Table S1 - Summary of the results reported by studies included in the scoping review

Abbreviations: NSC: Non ordinary State of Consciousness, EEG: Electroencephalogram, fMRI: functional Magnetic Resonance Imaging, SPECT: Single Photon Emission Computed Tomography, TMS-EEG: Transcranial Magnetic Stimulation and Electroencephalography, ECG: Electrocardiogram, EMG: Electromyogram, GSR: Galvanic Skin Response, rCBF: regional cerebral blood flow, ACC: Anterior Cingulate Cortex, PCC: Posterior Cingulate Cortex, PTSD: Post Traumatic Stress Disorder, AICT : Auto-induced cognitive trance, TMDs: Temporomandibular joint disorders, yo: Years old, VAS; Visual Analogical Scale, Vo2max: maximum volume of oxygen, L: Left, R: Right.

*Limitation reported by the authors of the scoping review (not in the original paper)

Note: The age, sex, induction and practice of NSC are not indicated when they are not reported in the article

Author, years	***Category***	***Aim of the study***	***Type of NSC and induction***	***Sample information*** ***Recruitment and qualification***	***Method***	***Measures***	***Results***	***Limitations (*)***
Houran et al., 1997	Phenomenology Psychology	Explain specific perceptual contents during shamanic experiences	Shamanic Journey Induction: Harner method (drumming)	N=30 1st-hand experiences of shamanic journeys	Experiences selected by Harner as examples of 1st-hand experiences of shamanic journeys	Narratives reports	Phenomenology: Presence of visual (e.g., a moving shadow, amorphous light) or auditory (footsteps, percipient's name being called out, animal vocalizations) experiences Psychology: Supernatural beliefs in 33% participants	Selective narrative report by the authors* Lack of information on the analysis*
Maurer et al., 1997	Psychology	Examine effects of drumming on NSC and relationships between these effects and hypnotizability	Shamanic journey Induction: Trance state: 16-inch Mylar drum session (live recording) Hypnotic state: standard hypnotic induction procedure of the Harvard Scale, Form A	N=169 Psychology students Recruitment: voluntary participation (choice between several projects)	6 groups: randomized 2 conditions: 1- drum followed by hypnotic induction 2- hypnotic induction followed by drum	Written free narratives Psychological questionnaires: Phenomenology of Consciousness Inventory and Harvard Group Scale of Hypnotic Susceptibility, Form A	Psychology: When the drum came before hypnosis: ↑ hypnotizability and ↑ intensity scores for body image, absorption and attention Participants with higher hypnotizability scores reported relaxed feelings and shamanic-like experiences	No assessment of participants' prior beliefs* No verification that the drumming induces trances*
Krycka, 2000	Phenomenology Clinical	Explore meanings of illness and healing potential of shamanic techniques (shamanic journey,	Shamanic journey Induction: Drumming (tape or real drum) and shamanic	N=15 Patients with a terminal or life-threatening illness who experienced a shamanic journey at some time before the study	Random assignment of one of the 2 shamanic practitioners which use 3 techniques (shamanic journey, power animal retrieval, and soul retrieval)	Phenomenological Interviews (before and within 1 month after intervention)	Phenomenology: Feeling dizzy, buzzing head, better understanding of one's life or illness, changes in somatosensory processes, visual and auditory hallucinations, communication with entities during shamanic journey Clinical: Personal agency: able to "do something" about being ill; Omniscient guide: able to anticipate events that they could not see before	Recruitment: known by therapist, patients have some familiarity with shamanic methods Small sample*

		power animal retrieval, and soul retrieval)	practitioner's guidance.	Age: 21-56 yo Sex: 5 men, 10 women Diagnosis: HIV/AIDS, multiple sclerosis, cancer, Epstein Barr virus infection diagnosed within 2 years			the intervention; Embodiment: their lost parts restored back into conscious awareness; Self-directed experience; Acceptance; free welcoming of the experience, modified perception of illness; Resilience: able to adapt to new and changing circumstances brought on by illness	
