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Exploration of trance states: phenomenology, brain correlates, and clinical applications☆

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This review provides an exploration of trance states, covering their phenomenology, neural mechanisms, and clinical uses. Trance states, present in diverse cultural contexts from shamanic practices to modern adaptations, have recently captured the interest of researchers and clinicians. Here, we delve into the phenomenological aspects of trance experiences, highlighting the most common features. Employing cutting-edge neuroscientific methods, we also report findings on the neural underpinnings of trance states. Furthermore, we look into the practical applications of such states in clinical settings. By bridging subjective experiences, neuroscience, and clinical relevance, this review enhances our understanding of trance states and their possible uses.

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Introduction

In the realm of modern science, there is a growing interest in trance states to study consciousness and possibly treat people suffering from various ailments. The term 'trance' has its roots in Latin, coming from 'transitus' (a passage) and 'transire' (to pass over), suggesting a transition from one state of consciousness to another, shifting from an ordinary to a modified state of consciousness. Trance has also been described as an intermediate state between the world of the living and the world of the dead [1].

Trance states can be induced through various means, including meditation, hypnotic suggestions, the use of psychoactive substances, and ritualistic practices. Shamanic trance is arguably one of the most widely known and ancient practices in human history. It plays a central role in the practices of shamans, individuals who serve as spiritual intermediaries in many indigenous cultures (Figure 1A). Shamanic trance is often induced through rhythmic drumming, chanting, or dancing, sometimes accompanied by drug intake, allowing the shaman to transcend ordinary reality and enter a world where they can interact with spirits and energies that are believed to influence the physical and spiritual well-being of individuals and communities. These shamanic trance experiences are culturally significant and serve as conduits for guidance, healing, and divination [2]. The context and setting of a trance ceremony are also carefully cultivated and prepared.

Currently, in the Western world, we have witnessed the development of trance practices that are detached from traditional rituals (Figure 1B). These practices are considered to serve personal growth and therapeutic purposes [3]. These Westernized trance states, most often derived from shamanic tradition, are achieved through various trainings that enable participants to voluntarily induce the trance state. For example, Harner's method is a structured approach to shamanic journeying that employs repetitive drumming or rat-

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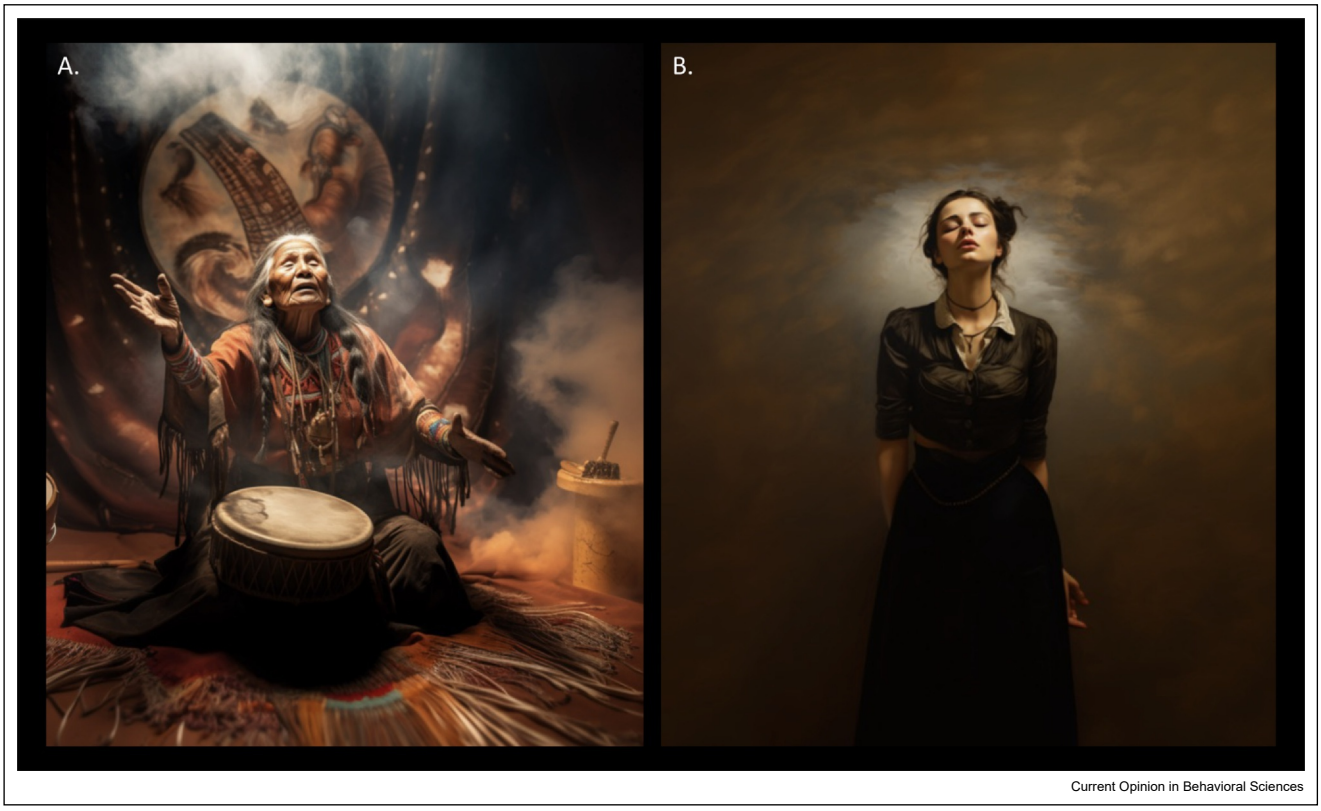
Figure 1



