pre-VR meditation, immediately after VR induction, and post-VR meditation). Across all four dimensions, a consistent pattern was observed: scores increased markedly immediately following the VR induction and remained elevated during post-VR meditation relative to pre-VR baseline, albeit with some attenuation from the immediate post-induction peak. This trajectory suggests both an acute experiential impact of the Ripple VR experience and a partial carryover effect into subsequent meditation sessions.

Figure 12

Mean trajectories of immersion, perceived meaningfulness, imagery absorption, and imagery vividness across experimental phases



Consistent with these trajectory patterns, pre-post comparisons revealed meaningful increases across all experiential dimensions (Table 15). For immersion, mean scores increased from pre-VR (M = 6.42, SD = 1.44) to post-VR meditation (M = 7.64, SD = 1.51), corresponding to a large effect size (d = 1.04). A more moderate increase was observed for perceived meaningfulness (pre-VR: M = 6.22, SD = 1.43; post-VR: M = 7.26, SD = 1.70; d = 0.66).

Imagery-related dimensions exhibited particularly pronounced changes. Imagery absorption showed a marked increase (pre-VR: M = 6.21, SD = 1.63; post-VR: M = 7.84,

SD = 1.57; *d* = 1.08), as did imagery vividness (pre-VR: *M* = 6.70, *SD* = 1.57; post-VR: *M* = 7.93, *SD* = 1.54; *d* = 0.90), both corresponding to large effect sizes.

Taken together, the observed mean differences and associated effect sizes indicate that exposure to the Ripple VR experience is associated with substantial increases in immersion and imagery-related qualities during subsequent meditation, alongside more moderate enhancements in perceived meaningfulness.

Table 15

Pre–post changes in dimensions of meditative experience assessed before and after the VR induction

Variable	Pre M (SD)	Post M (SD)	t(df)	p-value	Cohen's d
Immersion	6.42 (1.44)	7.64 (1.51)	t(23) = 5.12	< .001	1.04
Meaningfulness	6.22 (1.43)	7.26 (1.70)	t(23) = 3.25	.004	0.66
Imagery absorption	6.21 (1.63)	7.84 (1.57)	t(21) = 5.07	< .001	1.08
Imagery vividness	6.70 (1.57)	7.93 (1.54)	t(21) = 4.20	< .001	0.90

4. Discussion

The present pilot study sought to extend previous findings on the Ripple VR experience by examining its effects on meditative experience within the naturalistic context of a contemplative retreat. The results indicate that Ripple robustly induced states of selflessness, with nearly half of the participants meeting established criteria for a complete mystical-type experience. Pictographic analyses revealed a broad intensification of affective, relational, bodily and temporal dimensions during the VR induction, alongside selective persistence of these experiential qualities during post-VR meditations. Finally, exposure to Ripple was associated with substantial enhancements in immersion, meaningfulness, and imagery-related qualities of meditation, suggesting that the VR experience not only produced acute experiential effects but also modulated core dimensions of subsequent contemplative practice.

With respect to Objective 1, which sought to replicate previous findings from Study 3 of this doctoral thesis (Vidal et al., 2025), the present results indicate a robust induction of selflessness, together with a substantial increase in the proportion of participants who reported a complete MTE. Specifically, this proportion rose from 13.2% in Study 3 to 48.1% in the current pilot study. This marked increase suggests that refinements introduced in the present iteration of Ripple may have meaningfully

enhanced its experiential impact, including the full linguistic adaptation of the audio guidance into Spanish and the use of lighter, more ergonomically advanced Oculus Quest 3 headsets. At the same time, this increase cannot be attributed solely to technical or design-related improvements. The contemplative retreat context provided highly supportive conditions for transformative experiences, including sustained periods of silence, repeated meditation practice, and reduced external demands. Moreover, participants' strong intrinsic interest in contemplative practices and substantial prior meditation experience likely increased receptivity to selflessness and mystical-type states.

Objective 2 aimed to characterize experiential profiles across phases using repeated pictographic assessments, comparing meditative experience before and after VR exposure as well as during VR induction. The results showed that Ripple was accompanied by increases across multiple affective (warmth, positive emotions, compassion, self-compassion, ineffability), relational (interpersonal connection, connection with the planet), bodily (bodily boundaries, reference continuum), and temporal (time disappearance) dimensions. These domains correspond to core components of selflessness, conceptualized as arising from dynamic reconfigurations within the multidimensional network that constitutes the self, including embodied, affective, cognitive, and intersubjective processes (Berkovich-Ohana et al., 2024; Canby et al., 2024). Moreover, comparisons between meditation sessions conducted before and after VR exposure revealed carry-over effects on subsequent meditative experience. Post-VR meditations were characterized by higher levels of positive and prosocial affect, including warmth and compassion, as well as by greater temporal alteration and increased ineffability relative to pre-VR meditations. Together, these findings suggest that the experiential modulation observed during VR induction extended into subsequent contemplative practice.

Notably, ego attenuation remained relatively elevated and stable across all three phases, showing no substantial modulation by VR exposure. By contrast, ego inflation did not increase during the VR induction but exhibited a modest rise during the post-VR phase. This pattern should be interpreted with caution, as it was derived from a smaller number of valid evaluations, which may reflect variability in participants' understanding or subjective interpretation of this pictographic item. As the MPI (Delia et al., 2025) is currently undergoing iterative refinement and further empirical validation, ongoing work aims to enhance item clarity and overall psychometric robustness. Finally, negative

emotions remained consistently low across both pre- and post-VR meditation phases; the transient increase observed during the VR induction is more plausibly attributable to the heightened intensity and sensory salience of the experience – such as momentary physical discomfort, sensory overload, or mild cybersickness – rather than to affective distress per se.

Lastly, Objective 3 examined whether exposure to the Ripple VR experience was associated with changes in specific dimensions of meditative experience during subsequent meditation sessions. Consistent with previous findings (Slater & Sanchez-Vives, 2016; Navarrete et al., 2021; Palacios et al., 2026), post-VR meditations were characterized by substantial increases in imagery absorption and imagery vividness – capacities that are central to many contemplative techniques, particularly generative practices. In addition, immersion during meditation increased following VR exposure, in line with recent evidence showing that VR can enhance experiential engagement and presence (Seabrook et al., 2020; Jo et al., 2024; Xie et al., 2025). Perceived meaningfulness of meditation also increased during post-VR sessions, consistent with prior work highlighting the enduring salience and personal significance of immersive experiences (Baños et al., 2004; Riva et al., 2019), although these increases were more moderate than those observed for immersion and imagery-related dimensions.

Finally, several limitations of the present study should be acknowledged. First, the sample consisted exclusively of individuals attending a contemplative retreat, all of whom had prior meditation experience and a strong intrinsic interest in contemplative practices. While these characteristics likely facilitated engagement with both the VR induction and the subsequent meditation sessions, they limit the generalizability of the findings to broader populations, including meditation-naïve individuals or those with lower motivation for contemplative practice. Second, the study employed a naturalistic, non-controlled design without a comparison group, which precludes strong causal inferences regarding the specific contribution of the Ripple VR experience relative to other contextual factors inherent to the retreat setting, such as sustained silence, repeated meditation, and reduced external demands. Third, the relatively small sample size and exploratory multiple case series design, although well suited to capturing rich experiential dynamics, limit statistical power and warrant cautious interpretation of effect estimates.

In conclusion, this study demonstrates that the Ripple VR experience can be effectively integrated into a contemplative context. Exposure to Ripple reliably induced

selflessness and enhanced the intensity and depth of subsequent meditation practice. In addition, the study contributed to a clearer understanding of the experiential dimensions that constitute selflessness. Overall, the findings support the applicability of Ripple as a contemplative tool and its potential to deepen meditative experience.

Study 5. A Comprehensive Characterization of Selflessness in Virtual Reality: Phenomenology, Temporal Dynamics, and Clinical Relevance in Cancer Patients

1. Background

States of selflessness refer to psychological experiences in which the subjective sense of self is substantially attenuated or temporarily absent, and are typically accompanied by an expanded sense of interconnectedness with others and the world (Dambrun & Ricard, 2011; Berkovich-Ohana et al., 2024; Canby et al., 2024). Recent scientific interest has yielded preliminary evidence that these experiences are associated with enhanced psychological well-being, emotional regulation, and interpersonal functioning (e.g., Dambrun & Ricard, 2011; Britton et al., 2021; Zeifman et al., 2025; Lamas-Morales et al., 2025).

Although empirical research on the direct clinical application of selflessness remains at an early stage, converging theoretical frameworks and initial empirical findings point to its potential therapeutic relevance. Specifically, the cultivation of a transient and regulated reduction in self-centrality has been proposed as a possible transdiagnostic mechanism underlying psychological change (Van Gordon et al., 2015; Giommi et al., 2023; Sys et al., 2024; Lamas-Morales et al., 2025). At the applied level, these authors suggest that principles related to selflessness are increasingly being integrated into contemporary psychotherapeutic interventions, reflecting a gradual translation from theoretical models to clinical practice.

One population that may particularly benefit from such interventions is individuals living with cancer. A cancer diagnosis constitutes a highly stressful life event, exerting a profound impact not only on patients' physical health but also on their psychological functioning (Zare et al., 2019). Nevertheless, clinical care in oncology continues to be predominantly focused on the treatment of physical symptoms, whereas interventions aimed at enhancing psychological well-being remain limited and, in many cases, difficult to access (Carr & Steel, 2013; Stripp et al., 2025). Moreover, interventions addressing social and spiritual dimensions of well-being are particularly scarce, despite growing evidence that these dimensions represent central components of psychological

adjustment, meaning-making, and quality of life among oncology populations (Puchalski et al., 2019; Riba et al., 2019; McLouth et al., 2024).

In this context, prior research has begun to document the therapeutic potential of inducing selflessness-related states in oncology populations, most prominently through studies on psychedelic-assisted interventions (e.g., Agin-Liebes et al., 2020; Griffiths et al., 2016; Lewis et al., 2023; Ross, 2018; Ross et al., 2016, 2022; Shnayder et al., 2023; Millière, 2017; Roseman et al., 2018). Building on this line of work, more recent research has explored the use of immersive VR as a non-pharmacological means of eliciting comparable experiential states. Notably, a VR experience developed within the numadelic aesthetic was implemented in individuals living with life-threatening illnesses, including cancer (Kettner et al., 2025). This intervention was found to be feasible and well tolerated, and was associated with significant improvements in anxiety, depression, connectedness, and spiritual well-being, as well as reductions in demoralization. Together, these findings provide preliminary evidence that VR-based experiences designed to induce selflessness may yield clinically meaningful psychological benefits in oncology settings.

Within this emerging landscape, Ripple appears particularly relevant, as Studies 3 and 4 demonstrated its capacity to reliably elicit selflessness-related states in non-clinical samples. However, despite these promising findings, important gaps remain in our understanding of this complex experience. First, a comprehensive characterization of the phenomenology of VR-induced selflessness is needed. As stated in Study 2, phenomenological interviews constitute an essential methodological approach for this purpose, as they systematically elicit fine-grained first-person descriptions of lived experience, providing access to pre-reflective experiential dimensions and to the micro-dynamics through which states of selflessness unfold (Petitmengin, 2006). Moreover, non-verbal pictographic measures such as the Meditation Pictographic Inventory (MPI; Delia et al., 2025) provide a quantitative, phenomenology-based assessment of self-related states that complements verbal reports, thereby broadening the methodological scope and enabling a richer, multidimensional understanding of the experience.

In addition, the impact of the induction of selflessness on participants' everyday lives over time remains largely unknown. In Study 3, this issue was preliminarily examined through the assessment of peak experiences during the week following the Ripple induction, which pointed to the emergence of phenomena such as insight, gratitude, love, and compassion. These experiences have been described as markers of

psychological integration and identified as key mechanisms underlying the therapeutic benefits associated with selflessness-related states (Cummins & Lyke, 2013; Majić et al., 2015; Anālayo, 2003; Sedlmeier, 2018). Therefore, to investigate these processes in greater depth and with higher temporal resolution, the combined use of Ecological Momentary Assessment (EMA; Shiffman et al., 2008) and a Single-Case Experimental Design (SCED; Kazdin, 2011) appears particularly appropriate. EMA enables fine-grained, real-time assessment of affective, cognitive, and behavioral changes as they occur in participants' daily contexts. SCED methodologies, in turn, allow for rigorous within-person analyses of change processes, making them especially suitable for exploratory research on novel interventions and complex phenomenological processes.

Furthermore, applying this integrative methodological approach to an oncology population offers a valuable opportunity to examine the clinical feasibility and acceptability of Ripple in a highly vulnerable group, while also providing preliminary insight into its potential therapeutic relevance. More broadly, the integration of complementary methodologies – including phenomenological interviews, pictographic measures, EMA, and SCED – is essential for advancing the scientific understanding of complex, multidimensional phenomena such as selflessness. This form of methodological triangulation enables the convergence of first- and second-person data with longitudinal assessments, thereby supporting a more nuanced and mechanistically informed account of how selflessness is induced, maintained, and translated into clinically meaningful outcomes.

Given this background, the present study seeks to develop a comprehensive understanding of VR-induced selflessness in an oncology population, encompassing its phenomenological characteristics, temporal dynamics, and potential clinical relevance. Specifically, the study aims to: (1) evaluate the feasibility and acceptability of Ripple, as well as its proximal efficacy in inducing selflessness states in individuals living with cancer; (2) characterize the subjective experience of selflessness by examining its lived phenomenology through the combined use of pictographic measures and in-depth micro-phenomenological interviews; (3) investigate the temporal unfolding of selflessness following its induction using EMA, with the aim of identifying psychological processes over time and elucidating potential mechanisms of therapeutic change; and (4) examine whether the induction of selflessness is associated with group-level changes in clinical symptomatology, psychological and spiritual well-being, and perceived connectedness.

2. Method

2.1. Participants

Inclusion criteria were as follows: (1) age ≥ 18 years; (2) having a cancer diagnosis; (3) ability to read and understand Spanish; (4) access to and ability to use a smartphone with an Internet connection; and (5) provision of written informed consent prior to any study-related procedure.

Exclusion criteria were: (1) presence of a severe mental disorder (e.g., psychotic disorder or borderline personality disorder); (2) severe depressive or anxious symptomatology, self-destructive behavior, or suicide risk (defined as a total PHQ-9 score > 19 or a score > 1 on item 9); (3) habitual substance use; (4) presence of a medical condition preventing participation in the study (e.g., advanced physical deterioration, severe fatigue, or uncontrolled pain); and (5) an increase or change in psychotropic medication during the study period.

The study was preregistered at Open Science Framework (https://doi.org/10.17605/OSF.IO/2XQKT) and approved by the Ethics Committee of the University of Valencia (registration number: 3877411). The study was conducted at the laboratory facilities of the University of Valencia. All procedures involving human participants were conducted in accordance with the principles of the 1964 Helsinki Declaration and its subsequent revisions or comparable ethical standards.

2.2. Procedure

Participants were recruited through social media advertisements (e.g., Facebook and Instagram) and informational posters displayed in hospitals, primary care centers, and at the University of Valencia. Interested individuals accessed a secure online survey collecting sociodemographic data and eligibility screening information. Of the 37 individuals who completed the survey, 17 did not meet the inclusion criteria, resulting in a final sample of 20 participants. Eligible individuals were subsequently contacted for a telephone interview, during which they received detailed information about the study procedures and provided informed consent.

A multiple-baseline single-case experimental design (SCED) was employed to evaluate the effects of the Ripple VR intervention. In this design, Phase A represented the baseline period, during which no intervention was administered, whereas Phase B

corresponded to the treatment phase following the VR session. In accordance with established SCED methodological standards (Kratochwill & Levin, 2010), the study included a minimum of four replications of the effect across participants (e.g., at least four participants) to enhance external validity.

The 20 participants were allocated to five groups of four, each assigned a different baseline duration to ensure at least three distinct baseline lengths (Tate et al., 2016). Baseline duration was determined by an independent researcher using Randomizer.org, ensuring concealed allocation. Baseline periods ranged from 8 to 15 days (Group 1 = 8 days; Group 2 = 9 days; Group 3 = 10 days; Group 4 = 12 days; Group 5 = 15 days), followed by the intervention and post-intervention phases extending to Day 21. This structure ensured a minimum of five assessment points per phase, consistent with recommendations for reliability and interpretability in SCED research (Kratochwill et al., 2010).

The study was conducted between May and July 2025. On Day 1, participants completed the pre-intervention questionnaire battery and initiated a 21-day Ecological Momentary Assessment (EMA) protocol consisting of two daily assessments. Depending on their assigned baseline duration (8, 9, 10, 12, or 15 days), participants completed the Ripple VR session on the final day of the baseline phase. Sessions were conducted in groups of four at laboratory facilities, lasted approximately two hours in total, and included pre- and post-session state measures followed immediately by a micro-phenomenological interview. EMA assessments continued until Day 21, when participants completed the post-intervention questionnaire battery.

2.2.1. Ripple Induction

As described in detail in Study 3 of this doctoral thesis, Ripple is a multi-user VR experience involving four participants and a facilitator, designed to evoke states of selflessness and deepen interpersonal connection. The intervention conceptualizes the self as energetic, fluid, and characterized by permeable boundaries, and adapts Tonglen-inspired breathing and visualization practices to shift attention from self-focus toward relational openness. Ripple comprises three phases (≈45–50 min): Phase 1 (Preparation); Phase 2 (Induction), consisting of a 25-minute sequence of seven contemplative phases involving synchronized breathing, shared visualizations, and dyadic or collective coordination; and Phase 3 (Integration). During the induction phase, embodied

interactions allow participants' bodies to interact and converge, at times giving rise to experiences of energetic coalescence, in which individual boundaries momentarily dissolve into a shared experiential field. The preparatory and integrative phases provide the scaffolding necessary to contextualize and consolidate the induction process.

2.3. Measures

2.3.1. Demographic and Screening Measures

Demographic information was collected through the initial online survey and included age, gender, ethnicity, marital status, educational level, and occupation. Additional clinical information was obtained regarding cancer type, previous and current mental health diagnoses, psychological or psychiatric treatments, and substance use. These data were used both to characterize the sample and to determine eligibility for study participation.

Depressive and anxiety symptoms were assessed using the Patient Health Questionnaire–9 (PHQ-9; Kroenke et al., 2001), a nine-item self-report instrument scored on a 4-point Likert scale ranging from 0 ("not at all") to 3 ("nearly every day"), yielding total scores between 0 and 27. The PHQ-9 was administered exclusively for screening purposes to ensure participant safety. Participants presenting severe depressive symptomatology, indicators of self-destructive behavior, or suicide risk were excluded from the study. Exclusion criteria were defined as a total PHQ-9 score greater than 19 and/or a score greater than 1 on item 9 ("Thoughts that you would be better off dead or of hurting yourself in some way").

2.3.2. Within-Session State Measures

To address specific objectives 1 (feasibility, acceptability, and proximal efficacy) and 2 (phenomenological characterization), the following measures were administered immediately before and after the Ripple induction.

1) Self-Report Scales

Meditation Pictographic Inventory (MPI; Delia et al., 2025). The MPI is a state-level, pictographic instrument designed to assess momentary meditative phenomenology through symbolic visual representations. For each experiential domain, participants select the pictogram that most accurately reflects their current experiential state, allowing for an intuitive and efficient assessment of transient phenomenological qualities. In the present

study, only 9 of the 23 items comprising the full scale were administered, specifically those assessing warmth, time perception, compassion, self-compassion, ineffability, interpersonal connection, bodily boundaries, reference continuum, and ego attenuation. Each item consists of seven pictographic response options mapped onto a 7-point scale, with higher scores indicating stronger endorsement of the corresponding experiential dimension.

Nondual Awareness Dimensional Assessment – State (NADA-S; Hanley et al., 2018). The NADA-S is a brief state-level measure assessing momentary nondual awareness, conceptualized in the present study as selflessness. It captures two core experiential dimensions – self-transcendence and bliss – and is sensitive to immediate experiential shifts induced by consciousness-modifying procedures. Items are rated on a 0-10 Likert scale, with higher scores reflecting greater intensity of the assessed experiential states. The scale has demonstrated good internal consistency in prior research; in the present sample, reliability was acceptable (α = 0.62; ω = 0.71). The NADA-S was selected based on findings from Study 2 of this doctoral thesis, which identified it as having the strongest psychometric properties among available instruments.

Hedonic and Arousal Affect Scale (HAAS; Roca et al., 2023). The HAAS is a 30-item self-report instrument assessing affective states within the bidimensional valence-arousal framework (Kuppens et al., 2013). It comprises five subscales: high- and low-arousal negative affect, high- and low-arousal positive affect, and warmth-related affect. The scale has demonstrated good internal consistency in prior research (Roca et al., 2023), which was replicated in the present sample: negative affect high arousal (α = 0.64, ω = 0.72), negative affect low arousal (α = 0.83, ω = 0.85), positive affect high arousal (α = 0.87, ω = 0.88), positive affect low arousal (α = 0.87, ω = 0.87), and warmth (α = 0.85, ω = 0.88).

Subsequently, the following measures were administered only after Ripple, to evaluate the acceptability and tolerability of the VR experience.

Satisfaction with the Experience (adapted from Wrzesien & Alcañiz, 2010). Acceptability was evaluated through a brief satisfaction scale assessing perceived usefulness, intention to participate again, perceived therapeutic value, engagement, and intrinsic motivation. Participants rated each statement on a 10-point Likert scale ranging

from 1 (totally disagree) to 10 (totally agree), with higher scores indicating greater acceptability of the Ripple experience.

Adverse Effects of the Experience (Ad Hoc). Tolerability was assessed using a 13-item scale measuring the presence and intensity of possible negative reactions (e.g., "I felt fear or resistance at some moments," "I experienced headaches and/or body aches"). Items were rated on a 7-point Likert scale (1–7), with higher scores reflecting stronger or more frequent adverse effects. The specific items included in this scale can be consulted in Table 19 of the present study.

2) Micro-Phenomenological Interviews

To collect first-person accounts of the lived experience during the VR session, micro-phenomenological interviews were conducted. This method is designed to guide participants toward attending to their experience on a moment-by-moment basis, enabling rigorous and precise descriptions of how the experience unfolded, including potential changes and fluctuations across multiple experiential dimensions (Petitmengin, 2006). Unlike other qualitative approaches, micro-phenomenological interviewing prioritizes *how* the experience was lived rather than abstract reflections or interpretative judgments, thereby privileging concrete, first-person descriptions of what was actually experienced (Englander & Morley, 2023). In accordance with established methodological guidelines, all interviews were conducted by researchers formally trained in this interview technique (Martínez-Pernía et al., 2023, 2025; Zepeda et al., 2025).

All interviews were audio-recorded using mobile devices and transcribed verbatim, including verbal and paraverbal features, to support a comprehensive analysis of the reported experience. Throughout the interview process, interviewers adopted a phenomenological attitude, which involved acknowledging and bracketing prior assumptions regarding the construct under investigation in order to approach participants' accounts with openness and methodological rigor (Petitmengin, 2017).

At the start of each interview, participants were asked to identify the moment during the VR experience in which they felt the greatest sense of connection. They were then guided to evoke this moment as it originally occurred by reconnecting with its experiential qualities, in accordance with the evocation principle (Petitmengin et al., 2019). Participants were subsequently invited to describe this experience from beginning

to end, allowing for the identification of its temporal unfolding (diachronic level). This description was then explored in greater depth across bodily, emotional, cognitive, and spatial dimensions (synchronic level). At the conclusion of each interview, participants were provided with a recap of their descriptions using their own words to ensure fidelity, and were invited to add any relevant aspects that had not been previously addressed.

2.3.3. Ecological Momentary Assessment

To address specific objective 3, concerning the temporal dynamics of the selflessness experience, daily integration-related processes were monitored using an EMA protocol (Shiffman et al., 2008). EMA was implemented via mPath, a freely available smartphone application designed to facilitate in-the-moment data collection. Surveys were administered twice daily over a 21-day period, within two predefined four-hour response windows (13:00-17:00 and 19:00-23:00).

The EMA protocol comprised ten items assessing gratitude, awe, inner peace, insight (including meaningfulness and self-understanding), self-compassion, compassion toward others, interpersonal connectedness, psychological well-being, and psychological distress. Three of them – gratitude, insight, and compassion toward others – were directly derived from the results of Study 3 of this doctoral thesis, based on the psychological experiences most frequently reported through the PMES (Hadash et al., 2024) during the week following the VR induction. The remaining items reflected psychological variables that previous theoretical models and empirical research have associated with selflessness and its integration over time (Dambrun et al., 2019; Piff et al., 2015). Finally, two items specifically assessed daily fluctuations in psychological well-being and psychological distress.

All EMA items were adapted from validated instruments and reformulated to capture momentary fluctuations in these experiential dimensions. Responses were recorded using 0-100 visual analogue scales, enabling fine-grained assessment of within-day and across-day variability. The specific EMA items and their corresponding source measures are detailed in Table 16.

Table 16

Ecological Momentary Assessment (EMA) items and their corresponding validated source scales

Variable	EMA Question	Source Scale
Gratitude	Over the course of this morning*, to what extent have I experienced gratitude?	PMES (Hadash et al., 2024)
Awe	Over the course of this morning, to what extent have I felt that I am part of something greater than myself?	AWE-S (Yaden et al., 2018)
Peace	Over the course of this morning, to what extent have I experienced peace, harmony, or serenity?	OAV (Studerus et al., 2010)
Meaningfulness	Over the course of this morning, to what extent have everyday things taken on a special meaning?	OAV (Studerus et al., 2010)
Self-understanding	Over the course of this morning, to what extent have I gained an understanding or realized something about myself?	PMES (Hadash et al., 2024)
Self-compassion	Over the course of this morning, to what extent have I given myself the care and kindness I needed if I was having a difficult time?	SCS (Raes et al., 2011)
Compassion towards others	Over the course of this morning, to what extent have I experienced love or compassion toward others?	PMES (Hadash et al., 2024)
Interpersonal connectedness	Over the course of this morning, to what extent have I felt connected to others?	WCS (Watts et al., 2022)
Psychological well-being	Over the course of this morning, to what extent have I felt happy or joyful?	MHC-SF (Keyes, 2009)
Psychological distress	Over the course of this morning, to what extent have I felt sad, depressed, or hopeless?	PHQ-9 (Kroenke et al., 2001)

Note. In the evening EMA assessment, the phrase "over the course of this morning" was replaced with **"over the course of this evening".* PMES = Peak Meditative Experience Scale; AWE = Awe Experience Scale; OAV = Altered States of Consciousness Rating Scale; SCS = Self-Compassion Scale; WCW = Watts Connectedness Scale; MHC-SF = Mental Health Continuum–Short Form; PHQ-9 = Patient Health Questionnaire-9.

2.3.4. Pre- and Post-Intervention Measures

To address specific objective 4, concerning clinical and group-level outcomes, participants completed standardized measures of clinical symptomatology, psychological and spiritual well-being, and perceived connectedness at pre- and post-intervention to evaluate changes across the 21-day study period.

Brief Symptom Inventory (BSI-18; Derogatis, 2001). The BSI-18 is an 18-item self-report measure widely used to assess current psychological distress in medical and community populations. It provides a concise assessment of symptomatology across three dimensions – somatization, depression, and anxiety – each comprising six items.

Respondents rate the extent to which they experienced each symptom during the past seven days on a 5-point Likert scale ranging from 0 (“not at all”) to 4 (“extremely”). A global severity index, calculated by summing all item scores (range: 0–72), serves as an overall indicator of psychological distress. In the present sample, internal consistency was excellent (α = 0.90; ω = 0.91).

Mental Health Continuum – Short Form (MHC-SF; Keyes, 2009; Piqueras et al., 2022). The MHC-SF is a 14-item self-report instrument assessing three core components of positive mental health: emotional, psychological, and social well-being. Respondents indicate the frequency with which they experienced each state during the past month using a 6-point Likert scale ranging from 0 (“never”) to 5 (“every day”). The measure yields subscale scores for each well-being domain, as well as a total score indexing overall mental well-being or flourishing. In the present sample, internal consistency was excellent (α = 0.91; ω = 0.92).

Functional Assessment of Chronic Illness Therapy – Spiritual Well-Being (FACIT-SP; Peterman et al., 2002). The FACIT-SP is a 12-item self-report instrument designed to assess spiritual well-being in individuals with chronic illness. It evaluates two primary dimensions: Meaning or peace, reflecting a sense of purpose and inner harmony, and faith, reflecting comfort and support derived from spiritual beliefs. Items are rated on a 5-point Likert scale ranging from 0 (“not at all”) to 4 (“very much”), with higher scores indicating greater spiritual well-being. In the present sample, internal consistency was acceptable to good (α = 0.74; ω = 0.85).

Watts Connectedness Scale (WCS; Watts et al., 2022). The WCS is a 19-item self-report measure assessing the felt sense of connectedness across three domains: connectedness to self, connectedness to others, and connectedness to the world. Items are rated on 0-100 visual analogue scales ranging from 0 (“not at all”) to 100 (“completely”), with higher scores indicating greater perceived connectedness. In the present sample, internal consistency was excellent (α = 0.89; ω = 0.91).

2.4. Data Analysis

2.4.1. Within-Session State Analysis

Self-Report Scales. All statistical analyses were conducted using IBM SPSS Statistics (Version 28). Prior to hypothesis testing, descriptive analyses were performed to characterize the sample, including means and standard deviations for continuous

variables and frequencies for sociodemographic and study-related categorical variables. Changes in state experiential and affective responses associated with the VR session (MPI, NADA-S, and HAAS) were examined using paired-samples t-tests. All standard assumptions for the paired-samples t-test (normality of difference scores, absence of influential outliers, and appropriate scale properties) were assessed and met. Effect sizes were calculated using Cohen's d (Cohen, 1988).

Micro-Phenomenological Analysis. Micro-phenomenological analysis aims to provide an exhaustive exploration of lived experience by examining both its diachronic and synchronic dimensions (Petitmengin, 2006; Petitmengin et al., 2019). The diachronic dimension refers to how the experience unfolds over time, whereas the synchronic dimension concerns how its different components are structured and lived moment by moment. This approach enables the identification of recurrent experiential patterns across participants, allowing shared regularities to emerge at both temporal and structural levels and supporting the articulation of differentiated experiential structures.

To enhance the rigor and consistency of the analysis, an iterative procedure based on analyst triangulation was implemented, complemented by the calculation of an inter-rater agreement index. Similar procedures have been applied in previous experimental phenomenology studies, supporting their methodological relevance (Martínez-Pernía et al., 2023, 2025; Troncoso et al., 2025; Zepeda et al., 2025). The analytic process was organized into six phases.

In Phase 1, three analysts (J.V., A.Z., and Y.R.) independently analyzed the first five interviews using Atlas.ti 9. Each analysis began with a thorough reading of the full interview, followed by the preparation of a concise summary capturing the core of the participant's experience. Meaning units directly expressing lived experience were then identified. These units were transformed into diachronic and synchronic codes, with an explicit effort to remain descriptive and avoid interpretative elaboration.

In Phase 2, the analysts engaged in progressive abstraction, moving from concrete descriptions to more general categories. For instance, specific codes such as "chest expansion" were subsumed under broader categories such as "bodily sensation." This process involved identifying phenomenological invariants shared across participants.

In Phase 3, as principal categories (e.g., embodied affectivity) and their corresponding subthemes (e.g., affective quality) emerged, triangulation meetings were

conducted to establish a shared coding framework. These discussions focused on reaching agreement regarding the synchronic and diachronic categories and subcategories that structured the analysis.

Phase 4 involved the identification and characterization of the global experiential structure. Based on the analysis of the first five interviews, a preliminary structural framework was established. This framework was then used flexibly to analyze the remaining twelve interviews. The three analysts continued working independently, refining categories and subcategories as needed, thereby progressively consolidating the experiential structure.

In Phase 5, following completion of the individual analyses of all interviews, the inter-rater agreement index was calculated as the percentage of coding agreement among analysts for each interview.

Finally, in Phase 6, levels of agreement were reviewed to identify discrepancies, omissions, or inconsistencies. These issues were addressed through a joint and systematic re-examination of the interviews, leading to final consensus through collective discussion.

Integrated Self-Report and Phenomenological Results. To examine whether session-induced state changes varied as a function of the phenomenologically identified type of selflessness, participants were classified into two groups according to their dominant experiential structure (see Micro-Phenomenological Results). Between-group differences were assessed using change scores (Δ = post–pre) derived from within-session state measures, including the MPI, NADA-S, and HAAS. Given the small sample size and the presence of non-normal distributions across several variables, between-group comparisons were conducted using nonparametric Mann–Whitney U tests. Effect sizes were estimated using the rank-biserial correlation coefficient (r).

2.4.2. EMA Analysis

Data analysis for the EMA followed SCED guidelines, with a primary focus on individual-level evaluation of intervention effects. Analyses were conducted separately for each participant and outcome variable, enabling a fine-grained characterization of response patterns and heterogeneity in treatment effects.

Adherence to the EMA Protocol. Adherence to the EMA protocol was operationalized as the proportion of completed assessments relative to the total number

of scheduled prompts. Given the twice-daily assessment schedule over the 21-day study period, each participant was expected to complete 42 assessments (2 prompts per day × 21 days). Adherence was calculated both overall and separately for the baseline (Phase A) and intervention (Phase B) periods. This phase-specific approach enabled examination of potential systematic differences in adherence patterns across study phases, which is relevant for interpreting the validity and generalizability of the findings.

In line with established standards in EMA research, an adherence rate of ≥70% was considered sufficient for inclusion in the primary analyses (Stone & Shiffman, 2002). Participants who did not meet this threshold were retained for descriptive reporting but were examined separately to evaluate potential biases associated with missing data.

Descriptive Statistics. For each EMA variable, descriptive statistics were calculated separately for the baseline (Phase A) and intervention (Phase B) periods. Given the expected variability in individual response patterns, both mean and median values were reported to index central tendency, together with standard deviations and ranges (minimum–maximum) to characterize dispersion. These descriptive summaries provided an initial overview of within-phase stability and between-phase differences for each variable across participants.

Visual Inspection of Time-Series Data. Consistent with best practices in SCED methodology (Kratochwill et al., 2010), visual inspection of individual time-series data served as a primary analytic strategy. For each participant and outcome variable, graphical displays depicted daily EMA scores across the full 21-day study period, with a vertical demarcation indicating the transition from the baseline to the intervention phase. Visual inspection focused on identifying changes in level (i.e., immediate shifts following intervention onset), trend (i.e., rate and direction of change over time within phases), and variability (i.e., stability of responding), in accordance with the What Works Clearinghouse standards for SCED (Kratochwill et al., 2010; Tate et al., 2016).

Time-series plots were examined for outcome variables demonstrating the largest effect sizes in subsequent quantitative analyses. This selection strategy enabled a more detailed qualitative characterization of response patterns in the subset of outcomes most strongly influenced by the intervention. For each selected variable, representative cases were identified to illustrate prototypical patterns of change, including immediate level shifts, gradual improvement trajectories, and maintenance of effects over time.

Effect Size Analysis: Tau-U. To quantify the magnitude of intervention effects, Tau-U was computed for each participant and outcome variable. Tau-U is a nonparametric effect size index specifically developed for single-case time-series data and offers several advantages over alternative approaches (Parker et al., 2011). Unlike parametric methods that assume normally distributed data and homoscedasticity, Tau-U imposes no distributional assumptions and is robust to outliers and non-stationarity. The statistic integrates information on nonoverlap between phases – similar to other nonoverlap indices – while additionally controlling for baseline trend when present, thereby reducing the likelihood of erroneously attributing preexisting trends to intervention effects.

Tau-U values range from −1.00 to +1.00, with values closer to the extremes indicating stronger effects. Following commonly used interpretive guidelines (Parker et al., 2011; Vannest & Ninci, 2015), effect sizes were classified as small (|Tau-U| = 0.20-0.40), moderate (|Tau-U| = 0.40-0.60), large (|Tau-U| = 0.60-0.80), or very large (|Tau-U| > 0.80). Positive values indicate improvement (i.e., increases in desirable outcomes or decreases in undesirable outcomes), whereas negative values indicate deterioration. Statistical significance was assessed using two-tailed tests with alpha set at .05.

All Tau-U analyses were conducted using the *SingleCaseES* package (version 0.7.2) in R (Pustejovsky et al., 2023), which implements bias-corrected variance estimation and provides exact p values based on permutation distributions. Results were summarized in a matrix display presenting effect sizes for all participant-by-variable combinations, ordered by overall magnitude to facilitate pattern detection and between-participant comparisons.

This analytic strategy allowed for explicit examination of the heterogeneity inherent in single-case designs, capturing not only overall trends but also the range and structure of individual differences in response to the Ripple intervention. By triangulating visual inspection, descriptive statistics, and quantitative effect size estimates, the analysis provides a comprehensive characterization of intervention effects at both idiographic and nomothetic levels.

2.4.3. Pre- and Post-Intervention Analysis

Changes in psychological distress, psychological and spiritual well-being, and perceived connection over the 21-day intervention period, as assessed by the BSI-18, MHC-SF, FACIT-SP, and WCS, were examined using paired-samples t-tests. All standard

assumptions underlying the paired-samples t-test – including normality of difference scores, absence of influential outliers, and appropriate scale properties – were assessed and satisfied. Effect sizes were calculated using Cohen's d (Cohen, 1988).

3. Results

3.1. Sample

The initial sample consisted of 20 individuals diagnosed with cancer. Three participants were excluded from the analyses due to not completing the VR experience (n = 2) or failing to provide the required data (n = 1). The final sample therefore comprised 17 participants, whose ages ranged from 33 to 63 years (M = 51.12, SD = 7.85).

The sample was predominantly female (88.2%). Most participants identified as Caucasian or European (88.2%), while a smaller proportion identified as Latino (11.8%). Regarding marital status, more than half were married (58.8%), followed by divorced individuals (17.6%), those in a committed relationship (11.8%), and single or widowed participants (5.9% each). Educational attainment was generally high, with the majority reporting university-level studies (70.5%). In terms of occupational status, most participants were actively employed (64.7%), whereas others were on temporary leave or receiving disability benefits (29.4%), and a small proportion were unemployed (5.9%).

With respect to cancer type, the majority of the sample had breast cancer across various subtypes (n = 12). The remaining participants were diagnosed with colon cancer (n = 1), prostate cancer (n = 2), or endometrial cancer (n = 2). Regarding treatment status at the time of participation, most participants were not undergoing active oncological treatment and were instead attending regular follow-up or clinical monitoring appointments (n = 8). The remaining participants were receiving hormonal therapy, including agents such as tamoxifen or aromatase inhibitors (n = 5), chemotherapy (n = 3), or radiotherapy (n = 1).

3.2. Within-Session State Results

3.2.1. Self-Report Scales

As shown in Table 17, paired-samples t-tests revealed robust pre–post changes across most experiential domains. Participants reported significant increases in pictographic indicators (MPI) of warmth, compassion, self-compassion, interpersonal connection, bodily boundaries, and expansion of self-consciousness (reference

continuum), all with large effect sizes (*ds* > 0.90). Notably, the latter three exhibited particularly large effects (*d* = 2.41-2.79). By contrast, time perception, ineffability, and ego attenuation showed no meaningful differences (*ps* > .40).

Selflessness (NADA-S) increased substantially, with both self-transcendence and bliss demonstrating large effects (*d* = 1.68-2.48). Affect-related outcomes (HAAS) followed a consistent pattern: negative affect decreased across arousal levels, whereas low-arousal positive affect and warmth-related affect increased (*d* = |0.83|-1.97). High-arousal positive affect did not change significantly.