Kawai et al., 2001	Phenomenology Physiology	Investigate physiological mechanism underlying possession trances by examining plasma concentrations of neuroactive substances	Possession trance	N=24 Healthy participants as they were performing a ritual dedicatory drama Age: 35 ± 8 yo Sex: men Recruitment: cf method	2 groups formed a posteriori: based on appearance and behavior of subjects in the drama, subjects divided in Trance group, N=15 and Control group, N=9 2 conditions: 1- before trance 2- after trance	Phenomenological questions (episodic recall and subjective trance impressions) Clinical interview (medical, trance and family history Physiological measures: plasma concentrations (3 catecholamines; 3 catecholamine metabolites and 3 neuropeptides, blood pressure, heart rate)	Phenomenology: Trance group: Fixed, unfocused eyes, mask-like expression, stiffening of limbs, tremors, repeated automatism-like behaviors, falling to the ground, reported sense of well-being and euphoria, anterograde amnesia, eat chicks Control group: None of them ate the live chicks, but otherwise they performed the same actions as those of the trance group Physiology: ↑ heart rate for 2 groups, no difference in blood pressure, ↑ noradrenaline, dopamine and beta-endorphin after ritual for trance group	No examination of indexes representing strength of physical exercise (e.g., Vo2max, blood lactic acid concentration) Constitution of 2 groups a posteriori*
Oohashi et al., 2002	Phenomenology Psychology Neurophysiology (EEG)	Verify usefulness of portable EEG to study trance in natural environment Report 1st EEG findings on possession trances	Possession trance Induction: Vigorously beating bamboo musical instrument with stick	N=3 Healthy participants as they were performing a ritual dedicatory drama Age: 30 yo Sex: men Recruitment: cf method	2 groups formed a posteriori: based on appearance and behavior of subjects in the drama, subjects divided in Trance group, N=1 and Control group, N=2 3 conditions: 1- resting state 2- trance 3- post-trance	Phenomenological questions (episodic recall and subjective trance impressions) + Behaviors recorded on videotape Interviewed regarding personal facts and past history Standard clinical interview EEG	Phenomenology: Average trance duration of 7min50 with automatic movements, falls and loss of consciousness, stiffening and tremors, anterograde amnesia Psychology: No psychiatric pathologies Neurophysiology: In trance, ↑ power frequency theta, alpha1 and alpha2 (especially occipital); No epilepsy	Case study Potential contamination of EEG with movements No measure of carbon dioxide concentration on exhalation to show that no hyperventilation would affect EEG data Potential activation of linked earlobe reference electrodes Constitution of 2 groups a posteriori*

Park et al., 2002	Phenomenology Neurophysiology (EEG)	Examined physiological basis of trance state	Korean shamanistic dancing Induction: shamanic music and flowing white scarf, slow movements, quick turns	N=1 Salpuri dance expert Age: 35 yo Sex: woman NSC practice: > 20 years	4 conditions: 1- resting state 2- recall/remember trance experience 3- listening to participant's favorite music 4- memorization of 10 words	Free recall EEG	Phenomenology: Ecstatic state Neurophysiology: Recall state: ↑ theta and alpha1 in frontal and occipital areas; ↓ generalized frequency (Phi) in recall contrary to the others conditions	Case study Lack of information on neurophysiological analyses*
Ommeren et al., 2004	Psychology	Epidemiology study of mental disorders among shamans	Shamanic trance	N=574 Trance and non-trance practitioners Sex: Men Age (shaman): 51 yo Age (control group): 44 yo Recruitment: Interview	1 condition: structured interview 2 groups: 1- shaman (N=42) 2- non-shaman (N=532)	Phenomenological questions; (trance practice) Composite International Diagnostic Interview-2.1 (disorder modules: phobias and affective, generalized anxiety, persistent somatoform pain, post-traumatic stress, and dissociative disorder) Medical investigation	Psychology: Being a shaman not related to reported lifetime and 12-month disorders; Shamans and non-shamans did not differ in frequency of reported disorders over 12 months and over the lifetime	Identification of shamans based on self-report Participants with psychosis excluded Overrepresentation of trauma survivors Conceptualization of mental disorders in terms of ICD-10 psychiatric constructs but different from local conceptions of illness
Vuckovic et al. 2007	Clinical	Test feasibility and safety of shamanic healing for TMDs	Shamanic journey	N=20 Patients diagnosed with TMD with no previous shamanic treatment Age: 25-55 yo Sex: women	Participants randomly assigned shamanic practitioner Evaluations: - pre-treatment interview - 5 with one of the 4 shamanic practitioners - post-treatment self-reported pain and disability, and interview	Phenomenological Interviews Clinical questionnaires: Axis II pain & disability scales and Research Diagnostic Criteria for TMDs exam	This study demonstrated the feasibility and acceptability of clinical trials of shamanic healing Improvement in usual pain, in worst pain and in functional impact of TMDs	Only women Small sample* No control Group*
