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Classification schemes of altered states of consciousness

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ABSTRACT

In recent years, there has been a renewed interest in the conceptual and empirical study of altered states of consciousness (ASCs), induced pharmacologically or otherwise, driven by their potential clinical applications. To draw attention to the rich history of research in this domain, we review prominent classification schemes that have been proposed to introduce systematicity into the scientific study of ASCs. The reviewed ASC classification schemes fall into three groups according to the criteria they use for categorization: (1) based on the nature, variety, and intensity of subjective experiences (state-based), including conceptual descriptions and psychometric assessments, (2) based on the technique of induction (method-based), and (3) descriptions of neurophysiological mechanisms of ASCs (neuro/physio-based). By comparing and extending existing classification schemes, we can enhance efforts to identify neural correlates of consciousness, particularly when examining mechanisms of ASC induction and the resulting subjective experiences. Furthermore, an overview of what defining ASC characteristics different authors have proposed can inform future research in the conceptualization and quantification of ASC subjective effects, including the identification of those that might be relevant in clinical research. This review concludes by clustering the concepts from the state-based schemes, which are suggested for classifying ASC experiences. The resulting clusters can inspire future approaches to formulate and quantify the core phenomenology of ASC experiences to assist in basic and clinical research.

1. Introduction

Altered states of consciousness (ASCs) have been observed throughout human history, with evidence dating back to the Paleolithic era, such as carvings of hunters in trance-like states and Neanderthal shrines to animal gods (Campbell, 1984; Grof, 2019). Long before modern science began its investigation, numerous cultures explored altered states of consciousness through varying schools of thought, such as Buddhism, influencing the vocabulary and conceptualization of the early ASC classifications developed by prominent researchers in the sixties and seventies (Beischel et al., 2011; Fischer, 1992; Grof, 2019; Leary et al., 1964/2000; Lilly, 1972/2017; Metzner, 1971; Shear, 2011; Ustinova, 2017). These early ASC classifications can then be viewed as transitions from spiritual and conceptual approaches into empirical approaches that form the foundation of modern research. ASCs are generally defined as transient and reversible changes in subjective experience from an average normal, waking state that are noticeable from a first-person perspective (Beischel et al., 2011; Farthing, 1992;

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Ludwig, 1966; Tart, 1975/1983).

The investigation of ASCs in modern psychology and neuroscience has been important for two reasons. First, ASCs were historically used to understand psychiatric conditions, as early pharmacology sometimes considered them models of psychosis[7] (Corlett et al., 2011; Fischer, 1957; Grof, 2019; Vollenweider et al., 1997; Vollenweider and Geyer, 2001). This research followed the idea that understanding the neuronal mechanism of experimentally induced ASCs may help to reveal the mechanisms underlying psychiatric conditions. Today, pharmacological and non-pharmacological induction methods of ASC phenomena, like hallucinations or out-of-body experiences, are used to reveal their neural correlates (Amaya et al., 2023b; Avram et al., 2021; Schmidt et al., 2020; Stephan et al., 2009; Vollenweider and Preller, 2020).

Second, ASCs have been investigated for their potential clinical merit (Grof, 2019; Wolff et al., 2020; Yaden and Griffiths, 2021). Clinical research on psychedelic assisted psychotherapy, the combination of pharmacological inductions of ASCs with psychotherapeutic frameworks, shows clinical potential across different pathologies (Garcia-Romeu et al., 2014; Griffiths et al., 2008; Griffiths et al., 2006, 2011, 2016; Grob et al., 2011; Majić et al., 2015). While the exact mechanisms of these outcomes are still under investigation, it remains controversial if certain aspects of the experience, such as self-boundary dissolutions, acceptance, or mystical experiences might specifically support the clinical outcome (Aqil and Roseman, 2023; Letheby, 2021; Mortaheb and Fort et al., 2024; Rotz et al., 2023; Wolff et al., 2020), where specifically the intensity of positively experienced ASC features are current candidates for predicting therapeutic benefits (Holze, Gasser, et al., 2023; Holze et al., 2024; Roseman et al., 2017; Ross et al., 2016). To determine such contributions of specific ASC experiences, improvement in the nuanced conceptualization and measurement of ASC phenomenology are needed.

In this review we do not aim to compare different mechanistic models of brain function or offer competing mechanistic explanations of neurophysiological mechanisms. We focus on the most popular and reasonably advanced classification schemes, many of which are noticeably influenced by their respective *Zeitgeist*. We begin by summarizing a typical definition of ASCs, followed by brief overviews of three types of classification schemes presented in historical order. To identify areas of conceptual agreement across authors, we then offer a synthesis of overlapping phenomenological features, organized into clusters, derived from the reviewed classification schemes. While previous reviews have provided brief historical overviews of certain ASC classification schemes,[8] we expand on this work by offering a comprehensive summary of various schemes and their interrelationship while analyzing their commonalities (Beischel et al., 2011; Cofré et al., 2020; Passie, 2007; Yaden et al., 2024).

1.1. Definitions of Altered States of Consciousness (ASCs)

Over time, there have been different attempts in defining ASCs, often with accompanied changes in terminology. The question of how to define ASCs is central to their classification, as definitions and classification schemes are often conceptually intertwined. In this section, we summarize common defining criteria to delineate the scope of states addressed in later sections. Besides the term altered states (Ludwig, 1966; Tart, 1975/1983), other related concepts and terms are in use such as modified states (Freitas et al., 2016; Tassi and Muzet, 2001), global states (Bayne et al., 2016), alternate states (Evans, 1989), non-ordinary states (Oswald et al., 2023; Timmermann et al., 2023), or patterns of phenomenological properties (Rock and Krippner, 2007, 2011). Additionally, other terms have been used to specify ASCs that produce specific phenomenology or are brought about by certain inductions such as holotropic states (Grof, 2008), hallucinogen-induced altered states of consciousness (Sayin, 2012), experimental psychoses (Grof, 2019), exalted states (Fischer, 1971), or exceptional states (Revonsuo, 2009). The term "altered states of consciousness" was popularized by Arnold Ludwig in *Altered States of Consciousness*, describing them as an "uncharted realm of mental activity," (Beischel et al., 2011; Ludwig, 1966, p. 225). From there, Ludwig defines ASCs as:

> "[…] any mental state(s), induced by various physiological, psychological, or pharmacological maneuvers, or agents, which can be recognized subjectively by the individual […] as representing a sufficient deviation in subjective experience […] from waking consciousness," (Ludwig, 1966, p. 225).

A few years later, other researchers expanded on Ludwig's core definitions to further specify what constitutes an ASC (Beischel et al., 2011). Stanley Krippner, for example, adds that the sufficient deviation mentioned by Ludwig is represented by a "[…] difference in psychological functioning from the individual's normal, alert state," (Beischel et al., 2011, p. 116). Charles Tart further expanded this definition, adding that ASCs are represented by a qualitative and quantitative shift from "normal" wakefulness (Tart, 1975/1983). Importantly, Tart's work formalized the importance of a normal, wakeful state in what he would refer to as the baseline state of consciousness (b-SoC). In his conceptualization, any state of consciousness can be defined as "[…] a unique, dynamic pattern or configuration of psychological structures," (Tart, 1975/1983, p. 5). An ASC, therefore, is defined as a sufficient change (i.e., recognizable by the subjective observer) in unique pattern configuration from the b-SoC (Tart, 1975/1983). Later in his book *The Psychology of Consciousness* G. William Farthing, in an attempt to compile ASC research, defines an ASC as: "[…] a temporary change in the overall pattern of subjective experience, such that the individual believes that his or her mental functioning is distinctly different from certain general norms for his or her normal waking state of consciousness," (Farthing, 1992, p. 205).

Throughout the years it has generally been agreed upon that ASCs must be a noticeable deviation from "normal" waking experience that it is "altered" concerning the normal, waking state from which it deviates, meaning an ASC must be compared against a reference state (Beischel et al., 2011; Farthing, 1992; Tart, 1975/1983). For an ASC to exist relative to its reference state, the changes must be identifiable by the person or an external observer; though recognition of this change may occur retrospectively (Farthing, 1992; Tart, 1975/1983). For the individual, this can result in the perception that reality has shifted, and only upon returning to the regular waking state do they recognize that it was their mental state, not reality, that changed. This supports the necessity of using third-person questionnaires for retrospective phenomenological assessment in ASC research (Farthing, 1992; Pekala, 2013). Additionally, ASCs seem to have a set time course and therefore last only minutes, hours, or sometimes days (Dittrich, 1998; Majić et al., 2015; Nichols, 2016; Tart, 1975/1983). Transiency in ASCs implies their reversibility, both of which are reflected in various ASC definitional criteria and refer to the same concept of non-endurance (Cofré et al., 2020).

While many researchers agree that transiency is a definitional component of ASCs, some suggest that some states involving chronic conditions should also be considered ASCs. For example, there is ongoing discussion around whether sleep, disorders of consciousness

[7] Also referred to as "experimental psychoses," due to their transient nature (Grof, 2019).

[8] The term classification scheme is used over taxonomy as taxonomy can imply innate hierarchical relationship between concepts which do not always apply for the reviewed schemes.

(DOCs),[9] and/or psychiatric conditions should be included in the conceptualization of ASCs (Bayne et al., 2016; Giacino et al., 2014; Ludwig, 1966; Metzner, 2005a; Tart, 1975/1983; Vaitl et al., 2005). Some authors, such as Metzner and Vaitl, do not consider transiency by including psychiatric conditions, like schizophrenia, in the discussion of ASCs (Ludwig, 1966; Metzner, 2005; Tart, 1975/1983; Vaitl et al., 2005). Conversely, some authors emphasize the importance of transiency in the definition of an ASC due to the need of a comparison state in order to call it "altered" (Costines and Schmidt, 2024). The "reference problem" arises when the normal, wakeful state is not the baseline state of consciousness, such as in psychopathology or DOCs with persistent changes that can be considered chronically altered. Accordingly, one can either see transiency as a defining criterium for an ASC or categorize ASCs as either "transitory" or "chronic/permanent." Some ASCs can be entered voluntarily, or artificially induced, while other may result from ongoing physiological processes such as falling asleep (Cofré et al., 2020; Vaitl et al., 2005).

Multiple authors have argued that an ASC is characterized by changes across multiple dimensions of experience, not only changes in a single domain, such as changes in arousal or simple perceptual illusions. These dimensions are sometimes referred to as properties (Krippner, 2011), aspects (Wittmann, 2018; Tart, 1975/1983), facets (Ludwig, 1966), characteristics (Ludwig, 1966), structures (Dittrich, 1975, 1985), subsystems or divisions (Tart, 1975/1983), features (Niikawa, 2020), but most commonly as dimensions (Berkovich-Ohana and Wittmann, 2017; Dittrich, 1998; Farthing, 1992; Pekala, 2013; Vaitl et al., 2005). To describe the overall culmination of these different dimensions of experience researchers will sometimes use phrases like "experiential" or "phenomenological" patterns to convey the larger scale subjective changes observed in ASCs (Costines and Schmidt, 2024; Mortaheb and Fort et al., 2024; Rock and Krippner, 2007, 2011; Schmidt and Fejer, 2021).

The phenomenological description of states of consciousness as positions within a multidimensional space, where each dimension represents a specific aspect of consciousness, has been termed and formalized in different consciousness state-space (CSS)[10] models (Berkovich-Ohana and Glicksohn, 2014; Berkovich-Ohana and Wittmann, 2017; Paoletti and Ben-Soussan, 2020; Werner, 2009). These models represent ASCs as specific positions in an n-dimensional space, where each dimension corresponds to a distinct aspect of consciousness. Each specific expression of a phenomenological dimension in time defines a position along n-dimensions, and changes over time to define a trajectory in the n-dimensional CSS. The identification of the relevant dimensions to make the CSS formulation meaningful requires further research. The reviewed literature in this article contains many suggestions which can be interpreted as to suggest specific dimensions of a CSS model. The suggestion of dimensions of consciousness are typically derived from conceptual or empirical approaches. Conceptual approaches often draw on a specific theoretical framework and/or qualitative descriptions and can develop into empirical approaches when using quantitative methods to analytically evaluate clusters, factors, or dimensions of ASC phenomena psychometrically (Dittrich, 1998; Pekala, 2013; Studerus et al., 2010).

In sum, different attempts to specify the term ASCs point to the importance of both transiency and multidimensionality in changes from a baseline ("normal" or "average"), waking state that can be subjectively recognized by an individual or objectively by another through measurement. (Bayne et al., 2016; Farthing, 1992; Ludwig, 1966; Tart, 1975/1983).

1.2. Types of classification schemes

In comparing classification schemes of ASC descriptions, one can find different approaches with varying emphasis on the characteristics that can be used for classification. We categorize these by ordering them into three different types of classification schemes (Table 1): (1) Schemes based on the nature, variety, and intensity of subjective experiences (state-based), including conceptual descriptions and psychometric assessments, (2) schemes based on the technique of induction (method-based), and (3) schemes involving descriptions of neurophysiological mechanisms of ASCs (neuro/physio-based).

State-based classification schemes describe the subjective experience of an ASC, informing the questions like, "How does it feel?" or "What is it like?" In contrast, method-based schemes classify ASCs based on the induction method. It is important to note that they are distinct such that a state cannot be defined by its induction method. For example, the mere application of an induction technique, like meditation or hypnosis, does not guarantee the presence of an altered state. Examples of this include meditation practices that do not always lead to a meditative state and hypnotic practices that do not always lead to a hypnotic state (Tart, 1975/1983). Lastly, different induction methods can lead to similar states such as the state of sedation arising from pharmacological sedatives or exhaustion (Brasil-Neto et al., 1993; Zlott and Byrne, 2010). Taken together, confusing a state with an induction method entails several problems that can lead to difficulties in phenomenological investigation. As such, the description of a state of consciousness should be primarily based on their subjective effects, and ideally supported by descriptions in one's overall neurobiological and physiological state (Tart, 1975/1983). Neuro/physio-based classification schemes focus on the neurobiological, and sometimes physiological, processes that accompany an ASC. Some classification schemes, in their original versions, are presented as mixtures of these three types of description. In the following section we will provide summaries of state-based, method--based, and lastly neuro/physio-based schemes. The sections are organized in approximate chronological order so that the reader can navigate to the relevant scheme of interest (see Table 1).

2. State-based classification schemes

The hypothesis that ASCs share common, experiential denominators dates back to the mid-nineteenth century. An early example is *Du hachisch et de l'aliénation mentale: études psychologiques* by psychiatrist J. Moreau de Tours where he explores the idea of ASCs sharing multidimensional changes in phenomenology through his experiences with various ASC-inducing agents (Moreau, 1845). This hypothesis can also be found in the writings of William James where he writes on his consumption of alcohol, nitrous oxide, and ether (James, 1902/2009). These writings contain the core idea of state-based schemes: to elucidate the structure of ASCs by identifying distinct dimensions of experiences.

2.1. Categories of a typology of mysticism

One of the earliest and most influential attempts to understand ASC experiences within a state-based framework was Walter Pahnke's Categories of a Typology of Mysticism, developed as part of his doctoral dissertation at Harvard (Pahnke, 1963). This framework was not intended to classify the full spectrum of ASCs, but rather to describe the phenomenological core of mystical experiences associated with them using a structured set of conceptual categories. Though focused on a narrower phenomenon, its historical and ongoing relevance to ASC research warrants its inclusion among other state-based schemes.

Pahnke, both a minister and a psychiatrist, is best known for his work

[9] Disorders of Consciousness (DOCs) refer to severe and persistent alterations to the level of consciousness such that there is a reduced ability to maintain wakefulness or respond to the environment. They are often caused by factors such as stroke or traumatic brain injury. Examples include coma and the minimally responsive state (Gosseries et al., 2011).

[10] Some authors also refer to this as a phenomenal (Metzinger, 2020) or phenomenological (Berkovich-Ohana and Wittmann, 2017) state-space as it visualizes dimensions of changed experience.

Table 1

Summary Table of ASC Classification Schemes. Overview of reviewed state-based, method-based, and neuro/physio-based schemes. State-based schemes classify types of subjective experience; method-based detail how an ASC is induced. Neuro/physio-based classification schemes focus on the neurobiological, and sometimes physiological, processes that are characteristic of an ASC. Schemes are ordered chronologically.