Trance states seen through the eyes of an artificial intelligence artist (generated by Midjourney). Illustration of traditional shamanic trance **(A)** and contemporary Westernized trance **(B)**.

tling to induce a shamanic trance state [4–6]. This method was developed by Michael Harner, and it enables individuals to explore what may be perceived as the spirit world to seek advice and insight. It has made shamanic practices more accessible to a wider audience and has played a significant role in the resurgence of interest in shamanism in Western cultures. Another more recent example of a modernized trance is the 'auto-induced cognitive trance' developed by Corine Sombrun who has been trained in a traditional shamanic Mongolian community [7]. This trance state is initially induced by listening to sound loops featuring binaural sounds with pure tones and beating rates, complemented by music and voices. Subsequently, participants progressively learn to induce trance autonomously via body movements and vocalizations, without the need for the sound loop.

The next sections will delve into the phenomenology, neural processes, and clinical applications of trance states, both in the context of traditional culture and its Western adaptation. By synthesizing recent research findings, this multidimensional exploration aims to provide a holistic comprehension of trance states to offer guidance to individuals interested in such states.

Phenomenology

Subjective experiences of trance states have been investigated using various means: free recall, semi-structured interviews, and standardized and customized questionnaires. Although different induction techniques generate different trance experiences, characterized by different phenomenologies, several common features can be identified. These encompass alterations in spatiotemporal perception, increased absorption in the experience, modification in body sensation, shifts in thoughts, change in the sense of self-agency and ownership, intense emotions including a feeling of unity, and the impression of living a spiritual experience [5,6,8,9–11]. Some studies also describe complex visual imagery, uncontrolled bodily movements, decreased perception of pain, incoherent language, out-of-body experience, mystical experiences, and ego dissolution during trance [6,12–14]. Other studies highlight heightened internal awareness [5,15], while others report

Table 1

Empirical findings of trance published since 2021[a]. MRI: Magnetic Resonance Imaging, EEG: electroencephalography

