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Non-Ordinary States of Consciousness and Human Transformation:

A Narrative Literature Review of Neural, Physiological, and Phenomenological Patterns Through a Quantum Science Lens

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Abstract

Non-ordinary states of consciousness (NOSC) have long been described across cultures and spiritual traditions, while contemporary research increasingly examines them through neural, physiological, and phenomenological dimensions. This narrative literature review explores non-pathological NOSC across meditation, yoga, breathwork, psychedelic experiences, near-death experiences, and mystical states. The central question guiding this review is: What neural, physiological, and phenomenological patterns are associated with non-ordinary states of consciousness, and how might these states contribute to psychological transformation and human potential? Across the literature reviewed, NOSC are associated with changes in self-referential brain networks, brain wave activity, functional connectivity, autonomic regulation, interoceptive awareness, self-boundaries, time and body perception, unity, meaning, intuitive insight, and interconnectedness. These findings suggest that NOSC involve coordinated shifts across brain, body, and lived experience rather than isolated changes at one level alone. These shifts may contribute to psychological transformation by loosening ordinary patterns of self-reference and opening access to expanded awareness, meaning, connection, and potential. However, transformation is not automatic. Whether these openings become lasting change depends in part on intention, context, continued practice, and integration. Through a quantum science lens, NOSC may be interpreted as interactive, whole-system processes through which consciousness is reorganized, expressed, and embodied in the brain-body system.

Keywords.

Non-ordinary states of consciousness (NOSC); Altered states of consciousness (ASC); Neural correlates; Phenomenology; Contemplative practices; Meditation; Breathwork; Psychedelic experiences; Near-death experiences; Mystical experience; Quantum science; Psychological transformation; Human potential

1. INTRODUCTION

Non-ordinary states of consciousness (NOSC) have been described across cultures, spiritual traditions, contemplative practices, and modern scientific research. They may arise through meditation, yoga, breathwork, prayer, ritual, psychedelic experience, near-death experience, or other profound shifts in awareness. Although these pathways differ in method and cultural meaning, NOSC often involve changes in self-boundaries, perception of time and space, embodiment, meaning, intuitive insight, unity, and connectedness. Because of these features, NOSC have long been associated with spiritual insight, healing, creativity, psychological transformation, and the expansion of human potential.

Despite their long history, NOSC remain difficult to define and study within conventional scientific models. One reason is that consciousness itself does not yet have a single agreed-upon definition. While neuroscience has made significant advances in identifying neural correlates of conscious experience, questions remain about whether consciousness is produced by the brain, expressed through the brain, or reflects a more fundamental dimension of reality. These questions are especially important in the study of NOSC because such states often alter the ordinary sense of self, perception, embodiment, meaning, and reality.

Recent research provides ways to examine these experiences through measurable neural and physiological patterns. Although NOSC are often described in spiritual, mystical, or subjective language, emerging findings suggest that they are also associated with observable changes in brain activity, brain-body regulation, and lived experience. These findings do not fully explain consciousness itself, but they provide an important bridge between first-person reports of transformation and measurable changes in the brain-body system.

This paper is a narrative literature review examining non-ordinary states of consciousness through a quantum science framework. In this view, consciousness is not treated merely as a byproduct of neural activity, but as a fundamental dimension of reality that may be expressed, organized, and transformed through the brain-body system. The review considers empirical and theoretical literature across several NOSC contexts. Rather than treating NOSC as unusual experiences alone, this review considers them as states that may temporarily loosen ordinary patterns of self-reference and open access to forms of awareness, meaning, connection, and potential that are less available in ordinary waking consciousness. Whether these openings lead to lasting transformation depends in part on how they are understood, supported, and integrated over time. The central question guiding this review is: What neural, physiological, and phenomenological patterns are associated with non-ordinary states of consciousness, and how might these states contribute to psychological transformation and human potential?

2. THEORETICAL BACKGROUND

2.1 Interpreting NOSC Through a Quantum Science Lens

The study of non-ordinary states of consciousness requires a theoretical framework broad enough to include measurable neural and physiological activity, first-person phenomenological experience, and psychological transformation. Conventional neuroscience has contributed significantly to the study of consciousness by identifying brain regions, networks, and physiological patterns associated with attention, perception, emotion, self-related processing, and altered states. However, a purely reductionist model may be limited when examining experiences that involve unity, transcendence, expanded awareness, intuitive knowing, and changes in the perceived relationship between self and reality. For this reason, the present review is grounded in a quantum science framework that regards consciousness as foundational rather than merely reducible to neural activity.

For the purposes of this review, quantum science refers to a framework informed by concepts such as nonlocality, non-separability, entanglement, complementarity, coherence, potentiality, discontinuity, and observer participation. These concepts provide an interpretive language for considering forms of experience that appear to challenge strictly materialist, deterministic, and separable models of mind. Rather than treating NOSC only as altered brain states, a quantum science framework allows them to be examined as shifts in access to dimensions of consciousness that are expressed through the brain-body system.

2.2 Quantum Science and Neural-Physiological Patterns

Quantum science is relevant to the neural and physiological study of NOSC because it provides a scientific framework for understanding reality at subatomic, atomic, molecular, and nanoscale levels, where classical assumptions of separability, determinism, and locality are incomplete. Classical mechanics remains effective for describing many macroscopic systems, while quantum mechanics describes phenomena at these subtler levels in terms of probability, superposition, measurement, complementarity, and nonlocal correlation. As quantum systems interact with their surrounding environment, coherence may be lost through decoherence, giving rise to the more stable classical patterns observed at macroscopic levels. The nanoscale is relevant to this framework because it marks a range at which quantum effects may become significant. At the nanoscale, generally defined as approximately 1–100 nanometers, structures may exhibit properties that differ from their larger-scale forms partly because quantum effects become more relevant at that scale (National Nanotechnology Initiative, n.d.). This is significant for biological and neural organization because neural communication also involves nanoscale structures. For example, Purves et al. (2001) describe chemical synaptic clefts in the central nervous system as approximately 20–40 nanometers wide, while electrical synapses or gap junctions involve even smaller separations of approximately 2–4 nanometers. These examples show that biological communication occurs at dimensions where quantum principles are scientifically relevant to consider.