Type	Classification Scheme	Summary	Key References
State-Based	Categories of a Typology of Mysticism	Conceptual framework focused on understanding mystical experience in ASCs. Famously, led to the development of the Mystical Experiences Questionnaire (MEQ) to measure the experience in nine dimensions: Unity, Transcendence of Time and Space, Deeply Felt Positive Mood, Sense of Sacredness, Objectivity and Reality, Paradoxicality, Alleged Ineffability, Persisting Positive Changes in Attitude and Behavior, and Transiency.	Pahnke, (1963); MacLean et al., (2012)
	Subjective Intensity Scheme	Conceptualized levels for pharmacological ASCs from lowest to highest based on subjective intensity: Anesthetic, Emotional Stupor, Ego Consciousness, Sensory Awareness, Somatic Awareness, Cellular, Atomic-Electronic.	Leary, (1964)
	General Characteristics of ASCs	Conceptualization of ten ASC components: Alterations in Thinking, Disturbed Time Sense, Loss of Control, Change in Emotional Expression, Body Image Change, Perceptual Distortions, Change in Meaning or Significance, Sense of the Ineffable, Feelings of Rejuvenation, and Hyper-suggestibility.	Ludwig, (1966)
	Cartography of Ecstatic and Meditative States	ASCs are shown as the result of subjective hyperarousal (ergotropic) or hypoarousal (trophotropic).	Fischer, (1971), (1992)
	The Arica System	Conceptualization of pharmacological ASCs plotted on emotional valence and subjective intensity, labeled by "vibrational frequencies."	Lilly, (1972)/(2017)
	Varieties of Transpersonal Experience	Narrative-thematic grouping of self-reports from LSD psychotherapy. Includes experiences of basic perinatal matrices and the void, as examples.	Grof, (1972), (1973)
	The Spectrum of Consciousness	Levels of consciousness span a singular dimension of identity (narrow/expanded) on which four states can be classified: Shadow Level, Ego Level, Existential Level and Mind Level.	Wilber, (1975), (1993)
	Subsystems of ASCs	A grouping of categories of changed experiences under ASCs that interact with each other through direct routes of information flow and feedback loops involving the external world and the body. These include: Exteroception, Interoception, Input-Processing, Emotions, Memory, Space/Time Sense, Sense of Identity, Evaluation, Motor Output, and Subconscious.	Tart, (1983)
	Etiology-Independent Structures of ASCs	Conceptual framework highlighting how subjective changes in ASCs are shared among inductions. Famously led to the development of the 5-Dimensional Altered States of Consciousness (5D-ASC) Rating Scale to study ASC experience. Within the 5D-ASC, there are five dimensions: Oceanic Boundlessness, Dread of Ego Dissolution, Visionary Restructuralization, Auditory Alterations, and Vigilance Reduction. Additionally, 11 factors (11-ASC) such as Blissful State, Anxiety, and Complex Imagery.	Dittrich, (1975), (1998); Studerus et al., (2010)
	The Empirical-Phenomenological Approach	Conceptual framework that highlighted how ASCs, regardless of induction method, affect similar phenomenological properties. This led to the development of the well-known Phenomenology of Consciousness Inventory (PCI) of 12 major dimensions: Positive Affect, Negative Affect, Altered Experience, Visual Imagery, Attention, Self-Awareness, Altered State of Awareness, Internal Dialogue, Rationality, Volitional Control, Memory, and Arousal. Additionally, 14 minor dimensions such as Joy, Anger, Altered Perception, etc.	Pekala, (2013); Pekala et al., (1986); Pekala and Levine, (1981)
	Arousal-Hedonic Scheme	ASCs are plotted on basis of how energetic they feel (Arousal) and how pleasurable they feel (Hedonia).	Metzner, (2005a)
	Changed Dimensions of Subjective Experience in ASCs	Conceptualization of fourteen dimensions of ASCs: Attention, Perception, Imagery/Fantasy, Inner Speech, Memory, Higher-Level Thought, Meaning/Significance of Experiences, Time Experience, Emotional Feeling/Expression, Levels of Arousal, Self-Control, Suggestibility, Body Image, and Sense of Personal Identity.	Farthing, (1992)
	General Heuristic Model of ASCs	According to the author, ASC induction is the result of set/setting leading to six subjective changes: Thinking/Attitude, Feeling/Emotion, Perception/Sensation, Sense of Time/Space, Body Image, and Sense of Self/Identity.	Metzner, (2005a)
	Four-Dimensional Descriptive System	A system mapping ASCs based on their level of Awareness, Activation, Self-Awareness, and Sensory Dynamics.	Vaitl et al., (2005)
	Three-Dimensional Sphere (3DS) Models	Two models that visualize a three-dimensional phenomenological state-space with a spherical structure. Both models agree on two dimensions: (1) (Subjective) Time and (2) Emotion. The Berkovich-Ohana & Glicksohn Model suggests (3a) Awareness, while the Paoletti & Ben-Soussan Model suggests (3b) Self-Determination as the third dimension.	Berkovich-Ohana and Glicksohn, (2014); Paoletti and Ben-Soussan, (2020)
Method-Based	Systems Model	According to the author, ASC induction is the breakdown of baseline consciousness followed by the establishment of a new state through patterning and disruptive forces.	Tart, (1975)/(1983)
	Stimulus Intensity-Variability Schema	According to the author, ASC induction is mapped by two dimensions defining the intensity and variability of the stimulus.	Dittrich, (1985)
	Induction-Domain Schemes	Two attempts at classifying inductions based on their method (1) Vaitl et al. propose five categories such as pharmacological and psychological. (2) Cofré et al. propose four categories such as pharmacological and endogenous.	Vaitl et al., (2005); Cofré et al., (2020)
	Neuroscience-based Nomenclature (NbN)	Classification of ASC inducing pharmacological agents by their neuronal mechanism of action.	Zohar et al., (2015)
Neuro/Physio-Based	Cortico-thalamo-striato-cortical (CSTC) Feedback Loop Model	ASC induction is the result of the perturbation of cortico-thalamo-striato-cortical feedback loops.	Vollenweider and Geyer, (2001); Vollenweider and Preller, (2020)
	Hierarchical Alteration Scheme	A consciousness alteration hierarchy involving the interlocked systems of Self-Control, Arousal, Sensory Input, Neurochemical/Metabolic Processes (Chemistry), and Brain Dynamics.	Vaitl et al., (2005)
	Entropic Brain Hypothesis (EBH)	Pharmacological ASC induction seen as the result of increases in brain entropy.	Carhart-Harris et al., (2014); Carhart-Harris, (2018)
	Bayesian Predictive Coding Models	Pharmacological ASC induction is seen as the result of hierarchical information processing tied to Bayesian mathematical formulations. ASC phenomenology ultimately arises from a disbalance of top-down and bottom-up information.	Carhart-Harris and Friston, (2019); Corlett et al., (2009), (2019)

aiming to bridge clinical psychiatry and mysticism. Supervised by Timothy Leary and Richard Alpert (later known as Ram Dass), he conducted the now-famous Good Friday Experiment to test whether psilocybin could induce experiences comparable to those described in mystical traditions (Mosurinjohn et al., 2023). Drawing on the work of philosopher W.T. Stace, Pahnke outlined nine core dimensions of mystical experience: (1) the Unity dimension divided into internal and external unity. Internal unity involves a loss of the usual sense and self-boundaries accompanied by a profound sense of oneness. In contrast, external unity is felt through the physical senses and occurs when the perceived boundary between oneself and an external object dissolves, such that both are felt as part of the same undifferentiated whole; (2) the Transcendence of Time and Space dimension defined as the loss of the sense of time including "clock time," and one's sense of past, present, and future. Loss of the sense of space refers to a loss of usual orientation within one's three-dimensional perception of their environment. Sometimes this is referred to as feelings of eternity, and/or infinity; (3) the Deeply Felt Positive Mood dimension defined as universal elements of joy, blessedness, and peace at the highest levels that can sometimes be emotionally overwhelming. These can occur at peak experiences or in the ecstatic afterglow; (4) the Sense of Sacredness dimension defined as a feeling where one feels to be of special value, capable of being profaned with feelings of awe and wonder. It can be agnostic of religious beliefs and traditional theological terminology; (5) the Objectivity and Reality dimension defined by two interrelated elements of insightful knowledge/illumination and the authoritative nature of the experience. Insightful knowledge/illumination is felt intuitively on a non-rational level through direct experience, whereas authoritative nature is a certainty that such knowledge is truly real in an objective sense. This can be seen as the interplay between subjective and objective realities; (6) the Paradoxicality dimension defined as accurate and rational interpretations of mystical experiences that contradict logic. According to Pahnke, experiences of internal unity result in the loss of all experiential content such as the loss of the sense of self. Even amidst this loss of selfhood, it appears that a residual "I" persists to record and remember this experience, existing and not existing concurrently; (7) the Alleged Ineffability dimension defined as the experience being either beyond words or unable to be described accurately; (8) the Persisting Positive Changes in Attitude and Behavior dimension defined as lasting, positive effects of the mystical experience divided into four groups: toward self, toward others, toward life, toward the mystical experience itself. Toward self refers to a basic inward change of the personal "self" such as sustained increases in creativity and optimism. Toward others refers to outwardly directed personality changes such as increased sensitivity, compassion, openness, and tolerance. Toward life refers to marked changes in the philosophy of life, purpose/meaning, values, and new appreciation toward life as a whole. Lastly, the mystical experience refers to retrospectively viewing the experience as valuable and useful, seeing it as a high point in one's life from which one can grow. However, Pahnke, in his doctoral thesis, expanded the framework through the addition of (9) the Transiency dimension defined as the inability of the experience to be sustained indefinitely, marked by a transient appearance of unusual dimensions of consciousness defined by typology, eventual disappearance, and return to the more usual. Notably, the Transiency dimension did not come from Stace and was added by Pahnke himself (Barrett and Griffiths, 2018; Pahnke, 1963).

Although the item list from Pahnke's doctoral thesis was not formally named, it formed the conceptual and psychometric foundation for a series of influential measurement tools. In the late 1960s and 1970s, Pahnke and William Richards expanded this initial item set into a broader questionnaire designed for use in clinical settings (Barrett et al., 2015; Stocker et al., 2024). This questionnaire became known as the Psychedelic Experience Scale (PES) or States of Consciousness Questionnaire (SOCQ; Barrett et al., 2015; Stocker et al., 2024). This scale included items capturing sensory, emotional, and cognitive aspects of ASCs in addition to mystical features. In the early 2000s, researchers extracted a subset of 43 items specifically focused on the mystical dimensions from the Pahnke-Richards Scale. This version became known as the Pahnke-Richards Mystical Experience Questionnaire (MEQ43) and was used in a number of influential studies involving psilocybin (MacLean et al., 2012). The MEQ43 was subsequently refined through factor analysis into the MEQ30, a psychometrically validated short form that remains the most widely used version today (Barrett et al., 2015; MacLean et al., 2012). Most recently the MEQ and PES have seen further adaptations with the MEQ4 (Strickland et al., 2024) and the PES48 (Stocker et al., 2024).

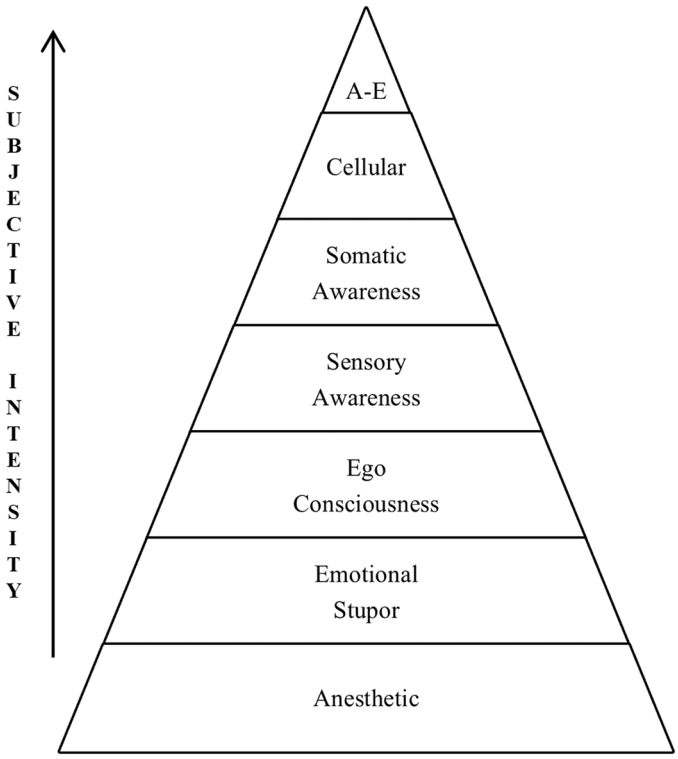

Fig. 1. *Visualization of the Subjective Intensity Scheme.* The seven states of altered consciousness described by Timothy Leary as we have sorted them on a vertical dimension of subjective intensity. At the lowest levels of subjective intensity resides the anesthetic state. As one increases degrees of subjective intensity through different pharmacological ASC induction methods, one may find themselves in a higher state. The zenith of the pyramid represents the "highest" level at maximum subjective intensity known as the Atomic-Electronic (A-E) state.

2.2. Subjective intensity scheme

Originally delivered as a lecture in 1963 and later published, *The Seven Tongues of God* essay contains a state-based framework from Timothy Leary that we here refer to as the Subjective Intensity Scheme. This scheme is a unidimensional framework that maps five altered states across a vertical dimension of subjective intensity, referring to higher and lower levels of consciousness (Leary, 1964, 1998; Fig. 1). This scheme was derived from Leary's controversial work as a clinical psychologist and as a researcher who often employed self-experimentation. Leary is mostly known as a psychologist and political figure largely associated with the American counterculture movement of the 1960s. His early work involved clinical applications of interpersonal dynamics and personality theory. Later, after a personal experience with psilocybin, he started the Harvard Psilocybin Project. He was involved with two important studies in parallel. First, the Concord Prison Experiment which ran from 1961 to 1963 where he found that psilocybin in conjunction with psychotherapy led to a significant decrease in

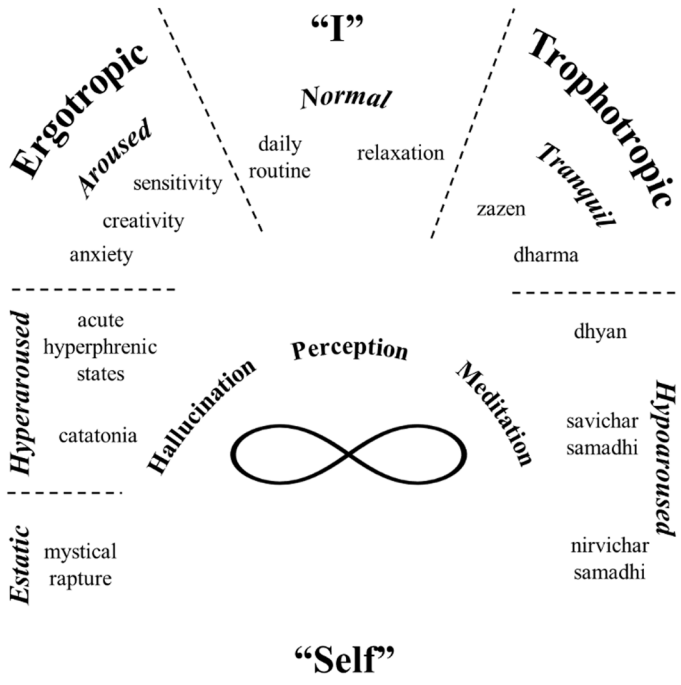

Fig. 2. *Visualization of the Cartography of Ecstatic and Meditative States.* Fischer's cartography maps states of consciousness on a Perception-Hallucination Continuum, increasing ergotropic states (left) or increasing trophotropic states (right). The 'I' and the 'Self' are conceptual markers to the mapping that display one's peak objective experience (i.e., the boundary between self and environment intact) and one's peak subjective experience (i.e., the self-environment boundary dissolved) showing that as one increases in either ergotropic or trophotropic arousal they move towards the 'Self' from the 'I.' The infinity symbol represents the loop feature of trophotropic rebound where one peak state experience can quickly bounce to the other. Figure recreated by the authors from the source material (Fischer, 1971, 1992).

recidivism (Doblin, 1991). Second, was the Good Friday Experiment where Leary advised Walter Pahnke (see above).