Authors, years	Type of study	Population	Methods	Results	Reported limitations
Huels et al., 2021 [6]	Group study	18 shamanic practitioners, 19 controls matched for age and sex	Altered State of Consciousness questionnaire and EEG during resting states, cognitive tests, classical music, and Harner's shamanic trance (with drum)	Higher scores for practitioners compared with controls for complex imagery, unity experience, spiritual experience, bliss state, disembodiment, insight, elemental visual alterations, and altered perceptions during trance, but not during classical music. Higher scores for practitioners during trance compared with classical music in all areas above except visual impairments ↑ gamma power, ↓ gamma complexity, and ↑ low beta criticality in practitioners during trance, which correlated with some items on the questionnaire (e.g., visual impairments, insight)	Small sample size, no *post hoc* test adjustment, no electromyography, variability of practice and ritual among practitioners, controls were passive, while practitioners were cognitively engaged in trance condition, no blinding between experimental conditions or groups
Rogerson et al., 2021 [9]	Case study	1 female practitioner (*Sangoma*, traditional South African healer)	Trance rating, free recall, and MRI in resting state and trance-inducing visualization task cued by self-selected music	Change in somatosensory sensations, ↑ external awareness, ↑ internal awareness, mental imagery, floating, rapid fluttering of eyelids, ↑ breathing, and ecstatic feeling ↑ activation in auditory cortices; right parietal area, right frontal area, and prostriata area linked to high trance perception; orbitofrontal cortex negatively activated and most correlated with music when trance was high; trance perception modulates auditory cortical signals	Single subject
Spindola-Rodrigues et al., 2022 [19]	Group study	19 Brazilian psychophonic mediums	Standardized neuropsychological and mental health tests (at rest)	Cognitive functioning of these mediums (who experience dissociative mediumistic trance) is equal to or above the norms. Overall cognitive health in executive functioning, memory, visuospatial functioning, attention, and language	Small sample size, cross-sectional design, no emotion, and no thought content analysis of the trance phenomenon

Table 1 (*continued*)

Authors, years	Type of study	Population	Methods	Results	Reported limitations
Lee and Kirmayer, 2023 [8]	Multiple case study	8 male *dang-kis* healing trance practitioners (Chinese spirit mediumship)	Open interviews and standardized psychological questionnaires	Alterations in consciousness level, ↓ control bodily movements, unintelligible language, communication with spirits, amnesia, change in experience of self, and modification of body perception during spirit possession trance Most participants appeared emotionally stable with internal locus of control, optimistic, confident, family-oriented, and sociable; the personality test was not different from the norm Therapeutic transformation included change in identity and social role, change in self-perception during trance, and lasting changes in the sense of self	Small sample size, no longitudinal design, no interview of assistants, devotees, and family members
Oswald et al., 2023 [28]	Group study	25 participants proficient in auto-induced cognitive trance	Cardiac and respiratory signals during resting state, mental imagery task, and auto-induced cognitive trance	Decrease in cardiac vagal control leading to a hyperarousal state of the autonomic nervous system in trance. More specifically, increased heart rate and decreased level of high-frequency heart rate variability with increases in respiratory amplitude, phase ratio, and respiration rate variability during trance compared with the other conditions. No differences between imagination and resting state conditions	Small sample size, imbalanced female–male ratio, no long-term prediction, no correlation with phenomenology or brain functions

[a] From a search on PubMed. The full article of Wahbeh et al. [22] could not be accessed.

increased environmental awareness, with hypersensitivity to light, smells, and sounds [9].

Some participants in such trance states also report communicating with disembodied entities or deceased people, as described in an online survey examining subjective experiences, mental health parameters, personality traits, and the influence of trance on 83 expert participants [16]. These types of trances are generally referred to as mediumistic trances or trance channeling and consist of being connected to a source of information inaccessible in the ordinary state of consciousness [16,17]. The individual's body is considered a channel of communication, and in some cases, the individual reports even being possessed by the communicating entity, a process known as incorporation or possession trance. Communication with spirits through the medium's spoken voice is referred to as psychophony, whereas psychography involves the transcription of messages from spirits by the medium's hand [18].

Although these experiences are unusual, recent work indicates that individuals experiencing these trance states are typically in good physical and mental health [8,16,17,19]. They do not seem to exhibit mental disorders as defined in the Diagnostic and Statistical Manual of Mental Disorders, nor do they seem to suffer from anxiety or depression [8,16,17,19].