Lee et al., 2010	Clinical	Understand the healing symbols used by shaman	Traditional shamanic healing Induction: By a ritual	N=21 Patients (13 were regular attendees and 8 were newcomers who had visited the shrine 1 to 3 times for less than a year)	4 conditions: 1- prehealing interview 2- healing process with video recording 3- post-healing interview	McGill Illness Narrative Interview	Clinical: 11 patients perceived their consultations as helpful, 4 as helpful but unable to follow all recommendations, 5 not sure of outcome because they had yet to see concrete results, 1 patient considered consultation unhelpful	Patient follow-up for only 1 month Recruitment bias (there were more regular patients than newcomers) No statistical analysis*

				Age: 26-67 yo Sex: 13 women, 8 men	4- follow-up interview, 1 month later by phone			
Polito et al., 2010	Phenomenology Psychology	Confirm that participation in a Native American sweat lodge ceremony induces NSC Explore relationships between paranormal beliefs, alexithymia and self-reported NSC	Shamanic trance Induction: Sweat lodge ceremony	N=55 Non-trance practitioners Age: 32±7 yo Sex: 29 men, 26 women NSC practice: 1st time experience for 80% (44) participants Recruitment: voluntary participation	2 conditions: 1- baseline 2- trance	Altered State of Consciousness Scale Psychological questionnaires: Paranormal beliefs scale, Toronto Alexithymia Scale and Profile of mood states questionnaire	Phenomenology: ego dissolution Psychology: ↑ positive mood after ceremony; 3 of prototypical/universal paranormal beliefs (psi, spiritualism and precognition) associated with higher ego dissolution scores; Positive relationship between alexithymia and intensity of NSC; Dimension "difficulty identifying feelings" was the only significant predictor of "oceanic vastness" and "visionary restructuring"	Participants did not have the same prior experiences of NSC* No investigation of psychiatric or neurological history*
Vuckovic et al. 2010	Phenomenology Clinical	Evaluate participants' perceptions of illness, healing process, from shamanic treatment	Shamanic journey	N=20 Patients diagnosed with TMD with no previous shamanic treatment Age: 25-55 yo Sex: women	Participants randomly assigned shamanic practitioner Conditions: - pre-treatment interview - 5 with one of the 4 shamanic practitioners - post-treatment self-reported pain and disability, and interview	Phenomenological Interviews Clinical questionnaires: Axis II pain & disability scales and Research Diagnostic Criteria for TMDs exam	Phenomenology: Relationship to TMD: ↑ optimism, hopefulness, empowerment, control over their condition, understanding of the illness; ↓ consumed thoughts & actions on a daily basis Connecting to the spiritual/transcendent self: ↑ awareness of spiritual and mystical forces, connection to animals and nature, feeling intense connection to land Connecting to a more authentic self: ↑sense of themselves, trust their instincts, confidence, balanced (back to normal) Awareness of mind-body connections: ↑connections between thoughts and emotions, and jaw clenching and pain. ↑ connection between stress and body manifestation Connecting to social self: ↑ confidence about expressing opinions or communicating with others Mechanisms of Healing: ↑ movement of energy and personal intention to change, ↑connection with shaman	Only women Small sample* No control Group*

							Other effects on physical health: better sleep, ↑ immune and digestive systems functions and energy level, ↓back pain (3), ↓ menstrual cycle problem (3) Clinical: Only 4 women with diagnosis of TMDs at the end of treatment Improvement in usual pain, in worst pain and in functional impact of TMDs	
Peres et al., 2012	Phenomenology Psychology Neuroimaging (SPECT)	Determine whether dissociative trance is associated with alterations in brain activity that differ from those when writing normally	Mediumistic trance Induction: Eyes closed, individual enters into communication with the spirit of a deceased person or other immaterial being	N=10 Healthy trance practitioners Less expert group: Age: 49±7 yo Sex: 4 women NSC practice: 16±22 yo Experts group: (>20 years of practice + at least 10 psychographs a month) Age: 48±30 yo Sex: 2 women NSC practice: 37±9 years	2 groups: 1- less expert, N=5 2- expert, N=5 2 randomized conditions: 1- writing in normal consciousness 2- writing in NSC	Phenomenological questions (trance experience) and Legible structured narratives Psychological questionnaires: Dissociative