Leary proposed that different levels of consciousness correspond to varying degrees of subjective intensity, with each drug activating a specific level (Leary, 1964). This idea, in part, could be inspired by anthropology and theology work that observed such ideas in ancient religions and cultures (Carod-Artal, 2015; Emboden, 1989; Leary, 1970; Nyberg, 1992; Weil, 1972/2004). According to Leary, however, it was primarily inspired by his personal use of drugs and observations of others on drugs. This led him to encourage others to try their own experiments with drugs to test his claims (Leary, 1964, 1998). Leary proposed seven levels of consciousness, ranging from the (1) "highest" state to the (7) "lowest" wherein the name of each level describes its composition concerning energy manifestation (Leary, 1998; Fig. 2): (1) The Atomic-Electronic Level of Consciousness induced by the strongest psychedelics such as lysergic acid diethylamide (LSD) and N, N-Dimethyltryptamine (DMT); (2) The Cellular Level of Consciousness induced by psychedelics such as peyote, mescaline, and psilocybin; (3) The State of Somatic Awareness induced by psychedelic drugs stronger than marijuana but weaker than the above such as hashish and 3, 4-Methylenedioxymethamphetamine (MDMA); (4) The State of Sensory Awareness as being produced by any psychedelic drug such as LSD, mescaline, psilocybin, and marijuana specifically; (5) The State of Ego Consciousness induced by energizers such as pills that propel you into action. Coffee, tea, and caffeine are mild versions; (6) The State of Emotional Stupor induced by moderate doses of alcohol; and (7) The Anesthetic State induced by barbiturates, alcohol, and narcotics. Of note, some recent reports indicate that the experiences induced by LSD and psilocybin are actually not distinguishable when directly compared in blinded studies (Holze et al., 2022; Ley et al., 2023), while meta-analyses are still not conclusive (Costines and Schmidt, 2024; Hirschfeld et al., 2023; Hirschfeld and Schmidt, 2021).

In sum, Leary's Subjective Intensity Scheme can be considered an early state-based attempt at classification that uniquely proposes levels of higher and lower consciousness as they are plotted across the conceptual dimension of subjective intensity (Leary, 1964). However, Leary did attempt to include some method-based elements by describing how each level is reached through specific drugs. Theoretically, the Subjective-Intensity Scheme is inspired by anthropology and theology yet primarily driven by Leary's own self-experimentation and observations of others. His work has left a lasting impact on ASC research, often being cited in current work investigating the clinical benefit of psychedelics and their safety regarding bringing about a mystical experience (Griffiths et al., 2008; Griffiths et al., 2011; Johnson et al., 2008).

2.3. General characteristics of ASCs

An early influential attempt at a systematic description of ASCs comes from the psychiatrist Arnold M. Ludwig. His research in the 1960s involved studying cases of witchcraft, auditory phenomena in schizophrenia, hypnosis, mesmerism, trance, and hallucinogenic drugs. In 1966, Ludwig published *Altered States of Consciousness* in *The Archive of General Psychiatry* where he described ASCs as "uncharted realms of mental activity," (Ludwig, 1966). Given how little was known about these phenomena, he set out to review, integrate, and organize the knowledge of his time into a theoretical system. Through his review of literature, he supposed ten common denominators (i.e., conceptual dimensions) of related subjective phenomena. Ludwig's General Characteristics of ASCs therefore represent a state-based classification scheme which attempts to describe what it is like to be in an ASC. They are as follows (Ludwig, 1966): 1) the Alterations in Thinking dimension defined as disturbances in cognition such as memory and attention; 2) the Disturbed Time Sense dimension defined as an altered sense of time and chronology; 3) the Loss of Control dimension defined as a fear of losing "grip on reality," this may manifest as resisting the ASC; 4) the Change in Emotional Expression dimension defined as emotional extremes such as ecstasy, fear, and depression; 5) the Body Image Change dimension defined as depersonalization, a "schism of body and mind," and a dissolution of boundaries between the self and other; 6) the Perceptual Distortions dimension defined as hallucinations, pseudo-hallucinations, and increased visual imagery; 7) the Change in Meaning or Significance dimension defined as an increased meaning or significance to experience, "eureka" moments, feelings of profound truth; 8) the Sense of the Ineffable dimension defined as ineptness or inability to communicate the nature of the experience to another; 9) the Feelings of Rejuvenation dimension defined as a new sense of hope, feelings of rebirth, or a personal renaissance following the ASC; 10) the Hypersuggestibility dimension defined as an increased susceptibility to accept and/or automatically respond to statements, or cues; it is further defined as the increased ability to misperceive or misinterpret situations or stimuli based on inner fears.

Ludwig's General Characteristics of ASCs were influential in the progression of ASC work, often being cited by later researchers like Charles Tart and Stanley Krippner (Rock and Krippner, 2007; Tart, 1975/1983). Furthermore, one can see Ludwig's General Characteristics appear in many classification schemes that came after as he was one of the first modern scientists to review, integrate, and organize ASC work into a broad descriptive classification scheme (Dittrich, 1998; Farthing, 1992; Pekala, 2013; Tart, 1983; Berkovich-Ohana and Glicksohn, 2014; Paoletti and Ben-Soussan, 2020).

2.4. Cartography of ecstatic and meditative states

In the 1970s, another state-based classification scheme was proposed by Roland L. Fischer focused on the physiological and psychological

dynamics of what it is like to be in the state (Fischer, 1971; Metzner, 2005a). With his research background in chemistry, Fischer was interested in how psychoactive drugs, like LSD, could serve as a model psychosis for understanding schizophrenia (Fischer, 1954, 1957). His state-based classification scheme was a map of inner space that he ultimately referred to as the Cartography of Ecstatic and Meditative States (Fischer, 1971). Fischer was inspired by the Ancient Greeks as well as both Eastern and Western theology in his conceptualization (Fischer, 1992). He intended to integrate knowledge between the objective and subjective worlds around continua of arousal states linked to different ASCs.

Fischer plotted arousal states along two continua: the Perception-Hallucination Continuum and the Perception-Meditation Continuum each representing increased levels of hyperarousal (ergotropic) and hypoarousal (trophotropic) respectively (Fig. 2; Fischer, 1969, 1971, 1992). The Perception-Hallucination Continuum contains the three ergotropic states, each defined by arousal sub-states (Fischer, 1971; Metzner, 2005a): 1) the Aroused State defined as feelings of sensitivity, creativity, and/or anxiety; 2) the Hyperaroused State defined as catalepsy and acute hyperphrenia; 3) the Ecstatic State defined as involving the peak feeling of mystical rapture where the outside world retreats to the fringes of consciousness, leaving the individual to observe himself.

In contrast, the Perception-Meditation Continuum involves the two trophotropic states, each defined by hypoarousal sub-states: 1) The Tranquil State defined by meditation, or *zazen* referring to Zen Buddhist meditation; 2) the Hypoaroused State defined as the presence of increasing levels of meditative and spiritual absorption which Fischer attempted to integrate with Buddhist texts by categorizing different levels of meditation within his classification scheme. This is evident via the explicitly named meditative levels of *Dhyana*, *Savichara Samadhi*, and *Nirvichara Samadhi* all which are taken from Buddhist writings to represent sub-states of the Hypoaroused state (Kesarcodi-Watson, 1982). Lastly, the classification scheme marks the Normal State/Point of Departure which is characterized by daily routine (i.e., leaning ergotropic) and relaxation (i.e., leaning trophotropic). Fischer reasoned that ergotropic and trophotropic systems are mutually exclusive, and as such, needed to be plotted on two distinct continua.

As one can see, the Cartography of Ecstatic and Meditative States is named for the highest ergotropic state i.e., Ecstasy and the highest trophotropic state i.e., Hypoaroused comprised of arousal sub-states linked to meditation (Fischer, 1971, 1992). The two exalted states are defined as being both the peak of ergotropic and trophotropic arousal respectively. Ecstasy is the ergotropic exalted state defined by the arousal sub-state of mystical rapture. Hypoaroused is the trophotropic exalted state only when it is experienced at the arousal sub-state of *nirvichar samadhi* (i.e., thoughtless awareness). This distinction exists because the Ecstasy state is defined by only one arousal sub-state whereas the Hypoaroused state is defined by three.

Given that Fischer's classification was not simply intended to map states but rather, as he formulates it, to integrate knowledge on the objective and subjective worlds he added the concepts of "I" and "Self" to his map. The normal state centers around the "I", that is, the objective self which interprets the internal world and is seen by the outside world through which the self can change the external environment (Fischer, 1971). The "Self" is, therefore, the subjective self which sees and knows, making the relationship between the "I" and the "Self" analogous to the "seer" and the "seen," with the objective "I" observing and the subjective "Self" interpreting (Fischer, 1971, 1992).

During the normal state, the "I" is experienced as independent from the environment; however, as ergotropic or trophotropic arousal increases experiences of ego dissolution occur leading to feelings of unity with the environment (Fischer, 1971). As such, moving along the two continua also moves one from the "I" and towards the "Self" which conceptually illustrates this dissolution in the mutual exclusivity of ergoptropic and trophotropic states. The "Self" of the Ecstatic state and the "Self" of the Hypoaroused (i.e., at its most intense the sub-state of *Nirvichar Samadhi*) state are the same as both engender a departure from the experienced independence of self and environment (Fischer, 1971). This dissolution in mutual exclusivity is further seen via "trophotropic rebound" where the peak of ergotropic arousal (i.e., intense sympathetic excitation) can rebound into Hypoaroused (i.e., the *Samadhi* sub-states) as a physiological protection mechanism (Fischer, 1971). This is also observed in sleep where we travel through excited states in REM and tranquil, delta-EEG wave stages of sleep (Fischer, 1992). Because of these rebound reversal phenomena, a loop connects both ecstasy and *samadhi* to symbolize this relationship (Fig. 2).

In sum, Fischer's approach to ASCs generated a map that primarily sees consciousness as an adaptation of the organism in response to a changing environment. The world of experience is, therefore, constructed from the relationship between the "I" and "Self" where we are either hyper or hypoaroused observers, respectively (Fischer, 1992). Because this cartography details ASCs on two extremes (i.e., ecstasy and hypoaroused) and highlights the independent, objective (i.e., environment oriented) "I" and the integrated, subjective "Self," respectively, it is sometimes called a Cartography of States of Consciousness or a Cartography of Cognitive and Non-Cognitive States (Fischer, 1992). This is because conceptual processes associated with the "I" are considered cognitive to maintain independence between person and environment. Processes associated with the "Self," however, are considered non-cognitive as they do not maintain separation of the individual and the environment. Fischer also referred to this map as a Cartography of Meaning based on his idea of an arousal-state bound nature of meaning, which refers to the meaning of an experience being largely dependent on the individual's level of arousal at the time of the experience (Fischer, 1992). Fischer's state-based taxonomical work on the energetics of a state laid the groundwork for later work such as the Arousal-Hedonic classification scheme (Metzner, 2005a).

2.5. The Arica system

The Arica System is comprised of two conceptual dimensions: subjective intensity and emotional valence. These dimensions form a framework where states, illustrated as strata, are theorized to illustrate higher and lower levels of ASC experiences (Lilly, 1972/2017; Fig. 3). The scheme was named after the Arica Desert where it was founded by the, often-controversial, neuroscientist John C. Lilly and philosopher Oscar Ichazo (Tart, 1975/1983). Of note, Lilly became known for increasingly unorthodox views and practices, gradually drifting away from mainstream science throughout his career. The Arica System is first described in Lilly's 1972 autobiography *The Center of the Cyclone* (Lilly, 1972/2017). In addition to being a neuroscientist, Lilly was also a biologist, psychoanalyst, and physician famous for his invention of the isolation tank. His early work included high-altitude research during the Second World War; however, he is also known for his work with LSD and dolphins, as he aimed to explore the nature of consciousness.

In the 1970s, after publishing *Programming and Metaprogramming in the Human Biocomputer: Theory and Experiments*, Lilly explored ASCs using drugs, isolation tanks, and retreats involving deep meditative group work (Lilly, 1968/2014, 1972/1977, 1972/2017). In *The Center of the Cyclone*, Lilly suggested two conceptual dimensions of ASCs: subjective intensity and emotional valence. With subjective intensity mapped on the ordinate, these states can be presented as stratified, illustrating lower levels of consciousness to higher levels. In conjunction with the emotional valence dimension, Lilly suggested levels of ASC phenomenology spanning the experiences of what he conceived of as "heaven" and "hell." Lilly's strata of ASC experiences were grounded in

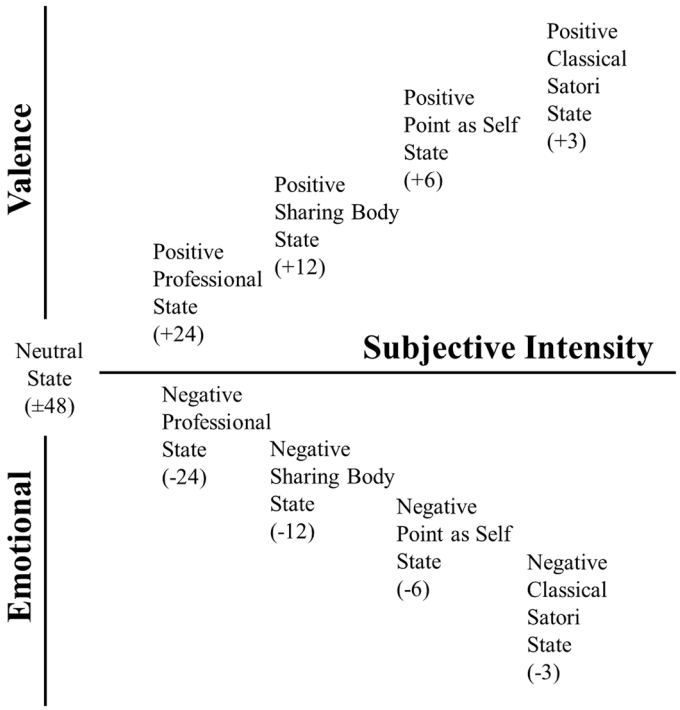

Fig. 3. *Visualization of the Arica System.* This novel visualization as made by the authors displays the states of the Arica System as they are mapped in two-dimensional space where emotional valence (positive or negative) represents the ordinate and subjective intensity represents the abscissa. The abscissa illustrates that The Neutral State (± 48) is minimally intense in terms of subjective experience and that the degree of subjective intensity can also be viewed as the degree of distance from consensus reality. This allows The Classical Satori State (3), in both its positive and negative iterations, to be the highest level of consciousness (i.e., high energy). The numbers of each state correspond to Gurdjieffian vibrational numbers (i.e., frequencies) which are then translated into a number delineating a level of consciousness of positive, neutral, and negative valence. In the case of neutral and positive values, these correspond directly to their frequencies. In terms of the negative values (-24, −12, −6, and −3), they correspond to the vibrational numbers 96, 192, 384, and 768 respectively.

the Gurdjieffian concept of vibrational numbers, which assign a vibrational frequency, or number, to everything in the universe (Nicolescu, 1997). These numbers represent degrees of discontinuous matter vibrations that are thought to make up the universe. They are used in the Arica System to label states of consciousness as having positive, neutral, and negative valence due to the idea that higher frequencies are associated with harmonious, positive states while lower frequencies are thought to align with disharmonious, negative states (Fig. 3).

The Neutral or Baseline state, numbered ± 48, represents the default setting for what Lilly calls the "human biocomputer" (Lilly, 1968/2014, 1972/2017). Ideally, this state is emotionally neutral, allowing for ordinary, day-to-day actions and creativity. It is akin to a meditative state with minimal "mental noise." The Basic Professional State, numbered 24, involves activities well-known to the person, similar to a flow state (Lilly, 1972/2017). It's defined by automaticity and reducing ego presence. Shifting out of this state can be dangerous, as in an athlete's self-doubt mid-performance which could lead to performance error. This state relies on practice in the Neutral State (± 48). The + 24 state is experienced as intense enjoyment; the −24, is experienced as self-doubt or negative substance experiences. The Sharing Body State, numbered 12, is experienced as the body acting as a conduit for "cosmic forces," marked by heightened body consciousness and intense emotions (Lilly, 1972/2017). The + 12 state is experienced as intense bodily bliss; the −12 state is experienced as intense pain, like severe migraines. The Point as Self State, numbered 6, reduces consciousness to a point that moves through non-ordinary realities (Lilly, 1972/2017). It involves direct perception and ego dissolution, transitioning into cosmic unity. The + 6 state is experienced as fusion with entities and feelings of energy and love; the −6 state is experienced as a purgatory-like state with fear and pain. The Classical Satori State, numbered 3, is the highest divine state of consciousness, involving complete detachment from the body and deity encounters (Lilly, 1972/2017). The + 3 state involves blissful deity encounters; the −3 state involves wrathful deity encounters and existential struggles.

The Arica System represents an early attempt to categorize levels of consciousness along two dimensions of subjective intensity and emotional valence, conceptually expanding on the Subjective-Intensity Scheme. Through its integration of religious and spiritual ideas with psychological concepts, the Arica System illustrates the mid-transition phase of ASC classification from early, mystical understandings to psychological inquiry. Lilly's work, aside from the invention of the isolation tank, was crucial in the development of ASC research during the 1970s and 1980s (Tart, 1975/1983).