The collective phenomenological attributes that manifest across diverse trance experiences pave the way for an exploration of the underlying brain correlates that give rise to such phenomena.

Brain imaging and (neuro)physiology

To date, only a few studies have used electroencephalography (EEG), functional magnetic resonance imaging (fMRI), or single-photon emission computed tomography (SPECT) to document the effect of trance on brain function. The majority of these studies employed EEG in single case reports and small group samples. Trance induction methods were based on different traditions and practices, such as Harner's shamanic trance, auto-induced cognitive trance, mediumistic trance, and possession trance.

Several observations can be drawn from these pioneering works. First, the majority of the studies report that electrical brain activity is modified when participants are in trance, regardless of the type of trances. For example, trance, as compared with ordinary states of consciousness, has been associated with an increase in alpha and theta rhythms [14,20,21], as well as an increase in gamma [6,22] and beta band power and connectivity [6,12,21,22]. Some researchers have observed a decrease in alpha rhythms during trance induced by drum beats [23], while others failed to confirm the presence of any differences in electrical brain activity during trance [24].

Second, using single pulses transcranial magnetic stimulation combined with EEG in a case report of auto-induced cognitive trance, an increase in the amplitude of the evoked potentials (generated by the pulses) was measured during frontal stimulations in trance compared with the ordinary state of consciousness [10]. In contrast, decreased responses were measured during parietal stimulations. These results suggest a brain target–specific dissociation in trance.

Third, one fMRI study revealed increased connectivity in the anterior and posterior cingulate cortices and the left insula, as well as decreased connectivity within auditory cortices during the Harner's trance in 15 experienced shamanic practitioners [5]. Another fMRI study reported increased connectivity between the auditory and somatosensory cortices and increased activation in the occipital, temporal, posterior cingulate, and orbitofrontal regions during trance in 8 spiritual mediums [11]. Similar activation in the auditory cortex, along with activation in the parietal and frontal cortices as well as in area prostriata, was found in a case study during a traditional trance process [9]. This latter study was the first to establish a direct correlation between fMRI signal fluctuations and the expert subject's perception of trance onset and intensity, thereby exploring the dynamics associated with the trance state.

Finally, SPECT recordings have shown a significant decrease in cortical and subcortical metabolism (including the culmen, hippocampus, anterior cingulate, occipital, temporal, and precentral gyri) during mediumistic trances in 10 psychographers [25].

Although some of these results seem somewhat contradictory, altogether, they suggest a modification of brain processes during trance. Notably, these changes appear to partly occur in the sensory cortices, which may be linked to the particular subjective experience, including auditory, visual, and kinesthetic perceptions. Some of these results are similar, while others are different from what has been previously reported in other nonordinary states of consciousness, including hypnosis [26], meditation [27], and psychedelic use [6].

One recent study investigated cardiorespiratory functions during auto-induced cognitive trance in 25 participants. Participants exhibited increased heart rate, reduced high-frequency heart rate variability, and increased amplitude and variability in respiratory signals during trance state compared with ordinary states of consciousness [28]. These findings indicate that auto-induced cognitive trance is linked to a reduced parasympathetic activity, suggesting a hyperarousal state of

Box 1 Clearing the terminological fog in trance research.

Terminology within consciousness research is often poorly defined, necessitating urgent clarification. For instance, terms like 'altered state of consciousness,' 'modified state of consciousness,' and 'nonordinary state of consciousness' are used interchangeably or distinctively by different researchers. The term 'trance' itself is an umbrella concept, encompassing a wide array of experiences that vary across ethnicities, sociocultural contexts, traditions, communities, and even among individuals. Recognizing the unique nature of each trance experience is crucial. However, the terminology related to trance is currently inconsistent, with some referring to it as a state (as we do here) and others as a process. This discrepancy extends to related concepts such as neoshamanism, channeling, possession, and mediumnic/mediumistic/mediumship trances, shamanic healing, shamanic journey, among others. The use of these terms strongly varies among scholars, and various methods of induction, practices, and contexts further add to the complexity of trance research.