Disorders Interview Schedule, Beck Depression Inventory, Beck Anxiety Inventory, Self-Report Psychiatric Screening Questionnaire and Schedules for Clinical Assessment in Neuropsychiatry SPECT	Phenomenology: All participants reported NSC during trance, but to varying degrees; Experts: deeper trance, with blurred consciousness, out of body experience, little or no awareness of content of writing; Less experts: less deep trance, wrote sentences dictated to them in their minds Text analysis: content involved ethical principles, importance of spirituality and bringing science and spirituality closer together in both groups. complexity of psychographic content > controlled writing complexity of psychographic content of experts > less experts Psychology: No mental disorders Neuroimaging: Resting state: Experts: ↑ activity in L culmen, L hippocampus, L inferior occipital gyrus, L ACC, R superior temporal gyrus, R precentral gyrus Trance state: Experts: ↓ rCBF in previous cited brain areas; Less experts: ↓ rCBF ↑ in these regions compared to normal writing Inversed correlation between change in complexity and change in rCBF in each region in both groups	Small sample size Use of a single cluster threshold as correction No single-subject analysis
Vuckovic et al. 2012	Phenomenology Clinical	Report on long-term quantitative and qualitative outcomes relative to end-of-treatment status of a phase I	Shamanic journey	N=19 Patients diagnosed with TMD with no previous shamanic treatment Age: 25-55 yo	Participants randomly assigned shamanic practitioner Conditions: - pre-treatment interview	Phenomenological Interviews Clinical questionnaires: Axis II pain & disability scales and Research Diagnostic	Phenomenology: 3 women: no symptoms anymore, ↑ well-being, feeling "balanced", "calm" and "at peace."; 11 women: ↓TMD symptoms, ↑ across interviews, ↓ hopeless about pain, ↑ feeling more at ease, balanced, and in control of their lives	Only women Small sample* No control Group*

		study (Vuckovic et al., 2010)		Sex: women	- 5 visits randomly assigned by one of the 4 shamanic practitioners - self-reported pain and disability were recorded at baseline and each treatment visit and at 1, 3, 6, and 9-month follow-ups.	Criteria for TMDs exam	Clinical: lasting effect of the shamanic treatment proved by usual pain, worst pain and, functional impact outcomes that remain low	
Gingras et al., 2014	Phenomenology Physiology	Study the role of repetitive drumming and shamanic journey on biochemical (salivary cortisol concentration) and psychological measures	Shamanic trance Induction: 15 minutes of exposure to repetitive drumming or instrumental meditation music	N=39 Healthy biology students Age: 33 yo Sex: 15 men, 24 women NSC practice: no shamanic experience Recruitment: posters and online advertising	2 groups x 2 conditions randomized: 1- shamanic instruction + drumming (N=10) 2- relaxation instruction + drumming (N=8) 3- shamanic instruction + meditation music (N=11) 4- relaxation instruction + meditation music (N=10)	Experience questionnaire constructed by authors (relaxation experiences and subjective "dreamlike experiences" after the music exposition) Psychological questionnaires: Multidimensional mood questionnaire and Big Five personality factors Salivary cortisol	Phenomenology: shamanic instruction during drumming: ↑ heaviness, ↓ heart rate, ↑ dream experiences ↑ dreamlike experiences during drumming with shamanic instructions Physiology: ↓ cortisol when listening to music (meditation and drums)	No control for confounding variables (age, sex) Music interventions might be more effective with individuals than with groups Intentions, trip purpose, personality, psychological states, belief systems influence on outcome of shamanic journeying Direct or indirect music/presence of practitioner changes the lived experience
Hove et al., 2016	Phenomenology Neuroimaging and neurophysiology (fMRI + EEG)	Examine brain modulation associated with trance	Shamanic trance Induction: Recorded rhythmic percussion (Michael Harner's Solo Drumming)	N=15 Trance practitioners Age: 50±8 yo Sex: 11 women NSC practice: 9±5 years Recruitment: newsletter of the Foundation of Shamanic Studies and by word of mouth. Training: in "core shamanism," a system of techniques	2 counterbalanced conditions: 1- resting state 2- shamanic drum	Phenomenological questions (trance experience) Phenomenology of Consciousness Inventory (body image, time sense, meaning/altered state, absorption) fMRI EEG	Phenomenology: All: experienced a deep shamanic journey in trance Neuroimaging and neurophysiology: fMRI: in trance, ↑ activity in PCC, dorsal ACC and insula/L