2.6. *Varieties of transpersonal experience*

In the 1970s, Stanislav Grof assembled a classification scheme of ASCs that did not rely on any dimensionality. Rather, he proposed groupings based on the similarity of narrative themes patients reported after psychotherapeutic work with LSD (Fig. 4). He framed these narratives as Varieties of Transpersonal Experience which are brought on by holotropic states of consciousness[11] (Grof, 1972). Grof is a Czech psychiatrist and ASC researcher. His early work was heavily influenced by Freudian psychotherapy which inspired him to explore LSD as a tool for psychotic experiential training whereby psychiatrists and psychologists could use the drug to explore the subjective worlds of psychotic patients (Grof, 1973; Melton, 2001). From there, he continued to examine the therapeutic potential of psychedelic drugs. His work encompasses interests spanning from therapeutic and heuristic approaches of ASCs including pharmacological (e.g., LSD) and non-pharmacological (e.g., stroboscopic light), to shamanism and near-death experiences (Grof, 1976; Melton, 2001; Taylor and Piedilato, 2002). However, he is best known for his often-controversial work on transpersonal experiences.

Grof defines transpersonal experiences as those that involve expansion or extension of consciousness beyond the usual ego boundaries and limitations of time and space (Grof, 1972). These experiences transcend one of several limitations such as body image, existence within the boundaries of the physical body, space-time constraints on perception (i.e., the "normal" range of exteroceptors and internal perception), and the subject-object dichotomy defined by ego boundaries (i.e., the duality of a subject and an object). Due to the intense nature of transpersonal experiences, they exclusively capture specific types of ASCs. Consequently, Grof's classification scheme falls short of encompassing the full spectrum of ASCs, addressing only a limited subset. For example, fantasy-play and vivid imagery may occur in some ASCs but are not considered transpersonal and are not covered by his definitions (Grof, 1972). Additional examples of non-transpersonal experiences linked to ASCs include the perception of elementary imagery such as patterns and shapes. Since Grof's work focused on LSD therapy sessions, his overall conceptualization of the transpersonal stems from the psychology of religion and the development of psychotherapy. For brevity, we will not cover in detail all the varieties shown here. A comprehensive description can be found in both Grof's paper *Varieties of Transpersonal Experiences: Observations from LSD Psychotherapy* and his book *Realm of the Human Unconscious: Observations from LSD Research* (Grof, 1972, 1976).

[11] Holotropic states of consciousness are, according to Grof, ASCs involving the highest degrees of subjective intensity such as those induced with 'heroic' doses of psychedelic drugs (Grof, 2008).

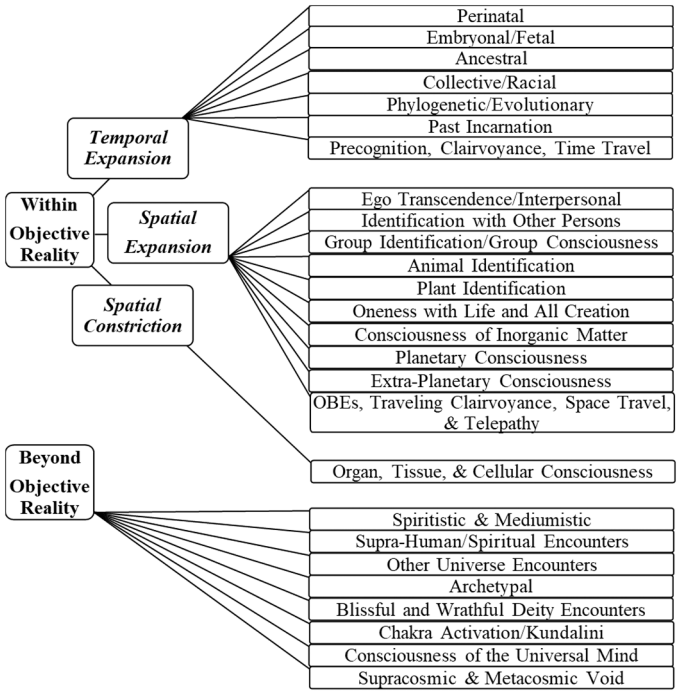

Fig. 4. *Visualization of the Varieties of Transpersonal Experience*. This novel visualization, created by the authors, organizes Grof's narrative clusters of ASC phenomenology derived from patient reports following psychedelic-assisted psychotherapy. The Varieties of Transpersonal Experience are categorized as occurring either Within or Beyond the framework of objective reality. Within experiences are considered objectively feasible (e.g., Space Travel) as space objectively exists, while Beyond experiences are considered objectively impossible (e.g., Blissful and Wrathful Deity Encounters). Within experiences are further classified into Temporal Expansion, Spatial Expansion, and Spatial Constriction, each reflecting distinct ways in which transpersonal ASCs are experienced.

Transpersonal experiences are firstly divided into experiential extensions of consciousness Within or Beyond the framework of objective reality (Grof, 1972). Within extensions of consciousness involve experiences that are considered as expanding our existing subjective experiences while still operating under the framework of feasibility in the objective world. For example, ancestral experiences involve subjective feelings relating to ancestors that feasibly could have existed. Beyond extensions of consciousness, on the other hand, involve experiences that transcend the feasibility of objective reality such as experiences with other dimensions and wrathful deities. Within extensions of consciousness encapsulate several specific categories of experience: Temporal Expansion, Spatial Expansion, and Spatial Constriction. Temporal Expansion experiences are defined as those that transcend the normal, linear perception of time. One of the most prominent categories of these experiences is known as Perinatal Experiences which are related to the circumstances of biological birth, seen as a reflection of an individual's early biological history (Grof, 1973).

Spatial Expansion experiences are another type of transpersonal experience that occur Within the framework of the objective reality (Grof, 1972). Spatial Expansion experiences are those involving profound alterations to the sense of self, extending beyond the ego boundaries where one feels a larger sense of interconnectedness with a greater reality. For example, Experiences of Ego Transcendence in Interpersonal Relations. These experiences often involve varying degrees of ego boundary loss and ultimately a merging union between one and another to the point of experiencing unity. Importantly, the subject always maintains awareness of their own identity, despite the intensity of the subjective merging.

Spatial Constriction experiences are the last type occurring Within the framework of the objective reality (Grof, 1972). These experiences are classified as Organ, Tissue, and Cellular Consciousness. These experiences are considered constricting as they do not involve a subject expanding their consciousness to something else, or a greater reality. Rather, the subject experiences an authentic tuning to a part of their biology such as individual organs, tissues, or even cells.

The second major classification of transpersonal experience involves those Beyond the framework of the objective reality (Grof, 1972). As mentioned, these are transpersonal experiences that are not feasibly possible in the objective reality such as experiencing the Supracosmic and Metacosmic Void. This experience involves feelings of "primordial emptiness" and "nothingness." The terms "supracosmic" and "metacosmic" refer to how the void can be experienced as above and below the world of creation. It is reported as being beyond everything experienced or conceived of including good and evil, light and dark. It is considered an exceptionally rare and ineffable experience, often linked to the consciousness of the Universal Mind. In sum, transpersonal experiences Beyond objective feasibility are those that could, in no way, be considered objectively possible.

To conclude, Grof's Varieties of Transpersonal Experience represents his attempt at a face-valid clustering of subjective reports based on narrative themes throughout his work in psychedelic assisted psychotherapy (Grof, 1972, 1976). While he speaks only of transpersonal experiences (i.e., those that generally transcend limitations of body, space, and/or time) his work represents an attempt to discuss how ASCs are subjectively experienced. Grof's work had a profound influence on other researchers like John C. Lilly and Walter Pahnke (Lilly, 1972/2017), and it continues to inspire modern theories such as Carhart-Harris' Entropic Brain Hypothesis (Carhart-Harris et al., 2014).

2.7. The spectrum of consciousness

In an attempt to develop a *psychologia perennis* (i.e., a universal doctrine of nature and reality), Ken Wilber proposed a model of consciousness aimed at providing a universal view of human consciousness (Huxley, 1945/2009b; Wilber, 1975). Wilber is known for his theoretical contributions to ASCs specific to the field of transpersonal psychology. His contributions have been controversially discussed, where they have been acknowledged for their depth in historical insight and logical clarity, while also being criticized for their lack of clinical knowledge (Beischel et al., 2011; Grof, 1998). His work draws inspiration from diverse religious traditions and a broad spectrum of mysticism, with a particular affinity for Buddhism (Wilber, 1975, 1993).

For Wilber, consciousness in general was inextricably tied to a sense of identity that ranged from narrow, (i.e., ego-centric) to expanded (i.e., identifying with a cosmic consciousness; Wilber, 1975; Young, 2002). This view of consciousness set in motion The Spectrum of Consciousness which was first introduced in 1975 in the *Journal of Transpersonal Psychology* and later expanded upon in his book *The Spectrum of Consciousness*. This model represents consciousness alteration as mapped progressively across a singular dimension of identity. Across the dimension of identity, he maps four levels of altered consciousness three of which contain distinct bands or gradations, illustrating that these levels shade into one another and cannot be separated (Fig. 5; Wilber, 1975, 1993; Young, 2002): (1) the Shadow Level was directly inspired by the work of Carl Jung whereby each ego is comprised of a persona (i.e., the socially acceptable mask) and a shadow (i.e., features of oneself contrary to society's expectations). According to Wilber, the Shadow Level is defined as the narrowest level of consciousness where one can dis-identify with parts of their psyche and shrink the overall concept of identity to parts of the ego, creating an inaccurate self-image. This is often done by relegating the undesirable aspects of oneself to the Shadow. The transition of this level into the next is represented by the Philosophic Bands which involve individual conditioned notions of self that are involved in the creation and maintenance of a shadow. (2) The Ego Level is defined as a level where one does not feel a direct

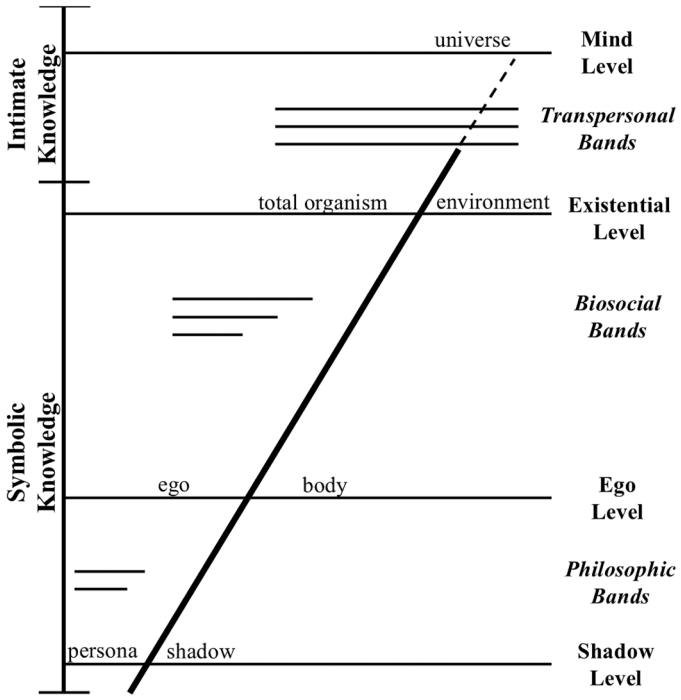

Fig. 5. *Visualization of the Spectrum of Consciousness.* The left side of the panel depicts the duality of symbolic knowledge and intimate knowledge, illustrating the transition from subject-object duality to unity. The right side of the figure contains four horizontal lines, each representing a level in the spectrum from the lowest (Shadow) to the highest (Mind). Between the levels, there are three clusters represented by smaller lines which represent transitional gradients from one level into the next, known as bands. A diagonal line traverses through the levels (i.e., single horizontal lines) and some bands (i.e., three-line clusters) to illustrate how the sense of self/identity changes across levels that are further represented by core dualities on either side. As one's state becomes more altered, their sense of identity can traverse the transpersonal bands where the line becomes dashed. This dashed line of identity symbolizes ego dissolution and the breakdown of previous dualities, resulting in unity at the Mind Level. A vertical line is added to this illustration to show how knowledge changes as one alters their state. Notably, this shows that transitioning to transpersonal bands involves a shift from symbolic to intimate knowledge (i.e., from outward, environment-oriented experience to inward, unitary experience). Figure created by merging concepts from various sources (Wilber, 1977/1993; Young, 2002).

identification with their psychophysiological organism, rather identification is with mental representations of that organism. The identification with this self-image leads to a duality of ego and body, i.e., a feeling of a disembodied psyche. Pure identification with this mental picture of oneself can lead to feelings of "I have a body," over "I am a body." The transition of this level into the next is represented by the Biosocial Bands that involve an internalized matrix of societal and familial premises put in place by social influences. Here, identity is shaped by the expectations of others, leading to a warped and conventionalized sense of reality. In essence, it illustrates how society shapes reality through various divisions and delineations. (3) The Existential Level is defined as a stratum of altered subjective experience where one is identified solely with their psychophysical organism. Here, there remains the boundary between self/other and self/environment from previous levels. It is discussed in Buddhist terms to represent a state of consistent existential, rational, and volitional awareness. The transition of this level into the next is represented by the Transpersonal Bands an area of the spectrum where one is not aware of their ego dissolution, yet their identity is not bound by their psychophysical organism. The area comprised by these bands is also referred to as supra-individual consciousness and can include astral travel, out-of-body experiences, traveling clairaudience, and some mystical states. (4) The Mind Level is defined as a stratum of intense subjective experience where one is melded with the universe; what Wilber calls the absolute mind or the only true consciousness. Any dualities that existed before this level are completely dissolved, such as the boundary between self and environment. It can be argued that the first three levels seem to deal more with Jungian personality psychology, whereas the latter three delve more into ASCs. For example, the Existential Level of increased awareness could apply to those in meditative states, whereas the Mind Level could apply to those in states induced by strong psychedelic drugs.

In a way similar to how Fischer included the "I" and "Self" in the Cartography of Meditative and Ecstatic States, Wilber creates a distinction between environment, outward-oriented knowledge (i.e., symbolic) and internally focused, unitary knowledge (i.e., intimate) within The Spectrum of Consciousness (Fischer, 1971; Young, 2002). Symbolic knowledge deals with the understanding of representative symbols to maintain the duality between the knower and the known, subject and object, so that one can remain environment oriented. Intimate knowledge, then, represents a unitary and direct feeling of reality that is wholly internally directed. As such, when one is moving across the spectrum (i.e., their state of consciousness is more altered), the nature of how they interpret knowledge, how they experience reality, has shifted from the symbolic to the intimate. During this shift, one is believed to retain the ability to process symbolic knowledge yet remain able to develop the ability to process intimate knowledge (Young, 2002). In sum, The Spectrum of Consciousness maps six levels of consciousness alteration along a singular dimension of identity. Importantly, it suggests that the lowest level of consciousness has the most narrow and constricted sense of self. This means that as one progresses across the spectrum, from one level to the next, their consciousness progressively expands until eventually all dualities are dissolved into unity as a feeling of cosmic consciousness at the Mind Level.

Stanislav Grof wrote on Wilber's work, praising his approach of "spectrum psychology," even suggesting that The Spectrum of Consciousness was compatible with his Varieties of Transpersonal Experience if Wilber's model included prenatal existence and biological birth (Grof, 1998). One could also see the similarities between Grof and Wilber in how they both posit the importance of experiences involving consciousness constriction or narrowing in their classification schemes (Grof, 1972; Wilber, 1975). Wilber himself compared his Spectrum to the Arica System by suggesting that the Mind Level and Classical Satori State are the same, among other similarities (Lilly, 1972/2017; Wilber, 1977/1993).

2.8. Subsystems of ASCs

In his 1975 book, *States of Consciousness*, Charles Tart suggested that a state of consciousness is a functioning system comprised of 10 component structures/subsystems that represent "experiential divisions," within the state (Tart, 1975/1983). Tart, an American psychologist and parapsychologist, was renowned for his work on ASCs and his contributions to the development of transpersonal psychology (Tart, 1975/1983). He investigated ASCs induced by various methods such as hypnosis and marijuana use (Hilgard and Tart, 1966; Tart, 1970a; Tart, 1970b) while also advocating for state-specific science[12] (Tart, 1972; Radin, 2023).

In the 1960s, Tart conducted a survey of graduate students, asking them how they recognized when they were in an ASC (Tart, 1975/1983). In *States of Consciousness*, he provides a table based on their answers, identifying components similar to The General Characteristics

[12] State-specific science is an approach to investigating ASCs through which a researcher conducts science (e.g., testing hypotheses) on an ASC of interest while in that ASC (Tart, 1972). It could be said that both the Subjective Intensity Scheme and Arica System were explicitly derived in this manner.