Table 17

Pre-post changes in state measures (MPI, NADA-S, and HAAS) assessed before and after the Ripple session

Variable	Pre M (SD)	Post M (SD)	t (16)	P-value	Cohen's d
MPI					
Warmth	4.12 (1.62)	6.76 (0.44)	7.09	< .001	1.72
Time perception	4.18 (1.81)	4.24 (2.31)	0.07	.943	0.02
Compassion	4.88 (1.17)	6.71 (0.59)	5.64	< .001	1.37
Self-compassion	4.41 (1.06)	5.94 (1.64)	3.79	.002	0.92
Ineffability	3.24 (1.89)	3.41 (1.70)	0.36	.722	0.09
Interpersonal connection	3.65 (1.06)	6.47 (0.62)	10.29	< .001	2.50
Bodily boundaries	2.47 (1.23)	5.88 (1.05)	9.93	< .001	2.41
Reference continuum	2.82 (1.33)	6.59 (0.71)	11.52	< .001	2.79
Ego attenuation	4.00 (1.66)	4.53 (2.35)	0.75	.462	0.18
NADA-S					
Self-transcendence	3.18 (1.87)	8.91 (1.09)	10.23	< .001	2.48
Bliss	6.00 (2.18)	9.29 (0.92)	6.93	< .001	1.68
Nondual awareness (Total)	4.12 (1.68)	9.04 (0.91)	10.47	< .001	2.54
HAAS					
Negative affect high arousal	7.88 (3.82)	4.47 (1.74)	-3.42	.003	-0.83
Negative affect low arousal	6.59 (5.08)	2.06 (2.44)	-5.08	< .001	-1.23
Positive affect high arousal	13.76 (5.71)	15.29 (4.40)	1.03	.316	0.25
Positive affect low arousal	11.35 (3.69)	16.65 (3.46)	5.46	< .001	1.32
Warmth-related affect	13.18 (3.61)	18.94 (4.07)	8.12	< .001	1.97

Note. MPI = Meditation Pictographic Inventory; NADA-S = Nondual Awareness Dimensional Assessment–State; HAAS = Hedonic and Arousal Affect Scale.

Finally, Table 18 and Table 19 provide the means, standard deviations, and minimum and maximum scores for all items of the Satisfaction and Adverse Effects Scales. Ripple demonstrated exceptionally high acceptability, with all satisfaction items receiving uniformly elevated ratings (Ms = 8.94-9.71 on a 1-10 scale), indicating that

participants consistently perceived the experience as highly valuable, engaging, and meaningful. Likewise, tolerability was remarkably strong, as adverse effects items showed minimal endorsement across the sample (*Ms* = 1.00-1.71 on a 1-7 scale), with most items clustering at the lowest possible values.

Table 18

Means (M), standard deviations (SD), and minimum (Min) and maximum (Max) scores on Satisfaction scale items.

Item	N	M	SD	Min	Max
I think this type of experience is useful to improve my knowledge about myself.	17	9.24	0.83	8	10
In case you meditate: I think this type of experience is useful to improve my knowledge about my meditative practice.	17	9.12	0.99	7	10
I believe this type of experience is useful in improving my knowledge of non-ordinary states of consciousness.	17	8.94	1.34	5	10
If possible, I would like to participate in this type of experiences soon.	17	9.47	1.18	6	10
I believe that participating in this type of experience can provide therapeutic knowledge to people.	17	9.71	0.69	8	10
I forgot how time passed while participating in this experience.	17	9.53	0.94	7	10
After this experience I want to learn much more about meditation.	17	9.18	1.78	3	10

Table 19

Means (M), standard deviations (SD), and minimum (Min) and maximum (Max) scores on Adverse effects scale items.

Item	N	M	SD	Min	Max
I have boycotted the experience.	17	1.00	0.00	1	1
I have felt fear or resistance to the experience at times.	17	1.47	1.28	1	6
I have had unpleasant feelings about my body representation.	17	1.00	0.00	1	1
I have had unpleasant feelings about merging bodies.	17	1.12	0.33	1	2
I felt anxious.	17	1.12	0.33	1	2
I experienced repeated and disturbing memories, thoughts, or images of a stressful experience from the past.	17	1.12	0.33	1	2
I had trouble thinking clearly and/or making decisions.	17	1.24	0.44	1	2
Anything bothered me.	17	1.06	0.24	1	2
I felt distant or isolated from other people.	17	1.06	0.24	1	2
I experienced headaches and/or body aches.	17	1.71	1.40	1	6
My hearing has become very sensitive.	17	1.06	0.24	1	2
I felt disconnected from the experience.	17	1.00	0.00	1	1
I have felt lost with the instructions.	17	1.35	0.61	1	3

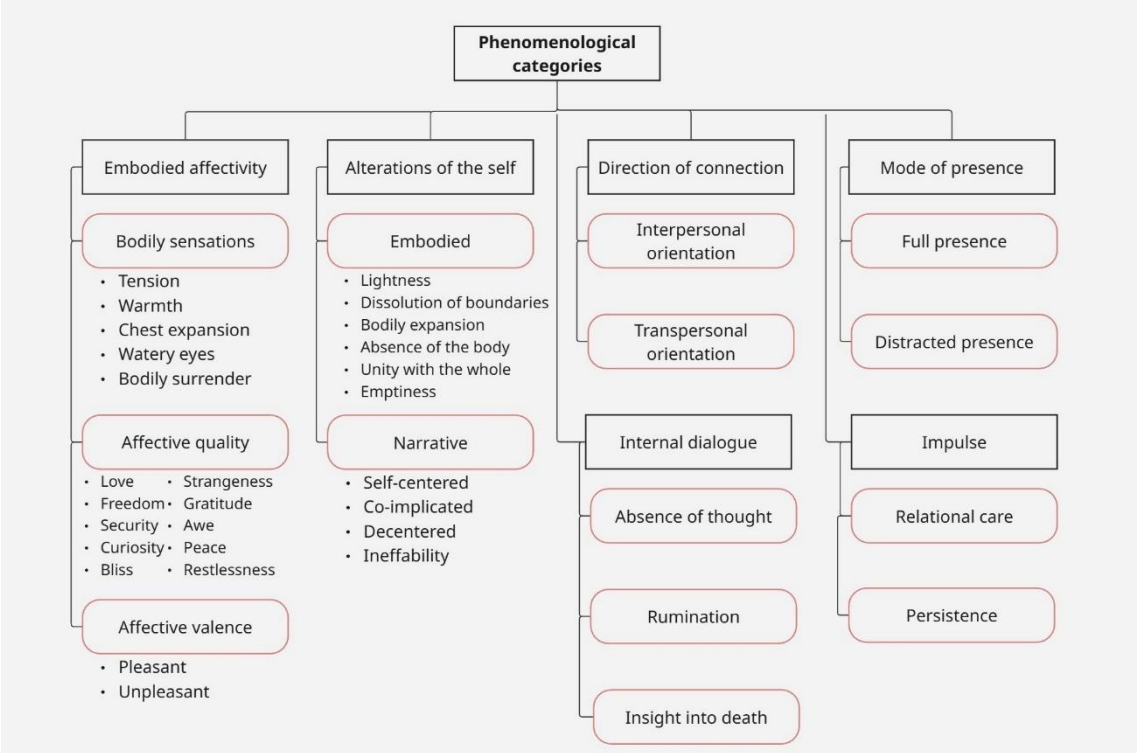
3.2.2. Micro-Phenomenological Results

At the first level of abstraction of the coding procedure (i.e., the initial criterion for data collection and organization), we identified 56 significant experiential codes (e.g., *chest expansion*). These codes were subsequently transformed into 14 emergent experiential subcategories (e.g., *bodily sensations*). In a subsequent analytic step, these subcategories were grouped into higher-order categories according to their thematic affinity (e.g., *embodied affectivity*). Finally, six core phenomenological categories or dimensions were identified at the highest level of abstraction (Figure 13).

The results are organized into three subsections. First, we present the six phenomenological categories and their corresponding subcategories that emerged from the analysis. Second, we describe the temporal structure of the experience, detailing its unfolding across distinct experiential phases. Finally, we outline the experiential structures, capturing the different ways in which participants embodied and navigated the experience of selflessness.

Figure 13

Hierarchical structure of micro-phenomenological experiential categories



Note. A schematic representation of the identified experiential categories is presented, with the main categories highlighted in black and the subcategories in red.

1) Description of Phenomenological Categories

Embodied Affectivity. This theme refers to the corporeal and emotional sensations that emerged during moments of the highest perceived connection within the VR experience. As the experience unfolded, participants described a lived intensification of bodily sensations and affective responses that arose pre-reflectively and were directly felt in the body.

The bodily sensations included tension, warmth, chest expansion, watery eyes, and a sense of bodily surrender. These sensations appeared spontaneously and became more salient during peak moments of the experience, thereby anchoring the sense of connection in the lived body.

> "Well, I was a little bit tense, a bit tense because I wanted to connect and I had an interest in connecting, so I was a little bit expectant to see what was going to happen." (P 3).

> "I felt warmth, I felt a lot of warmth […] It expands from the chest and it's like I say… Oh! It's fullness, it's joy that expands from the chest and covers the whole body." (P 11)

In addition to bodily sensations, various affective responses emerged during the moments of highest experiential intensity. This emotional response comprised affective quality and valence. Participants experienced unpleasant affective qualities such as strangeness and restlessness; however, the experience was predominantly characterized by positive affect, including love, freedom, security, curiosity, bliss, gratitude, awe, and peace.

> "It was like relaxed, but at the same time… restless, I don't know, I had a strange feeling, because, well, to see what was going to happen now." (P 1)

> "It was a very relaxed moment […] with a lot, a lot of peace, like a lot of calm and little thinking." (P 9)

> "Well, I felt a great sense of peace, a sensation that deeply moved me. I struggled not to cry because it felt like a sensation of love that was overwhelming, almost suffocating." (P8)

Alterations of the Self. These alterations encompassed both embodied and narrative dimensions of the self, reflecting shifts in participants' lived sense of selfhood during moments of the highest experiential connection. During these moments, they reported changes in how they perceived, inhabited, and related to the self, departing from their usual sense of bodily and narrative identity.

With respect to embodied alterations of the self, participants described marked changes in the felt sense of the body and its boundaries. These experiences ranged from sensations of lightness, bodily expansion, and the dissolution of bodily boundaries to the absence of bodily awareness, a sense of unity with the whole, and experiences of emptiness. Such phenomena were lived as transformations of bodily presence, in which the body became less localized, less clearly bounded, or partially absent from awareness, giving rise to a diffuse, expansive, or unitive experiential field.

> "I didn't feel my physical body. And if I did feel it, it was very light." (P 8)

> [Referring to the body]: "There are no limits, and in fact, not feeling connected to my body has made me feel better." (P 6)

> "I didn't feel skin at any moment. Neither skin, nor bones, nor anything. It was all at the level of the soul, of energy. As if the energy had left my body and the shell no longer existed." (P 12)

In parallel, participants reported narrative alterations of the self, reflecting shifts in how the self was positioned within the experience. These narrative positions included self-centered, co-implicated, and decentered orientations. A self-centered narrative involved a predominant focus on one's own concerns and personal perspective.

> "I was already calm, but even so I was still more focused on doing it right, on everything working, and kind of a little afraid that I wouldn't manage to abstract myself." (P 6)

A co-implicated narrative emerged when attention shifted toward others, with the self experienced as relationally involved with or oriented toward them.

> "I felt like it wasn't me, you know, I mean, like more outside of myself, as if I were floating with my partner, not thinking about myself, but rather about a union […] Attention is less focused on yourself and more focused on the bond, on the connection, on others." (P 9)

Finally, a decentered narrative was characterized by a fading of the sense of being the central point of the experience. Instead of feeling like an observing or acting self, participants described the experience as unfolding without a clear sense of personal position. The sense of self became diffuse or receded into the background, often expressed through bodily presence or emotion rather than reflective thought. Explicit self-awareness appeared only intermittently, typically when intentional action or movement was required.

> "I didn't identify as [says their name], as my human person, so to speak; I was experiencing it as something more outside of myself […] It wasn't personalized. My self was there, but it wasn't identified […] So, at that moment, my self was in my heart, in my emotions, but not in my head or my mind." (P 16)

> "I mean, it felt as if I had disappeared, you know? Like I didn't feel myself. The only moment when I felt myself was when I had to move my hands; otherwise, I wasn't aware of myself." (P 4)

Additionally, participants described ineffability as a narrative alteration of the self, referring to the difficulty or impossibility of articulating the experience in words. This ineffability reflected a gap between the lived intensity of the experience and the available narrative resources for its expression, rendering the experience partially resistant to verbal description.

> "It's hard to put into words; maybe tomorrow I'll tell you other things because I've had time to integrate it, but right now it's like I still have the 'wow' in my mouth." (P 2)

Internal Dialogue. This theme refers to the presence of an internal dialogue manifested as a continuous flow of thoughts and reflections that unfolded as the VR experience developed. In some participants, this internal dialogue took the form of rumination, lived as a persistent mental activity that ran parallel to the experience and occasionally shifted attention away from what was immediately present.

> "I was very focused on trying to do it right […] worrying about whether I was doing it right or wrong." (P 2)

In contrast, other participants reported moments characterized by an absence of thought, described as a temporary quieting of the internal dialogue. During these

moments, participants experienced a sense of mental silence or reduced cognitive activity, allowing the experience to unfold without reflective commentary.

> "For me, it was like the first real experience of meditation, with no thoughts in my head." (P 7)

> "My head switched off, for the first time in months." (P 2)

Finally, some participants described an insight into death, experienced as a sudden and meaningful internal realization that arose in the form of an inner dialogue. This insight was lived as a moment of clarity and understanding, in which death was experienced as something natural and peaceful.

> "It was a feeling of peace, of serenity. I imagined the afterlife as something like that. The transition to the other life, I imagined it that way at that moment." (P 12)

> "Well, I was imagining: maybe when I pass on to a better life… maybe it's a similar experience. Yes, of course, it occurred to me… it occurred to me to think about it." (P 3)

Mode of Presence. The mode of presence referred to the degree to which participants felt immersed and attentively engaged in the unfolding experience. Two forms were identified. Full presence was characterized by stable and immersive engagement, with attention anchored in the present moment. Participants described feeling fully absorbed, with minimal intrusion of distracting thoughts or external concerns.

> "I was completely focused. I didn't drift away even the slightest bit." (P 17)

In contrast, distracted presence involved unstable engagement, marked by recurrent shifts of attention away from the experience and accompanied by a diminished sense of immersion.

> "There were moments when I got a little distracted because my head is still a bit scattered." (P 2)

Direction of Connection. This theme refers to the orientation of the connection experienced during moments of highest experiential intensity. Two distinct forms were identified: interpersonal and transpersonal. The interpersonal form involved a connection oriented toward other people, including both the participants with whom the VR

experience was shared and individuals who were not physically present, such as family members, friends, or other oncology patients.

> "When the four of us were there [participants in the VR experience], my connection was directed toward them, toward being connected with them […] It made me really want to be able to have an experience like that with my family, with my husband and with my children, to be able to feel that we are connected in that way." (P 15)

In contrast, transpersonal orientation refers a mode of connection that extended beyond interpersonal relations. Participants described a sense of connection encompassing the world or the universe and, in some cases, a connection with a spiritual or transcendent entity.

> "At the beginning, above all, I felt a connection with the universe. It felt incredible […] because you are something insignificant, but you don't feel insignificant; it's a bit contradictory – you feel inside something so splendid, so incredible, so vast." (P 10)

Impulse. This theme refers to a pre-reflective impulse to act that arose during engagement with the VR experience. Such tendencies were lived as spontaneous orientations toward action rather than intentional or planned responses. Some participants described impulses oriented toward relational care, including wishes for the well-being of others or desires for physical closeness, such as hugging, calming, or accompanying others.

> "I had the intention of giving a physical hug in order to have an experience with more contact […] I'm very interested in supporting them, you know? Like giving them more support." (P 7)

> "The same thing that I was feeling, that something so big that I was feeling, I wanted the others to feel it." (P 12)

Other participants reported an orientation toward persistence, expressed as a tendency to remain within the experience for a longer duration. This impulse was lived as a reluctance to leave the VR experience or as a wish for it to continue.

> "I was left wanting to do more breathing. I suppose that, in some way, it was like wanting to prolong it. Oh, in the end it felt short." (P 14)

2) Temporality of the Experience

The diachronic dynamics captured the temporal dimension of the experience, illustrating how it unfolded and transformed over time. In this study, participants described the experience as being organized into three experiential phases.

First Phase: Initial Adaptation to the Experience. The first phase was characterized by an initial attunement to the VR environment, as participants oriented themselves to the novelty of the experience. At the bodily level, many participants reported tension, reflecting a state of alertness or bodily readiness. Affectively, some of them experienced curiosity, as well as feelings of strangeness or restlessness, resulting in a mixed affective valence that could be lived as both pleasant and unpleasant.

During this phase, the experience was predominantly organized around a self-centered narrative orientation, with attention directed toward one's own sensations, thoughts, and performance within the experience. Rumination was frequent, as participants monitored whether they were correctly following the instructions or reflected on concerns external to the experience itself. Correspondingly, the mode of presence was often distracted, with attention oscillating between the VR experience and reflective or evaluative thoughts. Overall, this phase reflected a preparatory mode of engagement, in which immersion had not yet fully stabilized.

> "I was already calm, but even so I was still more focused on doing it right, on everything working, and kind of a little afraid that I wouldn't manage to abstract myself […] So that's what caused me a little bit of… not fear, but of not being able to do it right and sabotaging the experience." (P 6)

Second Phase: Presence Shift. The second phase was marked by a qualitative shift in presence, characterized by a reduction in bodily tension and the emergence of bodily surrender. Participants described a letting go of active control, accompanied by affective qualities such as peace and security, resulting in a predominantly pleasant affective valence.

During this phase, attention became more steadily anchored in the present moment, giving rise to a mode of full presence. This phase functioned as a transitional moment in which the experience deepened, allowing for increased immersion and setting the conditions for more profound experiential transformations.

> "So I gradually started calming myself throughout the whole experience, letting go of worrying about whether I was doing it right or wrong […] And so I kept gaining calm throughout the experience until when I finally said, in for a penny, in for a pound – whatever has to be will be. And I connected, and it seemed impressive to me." (P 2)

> "At the beginning I was skeptical, I won't lie to you, but then I got into the story. And like I said, the music, the voice guides you along, and then the experience makes you say… well, let's let ourselves be carried along." (P 17)

Third Phase: Dissolution of the Self. The third phase corresponded to moments of the highest experiential intensity and was characterized by a convergence of bodily, affective, and self-related transformations. Bodily sensations such as warmth, chest expansion, and watery eyes became salient and were accompanied by predominantly positive affective qualities, including love, freedom, bliss, gratitude, awe, and peace, with a consistently pleasant affective valence.

At this stage, participants frequently reported embodied alterations of the self, including experiences of lightness, the dissolution of bodily boundaries, bodily expansion, the absence of bodily awareness, a sense of unity with the whole, or experiences of emptiness. These alterations were often accompanied by ineffability, reflecting the difficulty of articulating the experience in narrative terms. Internal dialogue was typically reduced or absent and, in some cases, gave rise to an insight into death, experienced as a calm and accepting form of understanding. The mode of presence during this phase was consistently described as full presence, characterized by a strong sense of immersion and immediacy.

> "Well, it was like everything was very volatile, so I didn't have the sensation of something physical, tangible. I was everything as a whole." (P 3)

> "It was like being in emptiness. I lost the reference, yes. And I wanted to feel that, I wanted to feel weightless." (P 5)

However, within this phase, variations emerged in how the self was positioned within the experience (co-implicated or decentered narratives), in the direction of connection (interpersonal or transpersonal), and in the type of impulse that arose

(relational care or persistence). These variations formed the basis for the distinct experiential structures described in the following section.

3) Description of Experience Structures

Beyond the identification of phenomenological categories and their temporal unfolding, the analysis revealed two distinct experiential structures, understood as coherent ways in which participants embodied and lived through experiences of selflessness during moments of the highest experiential intensity.

Dissolution of Self into Others. Within this structure, the self was lived as relationally extended and oriented toward others. Participants described experiencing themselves as deeply involved with other people, such that selflessness unfolded within a co-implicated narrative orientation. The direction of connection was predominantly interpersonal, marked by a felt sense of closeness, concern, or shared presence. Affectively, the experience was characterized by relational emotions, such as love and gratitude. Correspondingly, the impulse that emerged was oriented toward relational care.

Dissolution of Self into the Whole. Within this structure, as the sense of personal positioning diminished, experience was no longer organized around the individual self but unfolded within a broader, less self-referential experiential field. Selflessness was lived as a reduced salience of personal identity and self-focus, giving rise to a decentered narrative orientation. Participants described a transpersonal direction of connection. Affectively, the experience was marked by high-intensity affective qualities, such as bliss and awe, lived as expansive in nature. The action tendency that emerged within this structure was oriented toward persistence.

3.2.3. Integrated Self-Report and Phenomenological Results

As shown in Table 20, distinct patterns of change emerged for each phenomenological group according to their dominant experiential structure. Participants who experienced *Dissolution of self into the whole* showed significantly greater changes across several MPI items, including time perception, interpersonal connection, bodily boundaries, and ego attenuation, with effect sizes ranging from moderate to large ($Us \leq 12.5$, $ps \leq .022$, $rs = .54$-$.63$). These findings indicate a more pronounced alteration of temporal experience, self-world boundaries, and egoic structure in this group. No significant between-group differences were observed for warmth, compassion, self-

compassion, ineffability, or reference continuum, suggesting comparable changes in these dimensions across experiential types.

With respect to selflessness, no group differences emerged on the NADA-S for self-transcendence, bliss, or the total score (*ps* ≥ .46), indicating similar magnitudes across both groups. Regarding affective changes assessed by the HAAS, the *Dissolution of self into the whole* group again exhibited a significantly greater increase in positive affect low arousal (U = 15.0, p = .047, r = 0.49), reflecting enhanced calmness and serenity. No group differences were found for negative affect, positive affect high arousal, or warmth-related affect.

Table 20

Between-group differences in self-report measures of experiential change across phenomenological structures

Variable	Δ Dissolution of self into others M	Δ Dissolution of self into the whole M	U	P-value	r
MPI					
Warmth	2.44	2.87	31.0	.658	0.11
Time perception	-1.77	2.12	11.5	.020	0.57
Compassion	1.33	2.37	20.5	.132	0.36
Self-compassion	1.11	2.00	19.5	.105	0.38
Ineffability	0.11	0.25	39.0	.807	0.07
Interpersonal connection	2.22	3.50	12.5	.021	0.54
Bodily boundaries	2.66	4.25	12.5	.022	0.54
Reference continuum	3.88	3.62	42.0	.587	0.14
Ego attenuation	-1.22	2.50	9.0	.009	0.63
NADA-S					
Self-transcendence	6.05	5.37	36.5	1.00	0.01
Bliss	3.01	3.62	28.0	.463	0.18
Nondual awareness (Total)	5.03	4.79	30.5	.630	0.12
HAAS					
Negative affect high arousal	-4.22	-2.50	30.0	.592	0.14
Negative affect low arousal	-4.77	-4.25	32.5	.771	0.08
Positive affect high arousal	2.44	0.50	39.5	.772	0.08
Positive affect low arousal	3.88	6.87	15.0	.047	0.49
Warmth-related affect	5.77	5.75	33.0	.809	0.07

Note. MPI = Meditation Pictographic Inventory; NADA-S = Nondual Awareness Dimensional Assessment–State; HAAS = Hedonic and Arousal Affect Scale.

3.3. EMA Results

3.3.1. Adherence to the EMA Protocol

Adherence to the twice-daily EMA protocol was generally high across participants. Of the 17 participants, 14 (82.4%) completed at least 70% of the scheduled assessments, exceeding the recommended threshold for reliable data interpretation. The mean overall adherence rate was 90.3% (*SD* = 12.1%, range = 54.8%–100%), indicating strong compliance with the assessment protocol.

Three participants achieved perfect adherence (100%), completing all 42 scheduled assessments (Participants 1, 5, and 9). At the lower end of the distribution, one participant (Participant 7) completed only 23 of the 42 assessments (54.8%), falling below the 70% threshold and suggesting potential difficulties with sustained engagement in the monitoring protocol. The remaining participants exhibited adherence rates ranging from 73.8% to 97.6%, reflecting consistently high compliance across the 21-day study period.

Examination of phase-specific adherence patterns revealed no systematic differences between the baseline (Phase A) and intervention (Phase B) periods. Across participants, adherence remained relatively stable from baseline to intervention, suggesting that the VR session did not systematically influence participants' willingness or ability to complete daily assessments. This pattern is consistent with sustained motivation and engagement throughout the study period and indicates that missing data, when present, likely reflected sporadic nonresponse rather than systematic dropout or disengagement. Detailed adherence rates for each participant, including phase-specific breakdowns, are presented in Table 21.

Table 21

EMA adherence rates: global and phase-specific response percentages

Participant	Responses	Expected	Adherence (%)	Phase A	Phase B
Participant 1	42	42	100.0	16	26
Participant 2	38	42	90.5	19	19
Participant 3	38	42	90.5	17	21
Participant 4	35	42	83.3	12	23
Participant 5	42	42	100.0	14	28
Participant 6	41	42	97.6	14	27
Participant 7	23	42	54.8	13	10
Participant 8	36	42	85.7	14	22
Participant 9	42	42	100.0	22	20
Participant 10	38	42	90.5	25	13
Participant 11	39	42	92.9	17	22
Participant 12	41	42	97.6	17	24
Participant 13	31	42	73.8	10	21
Participant 14	37	42	88.1	23	14
Participant 15	41	42	97.6	18	23
Participant 16	40	42	95.2	16	24
Participant 17	40	42	95.2	27	13

Note. Expected responses = 42 (2 prompts/day × 21 days). Phase A = baseline period; Phase B = post-intervention period. Adherence rates ≥70% were considered adequate for inclusion in primary analyses.

3.3.2. Descriptive Statistics

Descriptive statistics for each EMA variable across the baseline (Phase A) and intervention (Phase B) periods are presented in Table 22. Across all measured outcomes, mean scores increased from baseline to intervention, with the magnitude of change varying by domain. The largest mean increases were observed for awe (M_A = 61.02, M_B = 71.40; Δ = 10.38 points), peace (M_A = 60.38, M_B = 69.46; Δ = 9.08 points), and self-understanding (M_A = 59.46, M_B = 69.10; Δ = 9.64 points), suggesting that these constructs were particularly responsive to the intervention.

Median values exhibited comparable patterns, with all outcomes increasing from Phase A to Phase B. The convergence of mean and median trends indicates that the observed changes were not primarily driven by outlier responses. Standard deviations were generally lower during Phase B than Phase A for most variables, indicating reduced within-participant variability following the intervention. This combination of increased central tendency and reduced variability is consistent with a stabilizing effect of the intervention on experiential states related to selflessness and psychological well-being.

Notably, psychological distress decreased from baseline (M_A = 20.95) to intervention (M_B = 16.34; Δ = -4.61 points), accompanied by a modest reduction in variability (SD_A = 21.53; SD_B = 20.72). This pattern suggests that the intervention may have contributed to reductions in day-to-day distress levels.

Table 22

Descriptive statistics for EMA variables by phase

Variable	Phase A M (SD)	Phase A Median	Phase A Range	Phase B M (SD)	Phase B Median	Phase B Range
Gratitude	66.06 (25.77)	71.0	0-100	70.90 (18.44)	72.0	16-100
Awe	61.02 (24.66)	67.0	0-100	71.40 (20.45)	75.0	13-100
Peace	60.38 (25.53)	61.0	0-100	69.46 (18.09)	70.0	11-100
Meaningfulness	58.91 (24.75)	61.0	0-100	67.88 (18.87)	70.0	7-100
Self-understanding	59.46 (23.62)	63.0	0-100	69.10 (18.17)	70.0	7-100
Self-compassion	63.02 (23.00)	64.0	0-100	69.21 (16.25)	69.0	8-100
Compassion towards others	67.59 (25.20)	75.0	0-100	73.03 (18.93)	76.5	11-100
Interpersonal connectedness	65.47 (27.56)	72.0	0-100	68.59 (22.48)	74.0	6-100
Psychological well-being	62.04 (27.51)	63.0	0-100	64.77 (22.86)	65.5	0-100
Psychological distress	20.95 (21.53)	15.0	0-100	16.34 (20.72)	8.0	0-100

Note. All variables rated on 0–100 visual analogue scales. Phase A = baseline period; Phase B = post-intervention period. Values represent pooled data across all participants with adequate adherence (n = 17).

3.3.3. Visual Inspection of Time-Series Data

Visual inspection of individual time-series data revealed substantial heterogeneity in response patterns across participants and outcome variables. To illustrate prototypical trajectories, detailed visual analyses are presented for three variables that demonstrated the largest overall effect sizes in subsequent quantitative analyses: awe, peace, and self-understanding. Representative cases were selected to exemplify distinct patterns of change, including immediate level shifts, gradual improvement trajectories, and sustained maintenance of effects over time.

1) Awe

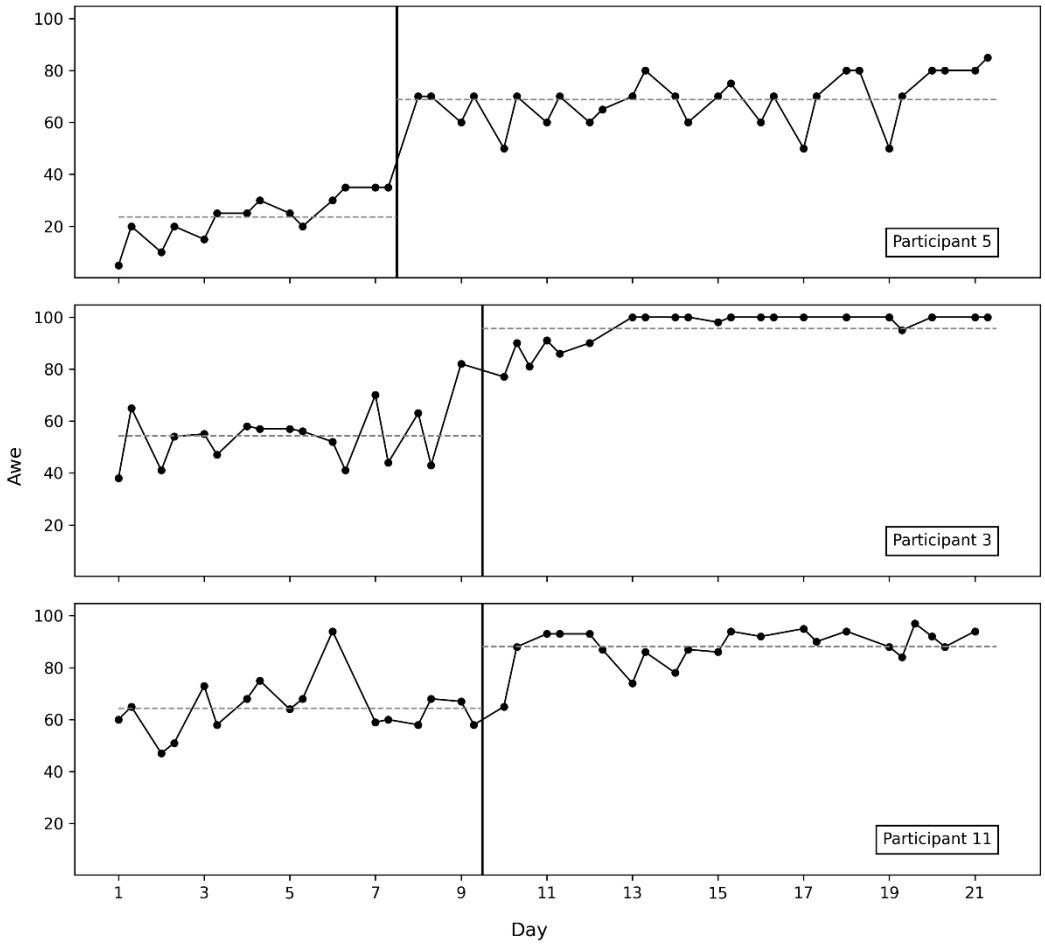
Participant 5 exhibited a dramatic and sustained increase in awe following the intervention (Figure 14, top panel). During the baseline phase, awe ratings were consistently low and stable, averaging approximately 25 on the 0-100 scale with minimal day-to-day fluctuation. Immediately following the VR session, awe scores increased sharply to approximately 70, representing nearly a threefold increase relative to baseline levels. This elevated level was maintained throughout the post-intervention period with moderate variability, suggesting a robust and enduring shift in the participant's capacity to experience awe in daily life.

Participant 3 demonstrated a similarly pronounced effect, although baseline variability was greater (Figure 14, middle panel). Baseline awe ratings fluctuated moderately around a mean of approximately 55, with occasional peaks exceeding 70. Following the intervention, ratings stabilized at a consistently high level near the upper bound of the scale (≥95), with minimal variability and no evidence of attenuation over time. This pattern suggests that the intervention was associated not only with an increase in mean awe levels but also with enhanced stability of the experience, as reflected in reduced day-to-day fluctuations.

Participant 11 showed a more gradual but ultimately substantial improvement (Figure 14, bottom panel). Baseline awe ratings displayed moderate variability, clustering around 60. Following the intervention, an immediate increase to approximately 90 was observed, followed by a brief regression and subsequent re-stabilization at a level substantially higher than baseline (approximately 85-90 by the end of the study period). This trajectory reflects an initial strong response followed by a consolidation phase, culminating in sustained maintenance of elevated awe levels.

Figure 14

Individual time-series plots of awe ratings across baseline and intervention phases for representative participants



2) Peace

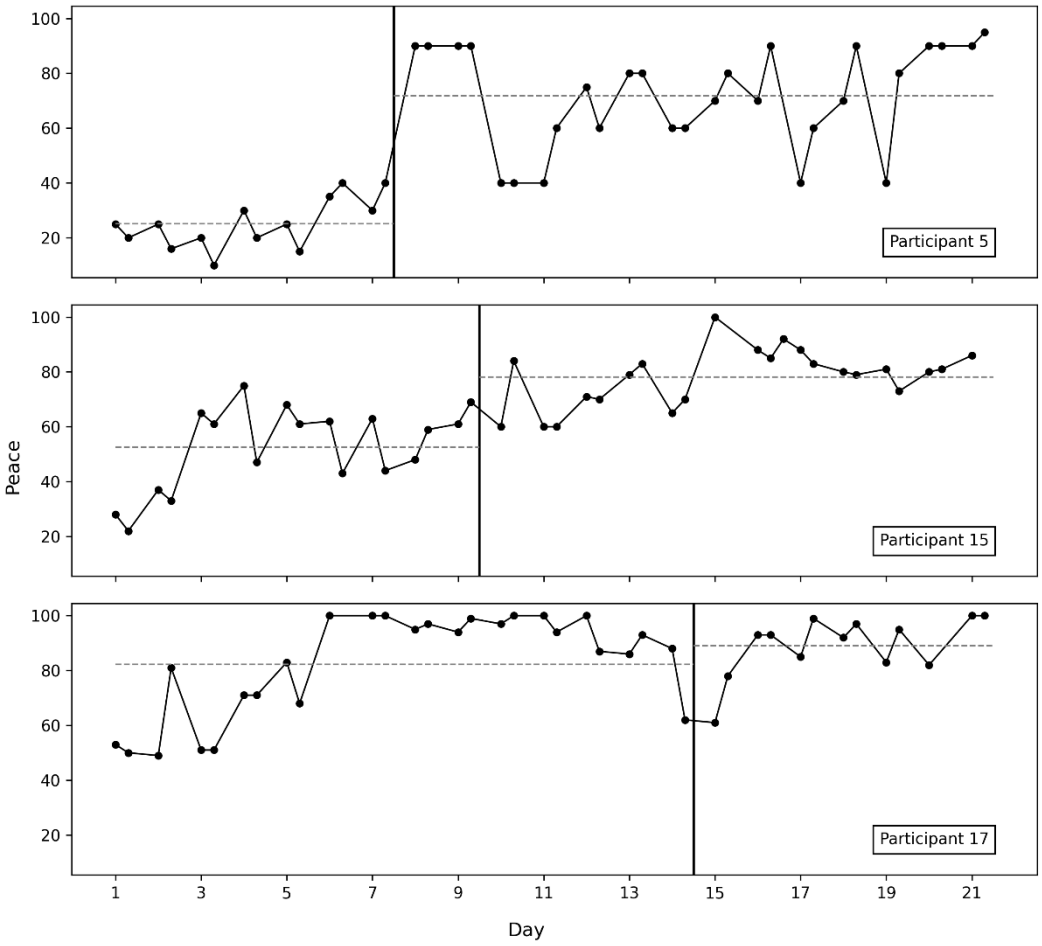
Participant 5 again exhibited one of the most pronounced effects, this time for peace (Figure 15, top panel). Baseline peace ratings were low and stable, averaging approximately 25, with no clear upward or downward trend. Immediately following the intervention, ratings increased sharply to approximately 90, representing a near quadrupling of baseline levels. Although some variability was observed during the post-intervention period – with occasional declines to around 40 – the overall trajectory remained substantially elevated relative to baseline, with most assessments clustering between 60 and 90. This pattern suggests that, while the intervention produced a strong immediate effect, day-to-day experiences of peace exhibited some natural fluctuation, potentially reflecting real-world stressors or contextual influences.

Participant 15 showed a more gradual but sustained trajectory of improvement (Figure 15, middle panel). Baseline peace ratings displayed an upward trend from approximately 30 to 60, suggesting some improvement prior to the intervention. Following the VR session, ratings continued to increase and stabilized at a high level (approximately 80), which was maintained throughout the remainder of the study period. This pattern suggests that the intervention may have accelerated or amplified an already emerging positive trend, ultimately yielding a robust effect.

Participant 17 demonstrated a distinct pattern characterized by high baseline variability followed by post-intervention stabilization (Figure 15, bottom panel). During baseline, peace ratings ranged widely from approximately 50 to 100, with frequent large fluctuations. Following the intervention, although ratings remained somewhat variable, they consistently fell within a higher and narrower range (80-100), suggesting that the intervention contributed to stabilizing the experience of peace at an elevated level.

Figure 15

Individual time-series plots of peace ratings across baseline and intervention phases for representative participants.



3) Self-understanding

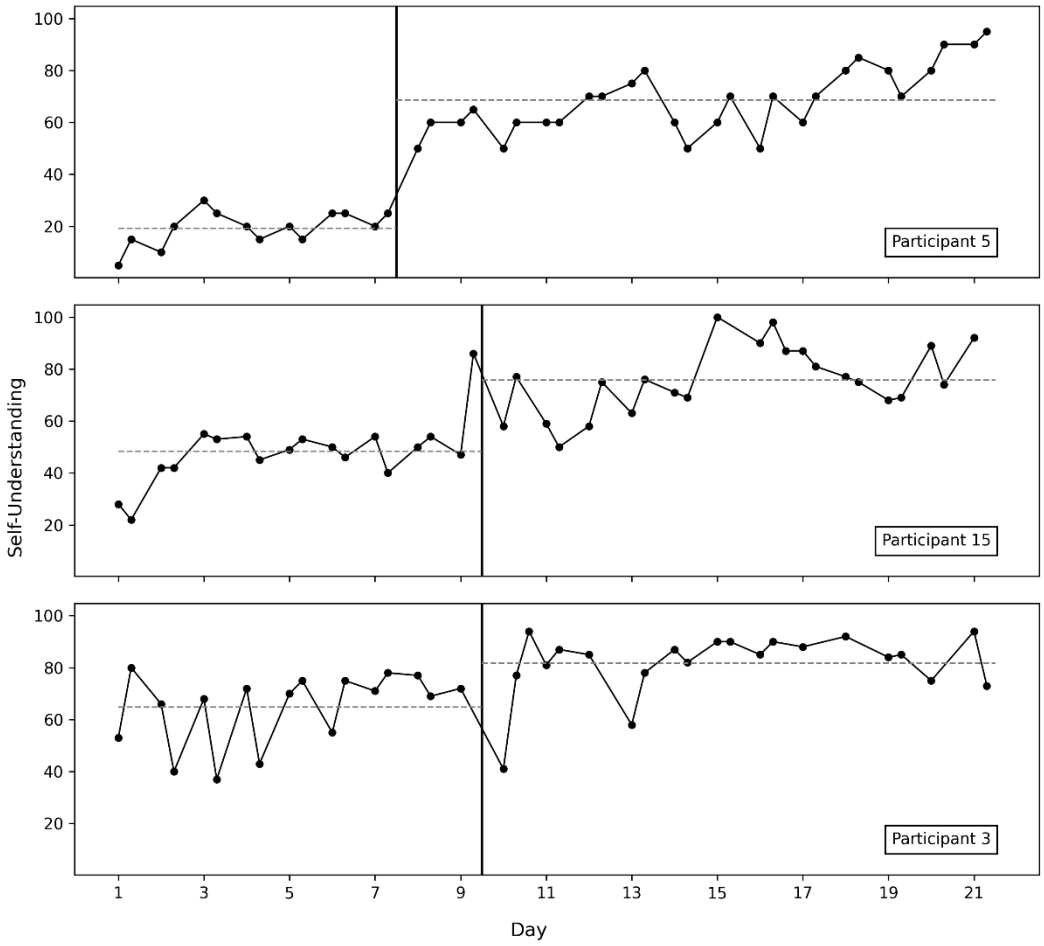
Participant 5 once again demonstrated a strong and immediate intervention effect for self-understanding (Figure 16, top panel). Baseline ratings were low and stable, averaging approximately 20, with minimal variability or discernible trend. Immediately following the VR session, self-understanding ratings increased sharply to approximately 60, followed by a further increase and stabilization at a high level (≥70) throughout the post-intervention period. This trajectory suggests that the intervention was associated with a sustained shift in the participant's capacity for self-awareness and insight.