anterior operculum and ↓ activity in brainstem; ↑ functional connectivity between PCC and dACC, bilateral insula, cerebellar lobules (VI and VIII), bilateral inferior parietal lobule (IPL), bilateral dorsolateral prefrontal cortex; ↓ functional connectivity between superior olivary complex (brainstem) and inferior colliculus, medial geniculate nucleus,primary auditory cortex EEG: No statistical difference in alpha and theta power between conditions	No naive controls Brainstem-mediated auditory triggering is analyzed here, whereas other studies say it is auditory cortex and thalamus Use here of a (passive) soundtrack while more "active" techniques such as singing and dancing could have induced stronger trance states

				developed and codified by Michael Harner				
Lee, 2016	Phenomenology Psychology	Explore if shaman healing is transformative Explore how shaman transformation is related to self and perceived legitimacy of mediumship	Trance of possession Induction: rituals at a particular time (consultation) and place (shrine)	N=1 Trance practitioner 10 shaman assistants & 9 clients Age: 43 yo Sex: Man NSC practice: for 30 years Recruitment: From a single temple Traning: with an advanced shaman	Interviews: 1- client interviewed before their consultation on the same day + interview of assistants 2- interview with the entity during shaman possession 3- interview with the shaman 3 months later	Triangular interviews: shaman, client and assistant (questions exploring Master's transformative experience and perceived legitimacy of Master's mediumship)	Phenomenology: vomiting when the spirit is about to enter the body, uncontrolled body movements, tremor, post-possession amnesia, access to information coming from elsewhere Psychology: Spiritual possession of shaman may be a form of spiritual training rather than pathological dissociation Factors that can explain positive transformation: Relationship between perceived legitimacy of one's spiritual possession and one's personal transformation; development of spirituality by internalizing positive traits of God (e.g., compassion); Personal transformation can parallel God transformation	Case study Assistants and clients may not represent entire population (skeptics refused to be interviewed) To obtain perhaps even more honest answers, interviews could be conducted outside the temple grounds or anonymous questionnaires Recalls based on memories
Flor - Henry et al., 2017	Phenomenology Psychology Neurophysiology (EEG)	Clarify whether shamanic trance states may represent psychopathology and demonstrate whether there are specific alterations in brain function that accompany the shamanic trance state	AICT Induction: vocalization, movements	N=1 Trance practitioner Sex: women Age: 45 yo (at the time of acquisitions, october 2007) NSC practice: for 6 years (at the time of the study) Recruitment: first AICT expert Training: Mongolian tradition	Comparison with data from control subjects 2 conditions: 1- resting state 2- trance	Quick Diagnostic Interview Schedule Psychological questionnaires: Basic Personality Inventory and Multidimensional Aptitude Battery EEG	Phenomenology: Tremors, visualizations, auditory perceptions, modification of perception of time and space, modification of perception and awareness of body (increase in force, reduction in pain, body temperature, perception of dissonance), protolanguage and singing, ego dissolution, possession, inner peace Psychology: No psychiatric disorders Neurophysiology: Modified inter-hemispheric connectivity; Beta rhythms: ↓ R hemisphere coherence, ↑ L hemisphere coherence and ↑ anterior-posterior coherence at fronto-central and occipital level	Case study* No possibility of making movements*
Kawai et al., 2017	Phenomenology Psychology Neurophysiology (EEG) and physiology	Examine EEG and physiological characteristics of possession trances	Possession trance Induction: bamboo musical instrument that subjects hit with stick	N=12 Trance practitioners and non-trance practitioners Age: 34 yo Sex: Men NSC practice:	2 groups formed a posteriori: based on appearance and behavior of subjects in the drama, subjects divided in Trance group, N=7 and Control group, N=5 3 conditions:	Phenomenological questions (episodic memories, subjective trance impressions and observations of experimenters) Medical interview EEG	Phenomenology: in possession trance, sudden excitement, repeated behaviors, fixed and/or blurred eyes, muscular rigidity, convulsion (tremor), amnesia Psychology: No pathologies, no abnormal behavior or dissociative trance in everyday life	EEG contamination by movements* No combination of biochemical and neurophysiological analysis* Recruitment a posteriori*