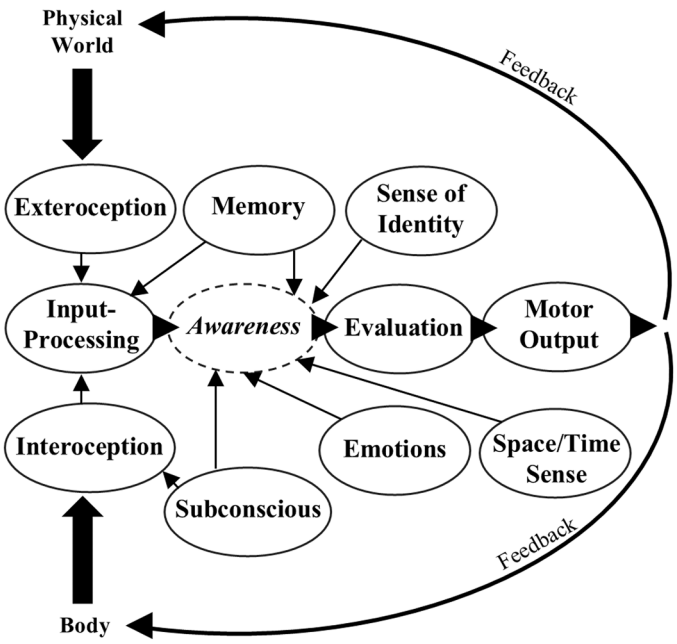

Fig. 6. *Visualization of the Subsystems of ASCs.* The 10 subsystems of ASCs and their primary information flow routes. Minor interactions between subsystems are not visualized to reduce clutter. Solid ovals represent subsystems, while the dashed oval represents Awareness, a core component of consciousness that is not itself a subsystem. Solid triangles represent the main route of information flow from Input-Processing through to Motor Output. Thin arrows represent the flow of information and interactions between other subsystems and components. Thick, block arrows represent incoming information from outside the subsystems (i.e., input from the physical world and the body). Curved arrows at the top and bottom of the figure represent feedback loops from the consequence of Motor Output. The top feedback loop is external and involves interaction with the Physical World and returning via Exteroception. The bottom feedback loop is internal and involves interaction with the Body and returning via Interoception. Figure recreated by the authors from the source material (Tart, 1975/1983).

of ASCs (Ludwig, 1966; Tart, 1975/1983). Tart's 10 components of experiential criteria to detect an ASC became known as the Subsystems of ASCs which underlie his Systems Model (see Systems Model section under Method-Based Classification Schemes). Tart describes his subsystems as "clusters of phenomena that seem to hold together," and can be seen as a state-based addition to his Systems Model. The subsystems are as follows (Tart, 1975/1983; Fig. 6): 1) the Exteroception subsystem represents sensing the external world along with alterations in various sensory characteristics of the perceived world. 2) the Interoception subsystem represents sensing the body, alteration in body image (size and/or shape), and changes in detectable physiological parameters such as heart rate, respiration rate, etc. 3) the Input-Processing subsystem represents seeing meaningful stimuli and further sensory excitement, sensuality, enhanced or decreased sensory intensity, alterations of interactions between various sensory modalities, illusions, hallucinations, and perceptions of things unlikely to exist in the environment. 4) The Emotions subsystem represents alterations in emotional response to stimuli. This involves overacting, underreacting, not reacting at all, or in a manner entirely different to what is normally to be expected. This also refers to the extreme intensity of emotions. 5) The Memory subsystem represents changes in the continuity of memory over time, explicit checking of memory, gaps in memory continuity, and the checking of fine details in the perceived environment against memories to detect incongruities. 6) The Time Sense subsystem represents an unusual feeling of "here and now" -ness, a feeling of intense slowing or speeding of time, atemporal experiences, sense of a time quality, and orientation to past and/or future regardless of relation to present. 7) The Sense of Identity subsystem represents a feeling of unusual identity, or role. This can be seen in alienation, detachment, and different perspectives on what constitutes a "usual" identity. 8) The Evaluation and Cognitive Processing subsystem represents alterations in rate of thought, quality of thought (sharpness, clarity), and rules of logic. 9) The Motor Output subsystem represents alteration in the amount of quality of self-control, change in how the body feels regarding motion and proprioceptive feedback, restlessness, tremors, and partial paralysis. 10) The Subconscious subsystem represents phenomena that occur outside of consciousness awareness from the reference point of a baseline state of consciousness where ASCs may make what was once unconscious, conscous.

Since the Subsystems constitute "experiential divisions," of an ASC, Tart further details how they interact with one another (Tart, 1975/1983; Fig. 6). Information from the external world enters the system via Exteroception, while bodily signals are processed through Interoception. Both streams of information are funneled into Input-Processing, which filters and organizes sensory data. From here, information is distributed to Memory, Awareness, and the Subconscious, shaping the contents of consciousness. This processed information then influences other experiential dimensions, including the Sense of Identity, Emotions, and Space/Time Sense. These in turn contribute to Evaluation and Cognitive Processing, where decisions and judgments are formed. The result of this evaluative process is translated into Motor Output, driving bodily actions and behaviors. These actions have consequences in the external environment and within the body. Environmental changes are registered through Exteroception, and bodily responses are sensed through Interoception, together forming two feedback routes. These feedback loops allow for continuous updating of the state of consciousness based on both bodily and environmental responses to action.

In sum, the Subsystems represent a grouping of categories of changed experiences under ASCs. Further, Tart conceptualizes these categories of phenomena as interacting with each other through direct routes of information flow and feedback loops involving the external world and body.

2.9. Etiology-independent structures of ASCs

The Etiology-Independent Structures of ASCs (*Ätilogie-unabhängige Strukturen veränderter Wachbewusstseinszustände* in the original German), represents a conceptual framework of ASCs proposed by Adolf Dittrich in the 1970s (Dittrich, 1975, 1985). Dittrich proposed that ASCs share common features of multidimensional alterations referred to as etiology independence, meaning that subjective changes are shared independent of the mechanism of induction (Dittrich, 1998). To test this hypothesis, scales were created and revised most notably resulting in the creation of the 5-Dimensional Altered States of Consciousness (5D-ASC) Rating Scale, the most popular psychometric tool for measuring subjective experience in ASCs with its associated 11 factor scoring scheme (Schmidt and Berkemeyer, 2018; Studerus et al., 2010). It should be noted that the Etiology-Independent Structures of ASCs was conceptualized to understand a more complete phenomenological profile of ASCs, and not just a specific dimension of the experience as is done with the Categories of a Typology of Mysticism (Dittrich, 1975; Pahnke, 1963).

In search of common dimensions among ASCs, the *Außergewöhnliche Psychische Zustände* (APZ), a precursor of the 5D-ASC, was created from the Etiology-Independent Structures of ASCs (Dittrich, 1975, 1998). The APZ included the formulation of three dimensions of subjective experience under ASCs (Dittrich, 1998): (1) the Oceanic Boundlessness dimension defined as derealization and depersonalization associated with positive emotional states including heightened mood, mystical experiences, and euphoria; (2) the Dread of Ego Dissolution dimension defined as negatively experienced derealization and depersonalization associated with ego dissolution or disintegration, including "bad trip" phenomena, unpleasant states, and loss of self-control phenomena

associated with anxiety; (3) the Visionary Restructuralization dimension defined as visual (pseudo)-hallucinations, visions, and synesthesia.

Bodmer et al. (1994) further developed the APZ into the OAV, an acronym representing the first letter of each dimension in their original German (Bodmer et al., 1994; Studerus et al., 2010). This modification made a change from a binary response to a visual analog while adding additional items (Studerus et al., 2010). Later, the OAV was expanded into the 5-Dimensional Altered States of Consciousness (5D-ASC) Rating Scale with the addition of two etiology-dependent dimensions: (4) the Auditory Alterations dimension defined as auditory (pseudo)-hallucinations, acoustic alterations and hallucinations and (5) the Vigilance Reduction dimension defined as cloudiness of consciousness and/or drowsiness.[13] The 5D-ASC is then the three primary, etiology-independent dimensions (Oceanic Boundlessness, Dread of Ego Dissolution, Visionary Restructuralization) of the OAV and the additional etiology-dependent dimensions (Auditory Alterations, Vigilance Reduction; Studerus et al., 2010).

Work from Studerus and colleagues on the OAV found that the original three-dimensional model could be improved to explain the subjective phenomena of ASCs (Studerus et al., 2010). Through confirmatory factor analysis, exploratory structural equation modeling, hierarchical item clustering, and multiple causes modeling 11 factors were derived (Studerus et al., 2010). The first five factors are comprised mostly of items from the Oceanic Boundlessness dimension: (1) the Experience of Unity factor representing feelings of oneness, sensing eternity, no feelings of conflict, merging with one's environment; (2) the Spiritual Experience factor representing religious/mystical type experiences associated with feelings of awe and connection to a higher power; (3) the Blissful State factor representing feelings of pleasure/ecstasy, peace, and love; (4) the Insightfulness factor representing feelings of profoundness, creativity, and clarity; (5) the Disembodiment factor representing feelings of losing the body independent of the environment, and out-of-body/floating sensations. The next two factors are comprised of items solely from the Dread of Ego Dissolution dimension: (6) the Impaired Control and Cognition factor representing feelings of mental disconnection (unable to complete congruent thoughts), isolation, mental paralysis, and impaired decision-making, inability to assign importance to things, feelings of being controlled as if one were a puppet with no free will; (7) the Anxiety factor representing fear that the altered state will not end, feelings of being under threat, inability to communicate fear, experience of strangeness and weirdness, terrifying distortions of perception, anxiety that something horrible will happen. The last four factors are comprised of only items from the Visionary Restructuralization dimension: (8) the Complex Imagery factor representing seeing complete scenes with eyes closed or in total darkness (i.e., complex hallucinations), visualization of pictures of the past, extremely clear fantasy, and vivid imagination; (9) the Elementary Imagery factor representing the perception of colors, patterns, flashes of light with eyes closed or in total darkness (i.e., simple hallucinations); (10) the Audio-visual Synesthesia factor representing the interaction and influence of different sensory modalities such as noise influencing visual experience and sound changing colors and shapes; (11) and the Changed Meaning of Percepts factor representing enhanced meaning and stronger emotional reactions to everyday objects. While not explicitly named in the Studerus et al. paper, many researchers have opted for calling this scoring scheme the 11-ASC[14] (Schmidt and Berkemeyer, 2018).

The Etiology-Independent Structures of ASCs is a highly important framework for modern ASC research, as one of its questionnaires, namely the 5D-ASC and its associated 11-ASC scoring scheme, are the most prevalent questionnaires in studies examining altered experiences across various states of consciousness including those induced by drugs and/or perceptual deprivation (Hirschfeld et al., 2023; Hirschfeld and Schmidt, 2021; Prugger et al., 2022; Schmidt and Berkemeyer, 2018). This framework provides a structured way of understanding and quantifying the subjective experiences of ASCs, facilitating comparison across studies and enhancing our understanding of the underlying dimensions of altered consciousness.

2.10. Empirical-phenomenological approach

In 1981, similar to the Etiology-Independent Structures of ASCs, Ronald Pekala conceptualized the Empirical-Phenomenological Approach which famously led to the development of the Phenomenology of Consciousness Inventory (PCI) to capture the *noeses* (i.e., the process of perceiving) and the *noema* (i.e., the content of perception) in a state of consciousness (Føllesdal, 2006; Pekala, 2013; Pekala and Levine, 1981). The name is derived from Pekala's 1981 publication that established the research line leading to the development of the PCI (Pekala and Levine, 1981). Within the Empirical-Phenomenological Approach there are both major dimensions of experience and minor dimensions which constitute some of them, for example, the PCI has the minor dimensions of Joy, Love and Sexual Excitement as part of the major dimension of Positive Affect (Pekala, 2013).

The first psychometric instrument developed from the Empirical-Phenomenological Approach was the Phenomenology of Consciousness Questionnaire (PCQ; Pekala, 2013; Pekala and Levine, 1981, 1982). The idea was to capture subjective ASC phenomena through the combination of ideas from Battista (phenomenology), Tart (subsystems), Krippner and Ludwig (ASC characteristics), and research on dimensions of attention (Pekala, 2013; Pekala and Levine, 1981, 1982). In 1983, The Dimensions of Consciousness Questionnaire (DCQ) arrived as a revision to the 37-item PCQ such that every dimension and subdimension contained four items. Positive and negative affect were also expanded to include eight items each to include subclasses of affect (Pekala, 2013; Pekala and Wenger, 1983). Ultimately, the DCQ was an 80-item scale that included the entire PCQ with added dimensions of Alertness, Rationality, and Arousal (Pekala, 2013; Pekala and Wenger, 1983). An abbreviated version of this questionnaire consisting of only 40 items was also constructed, known as the Abbreviated Dimensions of Consciousness Questionnaire (ADCQ), which essentially gave every dimension and subdimension two items instead of four (Pekala, 2013).

In 1986, the Phenomenology of Consciousness Inventory (PCI) was developed as a third-generation questionnaire directly from the (A)DCQ, which was then developed from the PCQ (Pekala, 2013; Pekala et al., 1986). The PCI assesses 12 major dimensions of consciousness and their constituent 14 minor dimensions (Pekala, 2013; Pekala et al., 1986): (1) the Positive Affect dimension is defined by its three minor dimensions involving ecstasy and extreme happiness (Joy), extent of intense sexual feelings (Sexual Excitement), and feelings of love and loving-kindness (Love); (2) the Negative Affect dimension is defined by its three minor

[13] Dittrich's interest in the existence of etiology-dependent dimensions, those associated with only some induction methods, led to development of the *Bewusstseinstrübung und Akustische Halluzinationen* (BETA) questionnaire shortly after the OAV. The BETA measured the dimensions of Auditory Alterations and Vigilance Reduction which were added into the OAV later to create the 5D-ASC (Studerus et al., 2010).

[14] While the term 11-Dimensions of Altered States of Consciousness (11D-ASC) Rating Scale is used in the literature, this abbreviation is slightly misleading as the analysis by Studerus et al. (2010) indicated 11 factors, not dimensions (see also Costines and Schmidt, 2024). The use of the abbreviation 11-ASC appears to be preferrable.

dimensions involving being very angry, upset, or enraged (Anger), being very sad or unhappy (Sadness), and being very frightened, scared, or afraid (Fear); (3) the Altered Experience dimension is defined by its four minor dimensions involving the extent to which subject feels their bodily feelings expand into the world around them (Altered Body Image), the extent to which the flow of time changed drastically, whether it seemed to speed up or slow down (Altered Time Sense), changes in perceptions of the world in terms of color, form, size, shape, or perspective (Altered Perception), the extent to which a person reports an experience that might be labelled religious, spiritual, or transcendental, or has feelings of awe, sacredness, or reverence (Altered Meaning); (4) the Visual Imagery dimension defined by its two minor dimensions involving the quantity of visual imagery produced (Amount) and the extent to which imagery is vivid and three-dimensional, or as clear and vivid as objects in the real world (Vividness); (5) the Attention dimension defined by its two minor dimensions involving whether attention is directed toward the internal subjective experience or the environment (Direction – Inward) and whether the person was absorbed into what they were experiencing or whether they were continually distracted by extraneous impressions (Absorption); (6) the Self-Awareness dimension defined as the extent to which a person is aware of being aware of themselves, versus having lost consciousness of themselves (i.e., not being aware of being aware of themselves); (7) the Altered State of Awareness dimension defined as the extent to which a person is in an extraordinary unusual and non-ordinary state of awareness versus one's state of consciousness not differing from normal; (8) the Internal Dialogue dimension defined as the extent to which a person is silently talking to themselves; (9) the Rationality dimension defined as whether thinking is clear and distinct, rational and easy to comprehend versus thinking being confused, muddled, non-rational, and very hard to comprehend; (10) the Volitional Control dimension defined as the extent to which one has complete control over what they are paying attention to or willfully controlling versus becoming passive and receptive to experience, having images pop into one's mind without any control; (11) the Memory dimension defined as assessing what one can remember about everything they just experienced versus not remembering the experience; (12) the Arousal dimension defined as a measure of muscular tension, tense and tight versus not very tense and tight at all. One key difference between the PCI and similar measures like the MEQ and 5D-ASC is that the PCI was generally refined through experiments using hypnosis as seen in work with the PCI's predecessor scales (Pekala, 2013; Pekala and Wenger, 1983).

While not used as frequently as the 5D-ASC, the Empirical-Phenomenological Approach's development of the PCI sees a consistent use in modern research investigating altered experience where its accumulated data is integrated with the Altered States Database, facilitating systematic comparisons across studies (Prugger et al., 2022; T. T. Schmidt and Berkemeyer, 2018).