These challenges highlight the need for well-defined and standardized terms, particularly regarding the specific types of trance, practices, methods of induction, and contextual frameworks. Improving terminology is of utmost importance for several reasons. First, it promotes precision by providing a standardized language for expressing complex ideas, reducing the risk of misinterpretation. Second, standardized terminology enhances the clarity of scientific communication, facilitating the understanding of research findings, and encouraging effective collaboration between peers. Third, it ensures the reproducibility of scientific experiments and results, which is a critical requirement in our field. Moreover, terminology also serves as the common language of scientific literature, allowing researchers to build on existing knowledge, form scientific theories, and integrate new discoveries into existing frameworks. Furthermore, it enables researchers from different domains to communicate effectively. Finally, in clinical contexts, adherence to specific terminology is crucial for compliance with safety standards and regulations. In sum, refining terminology will play an indispensable role in advancing this nascent scientific research.

the autonomic nervous system in trance. Note that the participants remained motionless in both trance and ordinary state of consciousness conditions [28].

Table 1 summarizes the experimental findings on phenomenology, cognition, and neurophysiological functions published since 2021. Undoubtedly, these preliminary observations necessitate further validation in larger samples with more robust methodologies. While diverse trance types stem from distinct induction procedures, they lay the groundwork for upcoming research. In the forthcoming years, integrating phenomenology and brain imaging promises to refine our understanding of these trance states from a neurophenomenological perspective, potentially unlocking their therapeutic applications.

Potential clinical applications

While investigating the neurophysiological mechanisms of trance states is essential for advancing our comprehension of these phenomena, it is equally important to examine the potential therapeutic effects of such trance states. Intriguingly, a noteworthy phenomenon unfolds daily: an increasing number of patients are seeking non-pharmacological complementary approaches to address their health concerns. This surge highlights the need for patients to actively engage in their own healthcare and reclaim a sense of responsibility for their well-being. These mind–body tools, which may be hypnosis, meditation, yoga, or other practices, empower individuals to regain control and autonomy in the management of their quality of life [29].

Currently, there is only limited empirical evidence on the clinical and therapeutic efficacy of trance practices. The effect of Harner's shamanic trance combined with Ingerman's technique of 'soul retrieval' [30] was evaluated in 23 females with temporomandibular pain. Participants self-reported decreases in temporomandibular pain perception and its functional impact after 5 sessions [31], and these improvements persisted for 9 months [32]. Participants also reported improved sleep, increased energy levels, and enhanced immune and digestive systems [33]. Harner's shamanic trance was also studied in 4 veterans with post-traumatic stress disorder who completed 7 or 8 sessions. All participants reported improved quality of life, while 3 patients also reported decreases in symptoms and enhanced spiritual well-being (abilities to stay in the present, accept the inexplicable, and uncertainties) [34]. Another study on 15 participants with life-threatening illness and terminal prognosis (e.g., acquired immunodeficiency syndrome, cancer) reported that shamanic-based intervention (including drum sounds, soul retrieval, and power animal) helped them enhance their ability to take an active role in their life despite the illness, receive a guidance in the form of an animal accompanying the individual, and feel a sense of embodiment to regain a place in the world [35]. Finally, the therapeutic effects of possession trance 'Dang-ki' from Chinese tradition were investigated in 21 participants who had physical issues (hypertension, chronic pain, and gastric problems) or psychosocial problems (depression and sleep disorders) [36]. In this context, the 'Dang-ki' experts went into trance to heal the patients. Eleven patients found the intervention helpful, 4 considered it beneficial but were unable to follow the recommendations, 5 were uncertain about its utility, and 1 deemed it useless. Various observations were reported, such as improvement in physical issues (e.g., pain reduction and increased energy), cognitive and emotional aspects (e.g., calmness, relief, and hope), interpersonal interactions (e.g., conflict avoidance), and spiritual beliefs (e.g., sense of divine strength). The experts practicing the 'Dang-ki' trance for these participants also described positive therapeutic effects for themselves, in which the embodied experience of self seems to have played a central role [8].