				trance between 1 and 4 times/year Recruitment: cf method	1- resting state 2- trance 3- post-trance	Physiological measures (blood pressure and heart rate)	Neurophysiology: EEG in trance, ↑ alpha1, alpha2, beta, theta; in post-trance, alpha2 stays high; No epilepsy Physiology: No difference between groups for blood pressure, heart rate	Constitution of 2 groups a posteriori*
Mainieri et al., 2017	Phenomenology Psychology Neuroimaging (fMRI)	Explore neural correlates of mediumistic-trance	Mediumnistic trance Induction: Reaching state of "mental emptiness"	N=16 Trance and non-trance practitioners Experts in trance: Age: 49 yo Sex: 3 men, 5 women NSC practice: for 15 years Matched controls (age, sex, education + with no previous experience of trance states) Recruitment: mediums were indicated by the coordinator of the spiritist group, who has more than 40 years of experience Training: all participants were trained within the same kardecist group which is a spiritualistic movement	Control group (N=8) Condition: - resting state Mediums group (N=8) Conditions: - resting state, - mediumnistic trance - cognitive tasks - imaginative trance	Phenomenological interview (trance experience and intensity) Psychological questionnaires: Positive and Negative Affective Scale, Emotion Self-Rating; Trance depth, Structured Clinical Interview for DSM-IV, Global Assessment Scale, Positive and Negative Syndrome Scale and Neurophysiological tests (executive functions, verbal fluency, working memory, verbal intelligence, handedness) fMRI	Phenomenology: ↑ surprise for imaginative trance; ↑ happiness for mediumistic trance, spiritual vision/clairvoyance, spiritual hearing, doubling experiences (experience of feeling out of one's own body and/or going elsewhere), telepathy for mediums during trance Psychology: No difference between control and mediums Neuroimaging: In trance state compared to resting conditions, ↑ activation in bilateral occipital cortex, temporal pole, L middle temporal gyrus, middle frontal gyrus, orbitofrontal cortex. In trance state compared to imaginative trance: ↑ activation in L lateral occipital cortex and PCC ↑ functional connectivity within the auditory and sensorimotor networks during trance state compared to resting state and imaginative trance condition No difference between trance experts and control group for resting state network at rest	Sample was restricted to kardecist mediums Small sample size MRI scans shorter than conventional resting-state scans
Wahbeh et al., 2017	Clinical	Explore feasibility of shamanic treatment for veterans with PTSD Collect preliminary data on PTSD-related outcomes	Shamanic journey Induction: Vocals, drumming, rattling, and other instruments producing sounds combine with the shamanic practitioner's	N=4 Veterans 2 participants with previous shamanic treatment Age: 49±13 yo Sex: Men	Treatment: 8 sessions (15 to 20 weeks)	PTSD Checklist The World Health Organization Disability Assessment Schedule2 The Spiritual Wellness	Clinical: ↓ of PTSD symptoms in 3 patients with improvements in quality of life and spiritual wellness Participant 1: improved focus, peace, and self-esteem. Reduced drug use, quicker emotional release, and enhanced trust. Occasional anger with fewer outbursts; Participant 3: Spiritual interventions halted destructive behavior, improved emotions, deepened connection to spirits. Optimism increased, traumatic experiences renegotiated; Participant 4: experienced PTSD symptom	Small sample size No control group No inclusion/exclusion criteria on alcohol or drug abuse, trauma, unstable home environment and severe health issues No long-term follow-up

			intentions and the spirit realm's guidance				exacerbation; substantial shift in physical body (lost 80 pounds and felt better physically)	
Konopacki & Madison, 2018	Phenomenology Neurophysiology (EEG)	Examine possible role of expectation of trance state when listening to monotonous drumming	Shamanic trance Induction: Shamanic drum sounds	N=24 Non-trance practitioners Age: 29±8 yo Sex: 3 men,11 women Recruitment: Umeå University students and members of the Yogasällskapet yoga center	2 randomized groups: 1- without suggestions, neutral text, N=12 2- with suggestions that drumming can induce a trance state, N=12 2 conditions: 1- rest 2- drum sounds	The Phenomenology of Consciousness Inventory EEG	Phenomenology: No difference in modified experience scores between groups (but relaxation reported); Altered experience score = 2.45/6 for both group Neurophysiology: for suggestion group, ↓ alpha during drum in occipital area	Inter-individual differences revealing heterogeneous group Recruitment bias (participants were recruited from the Yoga studio were the present author used to teach) People practicing meditation more likely to enter meditative state during experiment or control NSC in general