Exploring neuroscience within a quantum science framework provides a way to examine measurable neural correlates of non-ordinary states without reducing consciousness to brain activity alone. Although neural coherence observed during meditation and contemplative practices can be described within conventional neurophysiology, quantum theories of consciousness offer a broader framework for considering how coherence, organization, and conscious experience may be related. Hameroff and Penrose's Orch-OR theory proposes that consciousness may involve biologically orchestrated quantum coherence within neuronal microtubules, followed by moments of objective reduction in which quantum possibilities become actualized as conscious experience (Hameroff & Penrose, 1996). Hameroff (2014) later reviews this model, describing consciousness in relation to finer-scale quantum processes or vibrations within neuronal microtubules.

Coherence is especially relevant at the neural and physiological level. In a broad sense, coherence refers to ordered relationship, coordination, or meaningful organization within a system. In the context of NOSC, coherence is considered in relation to neural synchrony, brain network organization, autonomic regulation, and the integration of mind, body, and awareness.

2.3 Quantum Concepts and the Experience of Consciousness

Quantum science is also relevant to the phenomenological study of NOSC because many non-ordinary states involve changes in self-boundaries, perception, meaning, and the felt structure of reality. Complementarity is especially useful here because it addresses the limits of any single mode of observation. Bohr (1928) argued that light cannot be fully described only as a wave or only as a particle. Instead, wave-like and particle-like descriptions are both necessary, even though they are revealed under different experimental conditions and cannot be fully observed at the same time. Complementarity therefore means that different forms of observation reveal different but valid aspects of the same reality.

Applied to NOSC, complementarity suggests that no single method fully captures the complexity of altered consciousness. Brain imaging may reveal neural connectivity, physiological measures may reveal autonomic regulation, first-person reports may reveal unity or altered embodiment, and clinical outcomes may reveal changes in meaning or behavior. Each method reveals a different aspect of the same conscious event. This is particularly important in the study of NOSC because these states are not merely objects observed from the outside; they are lived experiences in which attention, intention, context, and interpretation influence what is experienced and what can be known.

Nonlocality, non-separability, and entanglement also provide important interpretive concepts. Aspect et al. (1982) demonstrated that entangled photons exhibit correlations that cannot be explained by ordinary local interactions or classical signal transmission. Even when experimental conditions ruled out communication at or below the speed of light, the correlated measurement outcomes persisted. This nonlocal correlation, known as quantum entanglement, challenges classical assumptions about separability and locality. In the present review, these concepts provide a scientific and

philosophical framework for understanding why NOSC often involve unity, interconnectedness, intuitive knowing, and altered boundaries between self and world. Such experiences are difficult to fully describe through strictly separative models of mind.

Within this framework, the brain is not understood as the sole producer of consciousness, but as a dynamic interface through which consciousness may be expressed, organized, filtered, and transformed. Goswami et al. (1995) define consciousness in several interrelated dimensions: consciousness as a field of awareness, the objects that appear within awareness, the subject or observer of experience, and consciousness as "the ground of all being" (p. 106). This view is especially relevant to NOSC because these states often involve a reorganization of the relationship among awareness, the contents of awareness, and the observing self. In ordinary waking consciousness, attention is often organized around personal identity, linear time, self-referential thought, and habitual perception. In NOSC, these ordinary patterns may soften, allowing expanded forms of awareness, meaning, unity, and connectedness to emerge.

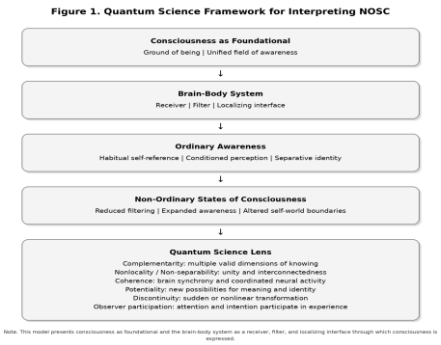


Figure 1 summarizes the quantum science framework used in this review to interpret NOSC as shifts in consciousness expressed through the brain-body system.

2.4 Quantum Science, Transformation, and Human Potential

A quantum science lens also allows NOSC to be understood in relation to potentiality, discontinuity, and transformation. Potentiality refers to possibilities that have not yet become actualized. In ordinary states of consciousness, perception and behavior are often shaped by habitual patterns of thought, emotion, memory, body awareness, and identity. NOSC may temporarily disrupt these patterns, allowing new meanings, emotional releases, insights, and self-understandings to emerge. Discontinuity is relevant because transformation does not always unfold gradually. Some NOSC involve sudden shifts in worldview, self-understanding, fear of death, compassion, or life orientation. In this sense, the lay phrase "quantum leap" points toward a more formal idea of discontinuity: a movement from one state of organization to another that is not simply linear or incremental.

Cross-cultural mystical traditions have long described transformative shifts in consciousness. In Christian mysticism, union with the divine is often understood as an experience that changes the person's relationship to self, God, and reality. Alvarez-Segura et al. (2022) describe Christian mystical experience as involving intuitive awareness, unity, and a transformed orientation toward life and the self. Yogic and meditative traditions similarly describe advanced states as involving expanded awareness, inner stillness, and direct experience of interconnectedness. Although these traditions use spiritual rather than scientific language, their descriptions are consistent with a non-separability framework in which consciousness is experienced as more fundamental than the ordinary egoic self.

This connection between NOSC, expanded awareness, and transformation is also reflected in writings on synchronicity and non-ordinary knowing. Kenyon (1994) suggests that deeper brain states are associated with higher levels of consciousness and increased experiences of synchronicity, described as an alignment between inner experience and outer events. This suggests that altered states of consciousness may heighten sensitivity to meaningful patterns that are not ordinarily perceived. Kenyon also links respiration with brain-state changes, proposing that shifts toward either slower or intensified breathing may correspond with changes in brain wave activity and increased likelihood of non-ordinary states. This provides an early theoretical bridge between breath regulation, neural state changes, and the induction of NOSC.

Vujičin (1995), writing on esoteric Christianity and Indian sages, suggests that mystical states may involve forms of perception or knowing that differ from ordinary waking consciousness. His discussion brings Western categories of extraordinary perception, such as telepathy, clairvoyance, precognition, psychokinesis, out-of-body experience, and survival of consciousness after death, into conversation with Indian accounts of siddhis, or unusual capacities associated with advanced spiritual practice. Rather than presenting these capacities as the goal of NOSC, this review interprets them as traditional and historically respected ways of describing expanded awareness, non-ordinary perception, and a loosening of the usual boundaries of self, body, and reality.