Participant 15 exhibited a more complex response pattern, characterized by moderate baseline variability followed by a spike to near-ceiling levels immediately after the intervention (Figure 16, middle panel). Although some regression was observed in the days following this peak – declining to approximately 60 – ratings subsequently stabilized at a level substantially higher than baseline (approximately 75–85). This sequence of initial spike, partial regression, and re-stabilization at an elevated level is consistent with a process of gradual integration of an intense experiential intervention.

Participant 3 showed a distinct trajectory marked by moderate baseline variability around 65 and an immediate post-intervention increase to approximately 85 (Figure 16, bottom panel). In contrast to Participants 5 and 15, self-understanding ratings for Participant 3 remained relatively stable throughout the post-intervention period, with only modest fluctuation. This pattern suggests a rapid and sustained benefit that did not require an extended consolidation phase.

Figure 16

Individual time-series plots of self-understanding ratings across baseline and intervention phases for representative participants

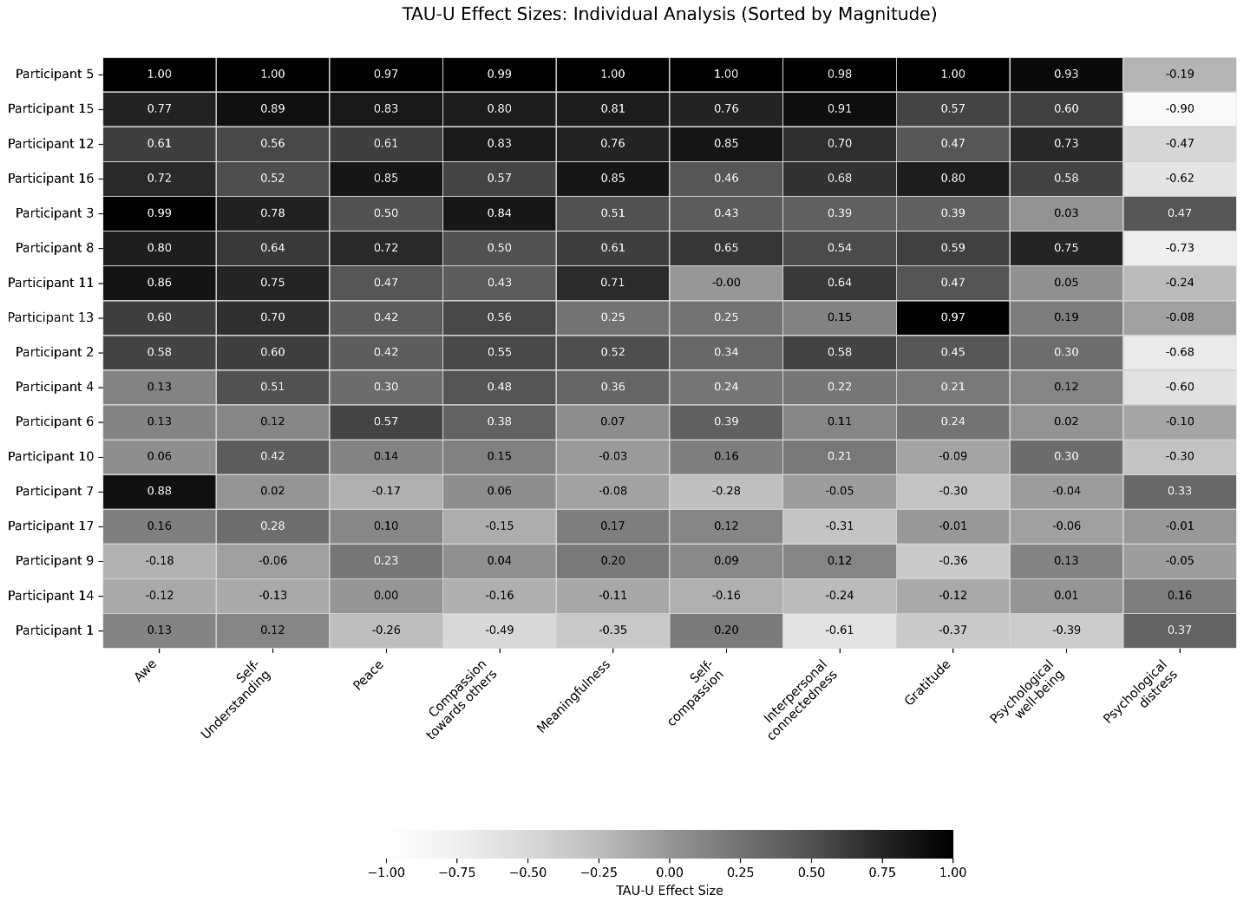


3.3.4. Effect Size Analysis: Tau-U

Tau-U effect sizes were computed for each participant-by-variable combination to quantify the magnitude of intervention effects (Figure 17; see also the Appendix of Study 5 for a meta-analytic summary of weighted average effects across outcome variables). The results revealed substantial heterogeneity across participants and outcome variables, with effect sizes ranging from large negative values (indicating deterioration) to near-perfect positive values (indicating complete nonoverlap between phases). The heatmap visualization, organized by ordering participants according to overall effect magnitude, facilitates identification of responders and nonresponders, as well as patterns of selective improvement across outcome domains.

Figure 17

Heatmap of Tau-U effect sizes across participants and outcome variables, sorted by overall magnitude.



The majority of participants exhibited positive effect sizes across multiple outcomes, with several individuals demonstrating very large effects (Tau-U > 0.80) on numerous variables. Participants 5, 15, 12, and 16 emerged as particularly strong responders, with Tau-U values exceeding 0.80 on at least five of the ten assessed outcomes. Notably, for Participant 5, effect sizes were near perfect (Tau-U ≥ 0.97) for eight of the ten variables, indicating essentially complete separation between baseline and intervention phases across most constructs.

At the level of specific outcome variables, awe and self-understanding demonstrated the most consistent positive effects across participants. For awe, 13 of 17 participants (76.5%) exhibited positive Tau-U values, with 8 participants (47.1%) showing large to very large effect sizes (Tau-U ≥ 0.60). Self-understanding displayed a similarly robust pattern, with 12 participants (70.6%) demonstrating positive effects and 7 participants (41.2%) exhibiting large to very large effects. Peace, meaningfulness, self-compassion, and compassion toward others also showed predominantly positive effects, although with greater variability in effect magnitude across individuals.

Psychological distress exhibited a more heterogeneous pattern, with approximately half of participants showing reductions (i.e., negative Tau-U values, indicating improvement) and half demonstrating increases or no change. Among those who improved, effect sizes were generally modest (Tau-U = −0.30 to −0.70), suggesting that the intervention exerted stronger effects on positive experiential states than on symptom reduction per se.

A subset of participants demonstrated minimal or negative effects across most variables, indicating nonresponse or potential deterioration. Most notably, Participants 1 and 14, and to a lesser extent Participants 7, 9, and 17, exhibited predominantly small or negative Tau-U values across multiple outcomes. For Participant 1, negative effects were particularly evident for peace (Tau-U = −0.26), meaningfulness (Tau-U = −0.49), self-compassion (Tau-U = −0.61), and psychological well-being (Tau-U = −0.39).

Overall, the Tau-U analyses converged with findings from visual inspection to indicate robust and predominantly positive intervention effects for the majority of participants, particularly for awe, self-understanding and peace.

3.4. Pre- and Post-Intervention Results

Pre-post comparisons are presented in Table 23. Changes in psychological distress (BSI-18) were small and nonsignificant, with slight reductions observed across somatization, depression, anxiety, and the global severity index (*ds* = -0.15 to -0.35). Similarly, emotional, social, and psychological well-being (MHC-SF) showed small, nonsignificant increases, with the largest effects emerging for social well-being and total well-being (*ds* = 0.29-0.41).

By contrast, spiritual well-being (FACIT-SP) demonstrated robust and statistically significant improvements. Meaning, peace, and faith all increased following the intervention (*ps* ≤ .009), with medium-to-large effect sizes (*ds* = 0.72–1.10). The total spiritual well-being score showed the strongest effect (*d* = 1.16), indicating substantial gains in existential clarity and inner harmony. Perceived connectedness also improved, although effects varied across domains. Connectedness to the world increased significantly (*p* = .021, *d* = 0.62), while connectedness to others and total connectedness showed moderate, nonsignificant positive changes (*ds* = 0.41-0.43). Connectedness to self did not increase and showed a small, nonsignificant decline.

Table 23

Pre-post changes in psychological distress (BSI-18), psychological well-being (MHC-SF), spiritual well-being (FACIT-SP), and connectedness (WSC) across the 21-day intervention

Variable	Pre M (SD)	Post M (SD)	t (16)	P-value	Cohen's d
BSI-18					
Somatization	6.18 (4.16)	5.76 (3.95)	-0.60	.557	-0.15
Depression	6.29 (4.51)	5.76 (4.97)	-0.69	.500	-0.17
Anxiety	7.59 (4.39)	6.12 (5.16)	-1.43	.171	-0.35
Global severity index	20.06 (11.57)	17.65 (13.01)	-1.22	.241	-0.30
MHC-SF					
Emotional well-being	9.71 (3.12)	10.47 (3.36)	1.18	.257	0.29
Social well-being	13.18 (5.95)	14.88 (5.58)	1.69	.111	0.41
Psychological well-being	21.18 (5.92)	22.00 (6.58)	0.67	.510	0.16
Total well-being	44.06 (13.40)	47.35 (14.46)	1.53	.146	0.37
FACIT-SP					
Meaning	11.47 (3.36)	12.53 (2.72)	3.04	.008	0.74
Peace	8.18 (3.66)	9.82 (2.92)	4.53	< .001	1.10
Faith	3.18 (2.60)	7.24 (3.67)	2.96	.009	0.72
Total spiritual well-being	22.82 (5.64)	29.59 (8.00)	4.77	< .001	1.16
WCS					
Connectedness to self	72.11 (13.84)	69.60 (15.77)	-0.79	.438	-0.19
Connectedness to others	58.79 (23.44)	64.44 (21.33)	1.69	.110	0.41
Connectedness to the world	49.45 (20.30)	60.90 (19.84)	2.56	.021	0.62
Total connectedness	59.56 (17.16)	64.76 (14.98)	1.79	.093	0.43

Note. BSI-18 = Brief Symptom Inventory–18; MHC-SF = Mental Health Continuum–Short Form; FACIT-SP = Functional Assessment of Chronic Illness Therapy–Spiritual Well-Being; WCS = Watts Connectedness Scale.

4. Discussion

The present study aimed to develop a comprehensive understanding of VR-induced selflessness among individuals living with cancer. To this end, we employed an integrative, multimethod design combining micro-phenomenological interviews, pictographic measures, EMA, and clinical self-report outcomes. This approach enabled the simultaneous examination of the lived qualities and fine-grained structure of the selflessness experience, its temporal unfolding in participants' everyday lives, and its potential associations with broader indicators of psychological, spiritual, and relational functioning. By situating these complementary levels of analysis within a single-case experimental framework, the study provides a nuanced, process-oriented account of VR-induced selflessness that is both experientially grounded and clinically relevant for oncology populations.

The first objective of this study was to evaluate the feasibility and acceptability of the Ripple VR experience, as well as its proximal efficacy in inducing selflessness-related states in individuals living with cancer. The findings converge with and extend those of previous investigations (Studies 3 and 4), demonstrating that this VR experience can reliably elicit pronounced states of selflessness, accompanied by increases in low-arousal positive affect and interpersonal warmth, alongside reductions in negative affect. Importantly, these experiential effects were associated with exceptionally high levels of acceptability and minimal adverse effects, indicating that Ripple is both engaging and well tolerated within a clinically vulnerable population. Taken together, these results support the feasibility of multi-user VR as a novel, non-pharmacological means of inducing selflessness, thereby offering a scalable and accessible alternative for clinical populations for whom existing approaches may be impractical or contraindicated (Barrett et al., 2016; Breeksema et al., 2022; Kettner et al., 2025).

The second objective was to characterize the subjective experience of selflessness by examining the lived phenomenology of the VR induction through the integration of pictographic state measures and micro-phenomenological interviews. Results from the pictographic assessments revealed significant increases in relational–affective dimensions, including warmth, compassion, and self-compassion, as well as enhanced interpersonal connection. These changes were accompanied by marked alterations in bodily self-perception, characterized by an attenuation of perceived bodily boundaries and an expansion of self-consciousness beyond the physical body. Together, these dimensions closely align with core components of selflessness as described in leading theoretical models (Dambrun & Ricard, 2011; Yaden et al., 2017; Canby et al., 2024; Berkovich-Ohana et al., 2024). Importantly, the same experiential dimensions were consistently identified in the micro-phenomenological interviews, indicating strong convergence between quantitative and qualitative levels of analysis.

At the phenomenological level, the experience of selflessness was characterized by a pattern of interrelated experiential categories, including shifts in embodied affectivity; alterations in both embodied and narrative dimensions of the self; changes in the direction and quality of connection; modulations of internal dialogue; variations in modes of presence; and the emergence of action tendencies. Taken together, these findings support contemporary accounts that conceptualize selflessness not as a unitary or static state, but as a phenomenon arising from dynamic reorganizations across embodied,

affective, cognitive, and intersubjective dimensions of the self (Berkovich-Ohana et al., 2024). Moreover, analysis of the temporal configuration of the experience enabled a more fine-grained understanding of its unfolding, revealing three successive phases: initial adaptation to the experience, presence shift, and dissolution of the self. Within this broader temporal framework, two distinct experiential structures were further identified, understood as coherent modes through which participants embodied and lived selflessness: *Dissolution of self into others* and *Dissolution of self into the whole*.

In addition, these experiential structures were associated with distinct profiles of change across the pictographic dimensions. Participants whose experience was characterized by *Dissolution of the self into the whole* showed greater alterations in time perception and a more pronounced attenuation of bodily boundaries, together with higher levels of reported interpersonal connectedness and greater calmness. Importantly, the convergence between the pictographic measures and the micro-phenomenological analysis strengthens the validity of the findings and highlights the value of integrating quantitative and qualitative approaches when investigating complex phenomena such as selflessness.

The third objective of this study was to examine the temporal unfolding of selflessness following its induction using EMA within a SCED. This methodological approach enabled us to move beyond immediate, session-bound effects and to explore how selflessness-related processes were expressed, consolidated, and potentially integrated into participants' everyday lives over time. The EMA findings suggest that the VR-induced selflessness may have contributed to enduring shifts in participants' daily experiential patterns. Notably, the most pronounced changes were observed in awe, peace, and self-understanding – experiential domains that have been theoretically linked to the integration of selflessness, as well as to broader processes of meaning-making and psychological reorganization (Piff et al., 2015; Yaden et al., 2017; Nour et al., 2016).

Visual inspection of individual trajectories revealed substantial heterogeneity in response patterns across participants and outcome variables. Whereas some participants demonstrated immediate and sustained improvements following the intervention, others exhibited more gradual change trajectories, transient post-intervention peaks followed by partial regression, or increased stability at elevated levels. Rather than constituting noise, this variability is consistent with the idiographic nature of experiential change and underscores the value of single-case designs for capturing non-linear and person-specific

processes of transformation (Scholten et al., 2024; Rochat & Manolov, 2024). Taken together, these findings suggest that participants may derive benefit from the intervention through distinct mechanisms or temporal pathways, rather than through a uniform pattern of change.

This heterogeneity was further reflected in the effect size analyses. The majority of participants exhibited positive effects across multiple outcome domains, suggesting that the intervention was associated with broad – and in many cases robust – shifts in daily experiential quality. Across variables, awe and self-understanding emerged as the most consistently affected outcomes, supporting their theorized role as central processes in the integration of selflessness experiences and in the translation of acute experiential shifts into sustained changes in everyday life (Piff et al., 2015; Yaden et al., 2017; Nour et al., 2016). Peace, meaningfulness and compassion also showed predominantly positive effects, albeit with greater interindividual variability. In contrast, changes in psychological distress were more modest and less consistent, a pattern that aligns with the conceptualization of Ripple as primarily targeting spiritual and existential dimensions of experience rather than directly addressing psychopathology (Vidal et al., 2025).

Finally, the fourth objective of this study was to examine whether the induction of selflessness through the Ripple VR experience was associated with group-level changes in indicators of psychological, spiritual, and relational functioning. While no significant changes were observed in clinical symptomatology or general psychological well-being, robust improvements emerged in spiritual well-being, including increases in meaning, peace, and faith. In addition, participants reported significant gains in connectedness to the world, reflecting a broader reorientation of experience beyond the individual self (Watts et al., 2022).

Taken together, these findings suggest that the clinical relevance of VR-induced selflessness lies primarily in fostering experiential qualities such as meaning, peace, faith and connectedness – dimensions that are central to spiritual and existential well-being and particularly salient in oncology contexts. Increasing attention has been devoted in recent years to these domains, given their relevance for patients facing life-threatening illness, uncertainty, and profound biographical disruption (Puchalski et al., 2019; McLouth et al., 2024; Stripp et al., 2025). From this perspective, Ripple may represent a valuable complement to existing symptom-focused approaches within integrative models

of psychosocial cancer care, addressing spiritual and existential dimensions that are often insufficiently targeted by conventional interventions (Riba et al., 2019).

More broadly, these findings underscore the value of integrative, multilevel methodological approaches for capturing the complexity of selflessness and its potential effects. By jointly examining phenomenological qualities, temporal dynamics in everyday life, and group-level clinical outcomes, the present study illustrates how different levels of analysis offer complementary insights into how selflessness is induced, lived, and integrated over time. Such methodological integration may be especially important when investigating complex experiential interventions in clinical populations and provides a useful framework for future research.

Finally, several limitations should be considered when interpreting the findings of the present study. First, the sample size was small and predominantly female, which may limit the generalizability of the results to broader and more diverse oncology populations. This limitation reflects the use of a SCED, which prioritizes within-person analyses and fine-grained characterization of individual trajectories. Nevertheless, replication in larger and more heterogeneous samples will be necessary to establish the robustness and external validity of the observed effects. Second, the study lacked a randomized control condition, making it difficult to fully disentangle the specific effects of the VR experience from nonspecific factors such as novelty, expectancy, or group context. Future studies employing randomized controlled designs and active control conditions will be essential to clarify the unique contribution of selflessness-related mechanisms. Finally, although the present study integrated phenomenological, temporal, and group-level outcomes, future research could incorporate additional measures – such as physiological indices, neurocognitive markers, or longer-term follow-up assessments – to better understand how selflessness-related experiences translate into enduring changes.

In conclusion, this study advances the understanding of VR-induced selflessness by characterizing its phenomenology, temporal dynamics, and clinical relevance in individuals living with cancer. The findings show that Ripple reliably elicits structured and dynamically unfolding experiences of selflessness, marked by distinct experiential profiles and sustained shifts in daily experience. Importantly, the intervention was feasible, well tolerated, and associated with meaningful existential and spiritual benefits, highlighting its potential as a clinically relevant contemplative intervention in oncology contexts.

CHAPTER IV. RESULTS

This chapter provides a comprehensive overview of the main empirical findings from the five studies conducted within this dissertation.

1. Main Results Study 1

Study 1 aimed to develop a deeper understanding of the Tonglen practice and to examine its effects on healthcare professionals' responses to human suffering using a mixed-methods randomized controlled design. The results are presented across three complementary levels of analysis.

1.1. Responses to Human Suffering

Regarding the self-report measures of the SoVT (Klimecki et al., 2013, 2014), participants in the Tonglen group reported higher levels of empathy and sadness following the intervention, whereas no comparable changes were observed in the control group. Anger, willingness to help, and positive affect did not show significant changes over time in either group.

Regarding the phenomenological results, three core experiential dimensions were identified: bodily resonance, perspective of internal dialogue, and prosocial motivation. Following the intervention, participants in the Tonglen group showed a significant increase in bodily resonance, expressed through more intense, vivid, and clearly embodied somatic sensations in response to others' suffering, together with a significant reduction in subtle or weak bodily sensations. In parallel, a significant reduction in self-focused internal dialogue during exposure to suffering was observed. Together, these changes reflect experiential dimensions associated with selflessness.

At a structural level, these dimensions formed three experiential structures: low sensitivity to suffering, high sensitivity to suffering, and compassionate support for suffering. Temporal analyses indicated that participants in the Tonglen group more frequently transitioned from lower to higher experiential structures across the intervention period. Specifically, the proportion of participants classified as Responders – those transitioning from low sensitivity to either high sensitivity or compassionate support – was higher in the Tonglen group (40%) than in the control group (9.1%).

1.2. Trait Compassion

The two-week Tonglen training was not associated with differential changes in trait-level compassion relative to the control group. SOCS (Gu et al., 2020) total scores and subscales remained stable across time in both groups. Similarly, no significant changes were observed in CMAS (Steindl et al., 2021) total scores or subscales. These findings indicate that the intervention did not produce measurable changes in trait compassion as assessed by standardized self-report instruments.

1.3. Subjective Experiences of Tonglen Meditation

Semi-structured interviews provided an in-depth understanding of how non-expert participants experienced and engaged with the practice of Tonglen meditation. Participants reported an enhanced connection with others' suffering, characterized by increased sensitivity, non-judgmental acceptance, and feelings of tenderness and compassion. In addition, they described greater awareness of bodily sensations, increased self-compassion, and experiences of calm, serenity, and psychological relief following the practice.

2. Main Results Study 2

Study 2 employed a scoping review methodology to systematically map existing assessment methods of selflessness and to examine how the construct has been conceptualized across empirical studies. Results are presented across three domains.

2.1. General Study Characteristics

The scoping review included 23 studies and identified three primary assessment modalities: self-report measures (n = 12), behavioral tasks (n = 3), and phenomenological interviews (n = 8). Self-report measures comprised full questionnaires (n = 4), subscales embedded within broader instruments (n = 5), and pictographic scales (n = 3).

Eighteen of the included studies were published after 2010. Research was conducted primarily in the United States (n = 9) and Israel (n = 5), with additional studies carried out in several European countries. Sample sizes ranged from single-case qualitative investigations to questionnaire-based studies including up to 1,602 participants (N = 1–1,602). Study populations comprised university students (n = 7), general population samples (n = 7), and long-term meditators (n = 6). In most samples, women represented the majority of participants.

2.2. Conceptualization of Selflessness

Selflessness was operationalized predominantly as a state (n = 18). Trait conceptualizations were observed in a minority of studies, including three self-report instruments and one phenomenological interview study. The NADA (Hanley et al., 2018) included both state- and trait-oriented versions.

Across the included studies, considerable variability was observed in the terminology and conceptual framing of selflessness. When mapped onto the model proposed by Canby et al. (2024), self-report measures assessed unity with all things (n = 8), self-loss (n = 7), body-boundary diminishment involving others (n = 6), and body-boundary diminishment involving objects (n = 6). Behavioral tasks assessed diminished ownership of thoughts and feelings as well as reduced agency, whereas phenomenological studies examined experiential dimensions including boundary diminishment, ownership, agency, self-loss, and loss of time and space.

Across studies and modalities, selflessness was operationalized through multiple distinct experiential dimensions rather than through a single indicator.

2.3. Characteristics of the Assessment Instruments

Self-report scales were used in 12 of the 23 included studies. Internal consistency was reported for the majority of instruments and was rated as sufficient according to COSMIN criteria (Mokkink et al., 2010; Terwee et al., 2018) in the corresponding evaluations. Evidence for structural validity, criterion validity, and test-retest reliability was reported for a smaller subset of instruments. In several instances, these measurement properties did not meet COSMIN thresholds. Content validity evaluations varied across instruments, with some measures meeting criteria for relevance, comprehensiveness, and comprehensibility, and others receiving mixed or indeterminate ratings. Among comprehensive self-report questionnaires, the NADA (Hanley et al., 2018) and the EDS (Sleight et al., 2023) demonstrated comparatively stronger psychometric support based on reported evidence across multiple measurement properties.

Behavioral tasks were included in three studies. These paradigms operationalized selflessness through experimental designs targeting self-referential processing, particularly ownership and agency, using performance-based indices such as response times and accuracy. In contrast, phenomenological approaches were included in eight

studies. These studies relied primarily on open-ended experiential reports, frequently embedded within neurophenomenological designs. A smaller number employed structured formats, including micro-phenomenological and semi-structured interviews.

Across the included studies, different assessment modalities captured partially overlapping dimensions of selflessness. No single method encompassed all identified experiential components within a single instrument or paradigm.

3. Main Results Study 3

Study 3 examined whether a single-session, multi-person VR experience (Ripple) induced a state of selflessness and assessed its immediate and short-term effects on affect, mystical-type experiences, and peak experiences. Results are presented across five domains.

3.1. Changes in Selflessness and Interpersonal Connectedness

Participation in the Ripple VR experience was associated with indicators of selflessness across multiple experiential dimensions. Histograms of post-experience pictographic item scores showed moderate to high levels of fusion with one's partner, dissolution of perceived bodily boundaries, self-diminishment, reduced intensity and duration of self-referential inner dialogue, and expansion of the spatial frame of self-awareness.

Participants also reported a significant increase in interpersonal connectedness with other VR group members, as measured by the IOS (Aron et al., 1992), from pre- to post-experience.

3.2. Changes in Affective States

Affective outcomes were assessed using the HAAS (Roca et al., 2023). The VR session was associated with significant increases in low-arousal positive affect (e.g., calmness, peacefulness, contentment) and feelings of warmth (e.g., bondedness, security, protection). In contrast, high-arousal positive affect and negative affect showed significant decreases following the experience.

3.3. Mystical-Type Experiences

A subset of participants reported experiences meeting criteria for MTEs during the VR session. According to established MEQ-30 criteria (MacLean et al., 2012), 13.2%

of participants met the threshold for a complete MTE, defined as scoring ≥60% on all four subscales. At the subscale level, the proportions of participants reaching the ≥60% threshold were as follows: mystical (35.8%), positive mood (24.5%), transcendence of time and space (43.4%), and ineffability (50.9%).

Correlational analyses indicated significant associations between indices of selflessness and MEQ-30 dimensions. Self-diminishment and fusion with others were significantly correlated with all four MTE subscales, whereas dissolution of bodily boundaries and expansion of spatial awareness were selectively associated with specific MTE dimensions. Regression analyses identified self-diminishment as a significant predictor of scores on the mystical subscale and the transcendence of time and space subscale.

3.4. Follow-Up Peak Experiences

One-week follow-up assessments, conducted using the PMES (Hadash et al., 2024), indicated that a substantial proportion of participants reported PEs during the follow-up period. The most frequently reported PEs were insight moments (28.2%), strong feelings of gratitude (25.6%), intense longing for others (20.5%), and extraordinary experiences of love and compassion (17.9%). Most PEs were characterized by a positive hedonic tone, but intense longing was occasionally described as unpleasant (33% of those reporting this experience).

3.5. Acceptability and Tolerability

The VR experience was well accepted and tolerated in this general population sample, as indicated by consistently high mean satisfaction scores and low mean adverse effects scores. Reported adverse effects were mild and infrequent and primarily consisted of transient physical discomfort and occasional difficulty understanding the audio guidance.

4. Main Results Study 4

This preliminary study extended previous work by assessing the effects of a refined version of the Ripple VR experience on meditative experience within the naturalistic context of a contemplative retreat. Results are summarized across three complementary domains.

4.1. Effects of the Ripple VR Experience

Results indicated a significant induction of selflessness, as reflected in NADA-S scores (Hanley et al., 2018). Significant increases were observed in both subscales – self-transcendence and bliss – as well as in the total score.

Mystical-type experiences were assessed using the MEQ-30 (MacLean et al., 2012). Overall, 48.1% of participants met criteria for a complete MTE, defined as scoring ≥60% on all four subscales during the VR session. At the subscale level, the proportions of participants exceeding the ≥60% threshold were: mystical (63%), positive mood (59.3%), transcendence of time and space (63%), and ineffability (70.4%).

4.2. Experiential Patterns across Phases and Changes in Pictographic Items

Across phases (pre-VR meditation, VR induction, and post-VR meditation), descriptive statistics and the radar plot showed that mean scores on MPI pictographic items (Delia et al., 2025) were generally higher during VR induction compared to pre-VR meditation, with post-VR meditation typically showing intermediate values.

Linear mixed-effects models further examined changes across phases. Relative to pre-VR meditation, VR induction was associated with significant increases across multiple affective (warmth, positive emotions, compassion, self-compassion, ineffability), relational (interpersonal connection, connection with the planet), bodily (bodily boundaries, reference continuum), and temporal (time disappearance) variables. In the post-VR versus pre-VR contrast, significant increases were observed for warmth, time perception, positive emotions, compassion, and ineffability, indicating that these variables remained significantly elevated during post-VR meditation relative to baseline.

4.3. Changes in Dimensions of Meditative Experience

Changes were examined for immersion, perceived meaningfulness, imagery absorption, and imagery vividness across pre-VR meditation, immediately after VR induction, and post-VR meditation. Mean scores increased across all four dimensions following VR induction and remained elevated during post-VR meditation relative to baseline. Pre–post comparisons showed significant increases in all four dimensions, with more pronounced changes observed for imagery-related dimensions and immersion, whereas perceived meaningfulness showed comparatively smaller changes.

5. Main Results Study 5

Study 5 investigated the feasibility, phenomenology, temporal dynamics, and clinical relevance of VR-induced selflessness (Ripple) in individuals living with cancer, using an integrative, multimethod multiple-baseline SCED design. Results are summarized across four complementary domains.

5.1. Feasibility, Acceptability, and Efficacy of the Selflessness Induction

During the VR session, state self-report measures showed robust and significant pre–post increases in selflessness, reflected in the NADA-S (Hanley et al., 2018) total score and its subscales (self-transcendence and bliss). These changes were accompanied by significant increases in low-arousal positive affect and warmth-related affect, as well as reductions in negative affect across arousal levels, as measured by the HAAS (Roca et al., 2023).

Importantly, the VR experience was well accepted and tolerated in this oncology sample, as indicated by consistently high mean satisfaction scores and low mean adverse-effect scores.

5.2. Phenomenology of Selflessness

Pictographic state assessments (MPI; Delia et al., 2025) showed significant pre–post increases across multiple dimensions, including relational affect (warmth, compassion, and self-compassion), interpersonal connection, attenuation of perceived bodily boundaries, and expansion of self-consciousness.

Micro-phenomenological interviews further described the lived experience of selflessness as involving systematic changes across interrelated experiential dimensions. These included shifts in embodied affectivity; alterations in both embodied and narrative aspects of the self; changes in the direction and quality of connection; modulation of internal dialogue (ranging from rumination to mental silence and occasional existential insight); variations in modes of presence (from distraction to full presence); and the emergence of impulses oriented toward relational care or experiential persistence.

Analysis of the temporal unfolding of the experience identified a coherent three-phase structure: (1) an initial phase marked by adaptation and evaluative self-focus; (2) a transitional phase characterized by increased presence and letting go; and (3) a final phase

of heightened experiential intensity, involving self-dissolution, altered boundaries, reduced internal dialogue, and frequent ineffability.

Within this temporal framework, two distinct experiential structures were identified. One involved *Dissolution of self into others*, characterized by a co-implicated narrative orientation, interpersonal connection, relational affect, and care-oriented impulses. The other involved *Dissolution of self into the whole*, characterized by a decentered narrative orientation, transpersonal connection, expansive affective qualities (e.g., awe and bliss), and persistence-oriented impulses.

These experiential structures were associated with differentiated quantitative profiles. Participants whose experience involved *Dissolution of self into the whole* showed significantly greater changes in pictographic dimensions, including time perception, interpersonal connection, bodily boundaries, and ego attenuation. This group also exhibited a larger increase in low-arousal positive affect, indicating greater calmness and serenity.

5.3. Temporal Dynamics of Selflessness in Daily Life

Adherence to the twice-daily EMA protocol was high (M = 90.3%), with no systematic differences between baseline and intervention phases, indicating sustained engagement throughout the study.

Descriptive EMA analyses indicated that mean scores increased from baseline to intervention phases across all measured outcomes. The largest mean increases were observed for awe, peace, and self-understanding, accompanied by a reduction in psychological distress. Median values showed comparable patterns, indicating that changes were not driven by outliers. Standard deviations were generally lower during intervention phase, suggesting reduced within-participant variability following the intervention.

SCED analyses, including visual inspection and Tau-U effect sizes, revealed substantial heterogeneity across participants and outcome variables. Individual trajectories showed diverse response patterns, including immediate and sustained improvements, gradual changes, transient post-intervention peaks followed by partial regression, and increased stability at elevated levels. Effect size analyses indicated that most participants exhibited positive effects across multiple domains, suggesting broad

and, in many cases, robust shifts in daily experiential quality. Across variables, awe and self-understanding were the most consistently affected outcomes. Peace, meaningfulness, self-compassion, and compassion toward others also showed predominantly positive effects, although with greater interindividual variability. Changes in psychological distress were more modest and less consistent.

5.4. Clinical and Well-Being Outcomes

At the group level across the 21-day period, pre–post comparisons showed robust and significant increases in spiritual well-being (FACIT-SP; Peterman et al., 2002), including meaning, peace, faith, and the total score. Perceived connectedness to the world (WCS; Watts et al., 2022) also increased significantly. Overall, these findings indicate that the clinical relevance of the intervention in this sample was reflected in existential-spiritual outcomes and enhanced transcendental connectedness.

CHAPTER V. CONCLUSIONS

This doctoral thesis advances a comprehensive scientific understanding of selflessness by refining its conceptualization and assessment and introducing an innovative immersive VR experience as a novel methodological approach for its experimental induction and clinical investigation. Despite increasing scholarly interest in the field, existing research continues to face conceptual and methodological limitations, particularly with respect to the reliable induction of selflessness under controlled experimental conditions and the systematic examination of its clinical relevance. The present thesis directly addresses these gaps through five interconnected studies: (1) a mixed-methods randomized controlled trial examining the effects of Tonglen meditation, a compassion-based contemplative practice particularly well suited to the induction of selflessness; (2) a scoping review systematically synthesizing existing theoretical perspectives and assessment methods, with the aim of clarifying conceptual frameworks and methodological approaches in the scientific study of selflessness; (3) a preliminary experimental study introducing Ripple, an immersive VR experience integrating Tonglen meditation, and evaluating its capacity to induce selflessness under controlled laboratory conditions; (4) a multiple case series examining the contemplative application of Ripple within a retreat context, focusing on its effects on participants' meditative experience; and (5) a single-case experimental design investigating the clinical application of Ripple in an oncology population, focusing on the experiential characteristics of VR-induced selflessness and its potential clinical relevance.

Taken together, these studies contribute to the field by demonstrating that selflessness can be systematically conceptualized, empirically assessed, and experimentally induced through VR as an ethically robust and methodologically innovative approach, with meaningful implications for clinical application.

The following sections provide a comprehensive discussion that integrates the findings from all five studies, highlighting their collective contribution to the scientific investigation of selflessness. The chapter begins with a summary of the main findings, followed by an examination of the strengths and limitations of the overall research. It then addresses the theoretical and clinical implications of the results, outlines directions for future research, and concludes by presenting the overall conclusions of this doctoral thesis.

1. Summary of the Main Findings

1.1. Tonglen meditation as a pathway to selflessness

Tonglen meditation constituted the central practice underlying this doctoral dissertation and served as the primary experimental method for inducing states of selflessness. Study 1 provided initial empirical support for its suitability as a methodological tool for investigating this construct. Beyond demonstrating feasibility, the study offered a more detailed characterization of the experiential structure associated with Tonglen practice, particularly in healthcare workers – a population regularly exposed to others' suffering. In doing so, the findings refined prior phenomenological descriptions of Tonglen (Andreu et al., 2025a) and extended the still limited empirical literature examining its psychological and experiential correlates (Gilbert et al., 2023; McKnight, 2012; Pardy, 2016; Mah et al., 2020; Andreu et al., 2025a, 2025b).

The results of Study 1 indicated that Tonglen training enhanced participants' sensitivity to suffering by strengthening embodied awareness and affective attunement to others' distress – processes that have been regarded as foundational to the emergence of empathic and compassionate motivation (Halifax, 2012; Singer & Klimecki, 2014; Gilbert, 2015; Jinpa, 2011). Importantly, phenomenological interviews revealed two core experiential shifts: an increased bodily resonance with others' suffering and a reduction in self-referential inner dialogue during the practice. These experiential patterns aligned with two central dimensions theoretically associated with selflessness in contemporary integrative frameworks (Berkovich-Ohana et al., 2024; Canby et al., 2024): (a) diminished self-other differentiation and (b) decreased narrative self-referential processing. In this respect, Tonglen appeared capable of reliably eliciting state-level transformations in self-experience that were consistent with current multidimensional models of selflessness. Notably, both classical contemplative accounts (Chödrön, 1994; Drolma, 2019; Jinpa, 2011) and recent empirical research (Andreu et al., 2025a) have characterized Tonglen as a practice particularly suited to the cultivation of selfless states. The present findings were consistent with this body of work and further reinforced its empirical plausibility.

In conclusion, Study 1 consolidated the methodological validity of Tonglen as a contemplative technique for both the empirical investigation and experimental induction of selflessness. Building on this foundation, Studies 3, 4, and 5 examined the integration

of Tonglen within a VR-based intervention, evaluating whether the structured combination of immersive technological affordances and the intrinsic contemplative mechanisms of the practice could systematically amplify or scaffold the emergence of selfless states.

1.2. Selflessness: a multidimensional phenomenon requiring a multimethod assessment approach

Study 1 identified two experiential dimensions associated with selflessness, providing preliminary evidence of its multidimensional structure and underscoring the value of phenomenological interviews for capturing its subtle and often pre-reflective aspects, as previously noted in the literature (Dambrun, 2016; Hanley & Garland, 2019; Berkovich-Ohana et al., 2024; Canby et al., 2024). However, the broader dimensional architecture of selflessness, as well as the range of assessment strategies capable of adequately measuring it, remained insufficiently clarified. To address this gap, Study 2 sought to delineate the construct more comprehensively and to identify appropriate methodological approaches for its evaluation, thereby establishing a clearer conceptual and methodological foundation for the subsequent studies in this dissertation.

The review conducted in Study 2 confirmed the absence of a consensual terminological and epistemological definition of selflessness (Canby et al., 2024; Britton et al., 2021). Related constructs have been described across diverse theoretical frameworks using partially overlapping terminology, resulting in conceptual fragmentation. In response to this lack of coherence, the integrative model proposed by Canby et al. (2024) was identified as a structured attempt to systematize the field by delineating distinct experiential dimensions underlying selflessness. When existing assessment instruments were examined in light of this framework, two domains emerged as the most consistently represented: a diminishment or dissolution of the sense of self, encompassing experiences of self-loss and reduced ownership and agency, and an enhanced sense of connectedness with others, including unity experiences and perceived boundary attenuation. Their convergence across theoretical models and measurement approaches indicates that these two domains constitute the core dimensions of selflessness, as previously noted by other authors (Yaden et al., 2017; Hanley et al., 2018).

Regarding assessment methodology, the field remains underdeveloped and characterized by important psychometric limitations, particularly when evaluated against

COSMIN criteria (Mokkink et al., 2010; Terwee et al., 2018). In this context, no single assessment strategy appears sufficient to capture the multidimensional complexity of selflessness. Pictographic scales were identified as valuable tools for assessing shifts in self-experience that may resist verbal articulation (e.g., the Meditation Pictographic Inventory; Delia et al., 2025). Likewise, phenomenological interviews – especially micro-phenomenological approaches (Petitmengin, 2006) – provided access to pre-reflective experiential dimensions that may remain inaccessible through standard self-report instruments. At the same time, the review identified specific self-report measures with comparatively stronger psychometric properties, including the NADA (Hanley et al., 2018) and the EDS (Sleight et al., 2023). Taken together, these findings supported the adoption of a multimethod assessment strategy integrating validated self-report instruments with pictographic and phenomenological approaches.