Wahbeh et al., 2019	Phenomenology Psychology Neurophysiology (EEG) and Physiology	Evaluate neurophysiological correlates of channeling	Channeling trance Induction: body is used as a "vehicle" to let disembodied entity incorporate the medium and communicate directly through speech, writing or movement	N=13 Trance practitioners Age: 57±13 yo Sex: 11 women Age channeling practice started: 39±21 years Recruitment: Online survey Training: spontaneous - 46.2%, received training - 30.8%, self-training - 23.8%	4 counterbalanced conditions: 1- resting state 2- reading a story at rest 3- channeling 4- reading a story during channeling	Phenomenological questions (trance experience) Voice recording Psychological questionnaires: Patient Health Questionnaire-4, Big Five Inventory-10, Multidimensional Personality Questionnaire, Empathy Quotient, Highly Sensitive Person Scale and Paranormal Belief and Experience Scale EEG Physiological measures (ECG, GSR body temperature, respiration)	Phenomenology: 7 participants feeling of channeling the same being for all sessions same channeling in all conditions Voice: Story reading significantly slower during channeling; Vocal valence (negativity) significantly lower when read during channeling than at rest, no difference in temperament and arousal (power level) Psychology: No psychiatric pathologies; Positive impact of channeling on daily life Neurophysiology: No significant differences between trance and resting state Physiology: no difference between rest and trance for ECG, respiration, GSR, temperature	Alternating conditions during protocol may have led to incomplete state changes Basic state of participants at rest may be relatively similar to trance state Small sample size All frequencies above 40hz filtered out Trance practitioners report different embodied beings, so perhaps different associated brain activities Remain still and silent The "incorporated beings" are actually multidimensional aspects of the channeler themselves
Gosseries et al., 2020	Phenomenology Psychology Neuroimaging (TMS-EEG)	Probe trance changes of electrical reactivity of cortical cir-	AICT Induction: Vocalizations, movements	N=1 Trance practitioner Age: 56 yo Sex: women	2 conditions: 1- resting state 2- trance	Free recall and Phenomenological questions (time perception, arousal, absorption, dissociation)	Phenomenology: ↑ awakening, ↑ absorption, ↑ dissociation, time perception modification, visualizations, auditory perceptions, possession, perception and body consciousness modification, positive emotions, ego dissolution, body movements	Case study No possibility of making movements during trance*

		cuits to magnetic perturbations		NSC practice: 17 years Recruitment: first AICT expert Training: Mongolian tradition		TMS-EEG	Neurophysiology: for frontal stimulation, ↑ amplitude of evoked potentials; for parietal stimulation, ↓ amplitude of evoked potentials	
Huels et al., 2021	Phenomenology Neurophysiology (EEG)	Elucidate the neural correlates of the shamanic state	Shamanic Trance Induction: Shamanic drum (Michael Harner's Solo Drumming)	N=37 Trance practitioners and non- practitioners NSC practice: > 5 years Matched controls (age, sex + with no previous experience of trance states) Training: shamanic tradition or style under expert supervision	2 groups: 1- control, N=19 2- trance practitioner, N=18 5 randomized conditions: 1- resting state 2- resting state (in a counterbalanced order): 3- cognitive tests 4- shamanic percussion 5- classical music	Altered State of Consciousness questionnaire EEG	Phenomenology: for shamanic drum, shamans scores > control scores in 8 domains (complex imagery, unity, spiritual experience, bliss state, disembodiment, insight, elemental visual alterations, altered perceptions); No group differences for classical music; Shamans score sign > during drumming vs. classical music in all areas above except for visual impairments Neurophysiology: for drum: ↑ gamma power in shaman, positively correlated with visual impairments, ↓ diversity gamma in shamans during drumming, negatively correlated with insight, ↑ low beta criticality in shamans during drum, positively correlated with visual impairments and complex imagery For non-specific drum: ↓ alpha functional connectivity and ↑ beta functional connectivity in shamans during drumming and classical music, ↑ high beta criticality during drumming and classical music in shamans, and ↑ gamma criticality during drum, classical music and resting in shamans	No electromyographic data to study movements. Gamma results could be contaminated with muscle artifacts Small sample size Variability of practice and rituals Controls at rest while practitioners in trance Comparison between this study and another previous study on psychedelics (not the same method) Difficult comparison between shamanic practitioners and healthy volunteers under psychedelics (e.g., different methodologies and doses of psychedelics, eyes open vs. eyes closed) Lack of blinding between conditions or groups