Transpersonal and developmental psychology also support the view that NOSC may be meaningful for human development. Gowan (1974) described mystical and psychedelic states as part of higher levels of human development, emphasizing that these states are not limited to drug-induced experiences but may also occur through meditation, spiritual practice, creative absorption, crisis, or peak experience. He associated these states with heightened perceptual vividness, intensified meaning-making, intuitive cognition, expanded sense of self, boundary dissolution, relational and empathic amplification, and other phenomena sometimes reported in mystical or transpersonal experience. Gowan emphasized that transcendent states differ from pathological states in part because of the individual's integrative capacity and ability to return to consensual reality. His view aligns with Maslow's (1943) concept of self-actualization and Jung's (1966) concept of individuation, both of which describe human development as a movement toward wholeness, integration, and realization of potential.

A quantum science framework allows this paper to hold several levels of inquiry together: the measurable neural and physiological patterns associated with these states, the phenomenological features through which they are experienced, the quantum concepts that help interpret shifts in consciousness and reality perception, and the transformational outcomes through which NOSC may contribute to human potential. By bringing these perspectives into dialogue, this review considers how NOSC may temporarily loosen habitual patterns of identity, perception, and self-reference, opening access to forms of awareness, meaning, and connection that are less available in ordinary waking consciousness. From a quantum science perspective, their transformational significance

lies not only in the altered state itself, but in how the experience is intentionally integrated and expressed over time.

3. METHODOLOGICAL APPROACH

This paper uses a narrative literature review approach to examine neural, physiological, and phenomenological patterns associated with non-ordinary states of consciousness and to consider how these states may contribute to psychological transformation and human potential. A narrative review was selected because the topic is interdisciplinary, drawing from neuroscience, consciousness studies, contemplative science, transpersonal psychology, and quantum science. Rather than limiting the review to one intervention, population, or methodology, this approach allows for a broader synthesis across multiple contexts in which NOSC have been reported.

The literature reviewed includes theoretical, empirical, and interdisciplinary sources related to meditation, yoga, breathwork, psychedelic experiences, near-death experiences, and mystical states. These categories were selected because they represent commonly reported pathways into NOSC and have been discussed in relation to altered consciousness, phenomenological change, and psychological or spiritual transformation. The amount and type of empirical evidence varies across categories, with some areas offering more direct neural or physiological research than others.

Sources were selected based on their relevance to three primary areas: descriptions or definitions of NOSC; reported neural, physiological, or phenomenological features of these states; and implications for psychological transformation, expanded awareness, or human potential. Priority was given to sources that addressed altered or non-ordinary states, contemplative or mystical experience, neural activity, brain network changes, brain wave activity, autonomic regulation, self-referential processing, coherence, or transformation following such experiences.

Because the purpose of this review is integrative rather than statistical, the literature was not analyzed through meta-analysis or systematic review procedures. Instead, sources were organized thematically according to the major contexts in which NOSC are reported. Within each thematic area, the review considers relevant neural or physiological correlates, phenomenological features, and reported psychological or transformational outcomes. The discussion then considers how recurring patterns across the literature may be interpreted through a quantum science framework that understands consciousness as foundational while still recognizing its expression through neural, physiological, and psychological processes.

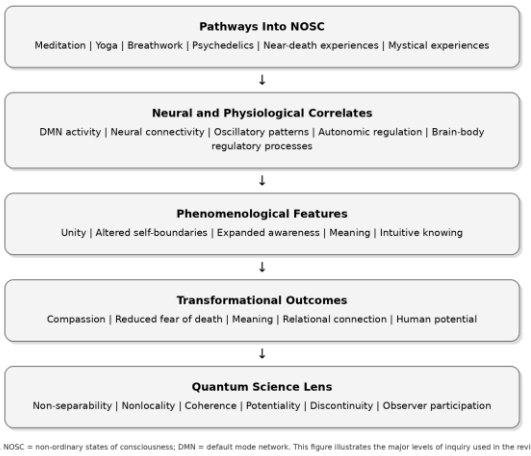
Because this review is narrative rather than systematic, it does not claim to include every available study on NOSC or to provide a quantitative comparison of findings across studies. The goal is not to reduce NOSC to a single mechanism or level of explanation, but to identify meaningful relationships among neural activity, physiological regulation, phenomenological experience, psychological transformation, and human potential within a quantum science framework.

4. FINDINGS

4.1 Pathways Into NOSC and Associated Neural, Physiological, and Phenomenological Patterns

Across the literature reviewed, several recurring neural, physiological, and phenomenological patterns appear across NOSC contexts. These include changes in default mode network activity, neural connectivity, brain wave activity, autonomic regulation, body-self perception, meaning-making, unity, ego-softening, and expanded awareness. The following section presents these findings across meditation, yoga, breathwork, psychedelic experiences, near-death experiences, and mystical states.

Figure 2. Levels of Inquiry in Non-Ordinary States of Consciousness



Note. NOSC = non-ordinary states of consciousness; DMN = default mode network. This figure illustrates the major levels of inquiry used in the review.

Figure 2 summarizes the major levels of inquiry used to organize the findings across NOSC contexts.

4.2 Meditation and Advanced Contemplative Practice

Meditation is one of the most frequently studied contemplative practices associated with altered or non-ordinary states of consciousness. The literature suggests that meditation may influence neural systems involved in attention, self-related processing, emotional regulation, body awareness, and large-scale neural coordination.

Brewer et al. (2011) examined the relationship between meditation and the default mode network (DMN), a brain network associated with mind-wandering, autobiographical thought, rumination, and the narrative sense of self. The study included three meditation styles: Focused Attention, Loving-Kindness, and Choiceless Awareness. Across meditation conditions, experienced meditators showed reduced activity in major DMN regions, including the posterior cingulate cortex and medial prefrontal cortex, and reported less mind-wandering than controls. The study also found stronger connectivity between the posterior cingulate cortex and regions involved in cognitive control, including the dorsal anterior cingulate cortex and dorsolateral prefrontal cortex, both during meditation and at rest. The study also found differences related to specific meditation styles, including reduced amygdala activity during Loving-Kindness meditation. The authors interpreted these findings as evidence that meditation alters DMN activity and its connectivity with regulatory networks. Because these connectivity patterns were observed during both meditation and rest, the results may suggest more enduring changes in present-centered awareness among experienced meditators. These findings are relevant to the present review because it demonstrates how neural findings may correspond with changes in cognitive processing.