The conclusions of Study 2 directly informed the design of the subsequent studies. Studies 3, 4, and 5 implemented this framework through the systematic integration of complementary assessment methods, combining validated self-report instruments – primarily the NADA (Hanley et al., 2018), which demonstrated stronger psychometric performance – with pictographic scales and micro-phenomenological interviews. Beyond structuring the empirical work of this dissertation, this approach contributes to establishing a more stable methodological foundation for future research on selflessness.

1.3. Virtual reality as a tool for the experimental induction of selflessness

A central contribution of this doctoral dissertation was the development and empirical validation of a scalable, cost-effective, and non-pharmacological method for inducing selflessness. This approach addressed key limitations associated with traditional pathways, including contemplative training, which typically requires prolonged practice and expert guidance (Anālayo, 2003; Olendzki, 2006; Tang et al., 2015); and psychedelic substances, which involve legal, medical, and safety constraints (Griffiths et al., 2008, 2011; Millière, 2017; Breeksema et al., 2022).

The method was implemented through *Ripple*, an immersive VR scenario integrating Tonglen meditation. This system translated the experiential mechanisms identified in Study 1 into a technologically mediated context designed to standardize and potentially amplify induction effects. Across three studies conducted in laboratory and

naturalistic settings, and involving both general and clinical populations, the Ripple experience demonstrated consistent efficacy in eliciting selflessness-related states.

Study 3 provided an initial test of Ripple's effectiveness in a general population sample. Results showed significant increases in selflessness and interpersonal connectedness, together with reductions in negative affect and high-arousal positive affect, and increases in low-arousal positive affect and warmth-related affect. These findings were consistent with previous work by Glowacki et al. (2020, 2022), who demonstrated that a comparable VR environment (Isness) elicited ego attenuation and enhanced feelings of connectedness. Notably, 13.2% of participants met criteria for a complete mystical-type experience (MTE; Stace, 1960; MacLean et al., 2012). The intervention was also associated with high acceptability and a low incidence of adverse effects.

Study 4 extended these findings by refining the Ripple experience and implementing it within a naturalistic contemplative retreat context. The updated version replicated the induction of selflessness observed in Study 3 and further intensified its phenomenological impact, as reflected in a substantial increase in complete MTEs – from 13.2% in Study 3 to 48.1% in Study 4. This amplification may be attributable to key refinements, including full linguistic adaptation of the audio guidance into Spanish and the use of lighter, ergonomically advanced Oculus Quest 3 headsets. These findings suggest that both contextual and technological optimization can deepen the selflessness-related states elicited through immersive VR.

Study 5 further extended this research to a clinical oncology population, assessing both efficacy and acceptability in a vulnerable group. The findings converged with and expanded upon those of Studies 3 and 4, demonstrating that Ripple reliably elicited pronounced states of selflessness, accompanied by increases in low-arousal positive affect and warmth-related affect, as well as reductions in negative affect. The intervention showed very high acceptability and minimal adverse effects, indicating that the protocol was feasible, well tolerated, and suitable for clinical implementation.

Taken together, these findings support immersive VR as a robust experimental platform for the controlled induction of selflessness. The effects were replicated across three independent studies, in distinct populations (general and clinical) and contexts (laboratory and retreat settings), demonstrating both reproducibility and contextual

generalizability. Beyond proof of concept, Ripple provides a standardized and accessible framework for the systematic investigation of selflessness and supports its potential translation into clinical and applied domains.

1.4. The phenomenological structure and temporal dynamics of VR-induced selflessness

The availability of a reliable VR-based experience to induce selflessness made it possible to examine this state under controlled laboratory conditions. This methodological advance enabled a systematic investigation of both its phenomenological structure and its temporal unfolding.

The phenomenological structure of the experience was assessed through pictographic measures and phenomenological interviews, following the framework established in Study 2. Pictographic instruments of Studies 3-5 identified a stable pattern of altered experiential dimensions associated with VR-induced selflessness. These instruments were progressively refined, evolving from single-item indicators in Study 3 to a validated multidimensional scale (the MPI; Delia et al., 2025). Across all three studies, two embodied dimensions were systematically observed: attenuation of bodily boundaries and expansion of self-awareness. These alterations were consistently present and represent core experiential features of selflessness, as also documented in prior research (e.g., Dor-Ziderman et al., 2013; Tagini & Raffone, 2010; Dunne, 2011; Hanley et al., 2018; Millière et al., 2018). In addition to these bodily dimensions, relational components were reliably identified across the three studies. Participants reported increased interpersonal connectedness and heightened relational affect, including warmth and compassion. These findings underscore the relational dimension of selflessness and align with previous empirical accounts (e.g., Dambrun & Ricard, 2011; Hanley et al., 2018; Yaden et al., 2017). Other experiential features varied across studies. Reductions in the intensity and persistence of self-referential inner dialogue were particularly evident in Study 3, whereas temporal alterations and ineffability were more prominent in Study 4.

Phenomenological interviews conducted in Study 5 provided a more detailed and structurally integrated account of the lived experience. VR-induced selflessness was characterized by interrelated shifts in embodied affectivity (e.g., warmth, love, awe, peace), alterations in both embodied and narrative aspects of self-experience (e.g., bodily expansion, unity, decentering), changes in relational orientation (interpersonal or

transpersonal), modulation of internal dialogue, variations in presence, and emergent action tendencies such as relational care. Within this configuration, two coherent experiential structures were identified: *Dissolution of self into others* and *Dissolution of self into the whole*. These findings converged with prior phenomenological accounts of selflessness (Dor-Ziderman et al., 2013; Berkovich-Ohana, 2017; Fingelkurts et al., 2020, 2022; Ataria et al., 2015; Nave et al., 2021; Lindström et al., 2022, 2023), while extending existing descriptions of its lived structure.

Taken together, the dimensions identified through pictographic measures and phenomenological interviews delineated a coherent experiential configuration closely aligned with the core components proposed in recent integrative models of selflessness (Berkovich-Ohana et al., 2024; Canby et al., 2024).

Beyond immediate session effects, we examined whether these changes extended into everyday life. In Study 3, a substantial proportion of participants reported peak experiences (PEs) during the following week. These episodes – characterized by intense emotional or cognitive shifts – have been associated with psychological integration and transformation (Timmermann et al., 2022; Vieten et al., 2018). Approximately 18% to 28% of participants reported experiences such as sudden insight, profound gratitude, or intensified love and compassion, suggesting that the intervention elicited psychologically salient processes that unfolded beyond the laboratory context.

Study 5 further examined temporal dynamics through ecological momentary assessment (EMA). The results indicated that VR-induced selflessness was not limited to a transient altered state but was reflected in shifts in everyday experiential patterns over subsequent days. Awe and self-understanding emerged as relatively stable indicators of this integration process, whereas peace, meaningfulness, and compassion showed positive trends with greater interindividual variability. Changes in psychological distress were modest, suggesting that the intervention primarily influenced meaning-related and relational dimensions rather than directly reducing symptoms.

In sum, the present findings show that VR-induced selflessness constitutes a coherent and theoretically grounded experiential configuration that can be reliably elicited under controlled conditions. Moreover, its effects extend beyond the immediate session, unfolding into measurable shifts in everyday experience.

1.5. Applied potential of VR-induced selflessness in contemplative and oncology contexts

Having established a coherent framework for conceptualizing, assessing, and experimentally inducing selflessness, this thesis examined its practical applicability. Across studies, the findings indicate that VR-induced selflessness can be integrated into contemplative settings and demonstrates clinical relevance in oncology contexts, underscoring its translational potential.

In the contemplative domain, Ripple was embedded within an ongoing retreat program in Study 4, allowing assessment of carryover effects on meditation sessions conducted before and after VR exposure. The results indicated that the effects extended beyond the immersive session and shaped subsequent practice. Post-VR meditations showed significant increases in positive affect and prosocial emotions – particularly warmth and compassion – as well as accelerated time perception and greater ineffability. Together, these changes suggest deeper experiential absorption and reduced conceptual mediation, indicating that the VR session functioned as a catalyst within the contemplative process.

VR exposure also influenced structural dimensions of meditation. Post-VR sessions demonstrated increased imagery absorption and vividness, capacities central to many contemplative techniques, especially generative practices. These findings align with prior research showing that immersive technologies can strengthen imagery-based engagement in contemplative contexts (Slater & Sanchez-Vives, 2016; Navarrete et al., 2021; Palacios et al., 2026). Meditation-related immersion also increased, consistent with evidence that immersive environments enhance presence and engagement (Seabrook et al., 2020; Jo et al., 2024; Xie et al., 2025). In addition, perceived meaningfulness showed a moderate increase, in line with studies suggesting that such experiences can produce enduring effects on personal salience and existential significance (Baños et al., 2004; Riva et al., 2019).

Taken together, these findings suggest that VR-induced selflessness can be coherently integrated into contemplative training. Rather than replacing traditional practice, Ripple appeared to amplify experiential depth by enhancing affective resonance, imagery engagement, experiential immersion, and perceived significance in subsequent

meditation. In this sense, VR may serve as a complementary contemplative technology that facilitates access to selflessness-related states.

Clinical applicability was examined in Study 5 within an oncology population. Results indicated significant improvements in spiritual well-being, including increases in meaning, peace, and faith, as well as enhanced connectedness to the world, reflecting a broader sense of belonging and unity (Watts et al., 2022). These findings suggest that the clinical relevance of VR-induced selflessness lay less in direct symptom reduction and more in fostering spiritual and existential dimensions of well-being. Such dimensions have received increasing attention in psychosocial oncology, given their central role for patients confronting life-threatening illness, uncertainty, and profound biographical disruption (Puchalski et al., 2019; McLouth et al., 2024; Stripp et al., 2025). Within integrative models of cancer care, Ripple may serve as a complementary intervention by addressing experiential and existential needs that are often insufficiently targeted by symptom-focused treatments (Riba et al., 2019).

In sum, Ripple demonstrated applicability beyond controlled research settings. It not only enhanced contemplative practice through measurable carryover effects but also supported spiritual and existential well-being in oncology contexts. Together, these findings extend the relevance of VR-induced selflessness beyond the laboratory, positioning it as a scalable intervention with potential for sustained contemplative development and integrative clinical care.

2. Strengths

This doctoral thesis presents several important strengths that are essential for interpreting its conclusions and broader implications.

First, it addresses a field that remains conceptually fragmented, methodologically heterogeneous, and only partially integrated into clinical practice, despite its growing theoretical and applied relevance. Selflessness has been examined across contemplative, psychological, and neuroscientific domains, yet these perspectives often lack conceptual integration. This dissertation responds to this fragmentation by systematically examining the conceptualization, assessment, experimental induction, and clinical relevance of selflessness, thereby contributing to a more coherent and empirically grounded basis for its scientific study.

Second, the thesis is characterized by methodological breadth and rigor. Across five interrelated studies, it incorporates a scoping review, a randomized controlled trial, and experimental designs including a multiple case series and a single-case design with ecological momentary assessment. This diversity of approaches allows the research program to test its core hypotheses under varied methodological and contextual conditions, strengthening the robustness of the findings, enabling triangulation across designs, and enhancing the ecological validity of the conclusions.

Third, the dissertation adopts a multimethod assessment strategy combining quantitative and qualitative approaches. It integrates validated self-report instruments, pictographic measures, and in-depth phenomenological interviews. This mixed-methods design enhances construct validity by capturing both measurable and experiential dimensions of selflessness, and enables a more comprehensive understanding of the construct.

Fourth, the thesis reflects a clear commitment to open science and research transparency. Where applicable, studies were preregistered, and datasets were deposited in accredited digital repositories to support reproducibility and future secondary analyses (see Chapter III, Methods). Moreover, Study 3 has been published in a Q1 open-access journal (Vidal et al., 2025), and the remaining manuscripts are currently under peer review. These practices strengthen the credibility, transparency, and cumulative value of the research program.

Finally, the present dissertation demonstrates strong internal coherence and cumulative progression. Each study builds systematically on the previous one: from an in-depth examination of Tonglen meditation as a method for inducing selflessness, to the clarification of its conceptual and methodological foundations, to the empirical testing of a VR-based induction paradigm (Ripple) integrating Tonglen, and ultimately to the examination of its applicability in contemplative and oncology settings. This stepwise progression ensures that theoretical refinement, methodological clarification, and applied evaluation evolve in a coordinated and mutually reinforcing manner.

3. Limitations

Despite its strengths, several limitations should be considered when interpreting the findings of this dissertation.

First, the studies adopted exploratory and feasibility-oriented designs, which entail inherent methodological constraints. Studies 3 to 5 were primarily pilot investigations relying on a single-session VR protocol without control conditions. In addition, although Study 1 employed a randomized controlled trial, it incorporated a passive control group. The absence of active comparison groups limits causal inference and makes it difficult to disentangle specific intervention effects from expectancy, novelty, contextual influences, or other non-specific factors. Consequently, the findings should be interpreted as preliminary evidence requiring confirmation through more rigorous and adequately controlled trials.

Moreover, Study 2 presents limitations inherent to its scoping review methodology. The substantial heterogeneity of definitions, theoretical frameworks, and measurement approaches across included studies restricted the possibility of achieving a fully coherent epistemological synthesis. Reliance on specific search terms may also have introduced selection bias by excluding relevant work using alternative terminology. Moreover, as a scoping review intended to map and systematize the field rather than to conduct a formal quality appraisal or meta-analytic synthesis, its conclusions are primarily descriptive and integrative.

Second, the generalizability of the findings is constrained by sample characteristics. Several studies relied on relatively small samples, particularly the multiple case series (Study 4) and the single-case experimental design (Study 5). Limited sample sizes reduce statistical power and increase the likelihood of unstable effect estimates, thereby restricting the robustness and external validity of the results. In addition, participants in Studies 3-5 were predominantly Spanish, highly educated adults from relatively homogeneous cultural backgrounds, many of whom had prior experience with contemplative practices. These demographic characteristics limit the extent to which the findings can be generalized to more diverse cultural, educational, and age groups.

Third, the dissertation primarily examines the short-term experiential effects of the Ripple experience rather than potential long-term transformations. Across the empirical studies, the outcomes mainly capture immediate changes following the

induction. Although Studies 3 and 5 included follow-up assessments several days after the VR experience, the overall temporal scope of the research designs remains limited. Consequently, the findings predominantly reflect transient experiential states rather than enduring transformations in self-experience that might unfold over longer timeframes, such as months or through sustained practice. Accordingly, the extent to which the observed effects translate into more stable, trait-level changes in self-related processes cannot be determined within the scope of the present designs.

4. Potential Implications and Future Directions

4.1. Theoretical implications

The findings of this doctoral dissertation contribute to ongoing debates in contemplative science, consciousness research, and self-theory by offering an empirically grounded and conceptually integrated account of selflessness. Taken together, these contributions yield four main theoretical implications.

First, the dissertation contributes to reducing epistemological fragmentation in the study of selflessness by clarifying its structure and specifying its core dimensions. Study 2 systematized diverse theoretical perspectives within a multidimensional framework grounded in the pattern theory of selflessness (Berkovich-Ohana et al., 2024) and the integrative model proposed by Canby et al. (2024). The subsequent empirical investigations (Studies 3 to 5) offered convergent support for this multidimensional architecture across contemplative, experimental, and clinical contexts. By grounding the construct in identifiable and empirically supported dimensions, this framework provides a clearer ontological foundation for cumulative research.

Second, the dissertation advances a theoretically grounded multimethod framework for assessing selflessness. By integrating validated psychometric instruments (e.g., NADA, Hanley et al., 2018), pictographic measures (e.g., MPI, Delia et al., 2025), ecological momentary approaches, and micro-phenomenological interviews, the empirical program shows that selflessness cannot be adequately captured through a single operationalization. Instead, different methods access complementary dimensions of experience. This approach contributes to a more rigorous methodological paradigm for investigating complex alterations in self-experience.

Third, the dissertation repositions compassion practices as structured methods for inducing alterations in self-experience, rather than merely as techniques for enhancing prosocial affect. The findings indicate that practices such as Tonglen can modify core dimensions of the self-pattern. These results support the view that compassion and selflessness are dynamically coupled, as previously suggested by several authors (Gilbert & Van Gordon, 2023; Hanley et al., 2017; Condon & Makransky, 2020). Specifically, compassion practices may actively trigger reconfigurations of the self, and these reconfigurations, in turn, reinforce relational orientation and prosocial engagement.

Fourth, the results extend embodiment theories and contemporary consciousness research by demonstrating that immersive VR can systematically modulate core dimensions of self-experience under controlled conditions. Studies 3 to 5 show that technologically mediated alterations in bodily representation can induce experiential configurations consistent with selflessness, in line with previous findings reported by Glowacki et al. (2020, 2022). Theoretically, these findings open a research program in which technologically mediated environments function as laboratories for investigating the mechanisms underlying transformations of self-experience across contemplative science, cognitive neuroscience, and psychology.

4.2. Clinical Implications

The findings of this doctoral dissertation further highlight several clinically relevant implications concerning the induction and application of selflessness in both contemplative and healthcare settings.

First, the application of immersive VR in contemplative contexts suggests that such interventions may enhance meditative experience and facilitate access to deeper states that might otherwise require extended training. This opens the possibility of integrating Ripple into structured contemplative programs, such as meditation retreats, as a complementary method for experiential training. Moreover, it could also be incorporated into contemplative-based psychotherapeutic approaches (e.g., mindfulness-based or compassion-based interventions), where immersive contemplative experiences may deepen experiential engagement and potentially enhance therapeutic outcomes.

Second, the Ripple VR experience may have important implications for emerging psychedelic research. Specifically, Ripple could be used prior to psychedelic administration as a preparatory or exploratory tool, allowing researchers to examine how

individuals respond to alterations in self-experience within a controlled and reversible environment before exposure to more intense pharmacologically induced states. Such preparatory applications may help characterize individual variability in responses to selflessness-related phenomena and contribute to safer and more personalized psychedelic interventions.

Third, the results support the feasibility, acceptability, and safety of VR-induced selflessness in oncology populations. The Ripple intervention was well tolerated and associated with improvements in spiritual well-being and transpersonal connectedness, dimensions that are particularly salient for individuals facing life-threatening illness (Puchalski et al., 2019; McLouth et al., 2024; Stripp et al., 2025; Riba et al., 2019). These findings indicate that VR-induced selflessness may represent a viable supportive care tool within psycho-oncology settings.

Finally, these findings also suggest that selflessness may operate as a transdiagnostic mechanism capable of modulating rigid self-patterns implicated in several mental health problems, such as depression, anxiety, trauma-related distress, or existential suffering, as indicated by recent literature (Giommi et al., 2023; Van Gordon et al., 2015; Sys et al., 2024; Lamas-Morales et al., 2025). By attenuating maladaptive self-focused narratives and fostering relational modes of experience, structured selflessness-induction protocols such as Ripple may contribute to increased psychological flexibility and adaptive functioning. Although further empirical validation is required, the present work provides preliminary empirical support and establishes a conceptual and methodological foundation for incorporating selflessness-based interventions into clinical contexts.

4.3. Future directions

Building on the theoretical and empirical findings presented in this doctoral dissertation, several directions for future research emerge. These avenues aim to consolidate the scientific study of selflessness, refine its methodological investigation, and expand its clinical and translational applications.

First, further theoretical refinement of the construct of selflessness remains necessary. Although recent integrative models (Berkovich-Ohana et al., 2024; Canby et al., 2024), together with the present dissertation, have provided important conceptual clarity, additional work is required to harmonize terminology across contemplative science, clinical psychology, and neuroscience. Future research should move toward

consensus-driven operational definitions, standardized multidimensional assessment batteries, and shared taxonomies that reduce jingle-jangle fallacies and support cumulative knowledge. Cross-cultural investigations will be particularly important for examining how different assumptions about the nature of the self shape both the phenomenology and interpretation of selfless experiences.

Second, longitudinal and process-oriented designs should be prioritized to examine the transition from state to trait selflessness. While the present work demonstrates the induction of transient selfless states through Tonglen meditation and immersive VR, it remains unclear under what conditions repeated exposure to such states may lead to more enduring reconfigurations of the self-pattern, as proposed by the PTSL (Berkovich-Ohana et al., 2024). Longitudinal studies incorporating repeated VR sessions would allow researchers to evaluate whether temporary self-pattern reorganizations stabilize over time and generalize across contexts. Such designs would also clarify potential dose-response relationships between frequency, intensity, and long-term psychological change.

Third, future investigations should further integrate first-person and third-person methodologies within a rigorous neurophenomenological framework. Although the present thesis combines phenomenological interviews with quantitative measures, future studies could systematically pair fine-grained experiential reports with neurophysiological indices (e.g., EEG, fMRI, heart rate variability) during VR-induced selflessness. This approach would facilitate the identification of neural and autonomic correlates associated with specific experiential dimensions, contributing to a more precise mechanistic understanding of how self-pattern reconfigurations unfold across experiential, cognitive, and physiological levels.

Fourth, the scalability and clinical translation of VR-based selflessness interventions require systematic evaluation. Ripple represents a promising tool capable of inducing selfless states under controlled and ethically robust conditions. However, randomized controlled trials with larger and more diverse clinical samples are needed to assess efficacy across diagnostic categories. Moreover, future research should explore the integration of selflessness-inducing VR experiences within structured psychotherapeutic frameworks. Rather than functioning as standalone interventions, immersive experiences such as Ripple may serve as experiential catalysts embedded within established modalities (e.g., compassion-focused therapy, acceptance-based approaches, meaning-

centered psychotherapy). Careful investigation of preparation and integration protocols will be essential to maximize therapeutic benefit and ensure psychological safety, particularly in vulnerable populations.

In summary, future research should progress along three interconnected axes: (1) advancing theoretical and mechanistic understanding of selflessness; (2) refining multimethod and neurophenomenological assessment strategies; and (3) expanding safe, scalable, and clinically grounded applications of VR-based selflessness interventions. Through these efforts, the study of selflessness may evolve from an exploratory field into a mature, integrative, and translational area of research capable of bridging contemplative traditions, immersive technologies, and clinical practice.

5. General Conclusions

This doctoral dissertation advances a comprehensive scientific understanding of selflessness. Across five interconnected studies, it clarifies the conceptual landscape of the construct, refines its assessment through a multimethod framework, demonstrates the feasibility of inducing selflessness-related states through Tonglen meditation and immersive virtual reality, and examines the applicability of VR-induced selflessness in both contemplative and oncology contexts. Collectively, these investigations lead to the following main conclusions:

1. Tonglen meditation constitutes a viable contemplative method for inducing state-level experiential shifts consistent with selflessness. The mixed-methods randomized controlled trial showed that Tonglen practice produces reliable experiential changes during exposure to suffering, including increased embodied resonance and reduced self-focused internal dialogue. These shifts align with core dimensions of selflessness and are directly relevant to compassion-based responding.

2. Selflessness can be conceptualized as a multidimensional and dynamic reconfiguration of self-experience. By integrating contemporary theoretical models with empirically grounded dimensional frameworks, this thesis reduces conceptual fragmentation and supports an understanding of selflessness as coordinated alterations across interrelated experiential dimensions rather than as a unitary state.

3. The scientific study of selflessness requires a multimethod assessment strategy. The scoping review and subsequent empirical studies converge in demonstrating that no single instrument adequately captures the complexity of selflessness. Rigorous investigation therefore requires the integration of psychometrically validated self-report measures, non-verbal pictographic tools, and phenomenological interviews, enabling triangulation between quantified state changes and fine-grained first-person descriptions.

4. Immersive VR (Ripple) provides a feasible, acceptable, and scalable method for experimentally inducing selflessness-related states under controlled conditions. Across studies, Ripple reliably elicited experiential configurations consistent with selflessness and enhanced interpersonal connectedness, while maintaining high acceptability and minimal adverse effects. As a non-pharmacological and standardizable induction method, Ripple addresses key limitations of traditional approaches, such as extended contemplative training requirements or pharmacological constraints, and offers a practical platform for systematic experimentation on self-experience.

5. VR-induced selflessness exhibits a coherent phenomenological structure and may extend beyond the acute session into processes of experiential integration. Phenomenological and temporal analyses indicate that VR-induced selflessness is not merely a transient state but a structured experience with identifiable profiles and dynamics. Post-session shifts were observed in everyday experience, with awe and enhanced self-understanding emerging as consistent indicators of integration.

6. Ripple demonstrates applied value within contemplative settings by deepening subsequent meditation practice. When implemented in a retreat context, Ripple appeared to function as an experiential catalyst, increasing the intensity and depth of subsequent meditation sessions, including greater imagery absorption and vividness, immersion, and perceived meaningfulness. These findings support the integration of VR-induced selflessness into contemplative environments as a complementary technological resource.

7. Ripple demonstrates clinical potential in oncology settings by improving spiritual well-being and relational openness. It was feasible, acceptable, and well tolerated

in this vulnerable population, underscoring its potential within frameworks that emphasize existential integration and spiritual care. In this sense, Ripple may serve as a valuable complement to symptom-focused psycho-oncological interventions.

In conclusion, this research demonstrates that selflessness can be clearly defined, rigorously measured, reliably induced, and meaningfully applied across general and clinical populations. By validating a scalable VR-based induction paradigm, it establishes a reproducible framework for studying selflessness with greater methodological precision and accessibility. These contributions lay the foundation for a cumulative and clinically relevant science of selflessness that bridges contemplative practice, immersive technology, and clinical psychology.

CHAPTER VI. SUMMARY IN VALENCIAN / RESUM EN VALENCIÀ

1. Introducció

1.1. El Concepte del S*elflessness*

El sentit del jo forma part essencial de l'experiència humana; de fet, la pregunta «qui soc jo?» ha ocupat un lloc central en la història del pensament humà. Des de les primeres reflexions de la filosofia clàssica fins als debats contemporanis en ciències cognitives, la naturalesa del jo ha estat objecte d'un interès persistent (p. ex., Olson, 1999; Parfit, 1984; Dainton, 2011; Dennett, 1992). Ara bé, nombroses tradicions i disciplines del coneixement també han descrit sistemàticament experiències en què aquest sentit del jo es veu atenuat, transformat o fins i tot dissolt temporalment (p. ex., Anālayo, 2003; Albahari, 2010; Siderits et al., 2011). En la literatura contemporània, aquest tipus d'experiències s'engloben sovint sota el terme de *selflessness* (que es mantindrà en anglès en aquest treball perquè no té un equivalent unívoc en valencià i és la denominació predominant en la literatura científica). Aquest concepte ha estat present en la psicologia des dels seus primers fonaments (James, 1890; Neisser, 1988; Damasio, 1999), però en les últimes dècades ha rebut una atenció acadèmica creixent. La present tesi doctoral s'inscriu dins d'aquest camp en desenvolupament i examina el *selflessness* en la seua totalitat, incloent-ne la conceptualització, l'avaluació, la inducció i la possible rellevància clínica.

Per comprendre què és el *selflessness*, el primer pas és establir un model coherent del jo. En la ciència contemporània, els debats han superat les concepcions substancialistes que concebien el jo com una entitat fixa i permanent, i cada vegada més, el jo és presentat com un procés dinàmic i multidimensional (p. ex., Varela, 1999; Metzinger, 2004, 2024). Entre aquests enfocaments recents, el treball de Shaun Gallagher proporciona un marc especialment influent. En el seu model inicial, Gallagher (2000) proposa que el jo està format per dues dimensions: el jo mínim, la sensació pre-reflexiva de subjectivitat que implica un sentit immediat de propietat, agència i perspectiva en primera persona; i el jo narratiu, que implica la identitat autobiogràfica sustentada per processos cognitius com el pensament auto-referencial i la imaginació futura. Desenvolupaments posteriors d'aquest autor conflueixen en l'anomenada teoria dels patrons del jo (Gallagher, 2013; Gallagher et al., 2024), que conceptualitza el jo com un patró emergent i dinàmicament organitzat que sorgeix de la interacció contínua entre processos corporals, afectius, cognitius, socials i ecològics. Segons aquest enfocament, el

jo no és reductible a cap domini únic ni és fix, sinó sensible al context i dinàmicament modificable. Aquesta perspectiva integradora proporciona el principal marc teòric de la present tesi doctoral.

1.1.1 Models Científics del Selflessness

En els darrers anys, la recerca empírica i teòrica sobre el *selflessness* ha experimentat un notable desenvolupament, donant lloc a diversos models orientats a aclarir-ne els mecanismes subjacents i a delimitar-ne les dimensions experiencials que el componen. El *selflessness* s'ha conceptualitzat tant com un tret com un estat. Els enfocaments orientats al tret el descriuen com un mode de funcionament relativament estable caracteritzat per una menor centralitat del jo i una major interdependència (Dambrun & Ricard, 2011; Wayment & Bauer, 2018; Soler et al., 2021).

Els enfocaments orientats a l'estat, per contra, es centren en alteracions transitòries del sentit ordinari del jo. Alguns models descriuen el *selflessness* principalment com una reducció del processament auto-referencial, com en les nocions d'estat hipoegoic (Leary et al., 2006) o de processament experiencial sense jo (Hadash et al., 2016). Altres models el conceptualitzen com un mode qualitativament distint de consciència en què el sentit de ser un subjecte delimitat i separat s'atenua o es dissol temporalment. Entre aquests s'inclouen constructes com el mode de consciència sense jo (Dor-Ziderman et al., 2013), la consciència no referencial (Tagini & Raffone, 2010), la consciència no dual (Dunne, 2011; Hanley et al., 2018), la dissolució de l'ego (Millière et al., 2018), les experiències d'auto-transcendència (Yaden et al., 2017) i l'experiència fenomènica mínima (Metzinger, 2004, 2024). Tenint en compte aquests diferents marcs teòrics, el *selflessness* pot entendre's com una família d'experiències caracteritzades per diversos graus d'atenuació del sentit del jo al llarg de diferents dimensions que apareixen de manera recurrent en els models descrits, incloent-hi la cognició auto-referencial, la consciència corporal (p. ex., propietat, agència o localització espacial) i el sentit de connexió amb altres persones o amb el món.

Com mostra la literatura actual, s'utilitzen múltiples termes i marcs teòrics per descriure experiències amb característiques fenomenològiques similars, fet que posa de manifest una manca de consens epistemològic i terminològic al voltant del concepte de *selflessness* i en dificulta el progrés científic (Britton et al., 2021).

1.1.2. Models Actuals Integradors

Amb l'objectiu de superar aquesta dificultat conceptual, dos models recents proposen enfocaments integradors complementaris. En primer lloc, basant-se en la teoria dels patrons del jo, Berkovich-Ohana et al. (2024) proposen una teoria dels patrons del *selflessness*, que el conceptualitza com una reorganització sistemàtica del patró del jo caracteritzada per canvis en el pes relatiu i les interrelacions dels processos que el constitueixen. Des d'aquesta perspectiva, les experiències de *selflessness* s'entenen com a estats en què els processos narratius i de reificació del jo s'atenuen o se suspenen temporalment, mentre que altres aspectes del patró del jo – com la consciència prereflexiva o el funcionament corporitzat – es mantenen operatius. Aquest model redueix l'ambigüitat conceptual en oferir un marc unificat que integra explícitament les dimensions prèviament identificades com a centrals en aquestes experiències. A més, conceptualitza el *selflessness* al llarg d'un continu que va des d'estats experiencials transitoris – caracteritzats per una atenuació temporal dels processos relacionats amb el jo – fins a trets més duradors que reflecteixen l'estabilització progressiva d'aquestes reconfiguracions. Així, una major flexibilitat del patró del jo i una menor identificació amb les estructures narratives i avaluatives esdevenen característiques estables del funcionament de l'individu en diferents contextos.

Complementant aquest enfocament teòric, Canby et al. (2024) desenvolupen un marc empíric orientat a identificar les dimensions experiencials del *selflessness*. El seu model descriu cinc dominis que inclouen setze característiques potencialment presents en aquestes experiències. Entre aquestes s'hi troben: (1) canvis en els límits corporals i en el sentit d'unitat; (2) alteracions en processos centrals relacionats amb el jo, com la disminució del sentit de propietat i d'agència; (3) formes més inespecífiques de pèrdua del jo (per exemple, canvis en la percepció personal de l'espai); (4) característiques fenomenològiques associades a aquest tipus d'experiències, com la sensació de rendició o entrega, la percepció sobtada de comprensió espiritual, l'augment de la sensació de confiança, les distorsions temporals i la inefabilitat; i (5) components afectius que reflecteixen tant valència emocional positiva com negativa.

En conjunt, aquests enfocaments suggereixen que el *selflessness* és un fenomen multidimensional i heterogeni que implica alteracions coordinades en diverses dimensions de l'experiència del jo, més que no pas un únic esdeveniment unitari.

1.2. L'Avaluació del *Selflessness*

La investigació científica del *selflessness* requereix no sols claredat conceptual, sinó també mètodes adequats per a la seua avaluació sistemàtica. Tanmateix, aquest fenomen planteja dos reptes principals des del punt de vista metodològic. En primer lloc, el *selflessness* sovint es descriu com a inefable – és a dir, difícil d'expressar mitjançant el llenguatge – ja que implica aspectes prereflexius de l'experiència, com ara canvis en els límits corporals, en el sentit de propietat o en l'agència (Dambrun, 2016; Hanley & Garland, 2019; Canby et al., 2024). En segon lloc, els models recents conceptualitzen el *selflessness* com un fenomen multidimensional, cosa que requereix instruments capaços de captar múltiples aspectes del funcionament relacionat amb el jo, en lloc de reduir el fenomen a una única dimensió (Berkovich-Ohana et al., 2024; Canby et al., 2024).

Malgrat aquests reptes, s'han desenvolupat diversos enfocaments per a la seua avaluació. Els estudis quantitatius utilitzen habitualment qüestionaris d'autoinforme com *l'Ego Dissolution Inventory* (EDI; Nour et al., 2016), l'*Ego Dissolution Scale* (EDS; Sleight et al., 2023) i el *Nondual Awareness Dimensional Assessment* (NADA; Hanley et al., 2018). També s'han introduït instruments pictogràfics per disminuir la dependència del llenguatge verbal explícit, incloent-hi ítems que avaluen la dissolució dels límits corporals, la interconnexió amb els altres i la perspectiva espacial (Aron et al., 1992; Dambrun, 2016; Hanley & Garland, 2019). En aquest context, el nostre grup de recerca ha desenvolupat recentment el *Meditation Pictographic Inventory* (MPI; Delia et al., 2025), un instrument de 23 ítems dissenyat per avaluar, mitjançant pictogrames, múltiples dimensions experiencials associades a la pràctica meditativa. El MPI és especialment adequat per investigar el *selflessness*, ja que permet captar diverses dimensions experiencials rellevants per a aquest constructe d'una manera no narrativa, abordant així les dues principals limitacions en la seua avaluació.

Més enllà de les mesures d'autoinforme, un nombre limitat de tasques conductuals s'han utilitzat per investigar el *selflessness* en condicions controlades de laboratori (Hadash et al., 2016; Kelley et al., 2002; Sui et al., 2012). Ara bé, aquests mètodes tendeixen a operacionalitzar-lo de manera relativament restringida, centrant-se principalment en el processament autoreferencial i deixant de banda altres dimensions que el conformen. Finalment, les entrevistes fenomenològiques proporcionen un enfocament qualitatiu que permet obtenir descripcions detallades en primera persona de l'experiència viscuda, cosa que possibilita examinar dinàmiques experiencials subtils que

poden romandre inaccessibles mitjançant qüestionaris estandarditzats (Petitmengin, 2006; Giorgi et al., 2017; Olivares et al., 2015).

En conjunt, l'avaluació del *selflessness* es veu dificultada pel seu caràcter inefable i multidimensional. Els diferents enfocaments disponibles – qüestionaris, instruments pictogràfics, tasques conductuals i entrevistes fenomenològiques – ofereixen cadascun un accés parcial a aquest complex fenomen.

1.3. La Inducció del Selflessness

A més de la seua conceptualització i avaluació, la investigació empírica del *selflessness* requereix mètodes d'inducció fiables. Històricament, diverses tradicions espirituals i filosòfiques han desenvolupat tècniques orientades a cultivar aquesta experiència, especialment pràctiques de meditació i l'ús de substàncies psicodèliques. Més recentment, la realitat virtual s'ha proposat com una nova eina experimental per a induir estats relacionats amb el *selflessness* en condicions controlades.

1.3.1. La Meditació

La meditació és una forma d'entrenament mental destinada a potenciar capacitats psicològiques com el control atencional i la regulació emocional (Tang et al., 2015). En la literatura científica contemporània, aquestes pràctiques solen classificar-se en tres grans famílies: pràctiques atencionals, constructives i deconstructives (Dahl et al., 2015). Tot i que difereixen en els seus mecanismes i objectius immediats, les tres categories s'han associat amb l'aparició d'experiències relacionades amb el *selflessness* (Lutz et al., 2015; Fredrickson et al., 2008). Dins d'aquest marc de pràctiques contemplatives, la present tesi se centra en Tonglen, una meditació de compassió que pertany a les pràctiques constructives i que s'ha seleccionat pel seu potencial per a induir *selflessness*.

La compassió es defineix com la resposta que sorgeix en presenciar el sofriment d'altres i que motiva el desig d'alleujar-lo (Goetz et al., 2010). Les meditacions basades en la compassió cultiven la capacitat de reconèixer el sofriment, ressonar-hi emocionalment, tolerar el malestar que genera i sentir-se motivat a alleujar-lo (Strauss et al., 2016). És important destacar que la compassió i el *selflessness* semblen processos estretament relacionats. A mesura que la compassió augmenta, els límits percebuts entre un mateix i els altres tendeixen a suavitzar-se, fet que facilita experiències de *selflessness*. De manera inversa, les experiències de *selflessness* poden ampliar la capacitat per a una compassió més inclusiva i incondicional (Gilbert & Van Gordon, 2023).

Meditació Tonglen per a Induir Selflessness. Dins d'aquesta família de pràctiques, Tonglen és una meditació de compassió en què els practicants visualitzen que reben el sofriment d'un altre durant la inhalació – sovint simbolitzat com un fum fosc – i que envien alleujament i benestar durant l'exhalació, generalment imaginats com llum o aire fresc. La recerca empírica suggereix que aquesta pràctica pot produir beneficis psicològics rellevants. En particular, Tonglen s'ha associat amb increments en la compassió, l'afecte positiu, la implicació empàtica i el benestar general, així com amb millores en marcadors fisiològics relacionats amb la implicació social (Pardy, 2016; McKnight, 2012; Gilbert et al., 2023; Mah et al., 2020; Andreu et al., 2025b).

Més enllà d'aquests beneficis, la meditació Tonglen s'ha descrit tradicionalment com una pràctica orientada a reduir l'autocentrament i a cultivar el *selflessness* (Chödrön, 1994). Mitjançant aquest procés de rebre el sofriment dels altres i oferir alleujament, els practicants desenvolupen gradualment una comprensió experiencial de la naturalesa compartida del sofriment i de la interdependència entre el jo i els altres (Drolma, 2019; Jinpa, 2011). En consonància amb aquesta perspectiva, investigacions microfenomenològiques recents mostren que els practicants experimentats poden entrar en un mode no dual d'experiència compassiva caracteritzat per una reducció dels límits entre un mateix i els altres, una disminució del control basat en l'esforç i l'emergència d'un camp atencional obert i expansiu (Andreu et al., 2025a).

En conjunt, els antecedents conceptuals, empírics i fenomenològics suggereixen que Tonglen pot induir *selflessness* no sols a través del cultiu de la compassió, sinó també mitjançant una transformació més profunda de l'experiència del jo. Aquesta doble capacitat el converteix en un mètode especialment adequat per a la investigació experimental i per a la inducció del *selflessness*.

1.3.2. Les Substàncies Psicodèliques

Les substàncies psicodèliques han sigut investigades com una altra via per a induir estats de *selflessness*. Tot i la seua gran riquesa i heterogeneïtat fenomenològica, un nombre creixent d'evidències indica la seua capacitat per a induir la dissolució de l'ego induïda per drogues (Millière, 2017).