2.11. Arousal-hedonic scheme

Around 1986, Ralph Metzner developed a classification scheme that mapped ASCs based on two dimensions: first, how subjectively energetic, or aroused, they felt and second, how pleasurable they felt (Metzner, 2005a). This two-dimensional approach we refer to here as the Arousal-Hedonic Scheme. Metzner was a German-American psychotherapist whose work began with Timothy Leary and Richard Alpert on the Harvard Psilocybin Project (Leary et al., 1963). His work would later encompass everything from psychedelic plants, such as ayahuasca, to shamanism, and even writings about myths and metaphors relating to self-transformation (Metzner, 1998, 2001, 2005b).

Metzner's work on understanding what he calls the "physiological energetics," of ASCs builds on similar work done by Roland Fischer (Fischer, 1971, 1992; Metzner, 2005a). While Metzner agrees with much of Fischer's mapping, he raised concerns about grouping states like schizophrenia and creative inspiration in the same high-energy

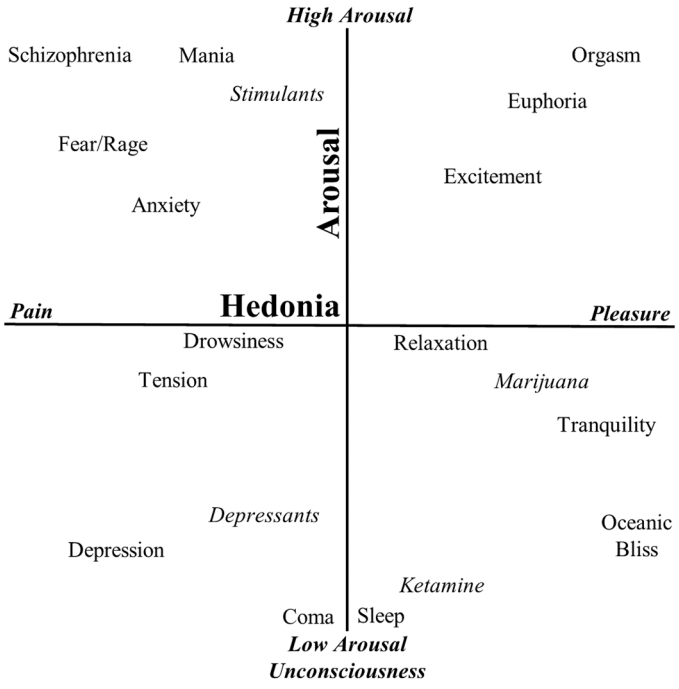

Fig. 7. *Visualization of the Arousal-Hedonic Scheme.* The two-dimensional Arousal-Hedonic Scheme borrows from Fischer's Cartography of Ecstatic and Meditative States, in that it uses the arousal continuum, represented here on the ordinate. Arousal is represented as high at the top of the ordinate and low/unconscious at the bottom. The Hedonic Continuum, Metzner's addition, is represented on the abscissa characterized by pain on the left and pleasure on the right. Emotional states, pathologies, and classes of drugs are plotted accordingly. Drugs are plotted in italics. For example, ketamine represents low arousal, approaching that of sleep and coma while it is also characterized by a moderate amount of pleasure comparable to relaxation. Figure recreated by the authors from the source material (Metzner, 2005a).

category. This led to the addition of a pain-pleasure continuum, or what he calls the hedonic continuum, to precisely define what "high" means in such a classification scheme. For example, high could either mean high arousal or stimulation or it can mean highly pleasurable. Metzner aimed to fix this with the addition of the hedonic continuum to the Cartography of Ecstatic and Meditative states (i.e. ergotropic versus trophotropic) leading to the creation of the Arousal-Hedonic Scheme (Fig. 7). Here, the intersecting continua deal with the following dimensions: a) Arousal versus Sedation; b) Pleasure versus Pain.

Metzner attempted to apply the Arousal-Hedonic Scheme empirically by creating a scale based on the idea that individuals, with little preparation, can give numerical estimates on the hedonic and arousal continuums (Metzner, 2005a). This Altered State Graphic Profile (ASGP) was made of an upper scale for the arousal continuum and a lower one for the hedonic continuum, complete with a time scale at the bottom so that a time interval can be recorded for each report. Every 15 or 30 minutes, participants had to indicate on a scale of + 3 to −3 their subjective sense of the two dimensions. The scores on the ASGP are defined on two continua: Arousal and Hedonic. The Arousal Continuum includes 0: Awake and calm, + 1: Alert/Attentive, + 2: Stimulated, + 3: Aroused/Excited, −1: Alpha/Meditative, −2: Drifting/Twilight, −3: Deep Trance/Sleep. The Hedonic Continuum includes 0: Neutral Point, + 1: Pleasant, + 2: Elated/Euphoric, + 3: Ecstatic/Heaven, −1: Unpleasant, −2: Painful/Disturbing, −3: Agony/Hell. While the ASGP saw little use, it was published in a study examining the psychobiologic effects of MDMA (Grob et al., 1995).

In addition to Arousal and Hedonia, Metzner proposed a third dimension that is not visualized known as Expansion versus Contraction (Metzner, 2005a). This dimension is described as purely energetic,

regardless of the content but is important as it separates psychedelic drugs from substances such as stimulants and depressants. As such, he labels psychedelic drugs as Consciousness-Expanding defined by this addition of apperception (i.e., a phenomenon where the objective observer is added to the experience). Psychoactive stimulants and depressants, according to Metzner, merely move consciousness up and down the arousal dimension and away from pain or discomfort and, as such, are considered Consciousness-Contracting. This implies that the two-dimensional Arousal-Hedonic Scheme can only account for substances that are consciousness-contracting and that consciousness-expanding substances, like psilocybin or LSD, transcend the scheme. In sum, the Arousal-Hedonic Scheme can be viewed as an extension of The Cartography of Ecstatic and Meditative States. While its related scale, the ASGP, did not see much use, the overall scheme marked the emerging importance of understanding subjective arousal in ASCs.

2.12. Dimensions of changed subjective experience in ASCs

In 1992, G. William Farthing published the textbook *The Psychology of Consciousness* which, in part, aimed to compile and review research on ASCs similar to Ludwig's work from 1966 (Farthing, 1992; Ludwig, 1966). Through his literature review, Farthing supposed 14 conceptual dimensions to ASCs. He simply called these Dimensions of Changed Subjective Experience in ASCs. The 14 dimensions are as follows (Farthing, 1992): (1) the Changes in Attention dimension defined as changes in attentional range such as internal, external, and the tendency to narrow one's focus such that they notice details about something they did not notice before (e.g., heightened engagement with music); (2) the Changes in Perception dimension defined as the recognition and interpretation of environmental objects and events such as perceptual illusions (i.e., the misidentification of objects and events) and synesthesia (i.e., one sensory modality being experienced in another) stemming from disruption in sensory-perceptual processes or the narrowing of attention; (3) the Changes in Imagery and Fantasy dimension defined as the vividness of mental imagery associated with increased fantastical thoughts, reverie (i.e., experiencing a series of thoughts or images occurring in a free association-like manner with no concurrent theme or narrative), real hallucinations (i.e., a perception believed to be real in the absence of a proper stimulus while the sense of reality is gone), and pseudo-hallucinations (i.e., a perception that is knowingly false as the overall sense of reality is still intact; Königsmark et al., 2021); (4) the Change in Inner Speech dimension defined as a decrease in narration associated with volitional thoughts becoming less connected to actions and the environment, overt speech becoming less coherent, and changes in verbal thought; (5) the Changes in Memory dimension defined as reduced recall, changes in associations between words, images, idea flow, and the stream of consciousness often leading to increases in creativity; (6) the Change in Higher-Level Thought dimension defined as difficulties in making decisions or solving problems due to changes in emotions, values, or disruption in short-term memory; (7) the Changes in the Meaning or Significance of Experiences dimension defined as feelings that certain thoughts or events are profoundly important or of mystical significance sometimes associated with extreme humor and feeling that one's ideas are more creative than normal; (8) the Changed Time Experience dimension defined as experiencing change in temporal duration where external time usually seems to slow down (i.e., internal time judgments have sped up) involving both linear time experience and a nonlinear experience of timelessness; (9) the Changes in Emotional Feeling and Expression dimension defined as changes in emotional feeling ranging from negative emotions (e.g., fear, anger, depression) to positive emotions (e.g., humor, love, joy) and increases in emotional reactivity (i.e., responding to events one may not normally respond to), emotional unresponsiveness (e.g., feelings of a "drugged stupor"), or uninhibited overt expressions of emotion (e.g., violent actions, affectionate touch); (10) the Changes in Level of Arousal dimension defined as extreme levels of arousal that may be reached and are not possible in the normal, waking state. Extremely low arousal can be present in hypnagogic states and extremely high in some drug states like the one produced by amphetamines; (11) the Changes in Self-Control dimension defined as increases in impulsivity, disregard for social inhibitions, lethargy, disruption in executing complex motor functions, automaticity of voluntary functions without a sense of volition (e.g., hypnotic suggestions), a voluntarily abandonment of conscious control in order to experience more mystical phenomena, and depersonalization where the loss of self-control is complemented by a feeling of one's own actions happening to them without a sense of volition; (12) the Changes in Suggestibility dimension defined as responsiveness to suggestions/hypersuggestibility (i.e., communications from one person to another that induce changes in the other's behavior or beliefs with coercion) usually observed in hypnosis, shamanic rituals, and marijuana intoxication; (13) the Changed Body Image dimension defined as common feelings of change in perceived body proportions, weight, or inner sensory events (e.g., experiences of levitation or numbness) where changes affect personal identity such that they can be experienced as frightening or oceanic feelings (i.e., a feeling of boundlessness); (14) the Changed Sense of Personal Identity dimension defined as changes in the overall sense of identity due to alterations in the other dimensions where one may feel that they are not themselves (i.e., they can no longer identify with their previous self-concept) that can be positive (e.g., feelings of rejuvenation and/or a feeling of being reborn) and negative (e.g., feelings that one is no longer in control of their thoughts or actions) that can occasion mystical type experiences involving a sense of unity, or oneness, with the environment which is typically felt as positive.

In sum, Farthing supposes 14 conceptual dimensions that he terms the Dimensions of Changed Subjective Experience in ASCs. This comprehensive review of previous ASC work is useful in that it can be seen as a successor to Ludwig's General Characteristics of ASCs. All of Ludwig's dimensions are included in Farthing's dimensions either conceptually or word for word. For example, Ludwig's Feelings of Rejuvenation dimension is represented as Farthing's Changed Sense of Personal Identity dimension. Further, Ludwig's Sense of the Ineffable dimension is represented as Farthing's Change in Inner Speech dimension which explains ineffability in terms of the narrative component of consciousness which is further explained in Julian Jaynes' book *The Origin of Consciousness in the Breakdown of the Bicameral Mind* (Farthing, 1992; Jaynes, 1976/2000; Ludwig, 1966). Lastly, Farthing's dimension of Change in the Level of Arousal can be seen as incorporating the idea of physiological energetics employed in Fischer's Cartography of Ecstatic and Meditative States, which would also inspire the later Arousal-Hedonic Classification scheme (Farthing, 1992; Fischer, 1971; Metzner, 2005a). Farthing's continuing inclusion and highlighting of the importance of changes in emotion, body image, and time sense from Ludwig could also be seen as laying theoretical groundwork for other classification schemes such as the Three-Dimensional Sphere (3DS) Models (Berkovich-Ohana and Glicksohn, 2014; Berkovich-Ohana and Wittmann, 2017; Farthing, 1992; Ludwig, 1966; Paoletti and Ben-Soussan, 2020).

2.13. General heuristic model of ASCs

The General Heuristic Model of Altered States of Consciousness was developed by Ralph Metzner to primarily examine ASCs induced by psychedelic drugs, though other inductions are included (Metzner, 2005a). Here, Metzner uses the term "heuristic" to indicate that this model serves as a framework for discovering and understanding states of

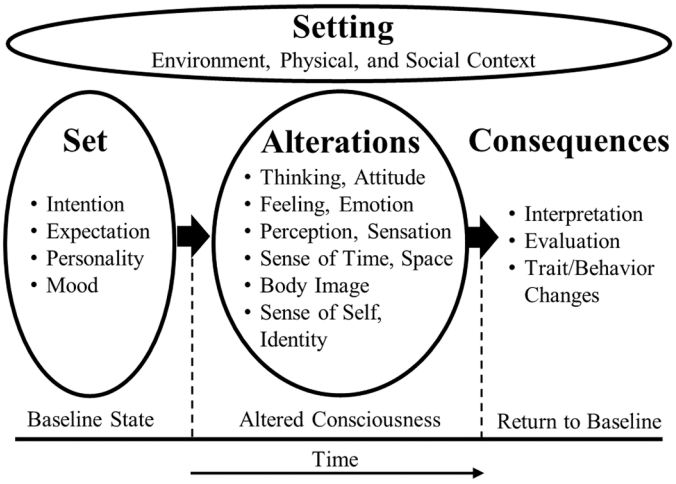

Fig. 8. *Visualization of the General Heuristic Model of Altered States of Consciousness.* The General Heuristic Model of Altered States of Consciousness represents how one moves from a baseline state of consciousness to an altered state of consciousness, and ultimately, a return to baseline over time. Setting defined as the environment, physical, and social context, blanket the entire timeframe of this alteration. At the baseline state, set defined as intention, expectation, personality, and mood, directly implicates alterations in the altered state which are reflected phenomenologically (e.g. in thinking and attitude). During the return to baseline, consequences are reflected upon such as a search for meaning in interpretation, evaluation of the experience as good or bad, and trait and/or behavior changes. Figure recreated by the authors from the source material (Metzner, 2005a).

consciousness, rather than providing an explanatory structure. He discusses how classification schemes have either focused on content, such as Stanislav Grof's perinatal matrices (discussed in the Varieties of Transpersonal Experiences), or physiological energetics such as Fischer's Cartography of Ecstatic and Meditative States (Fischer, 1971; Grof, 1972; Metzner, 2005a). In this general model, Metzner outlines six dimensions in a state-based manner, but also centers them around the idea of set and setting being integral to the induction process (Fig. 8). The six dimensions are as follows: (1) Thinking/Attitude, (2) Feeling/Emotion, (3) Perception/Sensation, (4) Sense of Time/Space, (5) Body Image, and (6) Sense of Self/Identity.

To bring about these multidimensional alterations, Metzner states that the content of a state of consciousness is a function of the internal set and external setting, mirroring the set and setting formulation of his colleague Timothy Leary. This hypothesis makes it clear that the content of a psychedelic experience is not so much a byproduct of the pharmacology but rather of the set defined as internal factors of expectation, mood, temperament, and attitude; and setting defined as the physical and social aspects of the external environment, including the internal states of the person administering the drug. Metzner points out that such a hypothesis explains why a psychedelic substance could be:

> "…interpreted as a model psychosis (psychotomimetic), an adjunct to psychoanalysis (psycholytic), a treatment for addiction or a stimulus to creativity (psychedelic), and a facilitator of shamanic spiritual insight (entheogenic), or even by the U.S. Army and the Central Intelligence Agency, as a truth serum…" (Metzner, 2005a, p. 28).

Such observations make it clear that the set is primary as it helps to determine the choice of setting (Metzner, 2005a). This formulation led to the General Heuristic Model of Altered States of Consciousness which can be seen as a model that visualizes the role of set and setting in bringing about the multidimensional changes in ASCs.[15]

Metzner's General Heuristic Model and his Arousal-Hedonic Classification Scheme are both a synthesis of previous work and attempts at ASC categorization. Beginning with the General Heuristic Model, one can see that it blended the set and setting hypothesis of Timothy Leary with multidimensional changes well documented by several previous researchers such as Arnold Ludwig and G. William Farthing (Farthing, 1992; Ludwig, 1966; Metzner, 2005a). Further, it appears to also integrate a time course of induction, done a few decades before by Charles Tart who conceptually mapped out how an ASC is induced in his Systems Model (Tart, 1975/1983).