Jinich-Diamant et al. (2025) studied a seven-day mind-body retreat that included meditation, reconceptualization, and open-label placebo healing rituals. In a subgroup of 20 healthy adults drawn from a larger retreat sample, the researchers compared pre- and post-retreat

neural and biological markers using fMRI, plasma-based molecular analyses, and cellular assays. During meditation, participants showed altered large-scale brain organization, including reduced integration within the default mode and salience networks, reduced whole-brain modularity, and greater global efficiency. These findings suggest that the retreat was associated with a more globally coordinated and less compartmentalized functional brain state. Participants also reported stronger mystical-type experiences after the retreat. At the biological level, post-retreat plasma was associated with changes related to neurite growth, cellular metabolism, BDNF-related activity, immune and inflammatory signaling, endogenous opioid pathways, and neurotransmission-related processes. This study is especially relevant to this review because it links an intensive contemplative retreat with measurable changes across neural, molecular, and phenomenological domains. It therefore supports the view that NOSC may involve coordinated shifts across the brain-body system rather than isolated changes in subjective experience alone.

Zanesco et al. (2023) examined whether intensive meditation retreat practice was associated with profound or mystical-type experiences. Compared with experienced meditators who continued ordinary daily life, retreat participants reported more frequent or intense experiences involving insight, emotional depth, altered perception, unity, sacredness, intuitive knowing, transcendence, and positive emotion. These findings are relevant because they show that meditation-related NOSC are not limited to neural or attentional changes, but may also involve rich phenomenological shifts in meaning, perception, and self-transcendence. The study supports the view that intensive contemplative practice can create conditions in which mystical or non-ordinary features of consciousness are more likely to emerge.

Lutz et al. (2004) used EEG to examine neural oscillatory activity in long-term Buddhist practitioners during compassion meditation. Compared with student controls, experienced practitioners showed stronger gamma-band activity and greater phase synchrony while generating unconditional compassion. Notably, differences between practitioners and controls were observed not only during meditation but also during resting baseline periods, suggesting that extensive contemplative training may be associated with both temporary state changes and more enduring differences in neural organization. For the present review, this study is important because it links advanced meditation with increased neural synchrony, supporting the view that some NOSC may involve heightened coordination across distributed brain systems.

Bremer et al. (2022) investigated whether a month of mindfulness meditation training altered communication among major large-scale brain networks in adults without prior meditation experience. Their findings showed increased functional connectivity among networks commonly linked to self-referential processing, salience detection, and executive control, including the default mode, salience, and central executive networks. This study suggests that even relatively brief mindfulness training may influence coordination across neural systems involved in attention, self-processing, and cognitive regulation.

In addition to functional changes observed during meditation, structural neuroimaging research

suggests that long-term meditation practice is associated with differences in brain morphology. In a systematic review and meta-analysis of 21 neuroimaging studies, Fox et al. (2014) identified consistent structural differences in eight brain regions among meditation practitioners. These regions included areas implicated in meta-awareness, interoceptive and exteroceptive body awareness, memory processes, self- and emotion-regulation, and communication within and across hemispheres. The authors concluded that meditation practitioners showed consistent, moderate structural differences. However, they cautioned that much of the available research was cross-sectional, making it difficult to determine whether meditation caused the observed differences or whether preexisting characteristics influenced who became long-term practitioners. This review is relevant to the present paper because it links advanced meditation with changes in self-awareness, embodiment, emotional processing, and nondual experience, while also emphasizing the need to distinguish temporary meditative states from enduring changes in consciousness.

Recent work on long-term meditators suggests that advanced meditation may involve changes in self-experience, embodiment, emotional processing, and perception of time and space. Ehmann et al. (2025) reviewed evidence that experienced meditators may show greater interoceptive awareness, cognitive-emotional integration, emotional neutrality, self-regulation, altered self-boundaries, and nondual awareness. The review also summarized neuroimaging findings involving networks related to salience, executive control, affective processing, empathy, and default mode activity. Although the authors cautioned that methodological limitations prevent firm conclusions about lasting trait effects, their review is useful for the present paper because it highlights advanced meditation as a neurophenomenological process. In this view, meditation-related NOSC may need to be studied across temporary states, longer-term traits, and advanced contemplative endpoints rather than treated as a single uniform phenomenon.

Overall, the meditation literature suggests that meditation-related NOSC are associated with changes in self-referential processing, emotional regulation, body awareness, neural rhythm, and large-scale brain network coordination. Intensive and advanced meditation practices may also increase the likelihood of mystical-type experience, altered self-boundaries, and nondual awareness. Although methodological limitations remain, these studies support the view that meditation can shift ordinary patterns of self-experience and awareness in ways that may contribute to psychological transformation and human potential.

4.3 Psychedelic Experiences

Psychedelic substances and plant medicines have long been used in many societies to induce mystical and spiritual experiences of oneness. Some findings also suggest overlap between psychedelic-related NOSC and neural patterns observed in deep meditative states. Contemporary research has examined these experiences in controlled settings, often focusing on mystical-type experience, ego dissolution, changes in self-processing, and long-term psychological outcomes.

De Wit's (2006) editorial described Griffiths et al. (2006) as methodologically rigorous, citing the

study's appropriate controls, strengthened design, and comprehensive data analysis. The editorial noted that psychedelic effects are linked to stimulation of serotonin 5-HT2A receptors and changes in cortical cell excitability, which may alter responsiveness to sensory or cognitive stimulation and contribute to changes in awareness. Griffiths et al. (2006) state the following regarding their findings: "The present double-blind study shows that psilocybin, when administered under comfortable, structured, interpersonally supported conditions to volunteers who reported regular participation in religious or spiritual activities, occasioned experiences which had marked similarities to classic mystical experiences and which were rated by volunteers as having substantial personal meaning and spiritual significance. Furthermore, the volunteers attributed to the experience sustained positive changes in attitudes and behavior that were consistent with changes rated by friends and family" (Griffiths et al., 2006, p. 12).

Griffiths et al. (2018) extended earlier psilocybin research by examining whether mystical-type experiences, when combined with meditation and other spiritual practices, were associated with lasting psychological and prosocial change. Compared with the low-dose group, participants in the high-dose psilocybin groups showed greater positive changes six months later in areas related to interpersonal connection, gratitude, forgiveness, spiritual experience, life meaning, attitudes toward death, religious coping, and community-rated behavior. The study also found that enduring effects were related both to the intensity of the mystical-type experience and to participants' continued engagement in meditation or spiritual practice. For the present review, these findings suggest that psychedelic-related NOSC may contribute to transformation when profound subjective experience is supported by ongoing contemplative or spiritual integration, producing sustained effects on traits associated with intrapersonal functioning, relational connectedness, and prosocial orientation.