La recerca mostra que psicodèlics clàssics com la psilocibina (Griffiths et al., 2008, 2011), l'LSD (Lyvers & Meester, 2012) i la DMT (Trichter et al., 2009) poden produir una reducció de la consciència autoreferencial i un difuminament dels límits entre

el jo i el món. Efectes similars també s'han descrit amb altres substàncies, com l'òxid nitrós (James, 1882) i la ketamina (Vollenweider & Kometer, 2010).

Des d'una perspectiva científica, aquests estats constitueixen una via experimental per a investigar alteracions en l'experiència del jo, ja que poden ser induïts i mesurats en condicions controlades (p. ex., Irrmischer et al., 2026; Timmermann, 2025). A més, en entorns clínics controlats, els psicodèlics han mostrat un potencial terapèutic significatiu, fet que ha contribuït al desenvolupament de la psicoteràpia assistida amb psicodèlics (Leary et al., 1964; Grof, 1980; Lewis et al., 2023).

1.3.3. Limitacions dels Mètodes Tradicionals d'Inducció

Malgrat el seu ús històric per a induir *selflessness*, tant la meditació com les substàncies psicodèliques presenten limitacions per a la investigació empírica. La meditació pot produir canvis profunds en l'experiència del jo, però sovint requereix una pràctica prolongada i mostra una gran variabilitat entre individus, fet que en dificulta la inducció fiable en contextos experimentals (Lindahl & Britton, 2019; Lindahl et al., 2017; Lutz et al., 2007). Les substàncies psicodèliques poden induir aquest tipus d'experiències en entorns controlats, però són agents farmacològics que poden provocar efectes adversos i estan subjectes a una regulació legal estricta que en limita l'ús en investigació (Studerus et al., 2010; Barrett et al., 2016; Breeksema et al., 2022; Schlag et al., 2022).

En conjunt, aquestes limitacions assenyalen la necessitat d'alternatives experimentalment viables i èticament robustes. En aquest context, la realitat virtual (RV) ha emergit com un mètode prometedor per a induir i estudiar experiències alterades del jo en condicions controlades.

1.3.4. La Realitat Virtual com a Nova Eina Experimental

La RV ofereix característiques tecnològiques que la fan especialment adequada per a induir estats relacionats amb el *selflessness* en condicions experimentals controlades. En particular, permet modificar la representació corporal i evocar emocions autotranscendents.

Mitjançant la substitució del cos físic per un cos virtual, els usuaris poden experimentar un fort sentit d'encarnació (*embodiment*), que inclou la localització del jo, la propietat corporal i l'agència (Longo et al., 2008; Kilteni et al., 2012; Slater et al., 2009). La manipulació d'aquests components pot generar il·lusions corporals intenses i alterar l'experiència del jo, com ara canvis en la propietat corporal, desplaçaments en la

localització del jo o alteracions de l'agència (Blanke & Metzinger, 2009; Amato et al., 2019; Chirico et al., 2018; Knibbe et al., 2018; Turbyne et al., 2021). A més, la RV pot evocar emocions autotranscendents com la compassió. Els paradigmes de RV encarnada permeten als usuaris habitar el cos d'una altra persona, fet que pot intensificar la implicació afectiva a través d'una experiència directa en primera persona (Navarrete et al., 2021) i reforçar pràctiques contemplatives orientades al cultiu de la compassió (Cebolla et al., 2019; Halim et al., 2023; Žilinský & Halamová, 2023).

A partir d'aquestes possibilitats, Glowacki i col·laboradors han desenvolupat entorns immersius dissenyats específicament per a evocar *selflessness* (Glowacki et al., 2020, 2022). La seua estètica numadèlica representa el cos com un camp dinàmic i lluminós amb límits difusos, fet que suavitza les fronteres corporals habituals i promou una atenuació del sentit del jo (Glowacki, 2024). Aquest enfocament es va implementar en l'experiència multiusuari de RV *Isness*, que ha demostrat la seua capacitat per a induir estats d'atenuació del jo i de connexió interpersonal (Glowacki et al., 2020, 2022).

Més recentment, aquests autors han desenvolupat *Ripple*, una experiència immersiva de RV que combina l'encarnació numadèlica amb la pràctica contemplativa de la meditació Tonglen. En integrar Tonglen dins d'un entorn de RV, *Ripple* pretén amplificar la inducció de *selflessness*. La investigació empírica i l'aplicació clínica de *Ripple* constitueixen el focus central d'aquesta tesi doctoral, i el seu disseny i implementació es descriuen detalladament en el Capítol III (Mètodes), especialment en l'Estudi 3.

1. 4. El Potencial Terapèutic del *Selflessness*

Les seccions precedents han abordat la conceptualització, l'avaluació i la inducció del *selflessness*, emmarcant aquest constructe dins de la literatura científica. Sobre aquesta base, la present secció examina el seu possible valor terapèutic i la seua rellevància clínica.

Diverses línies d'evidència suggereixen que el *selflessness* pot contribuir al benestar psicològic. Tradicions filosòfiques i contemplatives l'han considerat històricament una via cap al desenvolupament humà i la felicitat (Anālayo, 2003; Olendzki, 2006; Gallagher et al., 2024). En consonància amb aquesta perspectiva, diversos models contemporanis proposen una relació estreta entre la reducció de la

centralitat del jo i el benestar psicològic (Dambrun & Ricard, 2011; Wayment & Bauer, 2018; Soler et al., 2021; Dunne, 2011; Hanley et al., 2018; Yaden et al., 2017).

La recerca empírica també dona suport a aquesta relació. Estudis sobre meditació indiquen que l'atenuació dels processos autoreferencials constitueix un mecanisme clau dels beneficis de les pràctiques contemplatives (Britton et al., 2021; Lin et al., 2018). De manera similar, la investigació en psicodèlics assenyala que les experiències relacionades amb el *selflessness* són predictors importants d'efectes psicològics positius (Griffiths et al., 2008; Orłowski et al., 2022; Kałużna et al., 2022; Zeifman et al., 2025). En conjunt, aquests resultats suggereixen que el *selflessness* pot constituir una via transversal cap al benestar psicològic.

En conclusió, encara que la investigació clínica és encara emergent, algunes evidències indiquen que el cultiu de formes ben regulades de *selflessness* pot actuar com un mecanisme terapèutic, associant-se amb millores en la regulació emocional, la flexibilitat psicològica i el benestar general (Van Gordon et al., 2015; Giommi et al., 2023; Sys et al., 2024; Lamas-Morales et al., 2025).

1.4.1. El Potencial Terapèutic del Selflessness en la Població Oncològica

Entre les poblacions clíniques que podrien beneficiar-se especialment d'intervencions orientades al *selflessness* es troben les persones amb càncer. El diagnòstic de càncer constitueix un esdeveniment altament estressant que afecta no sols la salut física, sinó també el benestar psicològic i espiritual (Zare et al., 2019). De fet, més del 40% dels pacients oncològics compleixen criteris per a almenys un trastorn mental (Mitchell et al., 2011; Amiri, 2024). Tanmateix, les intervencions dirigides a millorar el benestar psicològic – i especialment l'espiritual – continuen sent limitades, malgrat el seu paper central en la qualitat de vida i l'adaptació a la malaltia en aquests pacients (Puchalski et al., 2019; McLouth et al., 2024; Riba et al., 2019; Stripp et al., 2025).

En aquest context, investigacions recents indiquen que les teràpies assistides amb psicodèlics poden reduir significativament l'ansietat i la depressió, i millorar el benestar psicològic i espiritual en pacients oncològics (Griffiths et al., 2008, 2011, 2016; Johnson et al., 2008, 2014; Agin-Liebes et al., 2020; Ross, 2018; Ross et al., 2016, 2022; Lewis et al., 2023; Shnayder et al., 2023). De manera rellevant, diversos estudis suggereixen que les experiències de *selflessness* juguen un paper central en aquests efectes terapèutics (Millière, 2017; Roseman et al., 2018). No obstant això, la seua implementació a gran

escala continua limitada per restriccions legals i mèdiques (Barrett et al., 2016; Breeksema et al., 2022; Kettner et al., 2025).

Per aquest motiu, resulta necessari desenvolupar intervencions alternatives que permeten induir *selflessness* de manera segura i escalable. En aquest sentit, la RV immersiva representa una plataforma prometedora. Evidències preliminars indiquen que intervencions de RV basades en l'estètica numadèlica poden millorar l'ansietat, la depressió, la connexió interpersonal i el benestar espiritual en pacients amb malalties greus, inclòs el càncer (Kettner et al., 2025). En aquest context, l'experiència de RV *Ripple* – dissenyada per a induir *selflessness* en condicions immersives i controlades – podria constituir una eina terapèutica escalable per a traslladar aquests beneficis a la pràctica clínica.

2. Objectius

Malgrat els avanços recents, la investigació científica del *selflessness* continua presentant importants limitacions, especialment pel que fa a la seua claredat conceptual, als mètodes d'avaluació i inducció i a la seua possible rellevància clínica. En aquest context, l'objectiu general d'aquesta tesi doctoral és avançar cap a una comprensió científica més integral del *selflessness*.

Per a assolir aquest propòsit, la tesi examina la inducció del *selflessness* mitjançant la meditació Tonglen, n'afina la conceptualització i l'avaluació, i investiga una experiència immersiva de RV (*Ripple*) que integra aquesta pràctica com una nova aproximació metodològica per a facilitar-ne la inducció controlada i l'estudi científic tant en contextos contemplatius com clínics. Amb aquesta finalitat, s'estableixen els següents objectius específics:

1. Aprofundir en la comprensió de la meditació Tonglen i dels seus efectes sobre la resposta dels professionals sanitaris davant el sofriment, amb especial atenció als canvis en dimensions experiencials associades al *selflessness*.
2. Identificar, sistematitzar i sintetitzar críticament els principals enfocaments teòrics i mètodes d'avaluació utilitzats actualment per a estudiar el *selflessness*, amb l'objectiu de proposar un marc multimètode coherent per a la seua investigació científica.
3. Avaluar l'eficàcia, la viabilitat i l'acceptabilitat d'una experiència immersiva de RV (*Ripple*), basada en la pràctica contemplativa de la meditació Tonglen i

dissenyada específicament per a induir *selflessness* en condicions experimentals controlades.

4. Examinar l'aplicació de *Ripple* en un context contemplatiu, avaluant els seus efectes sobre l'experiència meditativa dels participants en el context naturalista d'un retir contemplatiu.
5. Examinar l'aplicació de *Ripple* en un context clínic, amb l'objectiu d'aprofundir en la comprensió del *selflessness* induït mitjançant RV en una població oncològica, incloent-ne les característiques fenomenològiques, la dinàmica temporal i la possible rellevància clínica.

3. Mètodes i Resultats

3.1. Estudi 1. Transcendir l'Autocentrament: Un Assaig Controlat Aleatoritzat amb Mètodes Mixtos sobre la Meditació Tonglen en Professionals Sanitaris

Malgrat l'evidència prèvia que ha caracteritzat l'estructura experiencial i els efectes psicològics de la pràctica de Tonglen (McKnight, 2012; Pardy, 2016; Mah et al., 2020; Gilbert et al., 2023; Andreu et al., 2025a, 2025b), la recerca continua sent limitada i encara no s'ha examinat de manera sistemàtica com aquesta pràctica és percebuda i experimentada subjectivament per practicants no experts. Aquesta qüestió resulta especialment rellevant en entorns professionals amb una elevada exposició al sofriment, com és el cas de l'àmbit sanitari (Nembhard et al., 2023). A més, les respostes davant el sofriment estan configurades per processos fenomenològics prereflexius que habitualment queden fora de l'abast de les mesures estandarditzades d'autoinforme (Martínez-Pernía et al., 2023, 2025; Petitmengin, 2017). Per aquest motiu, es fa necessari adoptar aproximacions metodològiques integradores.

En aquest context, l'Estudi 1 tenia com a objectiu desenvolupar una comprensió més profunda de la pràctica de Tonglen i examinar els efectes d'un entrenament de dues setmanes sobre les respostes dels professionals sanitaris davant el sofriment humà. Amb aquesta finalitat, l'estudi perseguia tres objectius complementaris: (1) investigar com Tonglen modula les respostes emocionals davant el sofriment a nivell experiencial mitjançant una tasca conductual i entrevistes fenomenològiques; (2) avaluar si aquest entrenament breu s'associava amb canvis en la compassió com a tret, mesurada

mitjançant instruments estandarditzats; i (3) aprofundir en la comprensió de la pràctica de Tonglen analitzant les experiències subjectives dels participants durant la meditació mitjançant una entrevista semiestructurada realitzada al final del període d'entrenament.

L'estudi va adoptar un disseny d'assaig controlat aleatoritzat amb mètodes mixtos amb professionals sanitaris (p. ex., infermers, metges o psicòlegs clínics) reclutats a través d'hospitals i institucions sanitàries. Després d'un cribratge inicial (N = 159), 60 participants que complien els criteris d'inclusió van ser assignats aleatòriament al grup de meditació Tonglen o al grup control, i 47 van completar el protocol de dues setmanes (Tonglen: n = 25; control: n = 22). La mostra final estava formada majoritàriament per dones (80.9%), amb edats compreses entre 26 i 63 anys (M = 39.81; SD = 9.75). A més, el 85.1% dels participants reportaven experiència prèvia en meditació i el 61.7% mantenien una pràctica regular.

Els participants van assistir a dues sessions de laboratori separades per dues setmanes. En cada sessió van completar qüestionaris d'autoinforme sobre els nivells de compassió com a tret (SOCS-O i CMAS; Gu et al., 2020; Steindl et al., 2021) i una tasca conductual. Aquesta tasca consistia en la visualització de vídeos breus que mostraven situacions de sofriment humà, després dels quals els participants valoraven la seua experiència emocional (p. ex., empatia, tristesa, ira, afecte positiu, disposició a ajudar) mitjançant escales d'autoinforme (Socio-Affective Video Task, SoVT; Klimecki et al., 2013, 2014). A continuació, es realitzava una entrevista fenomenològica centrada en l'experiència subjectiva dels participants durant l'exposició al sofriment. Després de la primera sessió, el grup experimental va realitzar una meditació guiada de Tonglen de 15 minuts diàriament durant dues setmanes, mentre que el grup control va escoltar un relat neutral sense instruccions de pràctica posterior. En la segona sessió es van repetir les mesures i es va realitzar una entrevista semiestructurada addicional per explorar l'experiència dels participants amb la pràctica de Tonglen.

Pel que fa al primer objectiu – investigar com Tonglen modula les respostes emocionals davant el sofriment –, els resultats de les mesures d'autoinforme de la SoVT van mostrar que els participants del grup Tonglen van reportar nivells més elevats d'empatia (F(1, 42) = 8.52, p = .01, ges = .04) i de tristesa (F(1, 42) = 6.08, p = .02, ges = .03) després de la intervenció, mentre que no es van observar canvis comparables en el grup control. Respecte als resultats fenomenològics, es van identificar tres dimensions experiencials principals: ressonància corporal, perspectiva del diàleg intern i motivació

prosocial. Després de la intervenció, els participants del grup Tonglen van mostrar un increment significatiu de la ressonància corporal (p = .002), manifestat a través de sensacions somàtiques més intenses i vívides davant el sofriment d'altres persones. Paral·lelament, es va observar una reducció significativa del diàleg intern centrat en un mateix durant l'exposició al sofriment (p = .034). En conjunt, aquests canvis reflecteixen dimensions experiencials associades al *selflessness*.

Pel que fa al segon objectiu – avaluar els efectes de la pràctica en la compassió com a tret –, l 'entrenament de dues setmanes en meditació Tonglen no es va associar amb canvis significatius en la compassió en comparació amb el grup control. Les puntuacions totals i les subescales del SOCS es van mantenir estables al llarg del temps en ambdós grups (F(1, 39) = 0.62, p = .44, *ges* = .00). De manera similar, tampoc es van observar canvis significatius en les puntuacions totals ni en les subescales del CMAS (F(1, 39) = 1.55, p = .22, *ges* = .01). En conjunt, aquests resultats indiquen que la intervenció no va produir canvis mesurables en la compassió com a tret segons les mesures estandarditzades d'autoinforme.

Finalment, el tercer objectiu buscava aprofundir en la comprensió de la pràctica de Tonglen mitjançant l'anàlisi de les experiències subjectives dels participants durant la meditació. Les entrevistes semiestructurades van permetre analitzar amb més detall com els participants no experts experimentaven i s'implicaven en la pràctica de la meditació Tonglen. Els participants van descriure una major connexió amb el sofriment dels altres, caracteritzada per una sensibilitat més gran, una acceptació sense judici i sentiments de tendresa i compassió. A més, van reportar una major consciència de les pròpies sensacions corporals, un increment de l'autocompassió i experiències de calma, serenitat i alleujament psicològic després de la pràctica.

En conclusió, l'Estudi 1 de la present tesi doctoral va contribuir a aprofundir en la comprensió de la pràctica de Tonglen i dels patrons experiencials que s'hi associen en una població especialment exposada al sofriment dels altres. En particular, els resultats indiquen que aquesta pràctica va produir canvis en diverses dimensions experiencials centrals del *selflessness*, fet que suggereix el seu potencial per al cultiu d'aquest estat.

3.2. Estudi 2. Cap a Una Ciència del *Selflessness*: Una Revisió d'Abast de la Literatura sobre Mètodes d'Avaluació i Perspectives Teòriques

El concepte de *selflessness* ha estat present en la psicologia des dels seus inicis (James, 1890; Neisser, 1988; Damasio, 1999), però en les darreres dècades ha rebut una atenció creixent que ha impulsat el desenvolupament de diversos models teòrics per aclarir aquest fenomen. Propostes recents, com la de Canby et al. (2024), han intentat formular marcs integradors i identificar les dimensions comunes del constructe. No obstant això, encara no existeix un consens epistemològic ni terminològic clar sobre la seua definició (Canby et al., 2024; Britton et al., 2021).

L'estudi científic del *selflessness* requereix, a més d'una conceptualització precisa, el desenvolupament de mètodes fiables per a la seua avaluació. En aquest sentit, s'han emprat diverses aproximacions metodològiques, tant quantitatives com qualitatives (p. ex., Nour et al., 2016; Sleight et al., 2023; Hadash et al., 2016). Tanmateix, cap estudi havia examinat de manera sistemàtica el conjunt d'aquests mètodes ni la seua qualitat metodològica. Per abordar aquesta limitació, l'Estudi 2 realitza una revisió d'abast amb l'objectiu d'identificar els mètodes existents d'avaluació del *selflessness* i analitzar com aquest constructe ha estat conceptualitzat en la literatura empírica.

La revisió es va realitzar seguint les directrius PRISMA-ScR (Tricco et al., 2018). Es van incloure estudis que descrivien el desenvolupament o la validació psicomètrica d'escales, tasques conductuals o entrevistes fenomenològiques destinades a mesurar el *selflessness* o constructes afins, i es van excloure aquells que no estaven disponibles en anglès o que no informaven sobre el desenvolupament d'instruments d'avaluació. La cerca bibliogràfica es va dur a terme en Web of Science, Scopus, PubMed i PsycINFO mitjançant combinacions de termes relacionats amb *selflessness* i instruments de mesura. La cerca inicial es va realitzar al juliol de 2023 i es va actualitzar al novembre de 2024, incloent també literatura grisa per reduir possibles biaixos de publicació.

El procés de selecció va consistir en un cribratge de títols i resums seguit de la revisió completa dels textos elegibles, realitzat de manera independent per dos revisors. Les discrepàncies es van resoldre per consens fins a assolir un acord del 90%, utilitzant la plataforma Hubmeta. La cerca va identificar 23,606 articles, als quals es van afegir 36 registres procedents de cerques manuals; finalment, després del procés d'elegibilitat, es van incloure 23 estudis. L'extracció de dades es va centrar en les característiques dels

estudis, la conceptualització del *selflessness* i els mètodes d'avaluació utilitzats (escales d'autoinforme, tasques conductuals i entrevistes fenomenològiques), així com en les propietats psicomètriques dels instruments – validesa de contingut, validesa estructural, validesa de criteri, consistència interna i fiabilitat – avaluades segons les directrius COSMIN (Mokkink et al., 2010; Terwee et al., 2018).

Pel que fa a les característiques generals dels estudis, la revisió d'abast va identificar tres modalitats principals d'avaluació: escales d'autoinforme (n = 12), tasques conductuals (n = 3) i entrevistes fenomenològiques (n = 8). Les mesures d'autoinforme incloïen qüestionaris complets (n = 4), subescales integrades en instruments més amplis (n = 5) i escales pictogràfiques (n = 3). La majoria dels estudis (n = 18) es van publicar després de 2010. La recerca es va dur a terme principalment als Estats Units (n = 9) i a Israel (n = 5), amb altres estudis realitzats en diversos països europeus. Les mostres oscil·laven entre investigacions qualitatives de cas únic i estudis basats en qüestionaris amb fins a 1,602 participants (N = 1–1,602). Les poblacions estudiades incloïen estudiants universitaris (n = 7), mostres de població general (n = 7) i meditadors de llarga trajectòria (n = 6). En la majoria dels estudis, les dones representaven la major part dels participants.

Pel que fa a la conceptualització del *selflessness*, aquest constructe es va operacionalitzar predominantment com un estat (n = 18). Les conceptualitzacions com a tret apareixien només en una minoria d'estudis, incloent tres instruments d'autoinforme (Sleight et al., 2023; Butlein, 2006; Kohls & Walach, 2006) i un estudi basat en entrevistes fenomenològiques (Lindström et al., 2023). En conjunt, els estudis mostraren una notable variabilitat terminològica i conceptual en la manera de definir el *selflessness*. Quan es van examinar d'acord amb el model proposat per Canby et al. (2024), es va observar que les mesures d'autoinforme avaluaven principalment les següents dimensions: la unitat amb totes les coses (n = 8), la pèrdua del jo (*self-loss*; n = 7), la disminució dels límits corporals amb altres persones (n = 6) i la disminució dels límits corporals amb objectes (n = 6). Per la seua banda, les tasques conductuals mesuraven la disminució del sentit de propietat i d'agència; mentre que els estudis fenomenològics examinaven dimensions experiencials com la disminució dels límits del jo, la propietat, l'agència, la pèrdua del jo i la pèrdua del sentit del temps i de l'espai. En conjunt, aquests resultats indiquen que el *selflessness* es va operacionalitzar mitjançant múltiples dimensions experiencials diferenciades, més que a través d'un únic indicador.

Finalment, es van analitzar les característiques dels instruments d'avaluació identificats. Pel que fa a les escales d'autoinforme – incloent qüestionaris complets (Nour et al., 2016; Sleight et al., 2023; Hanley et al., 2018; Butlein, 2006), subescales integrades en instruments més amplis (Dittrich et al., 2010; Kohls & Walach, 2006; Hood, 1975; MacLean et al., 2012; Yaden et al., 2019) i escales pictogràfiques (Dambrun, 2016; Aron et al., 1992; Hanley & Garland, 2019) –, aquestes generalment no complien els estàndards psicomètrics establerts per les directrius COSMIN (Mokkink et al., 2010; Terwee et al., 2018). Tot i que sovint es reportaven nivells acceptables de consistència interna, altres propietats de mesura essencials, com la validesa de contingut, la validesa estructural, la validesa de criteri i la fiabilitat test-retest, eren sovint insuficientment examinades o directament no es reportaven.

Les tasques conductuals (Hadash et al., 2016; Kelley et al., 2002; Sui et al., 2012) també es trobaven poc desenvolupades en aquest camp, amb un nombre molt limitat d'estudis disponibles. A més, aquests paradigmes tendien a operacionalitzar el *selflessness* de manera molt restringida, sovint equiparant-lo a alteracions en la cognició autoreferencial. Els enfocaments fenomenològics per a l'avaluació del *selflessness* eren igualment escassos. La majoria dels estudis existents es basaven principalment en preguntes obertes dins d'un marc neurofenomenològic (Dor-Ziderman et al., 2013; Berkovich-Ohana, 2017; Fingelkurts et al., 2020, 2022), i només tres estudis van utilitzar metodologies qualitatives més sistemàtiques, com les entrevistes microfenomenològiques (Ataria et al., 2015; Nave et al., 2021; Lindström et al., 2023).

Malgrat aquestes limitacions, els resultats d'aquesta revisió suggereixen alguns mètodes especialment adequats per a l'avaluació del *selflessness*. Entre els qüestionaris d'autoinforme, el NADA (Hanley et al., 2018) i l'EDS (Sleight et al., 2023) van mostrar el suport psicomètric més sòlid, mentre que entre les mesures pictogràfiques el SFoRC (Hanley & Garland, 2019) va destacar com l'instrument amb propietats psicomètriques més robustes. Atès el caràcter complex i sovint inefable del *selflessness*, els instruments pictogràfics semblen especialment adequats per a la seua avaluació, ja que poden facilitar l'accés a dimensions experiencials difícils d'expressar verbalment. A més, es recomana complementar les mesures quantitatives amb entrevistes fenomenològiques, que permeten explorar amb més profunditat l'experiència subjectiva. Finalment, els resultats suggereixen la necessitat d'integrar diferents modalitats d'avaluació per captar adequadament la naturalesa multidimensional del *selflessness*.

En conjunt, aquests resultats van servir com a marc de referència per a la investigació del *selflessness* en els estudis posteriors d'aquesta tesi, orientant la conceptualització del constructe i la selecció dels mètodes d'avaluació pertinents.

3.3. Estudi 3. La Inducció del *Selflessness* a Través d'una Experiència de Realitat Virtual: Un Estudi Preliminar

Tradicionalment, la meditació i les substàncies psicodèliques han estat els principals mètodes utilitzats per induir experiències de *selflessness* (p. ex., Lindahl & Britton, 2019; Millière, 2017). Tanmateix, la meditació sol requerir una pràctica prolongada per assolir aquests estats, mentre que els psicodèlics presenten limitacions legals i possibles efectes adversos (Dor-Ziderman et al., 2013; Ataria et al., 2015; Breeksema et al., 2022). En aquest context, la RV ha emergit com una eina prometedora per induir experiències relacionades amb el *selflessness* de manera ètica, sistemàtica i controlada.

En aquesta línia, Glowacki i col·laboradors han desenvolupat Ripple, una experiència multiusuari de RV dissenyada específicament per induir estats de *selflessness* (Glowacki et al., 2020, 2022; Glowacki, 2024). Aquest entorn integra la pràctica contemplativa de Tonglen que, tal com es va mostrar en l'Estudi 1, pot generar canvis experiencials associats al *selflessness*. En Ripple, els elements de respiració i visualització propis de la meditació Tonglen es tradueixen en interaccions corporals i multisensorials dins d'un entorn immersiu, amb l'objectiu de potenciar la inducció d'aquesta experiència. En aquest marc, l'Estudi 3 de la present tesi doctoral ofereix una avaluació preliminar de l'acceptabilitat i dels efectes d'una única sessió de Ripple sobre el *selflessness* i els estats afectius associats.

L'estudi va comptar amb 56 voluntaris, amb una distribució de gènere equilibrada (50% dones), edats entre 23 i 53 anys ($M = 33.13$, $SD = 8.64$) i una proporció considerable de participants amb experiència prèvia en meditació (67.9%). Els criteris d'inclusió requerien tindre 18 anys o més i comprendre l'anglès, ja que l'experiència de RV es presentava en aquesta llengua. Es van excloure les persones amb antecedents neurològics o psiquiàtrics per motius de seguretat. Les sessions experimentals es van dur a terme en un laboratori de la Universitat de València i van seguir un format grupal amb quatre participants i un facilitador entrenat. Cada sessió, d'aproximadament 90 minuts, incloïa tres fases: l'avaluació basal, l'experiència de RV Ripple amb dispositius Meta Quest 2 i

l'avaluació posterior. Ripple consistia en un recorregut immersiu d'uns 50 minuts estructurat en tres fases: preparació, sessió central de RV, i fase final d'integració i reflexió (per a una descripció més detallada, vegeu el Capítol III d'aquesta tesi doctoral).

Les variables avaluades abans i després de l'experiència de RV van ser les següents. En primer lloc, per mesurar les diferents dimensions del *selflessness*, es van utilitzar mesures pictogràfiques, incloent-hi els límits corporals (PBBS; Dambrun, 2016), la ubicació espacial del jo (SFoRC; Hanley i Garland, 2019), la fusió interpersonal, l'atenuació del jo (*small self effect*) i la intensitat i la duració del diàleg autoreferencial (aquestes tres darreres dimensions es van avaluar mitjançant ítems *ad hoc*). Igualment, la connexió interpersonal amb el grup també es va mesurar mitjançant una mesura pictogràfica (IOS; Aron et al., 1992). A més, es van administrar qüestionaris d'autoinforme per mesurar els estats afectius (HAAS; Roca et al., 2023), les experiències místiques (MEQ-30; MacLean et al., 2012), la satisfacció amb l'experiència (Wrzesien i Alcañiz, 2010) i possibles efectes adversos (*ad hoc*). Finalment, una setmana després de la sessió presencial, es va avaluar l'aparició d'experiències intenses (*peak experiences*) com ara moments d'*insight*, amor o gratitud intensa (PMES; Hadash et al., 2024).

Els resultats indicaren que la participació en l'experiència de Ripple es va associar amb indicadors de *selflessness* al llarg de múltiples dimensions. En particular, els histogrames de les puntuacions dels ítems pictogràfics després de l'experiència de RV mostraren nivells moderats o elevats de dissolució dels límits corporals percebuts, expansió del marc espacial de l'autoconsciència, fusió amb la parella, atenuació del jo i una reducció en la intensitat i la duració del diàleg autoreferencial. Els participants també reportaren un increment significatiu en la connexió interpersonal amb altres membres del grup de RV entre el moment previ i posterior a l'experiència Ripple ($F(1, 53) = 66.11$, $p < .001$, $\eta^2 = .55$). A més, la sessió es va associar amb increments significatius en l'afecte positiu de baixa activació, com ara la calma i la serenitat ($F(1, 47) = 13.59$, $p < .001$, $\eta^2 = .22$), així com en els sentiments de calidesa ($F(1, 47) = 13.05$, $p < .001$, $\eta^2 = .21$). En contrast, l'afecte positiu d'alta activació i l'afecte negatiu mostraren disminucions significatives després de l'experiència.

Adicionalment, un subconjunt rellevant de participants va reportar experiències místiques durant la sessió de RV. Segons els criteris establerts (Barrett et al., 2015), el 13.2% dels participants va assolir el llindar per a una experiència mística completa. A més, es van observar associacions significatives entre les dimensions de *selflessness* i les

experiències místiques. En concret, l'atenuació del jo i la fusió amb altres es correlacionaren positivament amb les quatre subescales del MEQ-30 ($p < .01$). Igualment, les anàlisis de regressió lineal múltiple identificaren l'atenuació del jo com un predictor significatiu de les puntuacions en dos aspectes clau de les experiències místiques: la subescala mística ($t = 2.71$, $p = 0.01$) i la subescala de transcendència del temps i l'espai ($t = 2.45$, $p = 0.018$).

Pel que fa a les *peak experiences*, els resultats mostren que una proporció substancial de participants va reportar haver experimentat vivències intenses durant la setmana posterior a la sessió de Ripple. Entre les més freqüents destaquen els moments d'insight (28.2 %), els sentiments intensos de gratitud (25.6 %), un anhel profund cap als altres (20.5 %) i les experiències extraordinàries d'amor i compassió (17.9 %). En general, aquestes experiències es caracteritzaren per un to hedònic predominantment positiu. Tanmateix, l'anhel intens fou descrit en alguns casos com a desagradable (33 % dels participants que reportaren aquesta experiència).

Finalment, l'experiència de RV fou àmpliament acceptada i ben tolerada en la mostra de població general, amb puntuacions elevades de satisfacció i nivells baixos d'efectes adversos. Aquests, quan es produïren, foren lleus i poc freqüents, i consistiren principalment en molèsties físiques transitòries i en dificultats puntuals per a comprendre la guia auditiva.

En conclusió, els resultats preliminars suggereixen que Ripple pot facilitar experiències de *selflessness* i promoure una major connexió interpersonal. Aquestes experiències s'associen amb un increment de l'afecte positiu de baixa activació (p. ex., calma i calidesa), així com amb la generació d'experiències de tipus místic en una proporció significativa de participants. A més, una setmana després de la sessió, els participants reportaren experiències subjectivament intenses, com *insights* i sentiments de gratitud, anhel i amor, fet que suggereix una possible persistència dels efectes més enllà del context immediat de la intervenció.

3.4. Estudi 4. El Selflessness Induït per Realitat Virtual i els seus Efectes sobre l'Experiència Meditativa: Un Estudi Preliminar de Sèrie de Casos Múltiples

L'Estudi 3 de la present tesi doctoral (Vidal et al., 2025) va demostrar que Ripple, una experiència de RV multiusuari, és una eina prometedora per a la inducció controlada, segura i efectiva d'estats de *selflessness*. No obstant això, l'estudi presentava limitacions relacionades amb la comprensió de l'àudio en anglès i amb molèsties físiques derivades de les ulleres de RV. Per tal d'abordar-les, el contingut es va traduir al castellà i es van incorporar ulleres Oculus Quest 3, més lleugeres i amb un disseny més ergonòmic. A més, es va introduir una segona innovació metodològica: el *Meditation Pictographic Inventory* (MPI; Delia et al., 2025), un instrument no verbal basat en pictogrames que permet avaluar amb major precisió les dimensions del selflessness. Paral·lelament, la literatura indica que la RV pot potenciar aspectes clau de l'experiència meditativa, com ara la immersió, el significat percebut, l'absorció imaginativa i la vividesa de la imatge mental, amb possibles efectes sostinguts sobre la pràctica posterior (Seabrook et al., 2020; Baños et al., 2004; Navarrete et al., 2021; Palacios et al., 2026).

En conjunt, aquests antecedents van justificar la rellevància d'un segon estudi pilot dirigit a avaluar els efectes d'una versió refinada de Ripple sobre l'experiència meditativa en un context naturalista de retir contemplatiu. Els objectius foren: (1) replicar els efectes sobre el *selflessness* i les experiències de tipus místic; (2) comparar les qualitats experiencials de la meditació en tres fases – pre-RV, RV i post-RV – mitjançant mesures pictogràfiques repetides; i (3) analitzar els canvis en immersió, significat percebut i capacitat d'imaginació abans i després de la inducció.

L'estudi es va realitzar amb una mostra de 27 participants (28–70 anys; $M = 50.59$; $SD = 9.14$) que assistiren a un retir contemplatiu residencial. La mostra estava composta majoritàriament per dones (70.4%), d'origen caucàsic (92.6%) i amb estudis universitaris. Tots els participants presentaven experiència prèvia en meditació (2–10 anys; $M = 4.48$). La participació fou voluntària i es va obtenir el consentiment informat de tots els participants abans de l'inici de la recollida de dades. Al llarg del retir (del 7 al 9 de novembre de 2025), que s'inscrivia en el programa d'Entrenament en Benestar Basat en Pràctiques Contemplatives (Cebolla i Alvear, 2019), es dugueren a terme sessions guiades de meditacions atencionals i generatives.

Es va adoptar un disseny exploratori de sèrie de casos múltiples amb mesures repetides. La recollida de dades es va estructurar en tres fases: (1) sessions de meditació prèvies a la RV, (2) la inducció amb Ripple, i (3) sessions de meditació posteriors a la RV. Després de cada sessió de meditació i de l'experiència de RV, els participants completaren un diari estructurat de pràctica, que incloïa el MPI (Delia et al., 2025) i quatre ítems d'autoinforme destinats a avaluar la immersió, el significat percebut, l'absorció imaginativa i la vividesa de la imatge mental. Addicionalment, exclusivament després de l'experiència de RV, s'administraren mesures d'estat de *selflessness* (NADA-S; Hanley et al., 2018) i d'experiències de tipus místic (MEQ-30; MacLean et al., 2012). Aquest disseny de mesures repetides va permetre examinar tant els efectes immediats de la inducció en RV com les possibles modificacions en les característiques de les experiències meditatives abans i després de l'exposició.

Pel que fa al primer objectiu, orientat a replicar els resultats previs de l'Estudi 3 (Vidal et al., 2025), els resultats d'aquest estudi indicaren una inducció significativa de *selflessness* ($t = -8.10$, $p < .001$, $d = 1.56$), així com un increment substancial en la proporció de participants que informaren d'una experiència mística completa. En concret, aquesta proporció augmentà del 13.2% en l'Estudi 3 al 48.1% en el present estudi pilot.

El segon objectiu tenia com a finalitat caracteritzar els perfils experiencials al llarg de diferents fases mitjançant mesures pictogràfiques repetides, comparant l'experiència meditativa abans i després de l'exposició a la RV, així com durant la inducció en RV. Els resultats mostraren que l'experiència Ripple s'acompanyà d'increments en múltiples dimensions afectives (calidesa, emocions positives, compassió, autocompassió i inefabilitat), relacionals (connexió interpersonal i connexió amb el planeta), corporals (atenuació dels límits corporals i expansió de l'autoconsciència) i temporals (desaparició del temps) relacionades amb el selflessness. A més, les comparacions entre les sessions de meditació realitzades abans i després de l'exposició a la RV revelaren efectes de continuïtat (*carryover*) sobre l'experiència meditativa posterior. En concret, les meditacions posteriors a la RV es caracteritzaren per nivells més elevats d'afecte positiu i prosocial, incloent-hi la calidesa i la compassió, així com per una major alteració temporal i una major inefabilitat en relació amb les meditacions prèvies a la RV. En conjunt, aquests resultats suggereixen que la modulació experiencial observada durant la inducció en RV es va estendre a la pràctica contemplativa posterior.

Pel que fa al tercer objectiu, s'examinaren els canvis en la immersió, el significat percebut, l'absorció imaginativa i la vividesa de la imatge mental. Les comparacions indicaren que les meditacions posteriors mostraren increments significatius en totes quatre dimensions en comparació amb les meditacions prèvies a la RV, amb canvis més pronunciats en l'absorció imaginativa (t = 5.07, p < .001, d = 1.08), la vividesa de la imatge mental (t = 4.20, p < .001, d = 0.90) i la immersió (t = 5.12, p < .001, d = 1.04), mentre que el significat percebut mostrà canvis relativament més modestos (t = 3.25, p < .001, d = 0.66).

En conjunt, els resultats indiquen que l'experiència Ripple pot aplicar-se de manera efectiva en un context contemplatiu, induint de forma robusta estats de *selflessness* i modulant la intensitat i la profunditat de la pràctica meditativa posterior. Addicionalment, l'estudi contribueix a una caracterització més precisa de les dimensions experiencials associades al *selflessness*.

3.5. Estudi 5. Una Caracterització Integral del *Selflessness* en Realitat Virtual: Fenomenologia, Dinàmiques Temporals i Rellevància Clínica en Pacients Oncològics

Actualment, marcs teòrics convergents i evidència preliminar assenyalen la rellevància clínica del *selflessness*, proposat com a mecanisme transdiagnòstic de canvi psicològic (Van Gordon et al., 2015; Giommi et al., 2023; Sys et al., 2024; Lamas-Morales et al., 2025). En aquest context, la població oncològica emergeix com un àmbit d'aplicació especialment pertinent, atès que estudis previs han documentat reduccions significatives en símptomes d'ansietat i depressió, així com millores en el benestar psicològic i espiritual associades a la inducció d'estats vinculats al *selflessness*. Aquestes troballes provenen principalment d'intervencions amb psicodèlics (Griffiths et al., 2016; Lewis et al., 2023; Ross et al., 2016, 2022; Shnayder et al., 2023; Roseman et al., 2018), si bé més recentment també s'han començat a documentar en un paradigma de RV (Kettner et al., 2025).

En aquest marc emergent, Ripple es presenta com una eina especialment rellevant, atesa la seua capacitat per induir de manera fiable estats relacionats amb el *selflessness* en mostres no clíniques (Estudis 3 i 4); tanmateix, persisteixen llacunes importants, especialment pel que fa a la seua caracterització fenomenològica i al seu impacte al llarg del temps. En conseqüència, el present estudi investiga la viabilitat, la fenomenologia, la

dinàmica temporal i la rellevància clínica del *selflessness* induït per RV en persones amb càncer. Específicament, es proposa: (1) avaluar la viabilitat i acceptabilitat de Ripple, així com la seua eficàcia proximal per induir estats de *selflessness* en persones amb càncer; (2) caracteritzar l'experiència subjectiva del *selflessness* mitjançant l'anàlisi de la seua fenomenologia viscuda, combinant mesures pictogràfiques i entrevistes microfenomenològiques en profunditat; (3) examinar el desplegament temporal del *selflessness* després de la seua inducció mitjançant l'avaluació ecològica momentània (*Ecological Momentary Assessment*; EMA); i (4) analitzar si la seua inducció s'associa amb canvis en la simptomatologia clínica, el benestar psicològic i espiritual i la percepció de connexió.