Rogerson et al., 2021	Phenomenology Neuroimaging (fMRI)	Examine brain regions showing interaction with expert subject's perceptions Investigation into the perception of trance	Shamanic healing trance Induction: Music chosen by subject	N=1 Trance practitioner Age: 42 yo Sex: woman NSC practice: > 20 years	2 conditions: 1- resting state 2- trance state	Phenomenological questions (trance experience) fMRI	Phenomenology: Change in somatosensory sensations, ↑ external awareness, ↑ internal awareness, mental imagery, floating; Intense experience correlated with highest or strongest point of trance; Rapid blinking of the eyelids, increased breathing, feeling of ecstasy Neuroimaging: ↑ activation in auditory cortices; R parietal area, R frontal area and prostriata area linked to high trance perception; Orbitofrontal cortex negatively activated and most correlated with music when trance was high, showing	Case study

							greatest differential between high and low trance perception	
Lee and Kirmayer, 2022	Phenomenology Psychology	Evaluate therapeutic transformation of mediums during possession	Trance of possession Induction: By a ritual	N=8 Trance practitioners Age: 22-53 yo Sex: men NSC practice: between 4 and 32 years Recruitment: in 5 temples Training: either a person volunteers and trains to solicit a deity to possess him/her or a deity chooses a suitable person to be a shaman	1 condition: structured interview	Open interviews (recount their initiations and practices) Psychological questionnaires: Cross-Cultural Personality Assessment Inventory and Dissociative Experience Scale	Phenomenology: During trance, unable to move or speak, ↓ control bodily movements, alterations in consciousness, unintelligible language, communication with spirits, ↑ trance amnesia, change embodied experience of self, modification of perception of body Psychology: Personality traits: emotionally stable, oriented toward internal locus of control, optimistic, confident, family oriented, sociable, socially sensitive; CPAI-2 did not differ from standard; Participants' DES scores generally below pathological threshold of 30 but above average; Change in identity and social role, changes in self-perception during spirit possession, more lasting changes in the sense of self due to recurring possession experiences and changing social role and identity.	Case studies* Open interview* No information on recruitment or number of years of practice*
Grégoire et al., 2022	Phenomenological Psychological Neurophysiological and physiological Clinical	Evaluate short- and long-term clinical benefits of trance in oncology patients Measuring the evolution of phenomenological and neurobiological correlates of AICT Study whether AICT is mediated by the same mechanisms as the biopsychosocial model of hypnosis	AICT Induction: Vocalizations, movements	Need: 160 post-cancer patients Non-trance practitioners Age: > 18 yo Sex: men and moman NSC practice: no NSC experience Recruitment: online advertising, posters, flyers, institutions, doctors	Longitudinal study Preference-based design Evaluations: before and just after the interventions, 3 months and 1 year after the intervention	Phenomenological questionnaires: various questionnaires Psychological questionnaire: various questionnaires Clinical questionnaires: various questionnaires Medical data Questions about interventions and practice EEG Physiological measures (ECG, EMG, respiration, temperature, tumor marker rates)	Not applicable	Only patients who have completed their active treatments for less than a year can participate No inclusion of patients with brain tumors or who regularly and currently practice hypnosis, meditation or trance Recruitment bias (group interventions which could discourage some people from participating, the therapists involved in the study are recognized as international experts in their discipline, profile of participants already interested in these techniques) Study design (no randomization, designs of the three interventions are different in terms of duration and frequency)