Smigielski et al. (2019) studied the effects of psilocybin during a mindfulness-based retreat. The intervention led to unique, drug-dependent shifts in neural activity within self-referential networks. One key finding was that changes in connectivity between anterior and posterior regions of the default mode network were related to participants' reports of ego dissolution.

Moreover, greater alterations in self-experience and functional connectivity during the psychedelic state predicted sustained positive outcomes. This study is particularly relevant because it directly links a neural correlate, changes in self-referential network connectivity, with a phenomenological feature, ego dissolution, and later transformational outcomes.

Overall, the psychedelic literature suggests that psilocybin can occasion mystical-type NOSC marked by unity, personal meaning, spiritual significance, and altered self-experience when administered in carefully structured and supportive conditions. Across the studies reviewed, these states were associated with changes in self-referential brain networks, ego dissolution, and sustained positive changes in attitudes, values, interpersonal closeness, and psychological functioning. Together, these findings are significant because they connect neural changes, profound phenomenological experience, and longer-term transformation.

4.4 Near-Death Experiences

Near-death experiences (NDEs) represent another context in which non-ordinary states of consciousness are reported. NDEs are especially important to the study of consciousness because they often occur during extreme physiological crisis and are frequently followed by lasting psychological and existential transformation.

van Lommel et al. (2001) conducted a longitudinal study of 344 cardiac arrest survivors in the Netherlands. The study examined the percentage of patients who reported an NDE during cardiac arrest and explored the content and aftereffects of these experiences. Common features reported during NDEs included out-of-body experience, life review, altered perception of time and space, encounters with deceased loved ones, and access to knowledge or perception not ordinarily available. The occurrence of vivid and lasting experiences during cardiac arrest is notable because of the rapid cerebral hypoxia associated with this condition. Patients in the study reported long-term transformation after their NDE, despite the NDE itself lasting only moments. These transformations often took several years to unfold and included belief in life after physical death, reduced fear of death, increased intuition, greater appreciation for love and compassion, and a deepened sense of connection with self, others, and life as a whole.

In a later theoretical chapter, van Lommel (2004) interpreted these findings as suggesting the possibility that consciousness may not be entirely reducible to brain activity and proposed a model of nonlocal or continuous consciousness. NDE research is relevant to the present review because it challenges strictly reductionist explanations of consciousness and highlights the profound phenomenological and transformational dimensions of NOSC. Overall, NDE research suggests that brief non-ordinary states during physiological crisis may be followed by lasting changes in meaning, worldview, compassion, intuition, and connectedness.

4.5 Mystical Experiences

Mystical experiences are central to the study of NOSC because they appear across religious, contemplative, psychedelic, and spontaneous contexts. These experiences often include unity, sacredness, noetic quality, altered time and space perception, deep insight, elevated mood, and a sense of contact with divine or ultimate reality.

Because mystical experiences overlap with several NOSC contexts already discussed, this section uses Alldredge et al. (2025) as a primary source for its comprehensive synthesis of the literature and its attention to the phenomenological, therapeutic, contextual, and integrative dimensions most relevant to this review. Their review describes mystical experiences as coherent non-ordinary states often marked by unity, sacredness, transcendence, intuitive knowing, positive emotion, and difficulty translating the experience into language. Evidence reviewed by Alldredge et al. suggests that mystical experiences may support positive therapeutic outcomes, including increased well-being and reductions in symptoms associated with depression, anxiety, PTSD, and addiction. Rather than reducing mystical experience to a single explanation, the authors consider psychological, neurobiological, and sociocultural perspectives, including the roles of ego dissolution, brain processes, cultural meaning, and religious context. They also emphasize that mystical

experiences are not automatically therapeutic; their potential benefits depend on factors such as invitation, context, individual readiness, and later integration. For the present review, this work is relevant because it frames mystical experience as both a distinct phenomenological form of NOSC and a possible catalyst for psychological change when properly supported and integrated.

4.6 Breathwork, Pranayama, and Yoga

Breathwork and yoga represent embodied pathways into altered or non-ordinary states of consciousness. These practices are especially relevant because they involve the intentional regulation of breath, posture, attention, interoception, and autonomic activity. They therefore provide a bridge between physiological regulation and shifts in conscious experience.

Pranayama is a traditional yogic practice of intentionally regulating the breath through techniques that may alter its pace, depth, rhythm, and pattern. It is commonly used to influence attention, physiological arousal, and states of consciousness. Slow breathing is a central component of pranayama and other contemplative breath-regulation practices.

Zaccaro et al. (2018) reviewed psychophysiological research on slow breathing practices in healthy participants, focusing on voluntary breathing patterns below 10 breaths per minute. Across the studies reviewed, slow breathing was associated with changes in autonomic regulation, including increased parasympathetic activity and improved heart-rate variability. The review also reported central nervous system findings, including shifts in EEG activity and evidence that slow breathing may affect brain regions involved in bodily and emotional regulation. Psychologically, slow breathing was linked with greater relaxation, comfort, alertness, and positive mood, along with reductions in anxiety, arousal, anger, depression, and confusion. For the present review, these findings suggest that slow breathing may provide a physiological pathway into NOSC by coordinating breath, autonomic regulation, emotional state, and brain-body awareness.

Zaccaro et al. (2022) examined whether slow nasal breathing could help induce non-ordinary states of consciousness in experienced meditators. In a within-subject design, 12 participants completed slow nasal breathing and slow mouth breathing sessions at the same respiratory pace, allowing the researchers to compare the effects of slow breathing in general with effects more specific to nasal respiration. Slow nasal breathing was associated with a higher reported experience of being in a non-ordinary state of consciousness, including shifts in body perception, meaning, and awareness, along with reduced state anxiety. EEG findings also showed a slowing of brain activity, with increased delta and theta activity in prefrontal regions. In addition, the study reported changes in functional connectivity involving theta and high-beta activity, including regions associated with the default mode network. These changes occurred without reduced rationality or loss of voluntary control. For the present review, this study is relevant because it links a specific breath-regulation practice with measurable neural changes, altered body-self perception, and increased subjective experience of NOSC.

Yoga is relevant to NOSC because it integrates posture, movement, breath regulation, attention, and body awareness. Gothe et al. (2019)

reviewed neuroimaging studies on yoga practice and brain health and found preliminary evidence of structural and functional brain differences among yoga practitioners. Structurally, several studies reported differences in gray matter volume in regions involved in memory, emotional regulation, attention, and self-regulation, including the hippocampus, amygdala, prefrontal cortex, and cingulate cortex. Functionally, the review also described findings involving the default mode network and task-related cortical activation during cognitive and emotional challenges. These findings suggest that yoga may influence consciousness through embodied regulation, combining breath, movement, interoception, and attention in ways that support emotional regulation, cognitive control, and altered self-related processing.