L'estudi va incloure persones adultes amb diagnòstic oncològic i accés a telèfon intel·ligent, que van donar el seu consentiment informat. Es van excloure aquelles persones amb trastorns mentals greus o amb condicions mèdiques que dificultaren la participació. Els participants es van reclutar a través de xarxes socials i centres sanitaris i, després del procés de selecció, la mostra final va estar formada per 17 persones (33–63 anys; $M = 51.12$), majoritàriament dones (88.2%) i amb estudis universitaris (70.5%). La majoria presentava càncer de mama ($n = 12$). Es va utilitzar un disseny experimental de cas únic amb línies base múltiples, en què la durada de la fase basal (8–15 dies) es va assignar de manera aleatòria abans de la intervenció amb RV, seguida d'un període postintervenció fins al dia 21.

El procediment va combinar mesures multimètode per abordar els objectius de l'estudi. Durant la sessió presencial al laboratori de la Universitat de València, abans i després de la sessió de RV, es van administrar escales d'autoinforme per avaluar el nivell de *selflessness* (NADA-S; Hanley et al., 2018) i les seues dimensions fenomenològiques (MPI; Delia et al., 2025), així com els estats afectius (HAAS; Roca et al., 2023), juntament amb mesures d'acceptabilitat i efectes adversos. A més, es van dur a terme entrevistes microfenomenològiques en profunditat per caracteritzar l'experiència viscuda. D'altra banda, per analitzar la dinàmica temporal, es va implementar un protocol d'EMA, amb 10 ítems i dues avaluacions diàries durant 21 dies, orientat a captar els següents processos psicològics: sobrecolliment (*awe*), autocomprensió, pau, compassió (cap als altres), autocompassió, sentit vital, connexió interpersonal, gratitud, benestar psicològic i malestar psicològic. Finalment, per avaluar canvis clínics, es van administrar mesures pre i post-intervenció de simptomatologia psicològica (BSI-18; Derogatis,

2001), benestar mental (MHC-SF; Keyes, 2009), benestar espiritual (FACIT-SP; Peterman et al., 2002) i connexió percebuda (WCS; Watts et al., 2022), mitjançant instruments estandarditzats i validats.

Pel que fa al primer objectiu, els resultats convergeixen amb els d'investigacions prèvies (Estudis 3 i 4) i els amplien, mostrant que Ripple és capaç d'induir de manera fiable estats pronunciats de *selflessness* ($t = 10.47$, $p < .001$, $d = 2.54$), acompanyats d'un augment de l'afecte positiu de baixa activació ($t = 5.46$, $p < .001$, $d = 1.32$) i de la calidesa ($t = 8.12$, $p < .001$, $d = 1.97$), així com d'una reducció de l'afecte negatiu. De manera rellevant, aquests efectes es van associar amb nivells molt elevats d'acceptabilitat i una baixa incidència d'efectes adversos, tal com indiquen les puntuacions mitjanes altes de satisfacció i les baixes puntuacions en efectes adversos, cosa que suggereix que Ripple és una intervenció atractiva i ben tolerada en una població clínicament vulnerable.

El segon objectiu consistia a caracteritzar l'experiència subjectiva del *selflessness* mitjançant l'anàlisi de la seua fenomenologia viscuda, integrant mesures pictogràfiques (MPI; Delia et al., 2025) i entrevistes micro-fenomenològiques. Els resultats de les mesures pictogràfiques van mostrar increments significatius en diverses dimensions, incloent-hi l'afecte relacional (calidesa, compassió i autocompassió), la connexió interpersonal, l'atenuació dels límits corporals percebuts i l'expansió de la consciència del jo. A nivell fenomenològic, l'experiència es va caracteritzar per un conjunt de categories interrelacionades, com ara canvis en l'afectivitat corporitzada, transformacions en les dimensions corporal i narrativa del jo, variacions en la qualitat i direcció de la connexió, modificacions del diàleg intern, canvis en els modes de presència i l'aparició de tendències a l'acció. A més, l'anàlisi de la configuració temporal de l'experiència va permetre descriure'n el desplegament en tres fases successives: una fase inicial d'adaptació, un canvi en la presència i una dissolució del jo. Dins d'aquest marc temporal, es van identificar dues estructures experiencials diferenciades, enteses com a maneres coherents de viure el *selflessness*: la dissolució del jo en els altres i la dissolució del jo en el tot.

El tercer objectiu d'aquest estudi era examinar l'evolució temporal del *selflessness* després de la seua inducció. Els resultats de l'EMA suggereixen que el *selflessness* induït per RV podria haver contribuït a canvis sistemàtics en l'experiència quotidiana dels participants. La majoria va mostrar efectes positius en múltiples dimensions, indicant transformacions àmplies – i en molts casos robustes – en la qualitat de l'experiència

diària, amb l'emergència d'experiències intenses de pau, compassió, sentit vital i gratitud, entre altres. Entre les variables analitzades, el sentiment de sobrecolliment o meravella (*awe*) i l'autocomprensió van ser les més consistentment afectades (amb nombrosos participants amb Tau-U ≥ 0.60), mentre que la pau, el sentit vital i la compassió també van presentar efectes predominantment positius, tot i amb major variabilitat interindividual. En canvi, els canvis en el malestar psicològic van ser més modestos i menys consistents (Tau-U = −0.30 a −0.70), cosa que suggereix que la intervenció té un impacte més gran en les variables positives.

El quart objectiu era avaluar l'impacte de l'experiència en variables clíniques. Al llarg del període de 21 dies, les comparacions pre–post van mostrar increments significatius i robustos en el benestar espiritual ($t = 4.77$, $p < .001$, $d = 1.16$), incloent-hi dimensions com el sentit, la pau i la fe. Així mateix, la connexió percebuda amb el món també va augmentar de manera significativa ($t = 2.56$, $p = .021$, $d = 0.62$). En conjunt, aquests resultats suggereixen que la rellevància clínica de la intervenció en aquesta mostra es reflecteix principalment en resultats d'ordre existencial-espiritual i en un augment de la connexió transcendental.

En conclusió, aquest estudi amplia la comprensió del *selflessness* induït per RV mitjançant la seua caracterització fenomenològica, la seua dinàmica temporal i la seua rellevància clínica en persones amb càncer. Els resultats mostren que Ripple indueix de manera fiable experiències de *selflessness* estructurades i amb una evolució dinàmica, caracteritzades per perfils experiencials diferenciats i canvis consistents en l'experiència quotidiana. De manera rellevant, la intervenció es va mostrar viable, ben tolerada i associada a beneficis existencials i espirituals significatius, fet que en destaca el potencial com a intervenció contemplativa clínicament rellevant en contextos oncològics.

4. Conclusions

En aquesta tesi doctoral s'han dissenyat i desenvolupat un total de cinc estudis, per a cadascun dels quals s'han detallat el marc teòric, els objectius, la metodologia, els resultats i les discussions específiques. Les principals conclusions són les següents:

1. La meditació Tonglen es consolida com un mètode contemplatiu viable per a la inducció del *selflessness*. L'assaig controlat aleatoritzat amb enfocament multimètode va evidenciar que la seua pràctica genera canvis experiencials consistents durant l'exposició al sofriment, caracteritzats per un augment de la

ressonància corporal i una disminució del diàleg intern auto-centrat. Aquests efectes s'alineen amb dimensions nuclears del *selflessness* i resulten especialment rellevants per a processos de resposta compassiva, reforçant així la seua validesa com a eina per a la investigació empírica d'aquest constructe.

2. El *selflessness* es pot entendre com una reconfiguració multidimensional i dinàmica de l'experiència del jo. Integrant models teòrics contemporanis, aquesta tesi contribueix a una visió més coherent del constructe, concebut com un conjunt d'alteracions coordinades en dimensions experiencials interrelacionades, més que com un estat unitari. Aquesta proposta es veu reforçada per l'evidència empírica generada en la tesi, que confirma el caràcter multidimensional d'aquesta experiència.
3. L'estudi científic del *selflessness* requereix una estratègia d'avaluació multimètode. La revisió de l'abast i els estudis empírics posteriors coincideixen a assenyalar que cap instrument per si sol captura adequadament la complexitat d'aquest constructe. Per tant, la seua investigació rigorosa requereix combinar mesures d'autoinforme validades, eines pictogràfiques i entrevistes fenomenològiques, per tal d'integrar dades quantitatives amb descripcions detallades de l'experiència en primera persona.
4. L'experiència de RV Ripple ofereix un mètode viable, acceptable i escalable per a la inducció experimental del *selflessness* en condicions controlades. Els resultats mostren que indueix de manera fiable experiències coherents amb aquest constructe, amb alta acceptabilitat i mínims efectes adversos. Aquests efectes es van replicar en tres estudis independents, en poblacions i contextos diversos, evidenciant-ne la reproductibilitat i la generalització. Com a alternativa no farmacològica i estandarditzable, Ripple supera limitacions de mètodes tradicionals i proporciona una plataforma sòlida per a l'estudi experimental del *selflessness*.
5. El *selflessness* induït per RV es caracteritza com una experiència fenomenològicament estructurada que es prolonga més enllà de la sessió immediata i es tradueix en processos d'integració experiencial en els dies posteriors. Les entrevistes fenomenològiques permeten identificar la complexitat de l'experiència, així com categories compartides i perfils experiencials diferenciats. Paral·lelament, les dades recollides mitjançant avaluació ecològica

momentània evidencien canvis consistents en la vida quotidiana, amb el sobrecolliment (*awe*) i l'autocomprensió com a marcadors centrals d'integració.

6. Ripple mostra un potencial d'aplicació en contextos contemplatius, en afavorir una major profunditat de la pràctica meditativa. En un context de retir, es va associar amb un increment de la intensitat i la qualitat de les sessions de meditació. En particular, es van observar millores en aspectes clau de l'experiència meditativa, com la immersió, el significat percebut, l'absorció imaginativa i la vividesa de la imatge mental. Aquests resultats donen suport a la integració d'experiències de RV com Ripple en entorns contemplatius com a recurs tecnològic complementari per millorar la pràctica.
7. Ripple mostra potencial terapèutic en contextos oncològics, ja que s'associa amb millores en el benestar espiritual i la connexió transpersonal dels pacients. La intervenció va resultar viable, acceptable i ben tolerada, evidenciant-ne la utilitat en contextos clínics i en poblacions vulnerables. Es van observar efectes especialment rellevants en dimensions vinculades a l'atenció espiritual i la integració existencial. En aquest sentit, Ripple pot constituir un complement valuós a les intervencions psicooncològiques centrades en la simptomatologia.

4.1. Fortaleses i Limitacions

Aquesta tesi doctoral presenta diverses fortaleses rellevants que cal considerar en la interpretació dels seus resultats i implicacions. En primer lloc, aborda un camp encara fragmentat a nivell conceptual i heterogeni des del punt de vista metodològic, contribuint a una comprensió més integrada del *selflessness* mitjançant l'anàlisi sistemàtica de la seua conceptualització, avaluació, inducció experimental i rellevància clínica. En segon lloc, destaca per l'amplitud i el rigor metodològic, ja que integra cinc estudis amb dissenys diversos – incloent una revisió d'abast, un assaig controlat aleatoritzat i dissenys experimentals –, fet que permet contrastar les hipòtesis en diferents contextos i reforçar la robustesa i la validesa ecològica dels resultats. En tercer lloc, adopta una estratègia d'avaluació multimètode que combina aproximacions quantitatives i qualitatives, integrant instruments d'autoinforme validats, mesures pictogràfiques i entrevistes fenomenològiques en profunditat, cosa que afavoreix una comprensió més completa del constructe. En quart lloc, mostra un compromís clar amb la ciència oberta i la transparència, amb estudis preregistrats, dades accessibles en repositoris digitals i resultats publicats (Vidal et al., 2025) o en procés de revisió en revistes d'alt impacte.

Finalment, la tesi presenta una forta coherència interna i un desenvolupament acumulatiu, en què cada estudi es construeix sobre l'anterior, assegurant que el refinament teòric, la clarificació metodològica i l'avaluació aplicada evolucionen de manera coordinada.

No obstant això, aquesta tesi doctoral també presenta diverses limitacions que han de ser considerades. En primer lloc, els estudis adopten dissenys de caràcter exploratori i preliminar, amb les limitacions metodològiques inherents que això comporta. En particular, els Estudis 3 a 5 es basen en investigacions pilot amb protocols de RV d'una sola sessió i sense condicions de control actives, fet que limita la inferència causal i dificulta distingir els efectes específics de la intervenció d'altres factors no específics, com les expectatives, la novetat o el context. A més, l'Estudi 2 presenta limitacions pròpies de la metodologia de revisió d'abast, ja que l'heterogeneïtat de definicions, marcs teòrics i instruments de mesura dificulta una síntesi epistemològica plenament coherent. Així mateix, el caràcter descriptiu i integrador d'aquest tipus de revisió limita l'avaluació formal de la qualitat i la síntesi quantitativa dels resultats. En segon lloc, la generalització dels resultats es veu restringida per les característiques de les mostres, sovint reduïdes – especialment en els dissenys de sèrie de casos (Estudi 4) i de cas únic (Estudi 5) – la qual cosa limita la potència estadística i la robustesa de les estimacions. A més, els participants dels Estudis 3 a 5 eren majoritàriament adults espanyols amb un nivell educatiu elevat i certa experiència prèvia en pràctiques contemplatives, fet que en limita l'extrapolació a altres poblacions més diverses. Finalment, la tesi se centra principalment en els efectes experiencials a curt termini de la inducció amb Ripple, amb un abast temporal limitat. Tot i que els Estudis 3 i 5 inclouen seguiments de diversos dies, els resultats reflecteixen principalment estats transitoris i no permeten determinar fins a quin punt aquests efectes es tradueixen en canvis més estables en l'experiència del jo al llarg del temps.

4.2. Implicacions Teòriques i Clíniques

Els resultats obtinguts en la present tesi doctoral plantegen implicacions teòriques i clíniques significatives, establint una base teòrica i aplicada per a futures investigacions.

Pel que fa a les implicacions teòriques, en primer lloc, aquesta tesi contribueix a reduir la fragmentació epistemològica del camp mitjançant la identificació de les dimensions nuclears del *selflessness* dins d'un marc multidimensional, reconegut tant per models teòrics recents com per l'evidència empírica derivada dels estudis realitzats en aquesta tesi. En segon lloc, estableix un marc d'avaluació multimètode teòricament

fonamentat, mostrant que el *selflessness* no pot ser capturat mitjançant una única mesura, sinó que requereix la integració d'instruments psicomètrics, mesures pictogràfiques i entrevistes fenomenològiques per accedir a dimensions complementàries de l'experiència del jo. En tercer lloc, reinterpreta les pràctiques de compassió com a mètodes capaços de modular dimensions centrals de l'experiència del jo, evidenciant una relació dinàmica entre compassió i *selflessness*, en què les transformacions del jo i l'orientació prosocial es reforcen entre si. Finalment, amplia les teories de la incorporació (*embodiment*) i de la consciència en demostrar que la RV immersiva pot modular de manera sistemàtica dimensions fonamentals de l'experiència del jo en condicions controlades, obrint així noves vies d'investigació en què els entorns tecnològics funcionen com a laboratoris de l'experiència del jo en els àmbits de la ciència contemplativa, la neurociència cognitiva i la psicologia.

Pel que fa a les implicacions clíniques, els resultats posen de manifest el potencial del *selflessness* tant en contextos contemplatius com sanitaris. En primer lloc, suggereixen que l'ús de la RV immersiva pot millorar l'experiència meditativa i facilitar l'accés a estats profunds que, d'altra manera, requeririen un entrenament prolongat. Això obri la possibilitat d'integrar Ripple en programes contemplatius estructurats, com ara retirs de meditació, així com en intervencions psicoterapèutiques basades en mindfulness o compassió, on podria intensificar la implicació experiencial i potenciar els resultats terapèutics. En segon lloc, Ripple podria tenir un paper rellevant en la investigació emergent amb psicodèlics com a eina preparatòria, permetent explorar de manera controlada i reversible les respostes individuals a alteracions de l'experiència del jo abans de l'exposició a estats farmacològicament induïts, contribuint així a intervencions més segures i personalitzades. En tercer lloc, els resultats avalen la viabilitat, acceptabilitat i seguretat del *selflessness* induït per RV en poblacions oncològiques, amb millores en el benestar espiritual i la connexió transpersonal, dimensions especialment rellevants en contextos de malaltia greu, fet que suggereix el seu potencial com a eina de suport en psicooncologia. Finalment, aquests resultats apunten que el *selflessness* podria operar com un mecanisme transdiagnòstic capaç de modular patrons rígids del jo implicats en diversos problemes de salut mental, com la depressió, l'ansietat o el patiment existencial, afavorint una major flexibilitat psicològica i un funcionament més adaptatiu; tot i que cal més validació empírica, aquest treball estableix una base conceptual i metodològica per a la incorporació d'intervencions basades en *selflessness* en contextos clínics.

4.3. Futures Direccions

A partir dels resultats teòrics i empírics d'aquesta tesi, s'identifiquen diverses línies futures orientades a consolidar l'estudi científic del *selflessness*, refinar-ne l'abordatge metodològic i ampliar-ne les aplicacions clíniques. En primer lloc, es fa necessari un major refinament teòric del constructe, avançant cap a definicions operatives consensuades, instruments d'avaluació multidimensionals estandarditzats i taxonomies compartides que reduïsquen la fragmentació conceptual. En aquest sentit, la investigació intercultural serà clau per comprendre com les diferents concepcions del jo influeixen en la fenomenologia i la interpretació d'aquestes experiències. En segon lloc, cal prioritzar dissenys longitudinals i orientats a processos per examinar la transició d'estats puntuals de *selflessness* cap a configuracions més estables. La incorporació de sessions repetides de RV permetria determinar si les reorganitzacions temporals del patró del jo es consoliden amb el temps i es generalitzen a diferents contextos. En tercer lloc, futures investigacions haurien d'integrar de manera més sistemàtica metodologies de primera i tercera persona dins d'un marc neurofenomenològic, combinant dades experiencials amb indicadors neurofisiològics per avançar en la comprensió dels mecanismes implicats. Finalment, resulta fonamental avaluar l'escalabilitat i la translació clínica de Ripple mitjançant assaigs controlats amb mostres clíniques més àmplies i diverses, així com explorar la seua integració en marcs psicoterapèutics establerts.

4.4. Conclusions Finals

Aquesta tesi doctoral aporta una comprensió integrada del *selflessness*, avançant de manera substancial en la seua conceptualització, avaluació, inducció i aplicació clínica. Els resultats indiquen que es tracta d'un fenomen multidimensional i dinàmic, que pot ser induït tant mitjançant pràctiques contemplatives – com la meditació Tonglen – com a través de la RV immersiva, que emergeix com una via especialment controlada, segura i replicable. A més, aquesta tesi consolida el *selflessness* com un constructe amb potencial aplicat en contextos contemplatius i clínics, amb una projecció particular en l'àmbit de la psicooncologia. En conjunt, estableix una base teòrica, empírica i metodològica sòlida per a futures investigacions i obri noves vies per a l'ús de la RV en l'estudi i la facilitació de processos de transformació de l'experiència del jo en salut mental.

CHAPTER VII. REFERENCES

Agin-Liebes, G. I., Malone, T., Yalch, M. M., Mennenga, S. E., Ponté, K. L., Guss, J., Bossis, A. P., Grigsby, J., Fischer, S., & Ross, S. (2020). Long-term follow-up of psilocybin-assisted psychotherapy for psychiatric and existential distress in patients with life-threatening cancer. *Journal of Psychopharmacology, 34*(2), 155–166. https://doi.org/10.1177/0269881119897615

Albahari, M. (2010). Nirvana and ownerless consciousness. In M. Siderits, E. Thompson, & D. Zahavi (Eds.), *Self, no self? Perspectives from analytical, phenomenological, and Indian traditions* (pp. 79–113). Oxford University Press.

Amato, E. A., Perény, E., & Berthoz, A. (2019). Subjective effects of flying with an autoscopic self-avatar in third-person perspective within an immersive mixed reality. In *Proceedings of the 32nd International Conference on Computer Animation and Social Agents (CASA '19)* (pp. 69–74). Association for Computing Machinery. https://doi.org/10.1145/3328756.3328764

Amiri, S. (2024). The prevalence of anxiety symptoms/disorders in cancer patients: A meta-analysis. *Frontiers in Psychiatry, 15*, Article 1422540. https://doi.org/10.3389/fpsyt.2024.1422540

Anālayo, B. (2003). *Satipaṭṭhāna: The direct path to realization*. Windhorse Publications.

Anderson, T., Suresh, M., & Farb, N. A. S. (2019). Meditation benefits and drawbacks: Empirical codebook and implications for teaching. *Journal of Cognitive Enhancement, 3*(2), 207–220. https://doi.org/10.1007/s41465-018-00119-y

Andreu, C. I., Navarrete, J., Roca, P., Baños, R. M., & Cebolla, A. (2022). Effects of quality practice on a compassion cultivation training: Somatic and imagery levels of analysis. *Mindfulness, 13*(12), 3070–3079. https://doi.org/10.1007/s12671-022-02013-3

Andreu, C. I., Troncoso, A., Martínez-Pernía, D., Cebolla, A., & Baquedano, C. (2025a). Experiencing active compassion: A microphenomenological study of Tonglen meditation in expert practitioners. *Mindfulness, 16*(8), 2361–2377. https://doi.org/10.1007/s12671-025-02633-5

Andreu, C. I., Vidal, J., D'Elia, Y., Lecuona, O., Baños, R. M., Brito-Pons, G., Goldin, P. R., & Cebolla, A. (2025b). Investigating the psychophysiological effects of Tonglen

compassion meditation in healthcare workers. *Mindfulness, 16*(8), 2171–2183. https://doi.org/10.1007/s12671-025-02601-z

Aron, A., Aron, E. N., & Smollan, D. (1992). Inclusion of other in the self scale and the structure of interpersonal closeness. *Journal of Personality and Social Psychology, 63*(4), 596–612. https://doi.org/10.1037/0022-3514.63.4.596

Ataria, Y. (2014). Where do we end and where does the world begin? The case of insight meditation. *Philosophical Psychology, 28*(8), 1128–1146. https://doi.org/10.1080/09515089.2014.969801

Ataria, Y., Dor-Ziderman, Y., & Berkovich-Ohana, A. (2015). How does it feel to lack a sense of boundaries? A case study of a long-term mindfulness meditator. *Consciousness and Cognition, 37*, 133–147. https://doi.org/10.1016/j.concog.2015.09.002

Baños, R. M., Botella, C., Alcañiz, M., Liaño, V., Guerrero, B., & Rey, B. (2004). Immersion and emotion: Their impact on the sense of presence. *CyberPsychology & Behavior, 7*(6), 734–741. https://doi.org/10.1089/cpb.2004.7.734

Barrett, F. S., Bradstreet, M. P., Leoutsakos, J. S., Johnson, M. W., & Griffiths, R. R. (2016). The challenging experience questionnaire: Characterization of challenging experiences with psilocybin mushrooms. *Journal of Psychopharmacology, 30*(12), 1279–1295. https://doi.org/10.1177/0269881116678781

Barrett, P., Davies, F., Zhang, Y., & Barrett, L. (2015). The impact of classroom design on pupils' learning: Final results of a holistic, multi-level analysis. *Building and Environment, 89*, 118–133. https://doi.org/10.1016/j.buildenv.2015.02.013

Baumeister, R. F., Vohs, K. D., & Funder, D. C. (2007). Psychology as the science of self-reports and finger movements: Whatever happened to actual behavior? *Perspectives on Psychological Science, 2*(4), 396–403. https://doi.org/10.1111/j.1745-6916.2007.00051.x

Berkovich-Ohana, A. (2017). A case study of a meditation-induced altered state: Increased overall gamma synchronization. *Phenomenology and the Cognitive Sciences, 16*(1), 91–106. https://doi.org/10.1007/s11097-015-9435-x

Berkovich-Ohana, A., Brown, K. W., Gallagher, S., Barendregt, H., Bauer, P., Giommi, F., Nyklíček, I., Ostafin, B., Raffone, A., Slagter, H. A., Trautwein, F.-M., Vago, D., &

Amaro, A. (2024). *Pattern theory of selflessness: How meditation may transform the self-pattern*. *Mindfulness, 15*(8), 2114–2140. https://doi.org/10.1007/s12671-024-02418-2

Blanke, O., & Metzinger, T. (2009). Full-body illusions and minimal phenomenal selfhood. *Trends in Cognitive Sciences, 13*(1), 7–13. https://doi.org/10.1016/j.tics.2008.10.003

Branney, P. E., Brooks, J., Kilby, L., Newman, K., Norris, E., Pownall, M., Talbot, C. V., Treharne, G. J., & Whitaker, C. M. (2023). Three steps to open science for qualitative research in psychology. *Social and Personality Psychology Compass, 17*(4), Article e12728. https://doi.org/10.1111/spc3.12728

Breeksema, J. J., Kuin, B. W., Kamphuis, J., van den Brink, W., Vermetten, E., & Schoevers, R. A. (2022). Adverse events in clinical treatments with serotonergic psychedelics and MDMA: A mixed-methods systematic review. *Journal of Psychopharmacology, 36*(10), 1100–1117. https://doi.org/10.1177/02698811221116926

Britton, W. B., Desbordes, G., Acabchuk, R., Peters, S., Lindahl, J. R., Canby, N. K., Vago, D. R., Dumais, T., Lipsky, J., Kimmel, H., Sager, L., Rahrig, H., Cheaito, A., Acero, P., Scharf, J., Lazar, S. W., Schuman-Olivier, Z., Ferrer, R., & Moitra, E. (2021). From self-esteem to selflessness: An evidence (gap) map of self-related processes as mechanisms of mindfulness-based interventions. *Frontiers in Psychology*, *12*, 730972. https://doi.org/10.3389/fpsyg.2021.730972

Buckner, R. L., Andrews-Hanna, J. R., & Schacter, D. L. (2008). The brain's default network: Anatomy, function, and relevance to disease. *Annals of the New York Academy of Sciences, 1124*, 1–38. https://doi.org/10.1196/annals.1440.011

Butlein, D. A. (2006). *The impact of spiritual awakening on psychotherapy: A comparison study of personality traits, therapeutic worldview, and client experience in transpersonal, non-transpersonal, and purportedly awakened psychotherapists* (Doctoral dissertation, Institute of Transpersonal Psychology). ProQuest Dissertations & Theses Global.

Cabral-Juan, P., Reyes-Estrada, M., & Rodríguez-Gómez, J. (2024). Psychometric properties of Spanish version of mystical experience questionnaire and wellbeing measures. *Revista Puertorriqueña de Psicología, 35*(1), 124–134. https://doi.org/10.55611/reps.3501.11

Campos, D., Navarrete, J., & Cebolla, A. (2025). Compassion practice quality scale (CPQS). In O. N. Medvedev, C. U. Krägeloh, R. J. Siegert, & N. N. Singh (Eds.), *Handbook of*

assessment in mindfulness research. Springer. https://doi.org/10.1007/978-3-031-47219-0_99

Canby, N. K., Lindahl, J., Britton, W. B., & Córdova, J. V. (2024). Clarifying and measuring the characteristics of experiences that involve a loss of self or a dissolution of its boundaries. *Consciousness and Cognition, 119*, 103655. https://doi.org/10.1016/j.concog.2024.103655

Carbonaro, T. M., Bradstreet, M. P., Barrett, F. S., MacLean, K. A., Jesse, R., Johnson, M. W., & Griffiths, R. R. (2016). Survey study of challenging experiences after ingesting psilocybin mushrooms: Acute and enduring positive and negative consequences. *Journal of Psychopharmacology, 30*(12), 1268–1278. https://doi.org/10.1177/0269881116662634

Carbonaro, T. M., Johnson, M. W., Hurwitz, E., & Griffiths, R. R. (2018). Double-blind comparison of the two hallucinogens psilocybin and dextromethorphan: Similarities and differences in subjective experiences. *Psychopharmacology, 235*(2), 521–534. https://doi.org/10.1007/s00213-017-4769-4

Carr, B. I., & Steel, J. (Eds.). (2013). *Psychological aspects of cancer.* Springer.

Cebolla, A., & Alvear, D. (2019). *Psicología positiva contemplativa: Fundamentos para un entrenamiento en bienestar basado en prácticas contemplativas* [Positive contemplative psychology: Foundations for wellness training based on contemplative practices]. Kairós.

Cebolla, A., Herrero, R., Ventura, S., Miragall, M., Bellosta-Batalla, M., Llorens, R., & Baños, R. M. (2019). Putting oneself in the body of others: A pilot study on the efficacy of an embodied virtual reality system to generate self-compassion. *Frontiers in Psychology, 10*, Article 1521. https://doi.org/10.3389/fpsyg.2019.01521

Chirico, A., Ferrise, F., Cordella, L., & Gaggioli, A. (2018). Designing awe in virtual reality: An experimental study. *Frontiers in Psychology, 8*, Article 2351. https://doi.org/10.3389/fpsyg.2017.02351

Chödrön, P. (1994). *Start where you are: A guide to compassionate living.* Shambhala Publications.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Lawrence Erlbaum Associates.

Condon, P., & Makransky, J. (2020). Recovering the relational starting point of compassion training: A foundation for sustainable and inclusive care. *Perspectives on Psychological Science, 15*(6), 1346–1362. https://doi.org/10.1177/1745691620922200

Corbin, J., & Strauss, A. (2014). *Basics of qualitative research: Techniques and procedures for developing grounded theory* (4th ed.). SAGE.

Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience*. Harper & Row.

Cummins, C., & Lyke, J. (2013). Peak experiences of psilocybin users and non-users. *Journal of Psychoactive Drugs, 45*(2), 189–194. https://doi.org/10.1080/02791072.2013.785855

Dahl, C. J., Lutz, A., & Davidson, R. J. (2015). Reconstructing and deconstructing the self: Cognitive mechanisms in meditation practice. *Trends in Cognitive Sciences, 19*(9), 515–523. https://doi.org/10.1016/j.tics.2015.07.001

Dainton, B. (2011). *The phenomenal self*. Oxford University Press.

Damasio, A. R. (1999). *The feeling of what happens: Body and emotion in the making of consciousness*. Harcourt.

Dambrun, M. (2016). When the dissolution of perceived body boundaries elicits happiness: The effect of selflessness induced by a body scan meditation. *Consciousness and Cognition, 46*, 89–98. https://doi.org/10.1016/j.concog.2016.09.013

Dambrun, M., & Ricard, M. (2011). Self-centeredness and selflessness: A theory of self-based psychological functioning and its consequences for happiness. *Review of General Psychology, 15*(2), 138–157. https://doi.org/10.1037/a0023059

Dambrun, M., Berniard, A., Didelot, T., Chaulet, M., Droit-Volet, S., Corman, M., & Martinon, L. M. (2019). Unified consciousness and the effect of body scan meditation on happiness: Alteration of inner-body experience and feeling of harmony as central processes. *Mindfulness, 10*(8), 1530–1544. https://doi.org/10.1007/s12671-019-01104-y

Delia, Y., Lecuona, O., Herrero, R., Baños Rivera, R. M., Wrzesień, M., & Cebolla, A. (2025). Overcoming challenges in meditation assessment: Development and validation of the Meditation Pictographic Scale (MPS) [Preprint]. *PsyArXiv*. https://osf.io/4xez7

Dennett, D. C. (1992). The self as a center of narrative gravity. In F. Kessel, P. Cole, & D. Johnson (Eds.), *Self and consciousness: Multiple perspectives* (pp. 103–115). Lawrence Erlbaum Associates.

Derogatis, L. R. (2001). *Brief Symptom Inventory 18 (BSI-18): Administration, scoring, and procedures manual*. NCS Pearson.

Dittrich, A. (1998). The standardized psychometric assessment of altered states of consciousness (ASCs) in humans. *Pharmacopsychiatry, 31*(Suppl. 2), 80–84. https://doi.org/10.1055/s-2007-979351

Dittrich, A., Lamparter, D., & Maurer, M. (2010). *5D-ASC: Questionnaire for the assessment of altered states of consciousness—A short introduction* [Manual]. PSIN PLUS.

Dor-Ziderman, Y., Berkovich-Ohana, A., Glicksohn, J., & Goldstein, A. (2013). Mindfulness-induced selflessness: A MEG neurophenomenological study. *Frontiers in Human Neuroscience, 7*, Article 582. https://doi.org/10.3389/fnhum.2013.00582

Drolma, L. P. (2019). *Love on every breath: Tonglen meditation for transforming pain into joy.* New World Library.

Dunne, J. (2011). Toward an understanding of non-dual mindfulness. *Contemporary Buddhism, 12*(1), 71–88. https://doi.org/10.1080/14639947.2011.564820

Ekman, P., Davidson, R. J., Ricard, M., & Wallace, B. A. (2005). Buddhist and psychological perspectives on emotions and well-being. *Current Directions in Psychological Science, 14*(2), 59–63. https://doi.org/10.1111/j.0963-7214.2005.00335.x

Englander, M., & Morley, J. (2023). Phenomenological psychology and qualitative research. *Phenomenology and the Cognitive Sciences, 22*(1), 25–53. https://doi.org/10.1007/s11097-021-09781-8

Faller, H., Schuler, M., Richard, M., Heckl, U., Weis, J., & Küffner, R. (2013). Effects of psycho-oncologic interventions on emotional distress and quality of life in adult patients with cancer: Systematic review and meta-analysis. *Journal of Clinical Oncology, 31*(6), 782–793. https://doi.org/10.1200/JCO.2012.46.9557

Fasching, W. (2008). Consciousness, self-consciousness, and meditation. *Phenomenology and the Cognitive Sciences, 7*(4), 463–483. https://doi.org/10.1007/s11097-008-9090-6

Fingelkurts, A. A., Fingelkurts, A. A., & Kallio-Tamminen, T. (2020). Selfhood triumvirate: From phenomenology to brain activity and back again. *Consciousness and Cognition, 86*, Article 103031. https://doi.org/10.1016/j.concog.2020.103031

Fingelkurts, A. A., Fingelkurts, A. A., & Kallio-Tamminen, T. (2022). Self, me and I in the repertoire of spontaneously occurring altered states of selfhood: Eight neurophenomenological case study reports. *Cognitive Neurodynamics, 16*(2), 255–282. https://doi.org/10.1007/s11571-021-09719-5

Fredrickson, B. L., Cohn, M. A., Coffey, K. A., Pek, J., & Finkel, S. M. (2008). Open hearts build lives: Positive emotions induced through loving-kindness meditation build consequential personal resources. *Journal of Personality and Social Psychology, 95*(5), 1045–1062. https://doi.org/10.1037/a0013262

Gallagher, S. (2000). Philosophical conceptions of the self: Implications for cognitive science. *Trends in Cognitive Sciences, 4*(1), 14–21. https://doi.org/10.1016/S1364-6613(99)01417-5

Gallagher, S. (2013). A pattern theory of self. *Frontiers in Human Neuroscience, 7*, Article 443. https://doi.org/10.3389/fnhum.2013.00443

Gallagher, S., Raffone, A., Berkovich-Ohana, A., Barendregt, H. P., Bauer, P. R., Brown, K. W., Giommi, F., Nyklíček, I., Ostafin, B. D., Slagter, H., Trautwein, F.-M., & Vago, D. R. (2024). The self-pattern and Buddhist psychology. *Mindfulness*, *15*(4), 795–803. https://doi.org/10.1007/s12671-023-02118-3

García-Campayo, J., Barceló-Soler, A., Martínez-Rubio, D., Navarrete, J., Pérez-Aranda, A., Feliu-Soler, A., Luciano, J. V., Baer, R., Kuyken, W., & Montero-Marin, J. (2024). Exploring the relationship between self-compassion and compassion for others: The role of psychological distress and wellbeing. *Assessment, 31*(5), 1038–1051. https://doi.org/10.1177/10731911231203966

Gilbert, P. (2015). An evolutionary approach to emotion in mental health with a focus on affiliative emotions. *Emotion Review, 7*(3), 230–237. https://doi.org/10.1177/1754073915576552

Gilbert, P., & Van Gordon, W. (2023). Compassion as a skill: A comparison of contemplative and evolution-based approaches. *Mindfulness, 14*(10), 2395–2416. https://doi.org/10.1007/s12671-023-02173-w

Gilbert, P., Basran, J. K., Plowright, P., & Gilbert, H. (2023). Energizing compassion: Using music and community focus to stimulate compassion drive and sense of connectedness. *Frontiers in Psychology, 14*, Article 1150592. https://doi.org/10.3389/fpsyg.2023.1150592

Giommi, F., Bauer, P. R., Berkovich-Ohana, A., Barendregt, H., Brown, K. W., Gallagher, S., Nyklíček, I., Ostafin, B., Raffone, A., Slagter, H. A., Trautwein, F. M., & Vago, D. R. (2023). The (in)flexible self: Psychopathology, mindfulness, and neuroscience. *International Journal of Clinical and Health Psychology, 23*(4), Article 100381. https://doi.org/10.1016/j.ijchp.2023.100381

Giorgi, A. (1997). The theory, practice, and evaluation of the phenomenological method as a qualitative research procedure. *Journal of Phenomenological Psychology, 28*(2), 235–260. https://doi.org/10.1163/156916297X00103

Giorgi, A., Giorgi, B., & Morley, J. (2017). The descriptive phenomenological psychological method. In C. Willig & W. Stainton Rogers (Eds.), *The SAGE handbook of qualitative research in psychology* (2nd ed., pp. 176–192). SAGE Publications Ltd.

Glowacki, D. R. (2024). VR models of death and psychedelics: An aesthetic paradigm for design beyond day-to-day phenomenology. *Frontiers in Virtual Reality, 4*, Article 1286950. https://doi.org/10.3389/frvir.2023.1286950

Glowacki, D. R., Williams, R. R., Wonnacott, M. D., Maynard, O. M., Freire, R., Pike, J. E., & Chatziapostolou, M. (2022). Group VR experiences can produce ego attenuation and connectedness comparable to psychedelics. *Scientific Reports, 12*(1), Article 8995. https://doi.org/10.1038/s41598-022-12637-z

Glowacki, D. R., Wonnacott, M. D., Freire, R., Glowacki, B. R., Gale, E. M., Pike, J. E., de Haan, T., Chatziapostolou, M., & Metatla, O. (2020). Isness: Using multi-person VR to design peak mystical type experiences comparable to psychedelics. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems* (pp. 1–14). Association for Computing Machinery. https://doi.org/10.1145/3313831.3376649

Goetz, J. L., Keltner, D., & Simon-Thomas, E. (2010). Compassion: An evolutionary analysis and empirical review. *Psychological Bulletin, 136*(3), 351–374. https://doi.org/10.1037/a0018807

Grassi, L., Caruso, R., Hammelef, K., Nanni, M. G., & Riba, M. (2014). Efficacy and safety of pharmacotherapy in cancer-related psychiatric disorders across the trajectory of cancer care: A review. *International Review of Psychiatry, 26*(1), 44–62. https://doi.org/10.3109/09540261.2013.842542

Greenwald, A. G., McGhee, D. E., & Schwartz, J. L. (1998). Measuring individual differences in implicit cognition: The implicit association test. *Journal of Personality and Social Psychology, 74*(6), 1464–1480. https://doi.org/10.1037/0022-3514.74.6.1464

Griffiths, R. R., Johnson, M. W., Carducci, M. A., Umbricht, A., Richards, W. A., Richards, B. D., Cosimano, M. P., & Klinedinst, M. A. (2016). Psilocybin produces substantial and sustained decreases in depression and anxiety in patients with life-threatening cancer: A randomized double-blind trial. *Journal of Psychopharmacology, 30*(12), 1181–1197. https://doi.org/10.1177/0269881116675513

Griffiths, R. R., Johnson, M. W., Richards, W. A., Richards, B. D., McCann, U., & Jesse, R. (2011). Psilocybin occasioned mystical-type experiences: Immediate and persisting dose-related effects. *Psychopharmacology, 218*(4), 649–665. https://doi.org/10.1007/s00213-011-2358-5

Griffiths, R. R., Johnson, M. W., Richards, W. A., Richards, B. D., Jesse, R., MacLean, K. A., Barrett, F. S., Cosimano, M. P., & Klinedinst, M. A. (2018). Psilocybin-occasioned mystical-type experience in combination with meditation and other spiritual practices produces enduring positive changes in psychological functioning and in trait measures of prosocial attitudes and behaviors. *Journal of Psychopharmacology, 32*(1), 49–69. https://doi.org/10.1177/0269881117731279

Griffiths, R. R., Richards, W. A., Johnson, M. W., McCann, U., & Jesse, R. (2008). Mystical-type experiences occasioned by psilocybin mediate the attribution of personal meaning and spiritual significance 14 months later. *Journal of Psychopharmacology, 22*(6), 621–632. https://doi.org/10.1177/0269881108094300

Grof, S. (1980). *LSD psychotherapy.* Hunter House.