2.14. Four-dimensional descriptive system

In 2005, Vaitl et al. (2005) proposed a descriptive system of what comprises an altered state through four conceptual dimensions: Activation, Awareness, Self-Awareness, and Arousal (Vaitl et al., 2005). These dimensions were derived from a reduction of experiential reports down to their essential features (Vaitl et al., 2005): (1) Activation defined as the readiness of an organism to interact with its environment, subjectively represented by being alert, awake, responsive, and ready to act and react; characterized by Arousal (+) at the high end and Relaxation (-) at the low end of the spectrum; (2) Awareness defined as the variability of contents available to attention and conscious processing; reported mostly in post-hoc, reflective evaluation; characterized by awareness span, Wide (+) at the high end and Narrow (-) at the low end of the spectrum; (3) Self-Awareness defined as the "other pole of the bipolar self-world structure," where self-reflective experiences may be seen as truly "mine" or diminished in terms of forgetting oneself through the weakening of ego boundaries. Further, it is defined as a feeling of being "here and now," present in absorption and an intensified feeling of one's being reported mostly in post-hoc, reflective evaluation; characterized by Present (+) at the high end and Absent (-) at the low end of the spectrum; (4) Sensory Dynamics defined as the variety of experiences in the sensory and perceptual component of subjective experience. In ASCs, sensations can be reduced or enhanced. Some are characterized by the production of sensations and perceptions that do not have a contributing physical stimulus (hallucinations). The richness, vividness, structure, and content of these changes are often revealed in subjects' reports. They are characterized by Increased (+) at the high end and Decreased (-) at the low end of the spectrum.

Vaitl et al. (2005) mapped four of their five induction domains (see Induction-Domain Classifications) onto the Four-Dimensional Descriptive System (Vaitl et al., 2005). This allows us to view the Four-Dimensional Descriptive System as a state-based classification scheme whereby ASCs are characterized by the degree of experience along four different continua through a review of neuroscientific literature. While Farthing's Changed Dimensions of Subjective Experience in ASCs can be seen as a review and expansion of ASC work starting with Ludwig's General Characteristics of ASCs, The Four-Dimensional Descriptive System can be seen as a review and constriction of such work. Given that these were conceptualized as essential dimensions of altered experience, the authors' inclusion of Arousal highlights Fischer's work by underscoring the importance of physiological energetics in ASCs (Fischer, 1971, 1992; Vaitl et al., 2005). Awareness expands Farthing's dimension of Changes in Attention by providing both a wide and narrow span, while Self-Awareness deals conceptually with Fischer's idea of the "I" and "Self," the weakening of the self-environment boundary, or ego dissolution (Farthing, 1992; Fischer, 1971, 1992).

[15] One could argue that the General Heuristic Model is more method-based as it details how set and setting lead to alterations in experience, thereby describing mechanisms of induction.

Sensory dynamics can then be seen as a synthesis of conceptual dimensions relating to perceptual distortions and changes in imagery which are represented in both Ludwig and Farthing's work (Farthing, 1992; Ludwig, 1966).

2.15. Three-dimensional sphere (3DS) models

The 3DS Models proposed by Berkovich-Ohana and Glicksohn (2014) and Paoletti and Ben-Soussan (2020) conceptualize ASCs as positions within a three-dimensional state space, where each axis represents a distinct phenomenological dimension.[16] What makes these state-space models unique is their shared use of spherical geometry as a metaphor for how these dimensions relate and interact. In both models, a specific consciousness state is defined by its location in this space (i.e., a unique combination of values on the three axes) but the sphere metaphor provides additional structure to the understanding of relationships among these dimensions. Both models agree on two dimensions, namely (1) (Subjective) Time and (2) Emotion. The Berkovich-Ohana & Glicksohn Model suggests (3a) Awareness, while the Paoletti & Ben-Soussan Model suggests (3b) Self-Determination as the third dimension.

The Berkovich-Ohana & Glicksohn Model uses a spherical structure to reflect the nested relationship between core (minimal) and extended (narrative consciousness). States closer to the center are associated with minimal selfhood and embodied awareness, while those near the periphery involve narrative elaboration and increased psychological distance from the body. As such, distance from the center is interpreted phenomenologically as the degree to which one's sense of self expands from bodily immediacy toward abstract, autobiographical cognition.

The model builds on Damasio's work, particularly in the dimension of Awareness, which includes bodily and interoceptive sensations (Berkovich-Ohana and Glicksohn, 2014; Damasio, 2000, 2010). The dimension of Awareness spans from low phenomenal awareness to high access awareness, drawing on Block's distinction between phenomenal consciousness (subjective, unreportable experience) and access consciousness (reportable, cognitively accessible content; Berkovich-Ohana and Wittmann, 2017; Block, 2007). The dimension of Subjective Time maps experiential orientation from the subjective past through the present toward the future, with the "now" at the center of this axis. The poles, representing extended temporal experience, are increasingly dissociated from immediate bodily presence. The Emotion dimension spans from pleasant to unpleasant, further subdivided into arousal (raw, bodily activation) and valence (evaluative tone shaped by past experiences; Berkovich-Ohana and Wittmann, 2017).

Importantly, the Berkovich-Ohana & Glicksohn Model highlights two central phenomenological features of ASCs: (1) a collapse of temporal structure toward a state of timelessness, and (2) profound distortions or dissolution of the bodily self (Berkovich-Ohana and Wittmann, 2017). Various types of ASCs, such as psychedelic and meditative states, are modeled along these dimensions. For example, classic serotonergic psychedelics (e.g., psilocybin, LSD) may induce a breakdown in information integration related to bodily processing, which contributes to alterations in self-experience and temporal disintegration. This collapse of time perception, exemplified by rich, bizarre, and fast-paced experiences, can culminate in a sense of timelessness, located at the center of the time axis. These characteristics illustrate how this model can map ASCs as transient, but structured deviations along these phenomenological dimensions. Notably, this model has been applied to recent studies exploring psychedelics' effects on time perception and meditation's impact on bodily self-consciousness (Laukkonen and Slagter, 2021; Millière et al., 2018; Yanakieva et al., 2019).

The Paoletti & Ben-Soussan 3DS Model uses a spherical structure to represent a balanced state-space but emphasizes equidistance and neutrality. Here, the center symbolizes what they term the "place of pre-existence," a state in which consciousness is not identified with any particular content. It is conceived as a neutral equidistant point from all phenomenological dimensions, reflecting a state of non-attachment rather than the normal, waking state. This central point is a phenomenological ideal of stillness and openness, allowing for transformative or integrative experiences.

This model emphasizes the role of agency, balance, and non-identification in ASCs. The dimension of Self-Determination reflects one's degree of volitional engagement with conscious contents, spanning from a passive, reflective state to a heightened sense of autonomy and intentional transformation. The Subjective Time axis here refers to the experiential flow of time, ranging from rapid and fragmented perception to a timeless state of presence. The Emotion dimension, like in the Berkovich-Ohana & Glicksohn Model, spans from unpleasant to pleasant affect with valence shaped by the level of emotional regulation

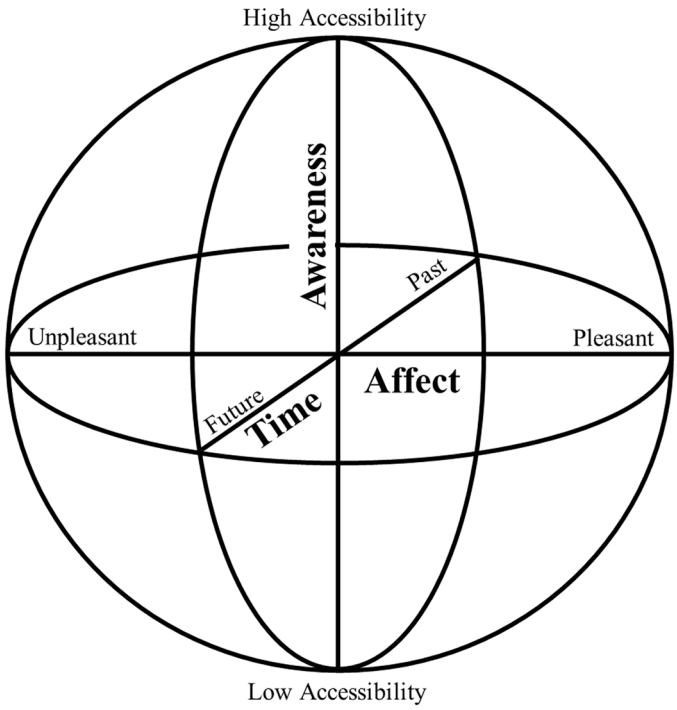

Fig. 9. *Visualization of the Berkovich-Ohana & Glicksohn Three-Dimensional Sphere (3DS) Model.* Three dimensions encompass the Berkovich-Ohana & Glicksohn 3DS Sphere Model: Subjective Time, Awareness, and Emotion. Subjective time deals with subjective past, present, and future with the "now" being at the center while the past and present are anchored at the ends. The Awareness dimension spans from low, phenomenal awareness to high, access awareness. The Emotion dimension ranges from pleasant to non-pleasant which are further conceptualized as phenomenologically distinct arousal and valence. Arousal involves bodily fluctuations felt near the body and valence involves using prior experiences to make meaning of current emotions at the present moment. Figure recreated by the authors from the source material (Berkovich-Ohana and Glicksohn, 2014). For the Paoletti & Ben-Soussan Model where Awareness is replaced with Self-Determination see (Paoletti and Ben--Soussan, 2020).

[16] Both models were renamed here for clarity and consistency. The model proposed by Berkovich-Ohana and Glicksohn (2014) was originally called the Consciousness State Space model. However, this term is relatively broad, as many state-based classification schemes reviewed here can be considered state-spaces. Likewise, the model proposed by Paoletti & Ben-Soussan was originally named the Sphere Model of Consciousness (SMC) but the Consciousness State Space model of Berkovich-Ohana and Glicksohn also features a sphere-based structure. To reduce confusion and highlight their structural and dimensional similarities, both models are referred to here by their authors' names and grouped together under the label Three-Dimensional Sphere (3DS) Models.

and depth of experience.

Overall, the Paoletti & Ben-Soussan Model highlights how specific ASCs, especially those induced through meditative practices, can reflect movement toward the center of the sphere, marked by decreased identification with phenomenological content and increased self-regulation. For example, deep mediative states may be characterized by emotional equanimity, a sense of timelessness, and enhanced volitional control, corresponding to proximity to the sphere's center. In contrast states marked by intense emotional reactivity, temporal dilation, and reduced self-determination, such as in certain drug-induced states, may be represented as occupying positions toward the periphery of the sphere. Notably, tpFig. 9)

3. Method-based classification schemes

Method-based classification schemes categorize ASCs according to their means of induction. Throughout history, human curiosity has given rise to a plethora of reports on how ASCs can be induced (Carod-Artal, 2015; Emboden, 1989; Leary, 1970; Nyberg, 1992; Ruck, 2006; Wasson et al., 1998). In one abstract formulation such methods have been termed consciousness-modifying techniques, with the basic distinction between pharmacological and non-pharmacological inductions. For the latter, additional collective terms like "laboratory psychonautics," "technologies of the sacred" (Grof, 2019), "induction procedures" (Glicksohn, 1991), "induction techniques" (Tart, 1975/1983), "psychological/physiological maneuvers" (Vaitl et al., 2005), or simply "other means," (Cofré et al., 2020) can be found in the literature. These different terms point to the diversity among methods. A particular challenge in classification arises when techniques are combined, making it difficult to determine the appropriate level of granularity as different mechanisms may elicit different subjective effects. For example, various forms of yoga and meditation often integrate postures and breathwork to achieve desired subjective outcomes, however distinguishing between the effect of interoceptive (e.g., breathing) and proprioceptive (e.g., postures) engagement on these outcomes remains challenging (Wheeler et al., 2019).

While many classification schemes focus on subjective experiences, fewer authors compiled overviews on these consciousness-modifying techniques which allow the identification of commonalities across these diverse practices. Ludwig, however, does briefly describe these so-called "productions of ASCs" in his seminal paper *Altered States of Consciousness* (Ludwig, 1966). Here, he suggests that ASCs arise in any setting in which agents (pharmacological inductions) or maneuvers (non-pharmacological inductions) interfere with the inflow of sensory or proprioceptive stimuli, the outflow of motor impulses, emotional tone, or the normal flow and organization of cognitive processes. He ultimately suggests that an optimal range of external information is necessary for the maintenance of the normal, waking state and that diverse environmental stimulation is required for normal cognitive, perceptual, and emotional experience.

We summarize three formal examples of method-based classification schemes: A general conceptual framework describing how specific triggers can induce the re-organization of psychological processes (Tart, 1975/1983), a two-dimensional classification system with a focus on sensory stimulation methods (Dittrich, 1985), two schemes that sort induction methods that we call Induction-Domain Classifications (Vaitl et al., 2005; Cofré et al., 2020), and a representative classification scheme for psychoactive drugs (Zohar et al., 2015).

3.1. Systems Model

In his book *States of Consciousness*, Charles Tart describes a state of consciousness as consisting of structures/systems (i.e., permanent fixtures of functions, systems, and subsystems) in the mind/brain that act on and transform information (Tart, 1975/1983). These can be activated by the allocation of attention/awareness, or what he calls psychological energy. Tart's systems model then details alterations of these states of consciousness primarily through transformation of the baseline state of consciousness (b-SoC) to an ASC and back, centering his work as primarily method-based. This model is conceptually related to the earlier theoretical work of Ronald Shor who conceptualized the fading of the general reality orientation[17] as necessary for the induction of an ASC, specifically in the context of hypnosis and trance (Shor, 1959). In his Systems Model, Tart outlines four stabilization processes that are involved in maintaining the integrity of a state of consciousness at any given time. These four processes are as follows: (1) Loading Stabilization defined as keeping attention/awareness deployed in desired structures with appropriate task orientation; (2) Negative Feedback Stabilization defined as correcting a subsystem if it deviates too far from what one perceives as the "normal" range; (3) Positive Feedback Stabilization defined as strengthening activity and/or providing rewarding experiences when subsystems are acting in ways to maintain stability; (4) Limiting Stabilization defined as restricting the range of functioning of subsystems that would destabilize the existing state of consciousness.

Tart continues to describe these subsystems as integral in the process of ASC induction (Fig. 10). To do so he outlines how a state of consciousness, beginning at the b-SoC, can become an ASC through two

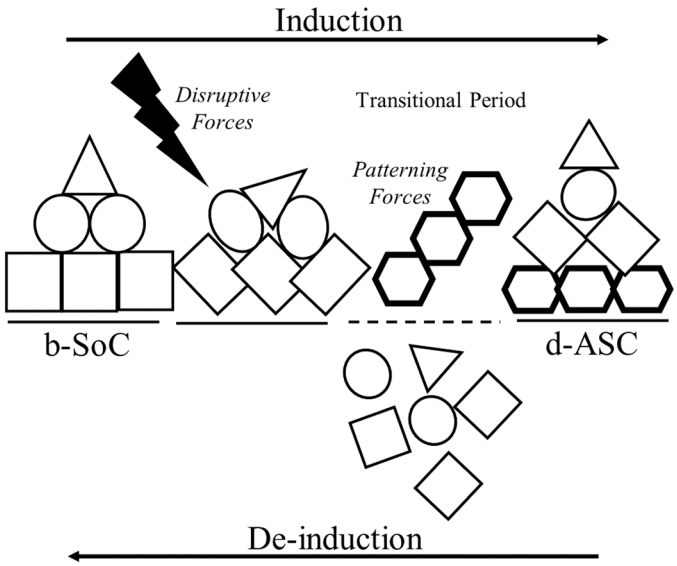

Fig. 10. *Visualization of the Systems Model.* The figure displays shapes that represent psychological structures and sub-structures that make up a discrete state of consciousness. Starting from the baseline state of consciousness (b-SoC), disruptive forces (manipulations of subsystems) destabilize the b-SoC's integrity. If these disruptive forces are strong enough, patterning forces (continued manipulations of subsystems) enter during a transitional period to lay the groundwork for what Tart refers to as a discrete altered state of consciousness (d-ASC) complete with a new arrangement of psychological structures and substructures. This process is known as Induction. As the default state is the b-SoC, the d-ASC will weaken over time back to a b-SoC, though this process can be expedited through anti-psychotics for example. This process is known as De-induction. The diagram was recreated by the authors from the source material (Tart, 1975/1983).

[17] Ronald Shor's Generalized Reality Orientation (GRO) refers to the implicit, structured cognitive framework that organizes an individual's ongoing sense of time, space, and externally reality in the waking state.

induction operations: disruption and patterning. Disruption is characterized by disruptive forces that break the integrity of subsystems, for example, by overloading or by depriving them of stimuli, or similarly, by providing ambiguous stimuli. This can also be done by withdrawing attention or awareness from certain subsystems, such as certain meditations that instruct the user to focus on their thoughts (i.e., disruption of Motor Output). Disruptive forces do not always guarantee an altered state as sometimes the stabilization processes still hold together, meaning multiple stabilization processes need to be disrupted to ensure an ASC induction. Therefore, an ASC cannot be assumed from an induction method alone (see Introduction).