Corso et al. (2023) reviewed emerging research on non-ordinary states of consciousness induced by mind-body practices such as meditation, yoga, breathwork, music ritual, and sensory-based practices. Their review suggests that these practices can sometimes produce experiences with mystical or non-ordinary features and that such experiences may be associated with changes in self-awareness, mood, motivation, values, and behavior. However, the authors note that the evidence base remains limited, with much of the current literature relying on qualitative or open-label studies. This article is relevant because it broadens the study of NOSC beyond psychedelic contexts and suggests that contemplative and embodied practices may offer accessible, non-pharmacological pathways into transformative states when drug- or plant-medicine approaches are unavailable or inappropriate.

Fincham et al. (2023) reviewed high-ventilation breathwork practices and their psychological, physiological, and potential clinical effects. Their review suggests that sustained rapid breathing can produce marked shifts in subjective experience while also affecting central and autonomic nervous system activity. These effects may occur through changes in neurometabolic processes and interoceptive signaling, making high-ventilation breathwork a distinct pathway into altered or non-ordinary states of consciousness. In contrast to slower breath-regulation practices, which often emphasize parasympathetic regulation and relaxation, high-ventilation practices appear to work through intensified bodily arousal and altered interoceptive feedback. For the present review, this distinction is important because it shows that breathwork may support NOSC through more than one physiological route: calming regulation in slow-breathing practices and heightened body-based shifts in sustained high-ventilation practices.

Overall, the breathwork, pranayama, and yoga literature suggests that embodied practices may influence NOSC through breath regulation, autonomic activity, interoception, emotional state, and brain-body coordination. Slow breathing appears especially relevant to relaxation, parasympathetic activation, and emotional regulation, while slow nasal breathing and high-ventilation breathwork may contribute to altered states through changes in neural activity, interoceptive feedback, and body perception. Yoga extends this embodied pathway by combining breath, movement, posture, attention, and body awareness in ways that may support brain network organization, cognitive-emotional regulation, and altered self-related processing.

Together, these findings suggest that breath- and body-based practices may offer accessible, non-pharmacological pathways into NOSC and may support psychological regulation, embodied awareness, and transformational change.

Figure 3. Major NOSC Pathways and Associated Findings

Pathway	Major Associated Findings
Meditation / Retreat Practice	DMN activity/connectivity changes; gamma synchrony; network coordination; mystical-type experience; molecular, immune, and endogenous opioid-related changes
Psychedelic Experiences	5-HT2A receptor stimulation; altered responsiveness to cortical stimulation and awareness; DMN connectivity changes; ego dissolution; mystical-type experience; sustained psychological change
Near-Death Experiences	Out-of-body experience; life review; altered time and space perception; reduced fear of death; increased intuition, love, and compassion
Mystical Experiences	Unity; sacredness; noetic awareness; meaning; connectedness; clinical relevance and therapeutic potential
Breathwork / Pranayama	Autonomic regulation; altered physiology; interoceptive shifts; altered body perception; changes in brain-body state
Yoga	Brain structure/function differences; DMN connectivity; emotional regulation; cognitive control

Note. NOSC = non-ordinary states of consciousness; DMN = default mode network. This figure summarizes selected major findings associated with each pathway and is not intended to list all findings from every study.

Figure 3 summarizes the major NOSC pathways reviewed and the primary findings associated with each.

5. DISCUSSION

Non-ordinary states of consciousness appear to involve shifts away from ordinary self-referential processing and toward more integrated, coherent, or expanded modes of awareness. Across meditation, yoga, breathwork, psychedelic experiences, near-death experiences, and mystical states, the literature points to recurring patterns: changes in self-related neural networks, brain wave activity and connectivity, autonomic and embodied regulation, lived experience of self and reality, and longer-term changes in meaning, values, emotion, and interpersonal closeness. Taken together, these findings suggest that NOSC are multidimensional processes in which neural, physiological, and phenomenological patterns interact rather than operate in isolation. From a quantum science perspective, this interaction is significant because consciousness, brain, body, and lived experience may be understood as dynamically related aspects of a larger whole.

5.1 Synthesis of Findings

Self-Referential Processing and Altered Selfhood

One recurring pattern across the literature is the relationship between default mode network activity and changes in self-related cognition. The DMN is a neural network associated with mind-wandering, autobiographical thought, rumination, and the narrative sense of self. Within the reviewed literature, DMN-related findings were most prominent in meditation, yoga, and psychedelic studies, where changes in DMN activity or connectivity were associated with shifts in self-referential processing and self-experience. Brewer et al. (2011) linked meditation experience with reduced DMN activity, decreased mind-wandering, and stronger connectivity between self-referential and cognitive-control regions. Gothe et al. (2019) also reviewed evidence suggesting that yoga practice is associated with changes in DMN functional connectivity. Smigielski et al. (2019) similarly linked psilocybin-related changes in self-experience with altered connectivity in self-referential networks, particularly within the DMN.

This pattern is important because it helps clarify the relationship between neural correlates, cognitive processes, and phenomenological experience. DMN activity is the neural correlate; self-referential thinking, mind-wandering, and rumination are cognitive processes associated with this network; and ego dissolution, self-boundary changes, nondual awareness, or expanded awareness are phenomenological

features reported in some NOSC contexts. These levels should not be collapsed into one another, but they may be meaningfully related. Across several NOSC contexts, altered self-processing appears to be one pathway through which ordinary identity structures may soften, allowing different forms of awareness, meaning, and connection to emerge.

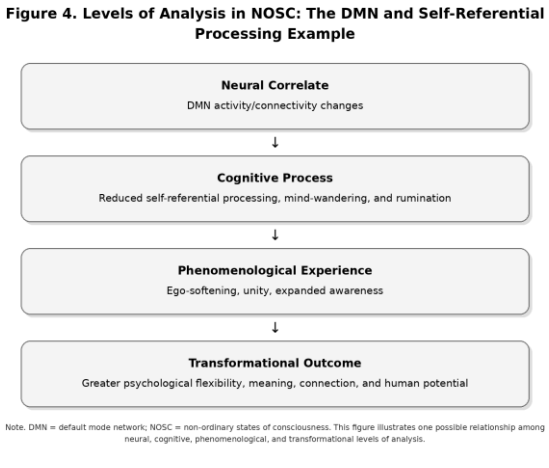


Figure 4 illustrates one example of how neural, cognitive, phenomenological, and transformational levels may be distinguished while remaining meaningfully related.