Gromala, D., Tong, X., Choo, A., Karamnejad, M., & Shaw, C. D. (2015). The virtual meditative walk: Virtual reality therapy for chronic pain management. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems* (pp. 521–524). Association for Computing Machinery. https://doi.org/10.1145/2702123.2702344

Gu, J., Baer, R., Cavanagh, K., Kuyken, W., & Strauss, C. (2020). Development and psychometric properties of the Sussex-Oxford Compassion Scales (SOCS). *Assessment, 27*(1), 3–20. https://doi.org/10.1177/1073191119860911

Hadash, Y., & Bernstein, A. (2019). Behavioral assessment of mindfulness: Defining features, organizing framework, and review of emerging methods. *Current Opinion in Psychology, 28*, 229–237. https://doi.org/10.1016/j.copsyc.2019.01.008

Hadash, Y., Plonsker, R., Vago, D. R., & Bernstein, A. (2016). Experiential self-referential and selfless processing in mindfulness and mental health: Conceptual model and implicit measurement methodology. *Psychological Assessment, 28*(7), 856–869. https://doi.org/10.1037/pas0000300

Hadash, Y., Veksler, T., Dar, O., Oren-Schwartz, R., & Bernstein, A. (2024). Peak experiences during insight mindfulness meditation retreats and their salutary and adverse impact: A prospective matched-controlled intervention study. *Journal of Consulting and Clinical Psychology, 92*(4), 213–225. https://doi.org/10.1037/ccp0000875

Halifax, J. (2012). A heuristic model of enactive compassion. *Current Opinion in Supportive and Palliative Care, 6*(2), 228–235. https://doi.org/10.1097/SPC.0b013e3283530fbe

Halim, I., Stemmet, L., Hach, S., Porter, R., Liang, H.-N., Vaezipour, A., Henry, J. D., & Baghaei, N. (2023). Individualized virtual reality for increasing self-compassion: Evaluation study. *JMIR Mental Health, 10*, e47617. https://doi.org/10.2196/47617

Hanley, A. W., & Garland, E. L. (2019). Spatial frame of reference as a phenomenological feature of self-transcendence: Measurement and manipulation through mindfulness meditation. *Psychology of Consciousness: Theory, Research, and Practice, 6*(4), 329–345. https://doi.org/10.1037/cns0000204

Hanley, A. W., Baker, A. K., & Garland, E. L. (2017). Self-interest may not be entirely in the interest of the self: Association between selflessness, dispositional mindfulness, and

psychological well-being. *Personality and Individual Differences, 117*, 166–171. https://doi.org/10.1016/j.paid.2017.05.045

Hanley, A. W., Nakamura, Y., & Garland, E. L. (2018). The Nondual Awareness Dimensional Assessment (NADA): New tools to assess nondual traits and states of consciousness occurring within and beyond the context of meditation. *Psychological Assessment, 30*(12), 1625–1639. https://doi.org/10.1037/pas0000615

Hood, R. W. (1975). The construction and preliminary validation of a measure of reported mystical experience. *Journal for the Scientific Study of Religion, 14*(1), 29–41. https://doi.org/10.2307/1384454

Hood, R. W., Jr., Ghorbani, N., Watson, P. J., Ghramaleki, A. F., Bing, M. N., Davison, H. K., Morris, R. J., & Williamson, W. P. (2001). Dimensions of the mysticism scale: Confirming the three-factor structure in the United States and Iran. *Journal for the Scientific Study of Religion, 40*(4), 691–705. https://doi.org/10.1111/0021-8294.00085

Irrmischer, M., Aqil, M., Luan, L., Wang, T., Engelbregt, H., Carhart-Harris, R., Linkenkaer-Hansen, K., & Timmermann, C. (2026). DMT-induced shifts in criticality correlate with self-dissolution. *Journal of Neuroscience, 46*(2), 1–8. https://doi.org/10.1523/JNEUROSCI.0344-25.2025

James, W. (1882). The subjective effects of nitrous oxide. *Mind, 7*(26), 186–208.

James, W. (1890). *The principles of psychology* (Vols. 1–2). Henry Holt.

Jinpa, T. (2011). *Essential mind training: Tibetan wisdom for daily life.* Wisdom Publications.

Jo, M., Kim, E., & Lee, J. (2024). Virtual reality vs. imagery: Comparing approaches in guided meditation. *Frontiers in Psychology, 15*, Article 1472780. https://doi.org/10.3389/fpsyg.2024.1472780

Johnson, M. W., Garcia-Romeu, A., Cosimano, M. P., & Griffiths, R. R. (2014). Pilot study of the 5-HT2A receptor agonist psilocybin in the treatment of tobacco addiction. *Journal of Psychopharmacology, 28*(11), 983–992. https://doi.org/10.1177/0269881114548296

Johnson, M. W., Richards, W. A., & Griffiths, R. R. (2008). Human hallucinogen research: Guidelines for safety. *Journal of Psychopharmacology, 22*(6), 603–620. https://doi.org/10.1177/0269881108093587

Josipovic, Z. (2014). Neural correlates of nondual awareness in meditation. *Annals of the New York Academy of Sciences, 1307*(1), 9–18. https://doi.org/10.1111/nyas.12261

Kałużna, A., Schlosser, M., Craste, E. G., Stroud, J., & Cooke, J. (2022). Being no one, being one: The role of ego-dissolution and connectedness in the therapeutic effects of psychedelic experience. *Journal of Psychedelic Studies, 6*(2), 111–136. https://doi.org/10.1556/2054.2022.00199

Karpinski, A., & Steinman, R. B. (2006). The single category implicit association test as a measure of implicit social cognition. *Journal of Personality and Social Psychology, 91*(1), 16–32. https://doi.org/10.1037/0022-3514.91.1.16

Kazdin, A. E. (2011). *Single-case research designs: Methods for clinical and applied settings* (2nd ed.). Oxford University Press.

Kelley, W. M., Macrae, C. N., Wyland, C. L., Caglar, S., Inati, S., & Heatherton, T. F. (2002). *Finding the self? An event-related fMRI study*. *Journal of Cognitive Neuroscience, 14*(5), 785–794. https://doi.org/10.1162/08989290260138672

Kettner, H., Glowacki, D. R., Wall, J., Carhart-Harris, R. L., Roseman, L., & Hardy, J. L. (2025). Observational cohort study of a group-based VR program to improve mental health and wellbeing in people with life-threatening illnesses. *Frontiers in Virtual Reality, 5*, Article 1466362. https://doi.org/10.3389/frvir.2024.1466362

Keyes, C. L. M. (2009). The nature and importance of positive mental health in America's adolescents. In R. Gilman, E. S. Huebner, & M. J. Furlong (Eds.), *Handbook of positive psychology in schools* (pp. 9–24). Routledge.

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

Klimecki, O. M., Leiberg, S., Lamm, C., & Singer, T. (2013). Functional neural plasticity and associated changes in positive affect after compassion training. *Cerebral Cortex, 23*(7), 1552–1561. https://doi.org/10.1093/cercor/bhs142

Klimecki, O. M., Leiberg, S., Ricard, M., & Singer, T. (2014). Differential pattern of functional brain plasticity after compassion and empathy training. *Social Cognitive and Affective Neuroscience, 9*(6), 873–879. https://doi.org/10.1093/scan/nst060

Knibbe, J., Schjerlund, J., Petraeus, M., & Hornbæk, K. (2018). The dream is collapsing: The experience of exiting VR. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems* (Article 483). Association for Computing Machinery. https://doi.org/10.1145/3173574.3174057

Ko, K., Knight, G., Rucker, J. J., & Cleare, A. J. (2022). Psychedelics, mystical experience, and therapeutic efficacy: A systematic review. *Frontiers in Psychiatry, 13*, Article 917199. https://doi.org/10.3389/fpsyt.2022.917199

Kohls, N., & Walach, H. (2006). Exceptional experiences and spiritual practice: A new measurement approach. *Spirituality and Health International, 7*(3), 125–150. https://doi.org/10.1002/shi.296

Kosunen, I., Salminen, M., Järvelä, S., Ruonala, A., Ravaja, N., & Jacucci, G. (2016). RelaWorld: Neuroadaptive and immersive virtual reality meditation system. In *Proceedings of the 21st International Conference on Intelligent User Interfaces* (pp. 208–217). Association for Computing Machinery. https://doi.org/10.1145/2856767.2856796

Kratochwill, T. R., & Levin, J. R. (2010). Enhancing the scientific credibility of single-case intervention research: Randomization to the rescue. *Psychological Methods, 15*(2), 124–144. https://doi.org/10.1037/a0017736

Kratochwill, T. R., Hitchcock, J., Horner, R. H., Levin, J. R., Odom, S. L., Rindskopf, D. M., & Shadish, W. R. (2010). *Single-case designs technical documentation.* What Works Clearinghouse, U.S. Department of Education.

Kroenke, K., Spitzer, R. L., & Williams, J. B. W. (2001). The PHQ-9: Validity of a brief depression severity measure. *Journal of General Internal Medicine, 16*(9), 606–613. https://doi.org/10.1046/j.1525-1497.2001.016009606.x

Kuppens, P., Tuerlinckx, F., Russell, J. A., & Barrett, L. F. (2013). The relation between valence and arousal in subjective experience. *Psychological Bulletin, 139*(4), 917–940. https://doi.org/10.1037/a0030811

Lamas-Morales, P., Hijar-Aguinaga, R., & Garcia-Campayo, J. (2025). Deconstructive meditations and psychotherapy: Transforming the perception of the self. *World Journal of Psychiatry, 15*(6), 107505. https://doi.org/10.5498/wjp.v15.i6.107505

Larsen, R. J., & Diener, E. (1992). Promises and problems with the circumplex model of emotion. In M. S. Clark (Ed.), *Emotion* (pp. 25–59). Sage.

Leary, M. R., Adams, C. E., & Tate, E. B. (2006). Hypo-egoic self-regulation: Exercising self-control by diminishing the influence of the self. *Journal of Personality, 74*(6), 1803–1831. https://doi.org/10.1111/j.1467-6494.2006.00429.x

Leary, T., Metzner, R., & Alpert, R. (1964). *The psychedelic experience: A manual based on the Tibetan Book of the Dead.* University Books.

Levitt, H. M., Bamberg, M., Creswell, J. W., Frost, D. M., Josselson, R., & Suárez-Orozco, C. (2018). Journal article reporting standards for qualitative primary, qualitative meta-analytic, and mixed methods research in psychology: The APA Publications and Communications Board task force report. *American Psychologist, 73*(1), 26–46. https://doi.org/10.1037/amp0000151

Lewis, B. R., Byrne, K., Hendrick, J., Garland, E. L., Thielking, P., & Beck, A. (2023). Group format psychedelic-assisted therapy interventions: Observations and impressions from the HOPE trial. *Journal of Psychedelic Studies, 7*(1), 1–11. https://doi.org/10.1556/2054.2022.00222

Liechti, M. E., Dolder, P. C., & Schmid, Y. (2017). Alterations of consciousness and mystical-type experiences after acute LSD in humans. *Psychopharmacology, 234*(9–10), 1499–1510. https://doi.org/10.1007/s00213-016-4453-0

Lin, Y., Callahan, C. P., & Moser, J. S. (2018). A mind full of self: Self-referential processing as a mechanism underlying the therapeutic effects of mindfulness training on internalizing disorders. *Neuroscience & Biobehavioral Reviews, 92*, 172–186. https://doi.org/10.1016/j.neubiorev.2018.06.007

Lindahl, J. R., & Britton, W. B. (2019). 'I have this feeling of not really being here': Buddhist meditation and changes in sense of self. *Journal of Consciousness Studies, 26*(7–8), 157–183.

Lindahl, J. R., Fisher, N. E., Cooper, D. J., Rosen, R. K., & Britton, W. B. (2017). The varieties of contemplative experience: A mixed-methods study of meditation-related challenges in Western Buddhists. *PLOS ONE, 12*(5), e0176239. https://doi.org/10.1371/journal.pone.0176239

Lindström, L., Kajonius, P., & Cardeña, E. (2022). Dissolution of what? The self lost in self-transcendent experiences. *Journal of Consciousness Studies, 29*(5–6), 75–101. https://doi.org/10.53765/20512201.29.5.075

Lindström, L., Stålhammar, S., & Cardeña, E. (2023). The core of me is that which observes: A mixed-methods study of trait-level sense of self. *Psychology of Consciousness: Theory, Research, and Practice, 12*(1), 1–18. https://doi.org/10.1037/cns0000377

Longo, M. R., Schüür, F., Kammers, M. P., Tsakiris, M., & Haggard, P. (2008). What is embodiment? A psychometric approach. *Cognition, 107*(3), 978–998. https://doi.org/10.1016/j.cognition.2007.12.004

Lutz, A., & Thompson, E. (2003). Neurophenomenology: Integrating subjective experience and brain dynamics in the neuroscience of consciousness. *Journal of Consciousness Studies, 10*(9–10), 31–52.

Lutz, A., Dunne, J. D., & Davidson, R. J. (2007). Meditation and the neuroscience of consciousness: An introduction. In P. D. Zelazo, M. Moscovitch, & E. Thompson (Eds.), *The Cambridge handbook of consciousness* (pp. 499–551). Cambridge University Press. https://doi.org/10.1017/CBO9780511816789.020

Lutz, A., Greischar, L. L., Rawlings, N. B., Ricard, M., & Davidson, R. J. (2004). Long-term meditators self-induce high-amplitude gamma synchrony during mental practice. *Proceedings of the National Academy of Sciences, 101*(46), 16369–16373. https://doi.org/10.1073/pnas.0407401101

Lutz, A., Jha, A. P., Dunne, J. D., & Saron, C. D. (2015). Investigating the phenomenological matrix of mindfulness-related practices from a neurocognitive perspective. *American Psychologist, 70*(7), 632–658. https://doi.org/10.1037/a0039585

Lyvers, M., & Meester, M. (2012). Illicit use of LSD or psilocybin, but not MDMA or nonpsychedelic drugs, is associated with mystical experiences in a dose-dependent

manner. *Journal of Psychoactive Drugs, 44*(5), 410–417. https://doi.org/10.1080/02791072.2012.736842

MacLean, K. A., Leoutsakos, J. M., Johnson, M. W., & Griffiths, R. R. (2012). Factor analysis of the mystical experience questionnaire: A study of experiences occasioned by the hallucinogen psilocybin. *Journal for the Scientific Study of Religion, 51*(4), 721–737. https://doi.org/10.1111/j.1468-5906.2012.01685.x

Mado, M., & Bailenson, J. (2022). The psychology of virtual reality. In S. C. Matz (Ed.), *The psychology of technology: Social science research in the age of Big Data* (pp. 155–193). American Psychological Association. https://doi.org/10.1037/0000290-006

Mah, K., Loke, L., & Hespanhol, L. (2020). Understanding compassion cultivation for design: Towards an autoethnography of tonglen. In *Proceedings of the 32nd Australian Conference on Human-Computer Interaction* (pp. 748–754). Association for Computing Machinery. https://doi.org/10.1145/3441000.3441065

Majić, T., Schmidt, T. T., & Gallinat, J. (2015). Peak experiences and the afterglow phenomenon: When and how do therapeutic effects of hallucinogens depend on psychedelic experiences? *Journal of Psychopharmacology, 29*(3), 241–253. https://doi.org/10.1177/0269881114568040

Martínez-Pernía, D. M., Troncoso, A. T., Chaigneau, S. E., Marchant, N. M., Zepeda, A., & Blanco-Madariaga, K. A. (2025). Bridging consciousness and AI: ChatGPT-assisted phenomenological analysis. *Frontiers in Psychology, 16*, Article 1520186. https://doi.org/10.3389/fpsyg.2025.1520186

Martínez-Pernía, D., Cea, I., Troncoso, A., Blanco, K., Calderón Vergara, J., Baquedano, C., Araya-Veliz, C., Useros-Olmo, A., Huepe, D., Carrera, V., Mack Silva, V., & Vergara, M. (2023). "I am feeling tension in my whole body": An experimental phenomenological study of empathy for pain. *Frontiers in Psychology, 13*, Article 999227. https://doi.org/10.3389/fpsyg.2022.999227

McKnight, D. (2012). *Tonglen meditation's effect on levels of compassion and self-compassion: A pilot study and instructional guide* (Master's thesis, Upaya Buddhist Chaplaincy Training Program). Upaya Zen Center. https://www.upaya.org/uploads/pdfs/McKnightTonglenThesis.pdf

McLouth, L. E., Shelton, B. J., Bursac, Z., Burris, J. L., Cheavens, J. S., Weyman, K., Peterman, A. H., Corum, L., Studts, J. L., & Arnold, S. M. (2024). “Pathways”: A hope-enhancing intervention for patients undergoing treatment for advanced lung cancer. *Psycho-Oncology, 33*(3), e6316. https://doi.org/10.1002/pon.6316

Metzinger, T. (2004). *Being no one: The self-model theory of subjectivity*. MIT Press.

Metzinger, T. (2024). *The elephant and the blind: The experience of pure consciousness: Philosophy, science, and 500+ experiential reports*. MIT Press.

Millière, R. (2017). Looking for the self: Phenomenology, neurophysiology and philosophical significance of drug-induced ego dissolution. *Frontiers in Human Neuroscience, 11*, Article 245. https://doi.org/10.3389/fnhum.2017.00245

Millière, R., Carhart-Harris, R. L., Roseman, L., Trautwein, F. M., & Berkovich-Ohana, A. (2018). Psychedelics, meditation, and self-consciousness. *Frontiers in Psychology, 9*, 1475. https://doi.org/10.3389/fpsyg.2018.01475

Mitchell, A. J., Chan, M., Bhatti, H., Halton, M., Grassi, L., Johansen, C., & Meader, N. (2011). Prevalence of depression, anxiety, and adjustment disorder in oncological, haematological, and palliative-care settings: A meta-analysis of 94 interview-based studies. *The Lancet Oncology, 12*(2), 160–174. https://doi.org/10.1016/S1470-2045(11)70002-X

Mokkink, L. B., Terwee, C. B., Knol, D. L., Stratford, P. W., Alonso, J., Patrick, D. L., Bouter, L. M., & de Vet, H. C. W. (2010). The COSMIN checklist for evaluating the methodological quality of studies on measurement properties: A clarification of its content. *BMC Medical Research Methodology, 10*, Article 22. https://doi.org/10.1186/1471-2288-10-22

Navarrete, J., Martínez-Sanchis, M., Bellosta-Batalla, M., Baños, R., Cebolla, A., & Herrero, R. (2021). Compassionate embodied virtual experience increases the adherence to meditation practice. *Applied Sciences, 11*(3), Article 1276. https://doi.org/10.3390/app11031276

Nave, O., Trautwein, F. M., Ataria, Y., Dor-Ziderman, Y., Schweitzer, Y., Fulder, S., & Berkovich-Ohana, A. (2021). Self-boundary dissolution in meditation: A phenomenological investigation. *Brain Sciences, 11*(6), 819. https://doi.org/10.3390/brainsci11060819

Neisser, U. (1988). Five kinds of self-knowledge. *Philosophical Psychology, 1*(1), 35–59. https://doi.org/10.1080/09515088808572924

Nembhard, I. M., David, G., Ezzeddine, I., Betts, D., & Radin, J. (2023). A systematic review of research on empathy in health care. *Health Services Research, 58*(2), 250–263. https://doi.org/10.1111/1475-6773.14016

Nicholas, C. R., Henriquez, K. M., Gassman, M. C., Cooper, K. M., Muller, D., Hetzel, S., Brown, R. T., Cozzi, N. V., Thomas, C., & Hutson, P. R. (2018). High dose psilocybin is associated with positive subjective effects in healthy volunteers. *Journal of Psychopharmacology, 32*(7), 770–778. https://doi.org/10.1177/0269881118780713

Nour, M. M., Evans, L., Nutt, D., & Carhart-Harris, R. L. (2016). Ego-dissolution and psychedelics: Validation of the Ego-Dissolution Inventory (EDI). *Frontiers in Human Neuroscience, 10*, 269. https://doi.org/10.3389/fnhum.2016.00269

Olendzki, A. (2006). The transformative impact of non-self. In D. K. Nauriyal, M. S. Drummond, & Y. B. Lal (Eds.), *Buddhist thought and applied psychological research: Transcending the boundaries* (pp. 250–261). Routledge.

Olivares, F. A., Vargas, E., Fuentes, C., Martínez-Pernía, D., & Canales-Johnson, A. (2015). Neurophenomenology revisited: Second-person methods for the study of human consciousness. *Frontiers in Psychology, 6*, Article 673. https://doi.org/10.3389/fpsyg.2015.00673

Olson, E. T. (1999). *The human animal: Personal identity without psychology*. Oxford University Press.

Orłowski, P., Ruban, A., Szczypiński, J., Hobot, J., Bielecki, M., & Bola, M. (2022). Naturalistic use of psychedelics is related to emotional reactivity and self-consciousness: The mediating role of ego-dissolution and mystical experiences. *Journal of Psychopharmacology, 36*(8), 987–1000. https://doi.org/10.1177/02698811221089034

Ostuzzi, G., Matcham, F., Dauchy, S., Barbui, C., & Hotopf, M. (2015). Antidepressants for the treatment of depression in people with cancer. *Cochrane Database of Systematic Reviews, 2015*(6), Article CD011006. https://doi.org/10.1002/14651858.CD011006.pub2

Pahnke, W. N. (1963). *Drugs and mysticism: An analysis of the relationship between psychedelic drugs and mystical consciousness* (Doctoral dissertation, Harvard University).

Palacios, A., Martínez-Gregorio, S., Andreu, C., Colombo, D., Cebolla, A., Baños, R. M., & Wrzesien, M. (2026). Enhancing compassion meditation through virtual reality and sensory priming: A focus on individual factors. *International Journal of Clinical and Health Psychology, 26*(1), Article 100657. https://doi.org/10.1016/j.ijchp.2025.100657

Pardy, J. (2016). *The tonglen experiences of individuals with established sitting meditation practices: A grounded theory study* (Master's thesis, Memorial University of Newfoundland). Memorial University Research Repository. https://memorial.scholaris.ca/items/6d5d4f48-f6fd-4498-8a95-85940dd3a76a

Parfit, D. (1984). *Reasons and persons*. Oxford University Press.

Parker, R. I., Vannest, K. J., Davis, J. L., & Sauber, S. B. (2011). Combining nonoverlap and trend for single-case research: Tau-U. *Behavior Therapy, 42*(2), 284–299. https://doi.org/10.1016/j.beth.2010.08.006

Peterman, A. H., Fitchett, G., Brady, M. J., Hernandez, L., & Cella, D. (2002). Measuring spiritual well-being in people with cancer: The Functional Assessment of Chronic Illness Therapy–Spiritual Well-Being Scale (FACIT-Sp). *Annals of Behavioral Medicine, 24*(1), 49–58. https://doi.org/10.1207/S15324796ABM2401_06

Petitmengin, C. (2006). Describing one's subjective experience in the second person: An interview method for the science of consciousness. *Phenomenology and the Cognitive Sciences, 5*(3–4), 229–269. https://doi.org/10.1007/s11097-006-9022-2

Petitmengin, C. (2017). Enaction as a lived experience: Towards a radical neurophenomenology. *Constructivist Foundations, 12*(2), 139–147.

Petitmengin, C., van Beek, M., Bitbol, M., Nissou, J. M., & Roepstorff, A. (2019). Studying the experience of meditation through micro-phenomenology. *Current Opinion in Psychology, 28*, 54–59. https://doi.org/10.1016/j.copsyc.2018.10.009

Piff, P. K., Dietze, P., Feinberg, M., Stancato, D. M., & Keltner, D. (2015). Awe, the small self, and prosocial behavior. *Journal of Personality and Social Psychology, 108*(6), 883–899. https://doi.org/10.1037/pspi0000018

Piqueras, J. A., Vidal-Arenas, V., Falcó, R., Moreno-Amador, B., Marzo, J. C., & Keyes, C. L. M. (2022). Validation of the Mental Health Continuum–Short Form (MHC-SF) for multidimensional assessment of subjective well-being in Spanish adolescents. *Psicothema, 34*(2), 332–343. https://doi.org/10.7334/psicothema2021.240

Piron, H. (2022). Meditation depth questionnaire (MEDEQ) and meditation depth index (MEDI). In O. N. Medvedev, C. U. Krägeloh, R. J. Siegert, & N. N. Singh (Eds.), *Handbook of assessment in mindfulness research*. Springer. https://doi.org/10.1007/978-3-030-77644-2_41-1

Pizarro, J. J., Basabe, N., Fernández, I., Carrera, P., Apodaca, P., Man Ging, C. I., Cusi, O., & Páez, D. (2021). Self-transcendent emotions and their social effects: Awe, elevation and kama muta promote human identification and motivations to help others. *Frontiers in Psychology, 12*, Article 709859. https://doi.org/10.3389/fpsyg.2021.709859

Puchalski, C. M., Sbrana, A., Ferrell, B., Jafari, N., King, S., Balboni, T., Miccinesi, G., Vandenhoeck, A., Silbermann, M., Balducci, L., Yong, J., Antonuzzo, A., Falcone, A., & Ripamonti, C. I. (2019). Interprofessional spiritual care in oncology: A literature review. *ESMO Open, 4*(1), e000465. https://doi.org/10.1136/esmoopen-2018-000465

Pustejovsky, J. E., Chen, M., & Swan, D. M. (2023). *SingleCaseES: A calculator for single-case effect sizes* (Version 0.7.2) [Computer software]. https://CRAN.R-project.org/package=SingleCaseES

Raes, F., Pommier, E., Neff, K. D., & Van Gucht, D. (2011). Construction and factorial validation of a short form of the self-compassion scale. *Clinical Psychology & Psychotherapy, 18*(3), 250–255. https://doi.org/10.1002/cpp.702

Raichle, M. E., MacLeod, A. M., Snyder, A. Z., Powers, W. J., Gusnard, D. A., & Shulman, G. L. (2001). A default mode of brain function. *Proceedings of the National Academy of Sciences, 98*(2), 676–682. https://doi.org/10.1073/pnas.98.2.676

Riba, M. B., Donovan, K. A., Andersen, B., Braun, I., Breitbart, W. S., Brewer, B. W., Carpenter, K. M., Holland, J. C., McMillian, N. R., & Zebrack, B. (2019). Distress management, version 3.2019: NCCN clinical practice guidelines in oncology. *Journal of the National Comprehensive Cancer Network, 17*(10), 1229–1249. https://doi.org/10.6004/jnccn.2019.0048

Ricoeur, P. (1992). *Oneself as another*. University of Chicago Press.

Riva, G., Wiederhold, B. K., & Mantovani, F. (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

Robinson, H. (2023). Dualism. In E. N. Zalta & U. Nodelman (Eds.), *The Stanford encyclopedia of philosophy* (Fall 2023 ed.). Metaphysics Research Lab, Stanford University. https://plato.stanford.edu/archives/fall2023/entries/dualism/

Roca, P., Vázquez, C., & Ondé, D. (2023). The Hedonic and Arousal Affect Scale (HAAS): A brief adjective checklist to assess affect states. *Personality and Individual Differences, 207*, Article 112151. https://doi.org/10.1016/j.paid.2023.112151

Rochat, L., & Manolov, R. (2024). Single-case methodology in cognitive behavior therapy: Promoting good practice within personalized psychotherapy research. *Journal of Behavioral and Cognitive Therapy, 34*(3), Article 100502. https://doi.org/10.1016/j.jbct.2024.100502

Roseman, L., Nutt, D. J., & Carhart-Harris, R. L. (2018). Quality of acute psychedelic experience predicts therapeutic efficacy of psilocybin for treatment-resistant depression. *Frontiers in Pharmacology, 8*, Article 974. https://doi.org/10.3389/fphar.2017.00974

Ross, S. (2018). Therapeutic use of classic psychedelics to treat cancer-related psychiatric distress. *International Review of Psychiatry, 30*(4), 317–330. https://doi.org/10.1080/09540261.2018.1482261

Ross, S., Agrawal, M., Griffiths, R. R., Grob, C., Berger, A., & Henningfield, J. E. (2022). Psychedelic-assisted psychotherapy to treat psychiatric and existential distress in life-threatening medical illnesses and palliative care. *Neuropharmacology, 216*, Article 109174. https://doi.org/10.1016/j.neuropharm.2022.109174

Ross, S., Bossis, A., Guss, J., Agin-Liebes, G., Malone, T., Cohen, B., Mennenga, S. E., Belser, A., Kalliontzi, K., Babb, J., Su, Z., Corby, P., & Schmidt, B. L. (2016). Rapid and sustained symptom reduction following psilocybin treatment for anxiety and depression in patients with life-threatening cancer: A randomized controlled trial. *Journal of Psychopharmacology, 30*(12), 1165–1180. https://doi.org/10.1177/0269881116675512

Schlag, A. K., Aday, J., Salam, I., Neill, J. C., & Nutt, D. J. (2022). Adverse effects of psychedelics: From anecdotes and misinformation to systematic science. *Journal of Psychopharmacology, 36*(3), 258–272. https://doi.org/10.1177/02698811211069100

Scholten, S., Schemer, L., Herzog, P., Haas, J. W., Heider, J., Winter, D., Reis, D., & Glombiewski, J. A. (2024). Leveraging single-case experimental designs to promote personalized psychological treatment: Step-by-step implementation protocol with stakeholder involvement of an outpatient clinic for personalized psychotherapy. *Administration and Policy in Mental Health and Mental Health Services Research, 51*(5), 702–724. https://doi.org/10.1007/s10488-024-01363-5

Seabrook, E., Kelly, R., Foley, F., Theiler, S., Thomas, N., Wadley, G., & Nedeljkovic, M. (2020). Understanding how virtual reality can support mindfulness practice: Mixed methods study. *Journal of Medical Internet Research, 22*(3), e16106. https://doi.org/10.2196/16106

Sedlmeier, P. (2018). Meditation and altered states of consciousness. *Journal of Consciousness Studies, 25*(11–12), 73–101.

Shaw, C., Gromala, D., & Song, M. (2011). The meditation chamber: Towards self-modulation. In D. Gromala & C. Shaw (Eds.), *Metaplasticity in virtual worlds: Aesthetics and semantic concepts* (pp. 121–133). IGI Global.

Shaw, R. L., Hiles, D. R., West, K., Holland, C., & Gwyther, H. (2018). From mixing methods to the logic(s) of inquiry: Taking a fresh look at developing mixed design studies. *Health Psychology and Behavioral Medicine, 6*(1), 226–244. https://doi.org/10.1080/21642850.2018.1515016

Shiffman, S., Stone, A. A., & Hufford, M. R. (2008). Ecological momentary assessment. *Annual Review of Clinical Psychology, 4*, 1–32. https://doi.org/10.1146/annurev.clinpsy.3.022806.091415

Shiota, M. N., Keltner, D., & Mossman, A. (2007). The nature of awe: Elicitors, appraisals, and effects on self-concept. *Cognition and Emotion, 21*(5), 944–963. https://doi.org/10.1080/02699930600923668

Shnayder, S., Ameli, R., Sinaii, N., Berger, A., & Agrawal, M. (2023). Psilocybin-assisted therapy mediates psycho-social-spiritual change in cancer patients as assessed by the NIH-HEALS. *Journal of Affective Disorders, 323*, 592–597. https://doi.org/10.1016/j.jad.2022.11.046

Siderits, M., Thompson, E., & Zahavi, D. (2011). *Self, no self? Perspectives from analytical, phenomenological, and Indian traditions*. Oxford University Press.

Singer, T., & Klimecki, O. M. (2014). Empathy and compassion. *Current Biology, 24*(18), R875–R878. https://doi.org/10.1016/j.cub.2014.06.054

Slater, M., & Sanchez-Vives, M. V. (2016). Enhancing our lives with immersive virtual reality. *Frontiers in Robotics and AI, 3*, Article 74. https://doi.org/10.3389/frobt.2016.00074

Slater, M., Perez-Marcos, D., Ehrsson, H. H., & Sanchez-Vives, M. V. (2009). Inducing illusory ownership of a virtual body. *Frontiers in Neuroscience, 3*(2), 214–220. https://doi.org/10.3389/neuro.01.029.2009

Sleight, F. G., Lynn, S. J., Mattson, R. E., & McDonald, C. W. (2023). A novel ego dissolution scale: A construct validation study. *Consciousness and Cognition, 109*, 103474. https://doi.org/10.1016/j.concog.2023.103474

Soler, J., Montero-Marin, J., Domínguez-Clavé, E., González, S., Pascual, J. C., Cebolla, A., Demarzo, M., Anālayo, B., & García-Campayo, J. (2021). Decentering, acceptance, and non-attachment: Challenging the question “Is it me?”. *Frontiers in Psychiatry, 12*, 659835. https://doi.org/10.3389/fpsyt.2021.659835

Song, J. Y., Klebl, C., & Bastian, B. (2023). Awe promotes moral expansiveness via the small self. *Frontiers in Psychology, 14*, Article 1097627. https://doi.org/10.3389/fpsyg.2023.1097627

Stace, W. T. (1960). *Mysticism and philosophy.* St. Martin’s Press.

Steindl, S. R., Tellegen, C. L., Filus, A., Seppälä, E., Doty, J. R., & Kirby, J. N. (2021). The compassion motivation and action scales: A self-report measure of compassionate and self-compassionate behaviours. *Australian Psychologist, 56*(2), 93–110. https://doi.org/10.1080/00050067.2021.1893110

Stellar, J. E., Gordon, A. M., Piff, P. K., Cordaro, D., Anderson, C. L., Bai, Y., Maruskin, L. A., & Keltner, D. (2017). Self-transcendent emotions and their social functions: Compassion, gratitude, and awe bind us to others through prosociality. *Emotion Review, 9*(3), 200–207. https://doi.org/10.1177/1754073916684557

Stinus, C., & Berjot, S. (2026). Selflessness as a potential buffer against depression: Investigating its impact on depressogenic schemas and identity threat. *Psychology of Consciousness: Theory, Research, and Practice*. Advance online publication. https://doi.org/10.1037/cns0000456

Stone, A. A., & Shiffman, S. (2002). Capturing momentary, self-report data: A proposal for reporting guidelines. *Annals of Behavioral Medicine, 24*(3), 236–243. https://doi.org/10.1207/S15324796ABM2403_09

Strauss, C., Lever Taylor, B., Gu, J., Kuyken, W., Baer, R., Jones, F., & Cavanagh, K. (2016). What is compassion and how can we measure it? A review of definitions and measures. *Clinical Psychology Review, 47*, 15–27. https://doi.org/10.1016/j.cpr.2016.05.004

Stripp, T. A., Jensen, L. H., Wehberg, S., Ahrenfeldt, L. J., Balboni, T. A., Sangild, P. T., Søndergaard, J., & Hvidt, N. C. (2025). Spiritual needs following cancer diagnosis: A national cross-sectional survey of randomly selected adults and cancer patients linked to nationwide registers. *Social Science & Medicine, 381*, Article 118198. https://doi.org/10.1016/j.socscimed.2025.118198

Studerus, E., Gamma, A., & Vollenweider, F. X. (2010). Psychometric evaluation of the altered states of consciousness rating scale (OAV). *PLOS ONE, 5*(8), e12412. https://doi.org/10.1371/journal.pone.0012412

Sui, J., He, X., & Humphreys, G. W. (2012). Perceptual effects of social salience: Evidence from self-prioritization effects on perceptual matching. *Journal of Experimental Psychology: Human Perception and Performance, 38*(5), 1105–1117. https://doi.org/10.1037/a0029792

Sys, S., Van Gordon, W., & Gilbert, P. (2024). A qualitative comparison of secular and Buddhist-informed mental health practitioners' perceptions of non-attachment. *Mindfulness, 15*(2), 345–358. https://doi.org/10.1007/s12671-023-02291-5

Tagini, A., & Raffone, A. (2010). The 'I' and the 'Me' in self-referential awareness: A neurocognitive hypothesis. *Cognitive Processing, 11*(1), 9–20. https://doi.org/10.1007/s10339-009-0336-1

Tanay, G., & Bernstein, A. (2013). State mindfulness scale (SMS): Development and initial validation. *Psychological Assessment, 25*(4), 1286–1299. https://doi.org/10.1037/a0034044

Tang, Y.-Y., Hölzel, B. K., & Posner, M. I. (2015). The neuroscience of mindfulness meditation. *Nature Reviews Neuroscience, 16*(4), 213–225. https://doi.org/10.1038/nrn3916

Tate, R. L., Perdices, M., Rosenkoetter, U., McDonald, S., Togher, L., Shadish, W., Horner, R., Kratochwill, T., Barlow, D. H., Kazdin, A., Sampson, M., Shamseer, L., & Vohra, S. (2016). The single-case reporting guideline in behavioural interventions (SCRIBE) 2016: Explanation and elaboration. *Archives of Scientific Psychology, 4*(1), 10–31. https://doi.org/10.1037/arc0000027

Teddlie, C., & Tashakkori, A. (2009). *Foundations of mixed methods research: Integrating quantitative and qualitative approaches in the social and behavioral sciences.* SAGE.

Terwee, C. B., Prinsen, C. A. C., Chiarotto, A., Westerman, M. J., Patrick, D. L., Alonso, J., Bouter, L. M., de Vet, H. C. W., & Mokkink, L. B. (2018). COSMIN methodology for evaluating the content validity of patient-reported outcome measures: A Delphi study. *Quality of Life Research, 27*(5), 1159–1170. https://doi.org/10.1007/s11136-018-1829-0

Thompson, E. (2010). *Mind in life: Biology, phenomenology, and the sciences of mind*. Harvard University Press.

Timmermann, C. (2025). Psychedelics and the neuroscience of self-consciousness. In D. J. Chalmers & M. Graziano (Eds.), *The MIT Press handbook of consciousness*. MIT Press. https://doi.org/10.7551/mitpress/14600.003.0026

Timmermann, C., Bauer, P. R., Gosseries, O., Vanhaudenhuyse, A., Vollenweider, F., Laureys, S., Singer, T., Antonova, E., & Lutz, A. (2022). A neurophenomenological approach to non-ordinary states of consciousness: Hypnosis, meditation, and psychedelics. *Trends in Cognitive Sciences, 27*(2), 139–159. https://doi.org/10.1016/j.tics.2022.11.006

Toraman Turk, S., Cox, K., & Plano Clark, V. L. (2025). Measuring the degree of mixed methods adoption: An investigation using doctoral dissertation abstracts. *Journal of Mixed Methods Research*. Advance online publication. https://doi.org/10.1177/15586898241313245

Tricco, A. C., Lillie, E., Zarin, W., O'Brien, K. K., Colquhoun, H., Levac, D., Moher, D., Peters, M. D. J., Horsley, T., Weeks, L., Hempel, S., Akl, E. A., Chang, C., McGowan, J., Stewart, L., Hartling, L., Aldcroft, A., Wilson, M. G., Garritty, C., … Straus, S. E. (2018). PRISMA extension for scoping reviews (PRISMA-ScR): Checklist and explanation. *Annals of Internal Medicine, 169*(7), 467–473. https://doi.org/10.7326/M18-0850

Trichter, S., Klimo, J., & Krippner, S. (2009). Changes in spirituality among ayahuasca ceremony novice participants. *Journal of Psychoactive Drugs, 41*(2), 121–134. https://doi.org/10.1080/02791072.2009.10399905

Troncoso, A., Blanco, K., Rivera-Rei, Á., & Martínez-Pernía, D. (2024). Empathy bodyssence: Temporal dynamics of sensorimotor and physiological responses and the subjective experience in synchrony with the other's suffering. *Frontiers in Psychology, 15*, Article 1362064. https://doi.org/10.3389/fpsyg.2024.1362064

Turbyne, C., Goedhart, A., de Koning, P., Schirmbeck, F., & Denys, D. (2021). Systematic review and meta-analysis of virtual reality in mental healthcare: Effects of full body illusions on body image disturbance. *Frontiers in Virtual Reality, 2*, Article 657638. https://doi.org/10.3389/frvir.2021.657638

Van Gordon, W., Shonin, E., & Griffiths, M. D. (2015). Towards a second generation of mindfulness-based interventions. *Australian & New Zealand Journal of Psychiatry, 49*(7), 591–592. https://doi.org/10.1177/0004867415577437

Vannest, K. J., & Ninci, J. (2015). Evaluating intervention effects in single-case research designs. *Journal of Counseling & Development, 93*(4), 403–411. https://doi.org/10.1002/jcad.12038

Varela, F. J. (1996). Neurophenomenology: A methodological remedy for the hard problem. *Journal of Consciousness Studies, 3*(4), 330–349.