These preliminary results appear to yield positive outcomes, both in terms of physical benefits (e.g., reduced functional pain) and psychological well-being (e.g., improved quality of life and restoration of agency despite illness). Nevertheless, these findings only stem from case studies and small cohort studies that have methodological limitations, including the absence of control groups or placebo conditions, a lack of uniformity in the proposed practices, no statistical analysis, and a dearth of standardized and objective measures to examine the clinical effects. Moreover, the types of trance explored thus far are heterogeneous, as are the investigated patient populations. Future research endeavors must therefore prioritize rigorous protocols, including adding a placebo condition or a control group, for such interventions.

The path forward

Both ancestral and modern traditions share the common denominator of using music and rhythm-based sequences to bring the individual into trance. The role of music thus deserves future in-depth research. For instance, one could compare the changes in phenomenological experience and brain activity associated with exposure to different sound loops (e.g., loops supposed to induce trance states compared with loops that do not induce such state) [37].

The potential integration of trance practices into patient care understandably faces a high degree of skepticism and caution within the scientific and medical communities. While some institutions have already embraced the use of other nonordinary states of consciousness such as hypnosis and meditation in their clinical routine (e.g., hypnosedation [38] and mindfulness-based interventions [39]), others remain watchful, seeking convincing evidence of their tangible benefits for patients [40]. It is our responsibility as scientific researchers to develop diligent protocols to provide valuable results. Ongoing clinical trials, such as those conducted by Gregoire and colleagues in oncology [41] , hold great promise in this regard. With the aid of state-of-the-art technology and brain imaging, combined with phenomenological measurements, we will also be able to refine our understanding of trance experiences and their underlying mechanisms. However, these high-tech tools do not yet offer the capacity to capture and comprehend all the phenomena experienced during trance states, such as feelings of communion with the universe or intense dissociation. Collaborations between various disciplines, such as neuroscience, anthropology, sociology, psychology, and philosophy, are thus warranted. These collaborations should be coupled with the imperative to standardize terminology (as outlined in Box 1) to more precisely define and characterize trance states. This combined effort will not only enrich our research but also contribute to the future of this field, allowing us to synthesize how trance relates to theoretical frameworks of brain function and well-being.

Conclusion

In this short paper, we have reviewed recent research on trance states, from their historical roots in traditional shamanic practices to their contemporary evolution in the Western world. Scientific research into the trance phenomenon is relatively recent, with an emerging interest in investigating its neurophenomenology and clinical applications. In a society where people are increasingly searching for meaning (the meaning of life and death, the meaning of symptoms and illnesses), the practice of trance may play an important role in enabling people to harness their intrinsic mental, emotional, and psychological resources, including resilience and coping mechanisms. This proactive approach may empower individuals to enhance their overall well-being and assume greater control over their lives. Our role, whether as clinicians or researchers, is to be able to offer accurate information to caregivers and patients alike regarding the efficacy of these tools and the context in which their use is relevant. Future studies combining neurophysiological and phenomenological measurements will be an important step toward understanding the processes underlying these trance states and, therefore, a more accurate application in the clinical management of patients.

CRediT authorship contribution statement

Olivia Gosseries: Conceptualization, Funding acquisition, Writing – original draft. **Nolwenn Marie:** Writing – review & editing. **Yannick Lafon:** Writing – review & editing. **Aminata Bicego:** Writing – review & editing. **Charlotte Grégoire:** Writing – review & editing. **Victor Oswald:** Writing – review & editing. **Audrey Vanhaudenhuyse:** Conceptualization, Funding acquisition, Writing – review & editing.

Declaration of Generative AI and AI-assisted technologies in the writing process

During the preparation of this work, the first author used a Language quality checker by Springer Nature and ChatGPT to improve language and readability, as well as Midjourney for illustrative purpose (figure). After using these tools/services, the authors reviewed and edited the content as needed and took full responsibility for the content of the publication.

Data Availability

No data were used for the research described in the article.

Declaration of Competing Interest

None.

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