The literature also suggests that changes in self-related processing may have transformational relevance. Reduced mind-wandering and rumination may support greater present-centered awareness, while more profound alterations in self-experience may contribute to experiences of unity, sacredness, or interconnectedness. In psychedelic, mystical, and near-death experience research, shifts in selfhood are often accompanied by changes in worldview, values, fear of death, compassion, and interpersonal connection. These findings suggest that altered self-processing may be one mechanism through which NOSC become psychologically or existentially meaningful.

Neural Rhythm, Connectivity, and Brain-Body Regulation

A second major pattern concerns neural rhythm, connectivity, and large-scale coordination. Across meditation, retreat, breathwork, and yoga studies, NOSC appear to involve changes not only in specific brain regions, but in the organization and regulation of the brain-body system as a whole. Meditation research points to changes in oscillatory activity, neural synchrony, and large-scale network coordination, including patterns involving the default mode, salience, and executive control networks (Bremer et al., 2022; Jinich-Diamant et al., 2025; Lutz et al., 2004). These findings suggest that meditation-related NOSC may reflect shifts in how distributed neural systems communicate and organize conscious experience.

Breathwork and pranayama research add an embodied dimension to this pattern. Slow breathing has been associated with autonomic and central nervous system changes, while slow nasal breathing has been linked with altered neural activity, functional connectivity, reduced anxiety, and subjective changes in body perception, meaning, and awareness (Zaccaro et al., 2018, 2022). These findings suggest that breath may influence NOSC not simply by calming the body, but by participating in the regulation of neural activity, interoceptive awareness, and emotional state.

Yoga research similarly supports the importance of embodied regulation. Gothe et al. (2019) reported structural and functional brain differences among yoga practitioners, including

differences in gray matter volume, cognitive control, emotional regulation, as well as DMN functional connectivity. Corso et al. (2023) and Fincham et al. (2023) also highlight the role of mind-body practices and breathwork in inducing altered states through physiological and interoceptive mechanisms. Taken together, these findings suggest that practices involving breath, posture, movement, attention, and interoception may alter consciousness by regulating both neural and bodily systems.

This pattern is significant because it suggests that NOSC may involve changes in the organization of consciousness across neural, physiological, and embodied levels. From a quantum-informed perspective, shifts in rhythm, connectivity, autonomic regulation, breath, and body awareness may be understood as expressions of a more coherent brain-body organization through which consciousness is experienced, regulated, and transformed.

Phenomenology, Transformation, and Human Potential

The phenomenological dimension is central to the study of NOSC because these states are defined not only by measurable neural or physiological changes, but also by how they are experienced from within. Across the literature reviewed, common phenomenological features include unity, sacredness, altered time and space perception, altered embodiment and self-boundary perception, elevated emotion, intuitive insight, ego dissolution, and expanded awareness. These features appear in meditation and advanced contemplative practice research, psychedelic studies, near-death experience reports, and mystical experience research.

The findings also suggest that phenomenological intensity may be related to later transformation. Zanesco et al. (2023) reported increased mystical experience features among meditation retreat participants, including unity, transcendence, sacredness, noetic awareness, and positive emotion. Griffiths et al. (2006, 2018) found that psilocybin could occasion mystical-type experiences rated as personally meaningful and spiritually significant, with later positive changes in attitudes, behavior, interpersonal closeness, gratitude, forgiveness, life meaning, and death transcendence. Smigielski et al. (2019) linked greater alterations in self-experience and functional connectivity during the psychedelic state with sustained positive outcomes. Near-death experience research similarly reports long-term changes in fear of death, intuition, values, love, compassion, and belief in life after physical death.

These findings suggest that NOSC may support psychological transformation through changes in self-experience, emotion, meaning, and connectedness. However, the literature also indicates that transformation depends on more than the occurrence of an altered state. Alldredge et al. (2025) emphasize that mystical experiences require attention to invitation, context, readiness, and integration. Similarly, Griffiths et al. (2018) found that sustained positive outcomes following psilocybin were related not only to the intensity of the mystical experience, but also to ongoing meditation and spiritual practice. Smigielski et al. (2019) further examined psilocybin within a mindfulness-based retreat context, suggesting that setting and contemplative structure may shape the meaning and aftereffects of the experience. Together, these findings indicate that

NOSC are not inherently therapeutic or integrative. Instead, they appear to create openings or potentials for transformation by loosening ordinary self-organization and making new forms of meaning, connection, and self-understanding more accessible. Their transformational significance depends in part on intentional preparation, ongoing practice, and the individual's capacity to understand, integrate, and embody the experience over time.

Within this review, psychological transformation refers to changes in self-experience, emotional regulation, meaning-making, worldview, and relational connectedness. Human potential refers to the broader developmental possibilities that may emerge from these changes, including expanded awareness, compassion, creativity, intuitive knowing, existential resilience, interconnectedness, and movement toward greater wholeness. In this sense, NOSC may function as catalysts for human potential when they loosen rigid patterns of self-reference and open new possibilities for perception, meaning, relationship, and connection. These phenomenological and transformational patterns also provide a bridge to a quantum science interpretation, particularly because many NOSC involve shifts from a separative self-experience toward an expanded awareness of self, others, and the world.

5.2 Quantum Science as an Integrative Lens

The studies reviewed provide evidence of neural and physiological correlates of NOSC, including changes in DMN activity, neural connectivity, oscillatory patterns, autonomic regulation, and broader brain-body processes. However, these findings do not fully explain consciousness itself. They show that NOSC are associated with measurable patterns in the brain and body, but they do not resolve whether consciousness is produced by the brain, expressed through the brain, or reflects a more fundamental dimension of reality.

For this reason, a quantum science framework is useful because it allows NOSC to be interpreted as multidimensional shifts in consciousness rather than as isolated neural, physiological, or subjective events. Within this framework, the brain-body system can be understood as an interface through which consciousness is organized, filtered, and expressed. Neural changes observed during NOSC may therefore be viewed as correlates of altered conscious organization rather than proof that the brain generates consciousness. This interpretation is especially relevant to experiences involving unity, interconnectedness, nondual awareness, and altered boundaries between self and world.