Varela, F. J. (1999). Present-time consciousness. *Journal of Consciousness Studies, 6*(2–3), 111–140.

Vidal, J., Andreu, C. I., Wrzesien, M., Colombo, D., Wall, J., Glowacki, D. R., Hardy, J. L., & Cebolla, A. (2025). Inducing selflessness through a numadelic virtual reality experience: A preliminary study. *Virtual Reality*, *30*(1). https://doi.org/10.1007/s10055-025-01293-z

Vieten, C., Wahbeh, H., Cahn, B. R., MacLean, K., Estrada, M., Mills, P., Murphy, M., Shapiro, S., Radin, D., Josipovic, Z., Presti, D. E., Sapiro, M., Chozen Bays, J., Russell, P., Vago, D., Travis, F., Walsh, R., & Delorme, A. (2018). Future directions in meditation research: Recommendations for expanding the field of contemplative science. *PLOS ONE, 13*(11), e0205740. https://doi.org/10.1371/journal.pone.0205740

Vlisides, P. E., Bel-Bahar, T., Nelson, A., Chilton, K., Smith, E., Janke, E., Tarnal, V., Picton, P., Harris, R. E., & Mashour, G. A. (2018). Subanaesthetic ketamine and altered states of consciousness in humans. *British Journal of Anaesthesia, 121*(1), 249–259. https://doi.org/10.1016/j.bja.2018.03.011

Vollenweider, F. X., & Kometer, M. (2010). The neurobiology of psychedelic drugs: Implications for the treatment of mood disorders. *Nature Reviews Neuroscience, 11*(9), 642–651. https://doi.org/10.1038/nrn2884

Watts, R., Kettner, H., Geerts, D., Gandy, S., Kartner, L., Mertens, L., Timmermann, C., Nour, M. M., Kaelen, M., Nutt, D., Carhart-Harris, R., & Roseman, L. (2022). The Watts Connectedness Scale: A new scale for measuring a sense of connectedness to self, others, and world. *Psychopharmacology, 239*(11), 3461–3483. https://doi.org/10.1007/s00213-022-06187-5

Wayment, H. A., & Bauer, J. J. (2018). The quiet ego: Motives for self-other balance and growth in relation to well-being. *Journal of Happiness Studies, 19*(3), 881–896. https://doi.org/10.1007/s10902-017-9848-z

Wrzesien, M., & Alcañiz, M. (2010). Learning in serious virtual worlds: Evaluation of learning effectiveness and appeal to students in the E-Junior project. *Computers & Education, 55*(1), 178–187. https://doi.org/10.1016/j.compedu.2010.01.003

Xie, F., Zheng, H., & Hu, X. (2025). The effectiveness of virtual reality in enhancing mindfulness: A systematic review and meta-analysis. *Frontiers in Public Health, 13*, Article 1709782. https://doi.org/10.3389/fpubh.2025.1709782

Yaden, D. B., Haidt, J., Hood, R. W., Vago, D. R., & Newberg, A. B. (2017). The varieties of self-transcendent experience. *Review of General Psychology, 21*(2), 143–160. https://doi.org/10.1037/gpr0000102

Yaden, D. B., Kaufman, S. B., Hyde, E., Chirico, A., Gaggioli, A., Zhang, J. W., & Keltner, D. (2019). The development of the Awe Experience Scale (AWE-S): A multifactorial measure for a complex emotion. *The Journal of Positive Psychology*, *14*(4), 474–488. https://doi.org/10.1080/17439760.2018.1484940

Zahavi, D. (2008). *Subjectivity and selfhood: Investigating the first-person perspective*. MIT Press.

Zare, A., Bahia, N. J., Eidy, F., Adib, N., & Sedighe, F. (2019). The relationship between spiritual well-being, mental health, and quality of life in cancer patients receiving chemotherapy. *Journal of Family Medicine and Primary Care, 8*(5), 1701–1705. https://doi.org/10.4103/jfmpc.jfmpc_131_19

Zeifman, R. J., Spriggs, M. J., Kettner, H., Lyons, T., Rosas, F. E., Mediano, P. A. M., Erritzoe, D., & Carhart-Harris, R. L. (2025). From relaxed beliefs under psychedelics (REBUS) to revised beliefs after psychedelics (REBAS). *Scientific Reports, 15*(1), Article 3651. https://doi.org/10.1038/s41598-023-28111-3

Zepeda, A., Troncoso, A., Pizarro, D., Baquedano, C., Gomez, R., Barria, S., Blanco, K., & Martínez-Pernía, D. (2025). The spectrum of embodied intersubjective synchrony in empathy: From fully embodied to externally oriented engagement in Parkinson's disease. *Frontiers in Psychology, 16*, Article 1570124. https://doi.org/10.3389/fpsyg.2025.1570124

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

APPENDICES

A. Appendices Study 2

A.1. Chronological Development of the Database Search Strategy

10/07/2023

ELEMENTS OF THE SEARCH

#1 → Selflessness

selfless*, “quiet ego”, humble, humility, “hypo egoic”, “hypo-egoic”, “delusion of me”, “ego attenuation”

#2 → Self-transcendence

“self-transcenden*”, “self transcenden*”, “ego transcenden*”, “transcendence of the ego” “non-duality”, “non-self”, “non-dual awareness”, “non-dual state*”, “non-referential awareness”, “ego-dissolution”, “ego dissolution”, “ego-loss”

#3 → Questionnaire

measure*, assess*, questionnaire*, scale*, instrument*, evaluat*, inventory, “behavior* task”, “behavior* measure”, “implicit measure”, “implicit task”

PubMed (10/07/2023)

Search	Query	Results
#4	Search: #1 OR #2 AND #3	2,359
#3	measure*[tiab] OR assess*[tiab] OR questionnaire*[tiab] OR scale*[tiab] OR instrument*[tiab] OR evaluat*[tiab] OR inventory[tiab] OR “behavior* task”[tiab] OR “behavior* measure”[tiab] OR “implicit measure”[tiab] OR “implicit task”[tiab]	10,130,131
#2	“self-transcenden*”[tiab] OR “self transcenden*”[tiab] OR “ego transcenden*”[tiab] OR “transcendence of the ego”[tiab] OR “non-duality”[tiab] OR “non-self”[tiab] OR “non-dual awareness”[tiab] OR “non-dual state*”[tiab] OR “non-referential awareness”[tiab] OR “ego-dissolution”[tiab] OR “ego dissolution”[tiab] OR “ego-loss”[tiab]	5,011
#1	selfless*[tiab] OR “quiet ego”[tiab] OR humble[tiab] OR humility[tiab] OR “hypo egoic”[tiab] OR “hypo-egoic”[tiab] OR “delusion of me”[tiab] OR “ego attenuation”[tiab]	2,963

Scopus (10/07/2023)

Search	Query	Results
#4	Search: #1 OR #2 AND #3	6,723
#3	TITLE-ABS-KEY(measure* OR assess* OR questionnaire* OR scale* OR instrument* OR evaluat* OR inventory OR "behavior* task" OR "behavior* measure" OR "implicit measure" OR "implicit task")	26,854,425
#2	TITLE-ABS-KEY("self-transcenden*" OR "self transcenden*" OR "ego transcenden*" OR "transcendence of the ego" OR "non-duality" OR "non-self" OR "non-dual awareness" OR "non-dual state*" OR "non-referential awareness" OR "ego-dissolution" OR "ego dissolution" OR "ego-loss")	13,437
#1	TITLE-ABS-KEY(selfless* OR "quiet ego" OR humble OR humility OR "hypo egoic" OR "hypo-egoic" OR "delusion of me" OR "ego attenuation")	12,584

Web of Science (10/07/2023) *Search in Web Of Science Core Collection*

Search	Query	Results
#4	Search: #1 OR #2 AND #3	7,074
#3	TS=(measure* OR assess* OR questionnaire* OR scale* OR instrument* OR evaluat* OR inventory OR "behavior* task" OR "behavior* measure" OR "implicit measure" OR "implicit task")	27,443,771
#2	TS=("self-transcenden*" OR "self transcenden*" OR "ego transcenden*" OR "transcendence of the ego" OR "non-duality" OR "non-self" OR "non-dual awareness" OR "non-dual state*" OR "non-referential awareness" OR "ego-dissolution" OR "ego dissolution" OR "ego-loss")	14,705
#1	TS=(selfless* OR "quiet ego" OR humble OR humility OR "hypo egoic" OR "hypo-egoic" OR "delusion of me" OR "ego attenuation")	13,948

PsycInfo (10/07/2023)

Search	Query	Results
#4	Search: #1 OR #2 AND #3	2,653
#3	(ti(measure* OR assess* OR questionnaire* OR scale* OR instrument* OR evaluat* OR inventory OR "behavior* task" OR "behavior* measure" OR "implicit measure" OR "implicit task")) OR (ab(measure* OR assess* OR questionnaire* OR scale* OR instrument* OR evaluat* OR inventory OR "behavior* task" OR "behavior* measure" OR "implicit measure" OR "implicit task"))	1,999,470
#2	(ti("self-transcenden*" OR "self transcenden*" OR "ego transcenden*" OR "transcendence of the ego" OR "non-duality" OR "non-self" OR "non-dual awareness" OR "non-dual state*" OR "non-referential awareness" OR "ego-dissolution" OR "ego dissolution" OR "ego-loss")) OR (ab("self-transcenden*" OR "self transcenden*" OR "ego transcenden*" OR "transcendence of the ego" OR "non-duality" OR "non-self" OR "non-dual awareness" OR "non-dual state*" OR "non-referential awareness" OR "ego-dissolution" OR "ego dissolution" OR "ego-loss"))	2,500
#1	(ti(selfless* OR "quiet ego" OR humble OR humility OR "hypo egoic" OR "hypo-egoic" OR "delusion of me" OR "ego attenuation")) OR (ab(selfless* OR "quiet ego" OR humble OR humility OR "hypo egoic" OR "hypo-egoic" OR "delusion of me" OR "ego attenuation"))	4,147

14/07/2023

ELEMENTS OF THE SEARCH

#1 → Selflessness

selfless*, "quiet ego", "hypo egoic", "hypo-egoic", "delusion of me", "ego attenuation"

#2 → Self-transcendence

"self-transcenden*", "self transcenden*", "ego transcenden*", "transcendence of the ego" "non-duality", "non-self", "non-dual awareness", "non-dual state*", "non-referential awareness", "ego-dissolution", "ego dissolution", "ego-loss"

#3 → Questionnaire

measure*, assess*, questionnaire*, scale*, instrument*, evaluat*, inventor*, "behavior* task", "behavior* measure", "implicit measure", "implicit task"

PubMed (14/07/2023)

Search	Query	Results
#4	Search: #1 OR #2 AND #3	1,640
#3	measure*[tiab] OR assess*[tiab] OR questionnaire*[tiab] OR scale*[tiab] OR instrument*[tiab] OR evaluat*[tiab] OR inventor*[tiab] OR "behavior* task"[tiab] OR "behavior* measure"[tiab] OR "implicit measure"[tiab] OR "implicit task"[tiab]	10,140,428
#2	"self-transcenden*"[tiab] OR "self transcenden*"[tiab] OR "ego transcenden*"[tiab] OR "transcendence of the ego"[tiab] OR "non-duality"[tiab] OR "non-self"[tiab] OR "non-dual awareness"[tiab] OR "non-dual state*"[tiab] OR "non-referential awareness"[tiab] OR "ego-dissolution"[tiab] OR "ego dissolution"[tiab] OR "ego-loss"[tiab]	5,016
#1	selfless*[tiab] OR "quiet ego"[tiab] OR "hypo egoic"[tiab] OR "hypo-egoic"[tiab] OR "delusion of me"[tiab] OR "ego attenuation"[tiab]	382

Scopus (14/07/2023)

Search	Query	Results
#4	Search: #1 OR #2 AND #3	4,162
#3	TITLE-ABS-KEY(measure* OR assess* OR questionnaire* OR scale* OR instrument* OR evaluat* OR inventor* OR "behavior* task" OR "behavior* measure" OR "implicit measure" OR "implicit task")	26,865,251
#2	TITLE-ABS-KEY("self-transcenden*" OR "self transcenden*" OR "ego transcenden*" OR "transcendence of the ego" OR "non-duality" OR "non-self" OR "non-dual awareness" OR "non-dual state*" OR "non-referential awareness" OR "ego-dissolution" OR "ego dissolution" OR "ego-loss")	13,437
#1	TITLE-ABS-KEY(selfless* OR "quiet ego" OR "hypo egoic" OR "hypo-egoic" OR "delusion of me" OR "ego attenuation")	1,803

Web of Science (14/07/2023) *Search in Web Of Science Core Collection*

Search	Query	Results
#4	Search: #1 OR #2 AND #3	3,362
#3	TS=(measure* OR assess* OR questionnaire* OR scale* OR instrument* OR evaluat* OR inventor* OR "behavior* task" OR "behavior* measure" OR "implicit measure" OR "implicit task")	19,337,807
#2	TS=("self-transcenden*" OR "self transcenden*" OR "ego transcenden*" OR "transcendence of the ego" OR "non-duality" OR "non-self" OR "non-dual awareness" OR "non-dual state*" OR "non-referential awareness" OR "ego-dissolution" OR "ego dissolution" OR "ego-loss")	11,289
#1	TS=(selfless* OR "quiet ego" OR "hypo egoic" OR "hypo-egoic" OR "delusion of me" OR "ego attenuation")	1,501

PsycInfo (14/07/2023)

Search	Query	Results
#4	Search: #1 OR #2 AND #3	1,493
#3	(ti(measure* OR assess* OR questionnaire* OR scale* OR instrument* OR evaluat* OR inventor* OR "behavior* task" OR "behavior* measure" OR "implicit measure" OR "implicit task")) OR (ab(measure* OR assess* OR questionnaire* OR scale* OR instrument* OR evaluat* OR inventor* OR "behavior* task" OR "behavior* measure" OR "implicit measure" OR "implicit task"))	2,001,984
#2	(ti("self-transcenden*" OR "self transcenden*" OR "ego transcenden*" OR "transcendence of the ego" OR "non-duality" OR "non-self" OR "non-dual awareness" OR "non-dual state*" OR "non-referential awareness" OR "ego-dissolution" OR "ego dissolution" OR "ego-loss")) OR (ab("self-transcenden*" OR "self transcenden*" OR "ego transcenden*" OR "transcendence of the ego" OR "non-duality" OR "non-self" OR "non-dual awareness" OR "non-dual state*" OR "non-referential awareness" OR "ego-dissolution" OR "ego dissolution" OR "ego-loss"))	2,509
#1	(ti(selfless* OR "quiet ego" OR "hypo egoic" OR "hypo-egoic" OR "delusion of me" OR "ego attenuation")) OR (ab(selfless* OR "quiet ego" OR "hypo egoic" OR "hypo-egoic" OR "delusion of me" OR "ego attenuation"))	648

07/01/2024 (2023-2024 Filter Update)

PubMed (07/01/2024)

Search	Query	Results
#4	Search: #1 OR #2 AND #3	138
#3	measure*[tiab] OR assess*[tiab] OR questionnaire*[tiab] OR scale*[tiab] OR instrument*[tiab] OR evaluat*[tiab] OR inventor*[tiab] OR "behavior* task"[tiab] OR "behavior* measure"[tiab] OR "implicit measure"[tiab] OR "implicit task"[tiab]	718,051
#2	"self-transcenden*"[tiab] OR "self transcenden*"[tiab] OR "ego transcenden*"[tiab] OR "transcendence of the ego"[tiab] OR "non-duality"[tiab] OR "non-self"[tiab] OR "non-dual awareness"[tiab] OR "non-dual state*"[tiab] OR "non-referential awareness"[tiab] OR "ego-dissolution"[tiab] OR "ego dissolution"[tiab] OR "ego-loss"[tiab]	316
#1	selfless*[tiab] OR "quiet ego"[tiab] OR "hypo egoic"[tiab] OR "hypo-egoic"[tiab] OR "delusion of me"[tiab] OR "ego attenuation"[tiab]	23

Scopus (07/01/2024)

Search	Query	Results
#4	Search: #1 OR #2 AND #3	327
#3	TITLE-ABS-KEY(measure* OR assess* OR questionnaire* OR scale* OR instrument* OR evaluat* OR inventor* OR "behavior* task" OR "behavior* measure" OR "implicit measure" OR "implicit task")	1,632,977
#2	TITLE-ABS-KEY("self-transcenden*" OR "self transcenden*" OR "ego transcenden*" OR "transcendence of the ego" OR "non-duality" OR "non-self" OR "non-dual awareness" OR "non-dual state*" OR "non-referential awareness" OR "ego-dissolution" OR "ego dissolution" OR "ego-loss")	825
#1	TITLE-ABS-KEY(selfless* OR "quiet ego" OR "hypo egoic" OR "hypo-egoic" OR "delusion of me" OR "ego attenuation")	142

Web of Science (07/01/2024) *Search in Web Of Science Core Collection*

Search	Query	Results
#4	Search: #1 OR #2 AND #3	245
#3	TS=(measure* OR assess* OR questionnaire* OR scale* OR instrument* OR evaluat* OR inventor* OR “behavior* task” OR “behavior* measure” OR “implicit measure” OR “implicit task”)	1,039,387
#2	TS=(“self-transcenden*” OR “self transcenden*” OR “ego transcenden*” OR “transcendence of the ego” OR “non-duality” OR “non-self” OR “non-dual awareness” OR “non-dual state*” OR “non-referential awareness” OR “ego-dissolution” OR “ego dissolution” OR “ego-loss”)	598
#1	TS=(selfless* OR “quiet ego” OR “hypo egoic” OR “hypo-egoic” OR “delusion of me” OR “ego attenuation”)	100

PsycInfo (07/01/2024)

Search	Query	Results
#4	Search: #1 OR #2 AND #3	80
#3	(ti(measure* OR assess* OR questionnaire* OR scale* OR instrument* OR evaluat* OR inventor* OR “behavior* task” OR “behavior* measure” OR “implicit measure” OR “implicit task”)) OR (ab(measure* OR assess* OR questionnaire* OR scale* OR instrument* OR evaluat* OR inventor* OR “behavior* task” OR “behavior* measure” OR “implicit measure” OR “implicit task”))	65,852
#2	(ti(“self-transcenden*” OR “self transcenden*” OR “ego transcenden*” OR “transcendence of the ego” OR “non-duality” OR “non-self” OR “non-dual awareness” OR “non-dual state*” OR “non-referential awareness” OR “ego-dissolution” OR “ego dissolution” OR “ego-loss”)) OR (ab(“self-transcenden*” OR “self transcenden*” OR “ego transcenden*” OR “transcendence of the ego” OR “non-duality” OR “non-self” OR “non-dual awareness” OR “non-dual state*” OR “non-referential awareness” OR “ego-dissolution” OR “ego dissolution” OR “ego-loss”))	132
#1	(ti(selfless* OR “quiet ego” OR “hypo egoic” OR “hypo-egoic” OR “delusion of me” OR “ego attenuation”)) OR (ab(selfless* OR “quiet ego” OR “hypo egoic” OR “hypo-egoic” OR “delusion of me” OR “ego attenuation”))	30

10/06/2024

PubMed (10/06/2024)

Search	Query	Results
#4	Search: #1 OR #2 AND #3	1,753
#3	measure*[tiab] OR assess*[tiab] OR questionnaire*[tiab] OR scale*[tiab] OR instrument*[tiab] OR evaluat*[tiab] OR inventor*[tiab] OR "behavior* task"[tiab] OR "behavior* measure"[tiab] OR "implicit measure"[tiab] OR "implicit task"[tiab] OR neuropheno*[tiab]	10,731,800
#2	"self-transcenden*"[tiab] OR "self transcenden*"[tiab] OR "ego transcenden*"[tiab] OR "transcendence of the ego"[tiab] OR "non-duality"[tiab] OR "non-self"[tiab] OR "non-dual awareness"[tiab] OR "non-dual state*"[tiab] OR "non-referential awareness"[tiab] OR "ego-dissolution"[tiab] OR "ego dissolution"[tiab] OR "ego-loss"[tiab]	5,273
#1	selfless*[tiab] OR "quiet ego"[tiab] OR "hypo egoic"[tiab] OR "hypo-egoic"[tiab] OR "delusion of me"[tiab] OR "ego attenuation"[tiab]	408

Scopus (10/06/2024)

Search	Query	Results
#4	Search: #1 OR #2 AND #3	4,478
#3	TITLE-ABS-KEY(measure* OR assess* OR questionnaire* OR scale* OR instrument* OR evaluat* OR inventor* OR "behavior* task" OR "behavior* measure" OR "implicit measure" OR "implicit task" OR neuropheno*)	28,617,320
#2	TITLE-ABS-KEY("self-transcenden*" OR "self transcenden*" OR "ego transcenden*" OR "transcendence of the ego" OR "non-duality" OR "non-self" OR "non-dual awareness" OR "non-dual state*" OR "non-referential awareness" OR "ego-dissolution" OR "ego dissolution" OR "ego-loss")	14,207
#1	TITLE-ABS-KEY(selfless* OR "quiet ego" OR "hypo egoic" OR "hypo-egoic" OR "delusion of me" OR "ego attenuation")	1,983

Web of Science (10/06/2024) *Search in Web Of Science Core Collection*

Search	Query	Results
#4	Search: #1 OR #2 AND #3	3,658
#3	TS=(measure* OR assess* OR questionnaire* OR scale* OR instrument* OR evaluat* OR inventor* OR "behavior* task" OR "behavior* measure" OR "implicit measure" OR "implicit task" OR neuropheno*)	21,036,732
#2	TS=("self-transcenden*" OR "self transcenden*" OR "ego transcenden*" OR "transcendence of the ego" OR "non-duality" OR "non-self" OR "non-dual awareness" OR "non-dual state*" OR "non-referential awareness" OR "ego-dissolution" OR "ego dissolution" OR "ego-loss")	12,067
#1	TS=(selfless* OR "quiet ego" OR "hypo egoic" OR "hypo-egoic" OR "delusion of me" OR "ego attenuation")	1,622

PsycInfo (10/06/2024)

Search	Query	Results
#4	Search: #1 OR #2 AND #3	1.591
#3	(ti(measure* OR assess* OR questionnaire* OR scale* OR instrument* OR evaluat* OR inventor* OR "behavior* task" OR "behavior* measure" OR "implicit measure" OR "implicit task" OR neuropheno*)) OR (ab(measure* OR assess* OR questionnaire* OR scale* OR instrument* OR evaluat* OR inventor* OR "behavior* task" OR "behavior* measure" OR "implicit measure" OR "implicit task" OR neuropheno*))	2.094.268
#2	(ti("self-transcenden*" OR "self transcenden*" OR "ego transcenden*" OR "transcendence of the ego" OR "non-duality" OR "non-self" OR "non-dual awareness" OR "non-dual state*" OR "non-referential awareness" OR "ego-dissolution" OR "ego dissolution" OR "ego-loss")) OR (ab("self-transcenden*" OR "self transcenden*" OR "ego transcenden*" OR "transcendence of the ego" OR "non-duality" OR "non-self" OR "non-dual awareness" OR "non-dual state*" OR "non-referential awareness" OR "ego-dissolution" OR "ego dissolution" OR "ego-loss"))	2.678
#1	(ti(selfless* OR "quiet ego" OR "hypo egoic" OR "hypo-egoic" OR "delusion of me" OR "ego attenuation")) OR (ab(selfless* OR "quiet ego" OR "hypo egoic" OR "hypo-egoic" OR "delusion of me" OR "ego attenuation"))	683

06/11/2024 (2024 Filter Update)

PubMed (06/11/2024)

Search	Query	Results
#4	Search: #1 OR #2 AND #3	115
#3	measure*[tiab] OR assess*[tiab] OR questionnaire*[tiab] OR scale*[tiab] OR instrument*[tiab] OR evaluat*[tiab] OR inventor*[tiab] OR "behavior* task"[tiab] OR "behavior* measure"[tiab] OR "implicit measure"[tiab] OR "implicit task"[tiab] OR neuropheno*[tiab]	643,457
#2	"self-transcenden*"[tiab] OR "self transcenden*"[tiab] OR "ego transcenden*"[tiab] OR "transcendence of the ego"[tiab] OR "non-duality"[tiab] OR "non-self"[tiab] OR "non-dual awareness"[tiab] OR "non-dual state*"[tiab] OR "non-referential awareness"[tiab] OR "ego-dissolution"[tiab] OR "ego dissolution"[tiab] OR "ego-loss"[tiab]	259
#1	selfless*[tiab] OR "quiet ego"[tiab] OR "hypo egoic"[tiab] OR "hypo-egoic"[tiab] OR "delusion of me"[tiab] OR "ego attenuation"[tiab]	28

Scopus (06/11/2024)

Search	Query	Results
#4	Search: #1 OR #2 AND #3	282
#3	TITLE-ABS-KEY(measure* OR assess* OR questionnaire* OR scale* OR instrument* OR evaluat* OR inventor* OR "behavior* task" OR "behavior* measure" OR "implicit measure" OR "implicit task" OR neuropheno*)	1,496,318
#2	TITLE-ABS-KEY("self-transcenden*" OR "self transcenden*" OR "ego transcenden*" OR "transcendence of the ego" OR "non-duality" OR "non-self" OR "non-dual awareness" OR "non-dual state*" OR "non-referential awareness" OR "ego-dissolution" OR "ego dissolution" OR "ego-loss")	690
#1	TITLE-ABS-KEY(selfless* OR "quiet ego" OR "hypo egoic" OR "hypo-egoic" OR "delusion of me" OR "ego attenuation")	136

Web of Science (06/11/2024) *Search in Web Of Science Core Collection*

Search	Query	Results
#4	Search: #1 OR #2 AND #3	209
#3	TS=(measure* OR assess* OR questionnaire* OR scale* OR instrument* OR evaluat* OR inventor* OR “behavior* task” OR “behavior* measure” OR “implicit measure” OR “implicit task” OR neuropheno*)	1,015,435
#2	TS=(“self-transcenden*” OR “self transcenden*” OR “ego transcenden*” OR “transcendence of the ego” OR “non-duality” OR “non-self” OR “non-dual awareness” OR “non-dual state*” OR “non-referential awareness” OR “ego-dissolution” OR “ego dissolution” OR “ego-loss”)	492
#1	TS=(selfless* OR “quiet ego” OR “hypo egoic” OR “hypo-egoic” OR “delusion of me” OR “ego attenuation”)	83

PsycInfo (06/11/2024)

Search	Query	Results
#4	Search: #1 OR #2 AND #3	73
#3	(ti(measure* OR assess* OR questionnaire* OR scale* OR instrument* OR evaluat* OR inventor* OR “behavior* task” OR “behavior* measure” OR “implicit measure” OR “implicit task” OR neuropheno*)) OR (ab(measure* OR assess* OR questionnaire* OR scale* OR instrument* OR evaluat* OR inventor* OR “behavior* task” OR “behavior* measure” OR “implicit measure” OR “implicit task” OR neuropheno*))	62.764
#2	(ti(“self-transcenden*” OR “self transcenden*” OR “ego transcenden*” OR “transcendence of the ego” OR “non-duality” OR “non-self” OR “non-dual awareness” OR “non-dual state*” OR “non-referential awareness” OR “ego-dissolution” OR “ego dissolution” OR “ego-loss”)) OR (ab(“self-transcenden*” OR “self transcenden*” OR “ego transcenden*” OR “transcendence of the ego” OR “non-duality” OR “non-self” OR “non-dual awareness” OR “non-dual state*” OR “non-referential awareness” OR “ego-dissolution” OR “ego dissolution” OR “ego-loss”))	113
#1	(ti(selfless* OR “quiet ego” OR “hypo egoic” OR “hypo-egoic” OR “delusion of me” OR “ego attenuation”)) OR (ab(selfless* OR “quiet ego” OR “hypo egoic” OR “hypo-egoic” OR “delusion of me” OR “ego attenuation”))	17

A.2. Assessment Criteria for Evaluating Content Validity

The Ten Criteria for Good Content Validity (Terwee et al., 2018):

Relevance:

1. Are the included items relevant for the construct of interest?
2. Are the included items relevant for the target population of interest?
3. Are the included items relevant for the context of use of interest?
4. Are the response options appropriate?
5. Is the recall period appropriate?

Comprehensiveness:

6. Are no key concepts missing?

Comprehensibility:

7. Are the PROM instructions understood by the population of interest as intended?
8. Are the PROM items and response options understood by the population of interest as intended?
9. Are the PROM items appropriately worded?
10. Do the response options match the question?

Each criterion is rated as sufficient (+), insufficient (-), or indeterminate (?). The general rule to give a sufficient rating per criterion is:

+ : > 85% of the items of the PROM (or subscale) fulfill the criterion.

– : < 85% of the items of the PROM (or subscale) does fulfill the criteria.

? : No(t enough) information available or quality of (part of a) the study inadequate.

Guidance for Determining the Relevance Rating, Comprehensiveness Rating, and Comprehensibility Rating per Study:

	Relevance	Comprehensiveness	Comprehensibility*
+	At least criteria 1 and 2 are rated + AND at least two of the other three criteria on relevance are rated +. Criteria 1 and 2 (relevance for construct and population) are considered the most important criteria and therefore they need to be rated +. A maximum of 1 criterion rated – is allowed, but reviewers can also rate ± in that case	Rating of criterion 6	Both criteria 9 and 10 are rated +
-	At least criteria 1 and 2 are rated – AND at least two of the other three criteria on relevance are rated –	Rating of criterion 6	Both criteria 9 and 10 are rated –
?	At least two of the criteria are rated ?	Rating of criterion 6	At least one of the criteria is rated ?
±	All other situations	Rating of criterion 6	One criterion is rated + and one is rated –

* Since we were unable to ask the population of interest directly, questions 7 and 8 were excluded from the analysis.

Guidance for Determining the Content Validity Rating per Study:

Rating	Description
+	The relevance rating is +, the comprehensiveness rating is +, and the comprehensibility rating is +
–	The relevance rating is –, the comprehensiveness rating is –, and the comprehensibility rating is –
±	At least one of the ratings is + and at least one of the ratings is –
?	Two or more of the ratings are rated ?

B. Appendices Study 3

Selection of Pictographic Measures of Selflessness

Perceived Body Boundaries Scale (PBBS; Dambrun, 2016).

Instructions: *Please indicate the image that best describes your experience in the virtual reality environment. To what extent did you feel that the boundaries of your body were altered?*

Spatial Frame of Reference Continuum (SFoRC; Hanley & Garland, 2019).

Instructions: *To what extent has your perception of yourself extended in the virtual reality experience? Using the letters and the following image, indicate how far you believe your "self" extends beyond your physical body. The letter "A" represents that your "self" stops at your physical body (A head, B chest, C abdomen). Starting from D, it indicates that your "self" extends to a space beyond your physical body. The rings are symbolic and do not represent actual distances.*

Fusion with VR-partner (Ad Hoc).

Instructions: *Please indicate the image that best describes your experience in the virtual reality environment. To what extent did you feel that you fused with your partner during the experience?*

Small Self Effect (Ad Hoc).

Instructions: *Please indicate the image that best describes your experience in the virtual reality environment. To what extent did you feel that your sense of self diminished?*

Self-Referential Inner Dialogue (Ad Hoc).

Instructions:

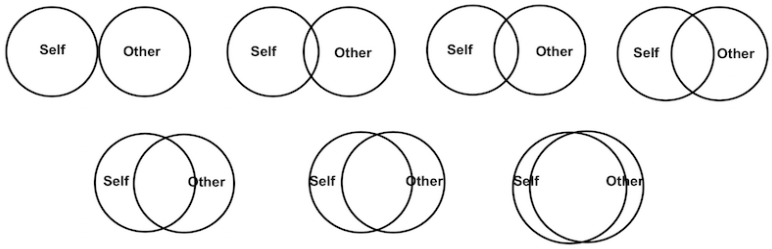
Item 1 (intensity): *Please indicate the image that best describes your experience in the virtual reality environment. To what extent did sensations, images, thoughts, and/or memories from your life (self-referential) appear?*

Item 2 (percentage of time): *During the virtual reality experience, what percentage of the time did you have sensations, images, thoughts, and/or memories of your life?*

100%	90%	80%	70%	60%	50%	40%	30%	20%	10%	0%

Inclusion of Other in the Self scale (IOS; Aron et al., 1992).

Instructions: *Which image best represents your relationship with the people who will participate (or have participated) in the experience? (1: do not overlap; 2: overlap slightly; 3: overlap somewhat; 4: overlap moderately; 5: overlap considerably; 6: overlap a lot; 7: mostly overlap).*



C. Appendices Study 4

Structured Practice Diary

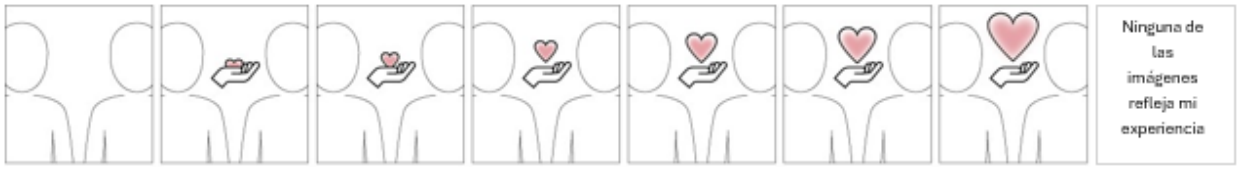
WARMTH

TIME PERCEPTION

POSITIVE EMOTIONS

NEGATIVE EMOTIONS

COMPASSION



SELF-COMPASSION

INEFFABILITY

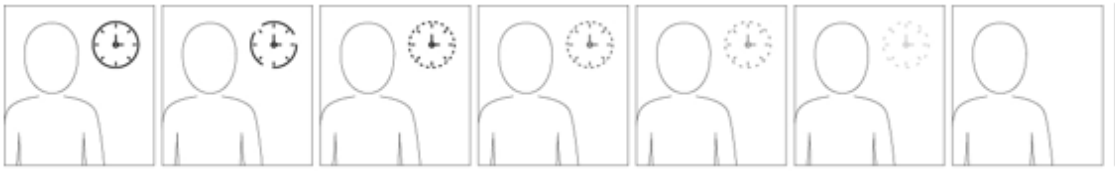
INTERPERSONAL CONNECTION

CONNECTION WITH THE PLANET

BODILY BOUNDARIES

REFERENCE CONTINUUM

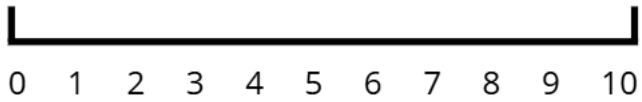
TIME DISAPPEARANCE



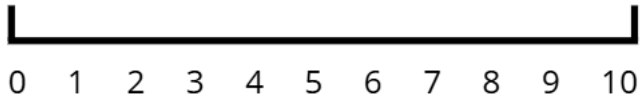
EGO ATTENUATION

EGO INFLATION

During the practice, I felt fully immersed in the meditative experience.

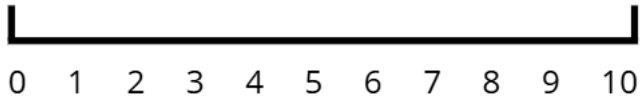


The meditation held a deep or transformative significance for me, generating a meaningful understanding or experiential insight.

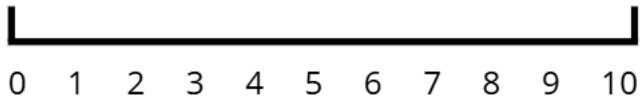


If the meditation involved visualization or imagery:

During the practice, I felt fully immersed in the visualization, to the extent that I forgot I was in the room.

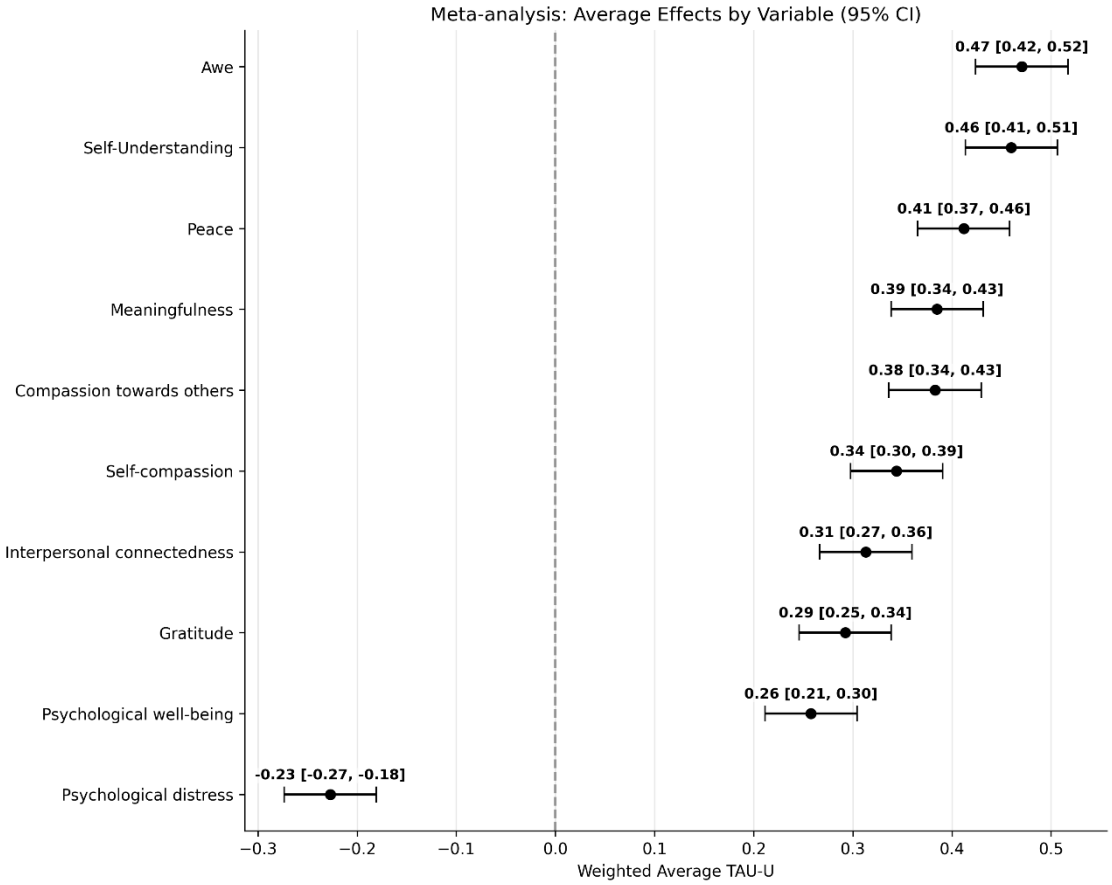


During the practice, I was able to visualize the mental imagery with clarity and detail.



D. Appendices Study 5

Meta-Analytic Summary of Weighted Tau-U Effect Sizes Across Outcome Variables



Note. Points represent weighted Tau-U effect sizes for each outcome variable, with horizontal bars indicating 95% confidence intervals. Positive values indicate improvement associated with the intervention, whereas negative values indicate deterioration. The dashed vertical line at zero denotes no effect. Effect sizes are aggregated across participants, providing a meta-analytic overview of intervention effects across outcome domains.