Quantum concepts such as nonlocality, non-separability, coherence, potentiality, discontinuity, and observer participation help clarify different dimensions of NOSC. Nonlocality and non-separability are relevant to reports of unity, intuitive knowing, meaningful connection, and experiences that appear to extend beyond ordinary boundaries of self, body, time, or space. Coherence relates to findings of neural synchrony, connectivity, autonomic regulation, and ordered brain-body coordination. Potentiality and discontinuity are relevant to the transformational dimension of NOSC, in which new meanings, identities, values, and relational possibilities may emerge through nonlinear shifts in worldview, self-understanding, or life orientation. Observer participation is relevant to contemplative and

mystical traditions in which attention, intention, and awareness actively participate in shaping experience.

NOSC cannot be fully understood by isolating one level of explanation or by simply adding neural, physiological, and phenomenological findings together. A quantum science lens helps interpret these states as interactive, relational, whole-system processes involving consciousness, brain, body, and lived experience. If consciousness is foundational, then psychological development may involve more than symptom reduction or cognitive change; it may involve a reorganization of the relationship between awareness, selfhood, meaning, and reality. In this view, practices such as meditation, yoga, and breathwork may support human development by increasing coherence across mind, body, and awareness, while profound spontaneous or induced NOSC may open access to forms of meaning, connection, and self-understanding that are less available in ordinary waking consciousness.

5.3 Implications

The findings reviewed in this paper have implications for mental health, human relationships, self-development, and the broader expansion of human potential. Across meditation, yoga, breathwork, psychedelic experiences, near-death experiences, and mystical states, NOSC appear to involve shifts in self-referential processing, emotional regulation, body awareness, meaning-making, and perceived connectedness. These patterns suggest that non-ordinary states may be relevant not only to spiritual or mystical experience, but also to psychological transformation and the development of human capacities.

In counseling and mental health, NOSC may expand how transformation is understood. Healing may involve not only symptom reduction or cognitive change, but also shifts in self-experience, emotional openness, embodied awareness, compassion, and meaning. Practices such as meditation, yoga, and breathwork may support emotional regulation and self-awareness by helping individuals observe thoughts, emotions, and bodily states without becoming fully identified with them. At the same time, these states require careful attention to readiness, context, and integration, because non-ordinary experiences are not automatically healing or stabilizing.

NOSC may also be relevant to human relationships. Experiences of unity, interconnectedness, ego-softening, compassion, and reduced fear can alter how individuals relate to themselves, others, and life as a whole. These shifts may support greater empathy, forgiveness, relational presence, and responsibility. In this way, NOSC may have implications for couples, families, communities, professional settings, and broader social life by loosening rigid separations between self and other and increasing awareness of relational interdependence.

Finally, NOSC may contribute to self-development and human potential by opening access to perspectives, meanings, and possibilities less available within habitual patterns of identity, perception, and behavior. From a quantum science perspective, these states may reveal potentialities that become meaningful only when they are integrated and embodied over time. When insights from non-ordinary states are supported by reflection, discernment, and continued practice, NOSC may help individuals

cultivate greater coherence, compassion, creativity, relational awareness, and alignment between inner experience and outer action.

5.4 Limitations

Several limitations should be noted. First, this review is narrative rather than systematic and does not claim to include every available study on NOSC. Second, the literature reviewed is methodologically diverse. Meditation, yoga, breathwork, psychedelics, near-death experiences, and mystical states are related but distinct phenomena, and their findings should not be treated as interchangeable. Third, many studies include small samples, cross-sectional designs, retrospective reports, or specialized participant groups, such as long-term meditators, retreat participants, or cardiac arrest survivors. These limitations make it difficult to draw broad causal conclusions.

Another limitation is that neural, physiological, and phenomenological findings are not always measured together. Many neuroscience studies identify brain or physiological changes without detailed first-person reports, while many mystical and near-death experience studies emphasize phenomenology and transformation without direct neural measurement.

5.5 Future Research

Future research would benefit from interdisciplinary models that can hold neural correlates, physiological regulation, phenomenological experience, and quantum science together without reducing one dimension to another. Such designs could more comprehensively examine how specific features of NOSC correspond with measurable brain-body patterns. Longitudinal research is also needed to clarify how temporary altered states become enduring transformation. The literature suggests that integration, context, readiness, and continued practice are important, but more research is needed to determine which conditions support lasting psychological change. Future studies should also continue examining contemplative and mind-body practices as accessible, non-pharmacological pathways into NOSC, especially in comparison with psychedelic-induced mystical experiences. Such an approach may allow NOSC to be studied not only as altered brain states, but as meaningful transformations in the organization of consciousness.

6. CONCLUSION

Non-ordinary states of consciousness arise across meditation, yoga, breathwork, psychedelic experiences, near-death experiences, and mystical states. Although these pathways differ, the literature reviewed suggests that NOSC are associated with recurring neural, physiological, phenomenological, and transformational patterns. These include changes in default mode network activity and connectivity, neural oscillatory patterns, autonomic regulation, altered self-experience, expanded awareness, unity, meaning, and, in some cases, enduring shifts in values, worldview, compassion, and relational connection.

A quantum science framework offers a way to interpret NOSC as multidimensional states rather than as events reducible to any single level of explanation. While conventional neuroscience often interprets patterns associated with NOSC as brain-generated phenomena, an alternative ontological model proposes that consciousness is

foundational and that the brain-body system functions as a localizing structure through which consciousness is expressed. Concepts such as complementarity, nonlocality, non-separability, coherence, potentiality, discontinuity, and observer participation therefore help situate NOSC within a broader model of consciousness, reality, and transformation.

From this perspective, NOSC may represent temporary shifts in the ordinary filtering and conditioning of awareness. As habitual self-referential processing softens and coherence increases, forms of awareness less available during ordinary waking cognition may become more accessible. These states may not create new capacities so much as reveal dimensions of consciousness ordinarily constrained by habitual, predictive, and ego-centered organization. If consciousness is understood, as Goswami et al. (1995) propose, as the ground of being, then individual consciousness may be interpreted as a localized expression within a deeper, unified field of awareness.

This review suggests that NOSCs are important to human potential because they can loosen ordinary patterns of self-reference and open new possibilities for awareness, meaning, connection, and development. Their transformational value, however, depends not only on the altered state itself, but on the intention, context, reflection, continued practice, and integration that follow. In this way, non-ordinary states of consciousness can be studied as whole-system phenomena with the potential to reveal expanded forms of awareness and transform how consciousness is organized, expressed, and lived over time.

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