Patterning is characterized by patterning forces which are psychological and physiological actions that structure incoming subsystems into a new system (i.e., an ASC; Tart, 1975/1983). The ASC must then develop its stabilization process to endure. Patterning forces can also serve to destabilize a state of consciousness, meaning a disruptive force can also be a patterning force. A good example of this is stroboscopic light stimulation (Amaya, et al., 2023a; Bartossek et al., 2021). Here, Exteroception and Input-Processing are disrupted through overloading the visual system with stimuli, yet entrainment (i.e., the process of the brain synchronizing with the rate of flicker) is evidence of how it is also a patterning force.

To summarize, a successful induction must employ the operations of disruption and patterning. If successful, disruptive forces will result in the destruction of the b-SoC's integrity, leading to a transitional and disorganized period (Tart, 1975/1983). During this period, patterning forces will drift in to lay the groundwork for the new ASC which must develop its stabilization process to endure. This process in reverse is known as de-induction. In a method-based manner, the Systems Model can classify whether the degree of induction is enough for one to remain at the b-SoC, enter a transitional state, or fully develop into an ASC.

It can be argued that most neurobiological explanations of how ASCs are induced are, in some conceptual manner, compatible with the Systems Model as they involve temporary disruption and a transient period of sustained alteration in the brain when compared to the baseline state (Carhart-Harris et al., 2014; Corlett et al., 2009; Tart, 1975/1983; Vaitl et al., 2005; Vollenweider and Geyer, 2001). Tart's emphasis on a baseline state of consciousness in itself is still highly relevant in the debate around whether psychiatric conditions can be considered ASCs because a baseline state is necessary to avoid the "reference problem" (see Introduction; Bayne et al., 2016; Metzner, 2005a; Tart, 1975/1983; Vaitl et al., 2005).

3.2. Intensity-variability scheme

Adolf Dittrich, who is perhaps best known for the development of the previously described 5D-ASC Rating Scale, acknowledged in his dissertation, that besides the study of subjective experiences, there is also knowledge to be gained from the systematic analysis of techniques that can induce ASCs. In 1985, he detailed the Intensity-Variability Scheme to describe inductions driven by a change in sensory stimulation such as sensory or perceptual deprivation and sensory overload (e.g., stroboscopic light stimulation). Dittrich placed these on a two-dimensional coordinate plane within the orthogonal axes of intensity and variability which can be increased or decreased from average levels of daily stimulation (Fig. 11). Despite the scheme's simplicity, multiple additional methods, which Dittrich did not discuss could be placed. Techniques such as chanting or the whirling dervish[18] comprise the core dimension of affecting variability in not only sensory stimulation but also one's behavior. To the best of our knowledge, the addition of further axes has never been systematically followed up.

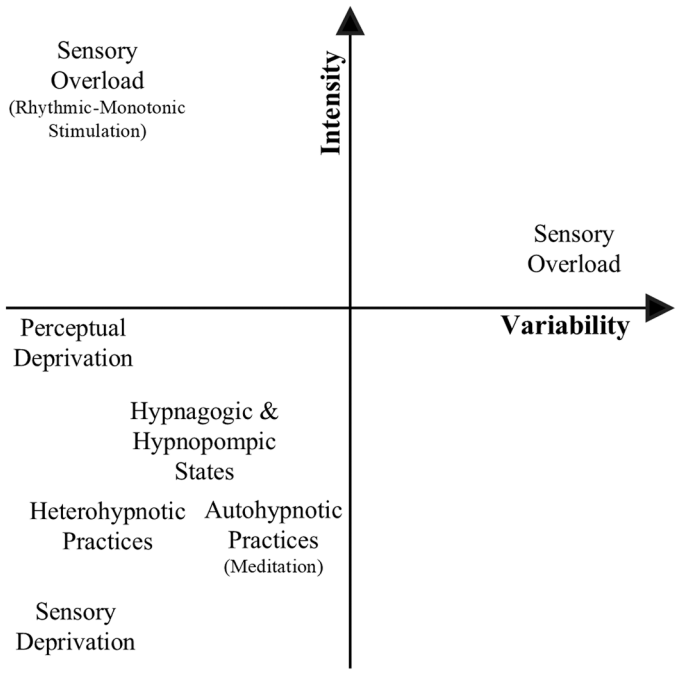

Fig. 11. *Visualization of Dittrich's Intensity-Variability Classification Scheme.* The two dimensions (continua) of variability and intensity are represented by orthogonal axes creating a plane on which different ASC induction techniques are placed. For example, sensory overload, exemplified by stroboscopic light stimulation, exists at the high end of the variability continuum because of the intense randomness of incoming light. Figure recreated by the authors from the source material (Dittrich, 1985).

3.3. Induction-domain schemes

Induction-Domain Schemes are a subset of method-based schemes that attempt to classify ASCs by the general category, or domain, of their induction method. In reviewing the literature, two attempts to sort ASC inductions into categories (domains) appear in 2005 and 2020. First, Vaitl et al. (2005) proposed a classification for ASC inductions based on the methods used to induce them. This Induction-Domain Scheme derives five categorical domains of induction method classification (Vaitl et al., 2005): (1) Spontaneously Occurring ASCs are defined as those that happen during daily activities due to spontaneous fluctuations in alertness and vigilance. The authors propose a wakefulness-drowsiness-sleep continuum on which these ASCs are phenomenally experienced. The four major classes of spontaneously occurring ASCs are states of drowsiness, daydreaming, hypnagogic states, and sleep/dreaming. Additionally, near-death experiences are also considered spontaneously occurring. (2) Physically and Physiologically Induced ASCs encompass techniques that affect physiology. This classification involves extreme environmental conditions, starvation, forced respiratory maneuvers, and sexual activity/orgasm. (3) Psychologically Induced ASCs cover a wide range of techniques that stem from Eastern cultures, religions, and philosophy in addition to experimental stimulation procedures and clinical interventions including sensory deprivation, homogenization, and overload such as during rhythm-induced trance (drumming and dancing), relaxation, meditation, hypnosis, and biofeedback. (4) Disease Induced ASCs refer to multiple pathological conditions that result in various "degrees of ASC," (Vaitl et al., 2005). These disorders can affect brain structures, either directly or indirectly, resulting in shifts on the waking-coma axis and include psychotic disorders, coma and the vegetative state, epilepsy, and other diseases such as Alzheimer's disease,

[18] The whirling dervish is a form of spiritual meditation often used in religious practice involving rhythmic music and simultaneous spinning movements in a small group. It is largely associated with the Sufi sect of Islam (Harel et al., 2021).

Morbus Parkinson, and frontotemporal dementia (Vaitl et al., 2005). (5) Pharmacologically Induced ASCs are not reviewed by the authors but are still considered a part of the overall classification. One may consult drug classification schemes such as the Neuroscience-based Nomenclature (see below) or others for further description (Vaitl et al., 2005; Volgin et al., 2019; Zohar et al., 2015).

The induction-domain classification of Vaitl et al. (2005) can be seen, first, as a formal attempt to distinguish pharmacological from non-pharmacological ASC inductions through the supposition of categories, an approach that was also used later by in 2020 by Cofré et al. (2020). In this article, researchers categorized ASCs by their method of induction (Cofré et al., 2020): (1*)* Natural or Endogenous referring to states within the sleep cycle such as deep sleep and dreaming; (2) Pharmacological referring to ASC induction via a psychoactive agent such as general anesthesia or production of the psychedelic state via psilocybin or LSD; (3) Induced by Other Means, such as meditation and hypnosis; (4) Pathological defined as ASCs brought about by neurological or psychiatric pathological processes such as disorders of consciousness, brain death, and epilepsy. Additionally, the authors further distinguish ASCs as either transitory or permanent based on their mechanism of induction. For example, the psychedelic state, as induced by LSD or psilocybin, is defined as transitory, brain death is defined as permanent, and disorders of consciousness (DOCs), are defined as either transitory or permanent.

In sum, the induction-domain classification schemes proposed by both Vaitl et al. (2005) and Cofré et al. (2020) represent attempts at categorizing types of induction methods. Such approaches have experimental merit wherein the use of an agreed-upon Induction-Domain Scheme can assist in the operationalization of induction methods leading to greater generalizability and comparability among ASC data. Of note, both induction-domain classifications suggest the inclusion of DOCs and psychiatric conditions as being ASCs, first by Vaitl et al. (2005) via the Disease Induced domain and then by Cofré et al. (2020) via the Pathological domain both of which do not fall into the typical definition of ASCs (Farthing, 1992; Ludwig, 1966; Tart, 1975/1983).

3.4. Neuroscience-based nomenclature (NbN)

Different classifications for psychoactive drugs have been proposed as method-based classification schemes for ASCs. While some focus on chemical formulations, others emphasize the induced effects or mechanisms of action. These various approaches, and their refinement over time, reflect growing understanding of how pharmacological activity relates to subjective effects. For example, psilocybin, mescaline, lysergic acid diethylamide (LSD), and N,N-Dimethyltryptamine (DMT) may be classified as hallucinogens based on their subjective effects or alternatively as 5-HT_2A receptor agonists. In the latter case, the classification is focused on the main neuropharmacological mechanisms related to the drug effects (Becker et al., 2023; Holze et al., 2021; Klaiber et al., 2024; Rickli et al., 2016; Vollenweider et al., 1998). These various labels differ in terms of whether they prioritize experiential outcomes or biological mechanisms.

While multiple drug classification systems could inform ASC research, we focus here on the Neuroscience-based Nomenclature (NbN) due to space constraints. The NbN was developed to shift away from traditional disease-based categorizations (e.g., antidepressant, antipsychotic) in favor of a framework grounded in mechanisms of action and targeted neurotransmitter systems (Zohar et al., 2015). In the context of ASC classification, the NbN contributes a neuropharmacological perspective to identify the relevant neural mechanisms to induce specific subjective effects.

The popular Anatomical-Therapeutic-Chemical classification system of 1976, under the broad term psycho-analeptic (i.e., to exert a stimulating effect on the mind), had a disease-based focus (Zohar et al., 2015). However, its shortcomings were pointed out in a 2009 editorial by David Nutt (Nutt, 2009; Zohar et al., 2015). The NbN aimed to integrate contemporary scientific knowledge and focus on pharmacological domains and modes of action. For the 108 included drugs, 11 pharmacological domains were identified based on what neurotransmitter system they affect: Acetylcholine, Dopamine, GABA, Glutamate, Histamine, Ion Channel, Lithium Mimetic, Melatonin, Norepinephrine, Opioid, and Serotonin. At the same time, 10 modes of action are defined based on any given drug's effect on neurotransmission: Receptor Agonist, Receptor Partial Agonist, Receptor Antagonist, Reuptake Inhibitor, Reuptake Inhibitor and Releaser, Reuptake Inhibitor and Receptor Antagonist, Enzyme Inhibitor, Ion Channel Blocker, Positive Allosteric Modulator (PAM), and Enzyme Modulator (Zohar et al., 2015). While most of the contained drugs do not qualify as ASC-inducing agents (according to the typical definitions previously discussed), the NbN can be seen as a bridge between the purely method-based classification and neuro/physio-based classification systems. In sum, all types of purely pharmacology-based drug classification schemes could be seen as method-based classification schemes when ASC-inducing drugs are of interest. More advanced schemes like the NbN draw attention to the downstream neurobiological mechanisms that are stimulated by the drug.

4. Neuro/physio-based classification schemes

The evolution of psychoactive drug classification exemplifies how advancements in understanding physiological mechanisms can reshape classification schemes (Zohar et al., 2015). The first phase of this evolution begins with observations of a specific agent inducing ASCs which highlight the eventual identification of molecule-receptor interactions governing drug action, such as with psilocybin. The next phase involves pinpointing relevant physiological mechanisms underlying ASC experiences. For instance, hallucinations can occur as a result of 5-HT_2A receptor stimulation (e.g., classic serotonergic psychedelics), NMDA receptor antagonists (e.g., atypical psychedelics like ketamine), or sensory homogenization, indicating diverse pathways to similar phenomena. Neural correlates of hallucinations likely lie in computational principles activated by various ASC-inducing agents or techniques. Ongoing research reports numerous candidate mechanisms, correlates, and neurophysiological principles, including shifts in brain dynamics and measures from EEG and MRI studies (Amaya et al., 2023b; Carhart-Harris et al., 2014; Carhart-Harris and Friston, 2019; Corlett et al., 2009; Mortaheb and Fort et al., 2024; Schmidt et al., 2020; Vollenweider and Geyer, 2001). While neuronal mechanisms are commonly assumed as neural-correlates of consciousness, the term neuro/physio-based acknowledges other physiological processes that could serve as relevant correlates until further neural processes are understood such as blood CO_2 concentration or heart rate entropy (Havenith et al., 2025; Rosas et al., 2023).

Neurobiological and computational models of consciousness may have implications for ASC classification schemes, such as in the refinement of our understanding around neural correlates of consciousness as criteria for classification (see below). Ultimately, all theories of consciousness that describe neural mechanisms underlying ASC phenomena can inform a classification scheme (for an overview see Seth and Bayne, 2022).

4.1. Cortico-Striato-Thalamo-Cortical (CSTC) feedback loop model

The cortico-striato-thalamo-cortical (CSTC) Feedback Loop Model is one example of a neurobiological model that can be used for ASC classification. The CSTC model suggests that phenomenological outcomes of ASC experiences can be explained, in part, by the perturbance of feedback loops involving the thalamus (Vollenweider and Geyer, 2001; Vollenweider and Preller, 2020). Here, feedback signals control

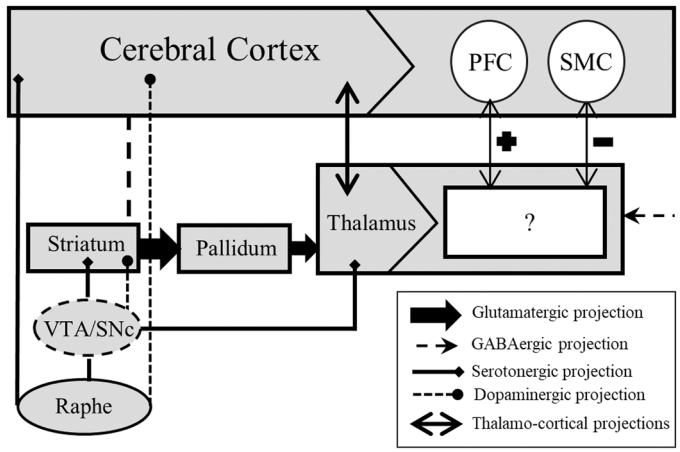

Fig. 12. *Visualization of the Cortico-Striato-Thalamo-Cortical (CSTC) Feedback Loop Model.* Under psychedelics key brain circuits are engaged. Serotonergic projections from the raphe nuclei directly reach the striatum, thalamus, and the cortex (thick, diamond-end arrows). Dopaminergic projections from the ventral tegmental area/substantia nigra (VTA/SNc) target the striatum and cerebral cortex (dotted, circle-end arrows). The striatum, integrating both serotonergic and dopaminergic inputs, projects glutaminergic signals to the pallidum, which extends to the thalamus (thick block arrows). The thalamus, receiving serotonergic and glutamatergic inputs, exchanges bidirectional signals with the cerebral cortex (thick, bidirectional arrow). The cerebral cortex, reciprocating with the thalamus, receives serotonergic and dopaminergic inputs and sends GABAergic projections (dotted, pointed arrow) to the striatum. Within this circuit, the prefrontal cortex (PFC) and sensorimotor cortices (SMC) exhibit shallow thalamic hyperconnectivity (thin, bidirectional arrow "+") and deep thalamocortical hypoconnectivity (thin, bidirectional arrow "-") with unspecified thalamic subdivisions (question mark) which also receive GABAergic projections. Figure adapted from the source material (Avram et al#, 2021).

thalamic filtering of incoming sensory information, partially through the striatum, to determine which signals reach the cortex. While under normal circumstances this filtering process removes irrelevant information, its perturbation is thought to be central in hallucination production, feelings of ego-dissolution, and in cognitive alterations under ASCs (Vollenweider and Preller, 2020). Certain ASC inductions, namely psychedelics, are thought to disrupt thalamic filtering allowing excess information to reach the cortex. This excess information is therefore unable to be processed due to disrupted communication between cortical brain areas (Geyer and Vollenweider, 2008; Vollenweider and Geyer, 2001; Fig. 12).

The CSTC Feedback Loop model primarily aims to explain the actions of psychedelic drugs inspired by psychosis research specific to the 5-HT_2A receptor (Vollenweider and Geyer, 2001; Vollenweider and Preller, 2020). Given its prominence and specificity, it can contribute to informing ASC classification schemes. For example, there is recent research specifically investigating thalamocortical connections of various ASCs on whether they are hypo or hyperconnected (Amaya, et al., 2023b; Avram et al., 2022; Moujaes et al., 2023; Preller et al., 2019; Schmidt et al., 2020). As such, the CSTC Feedback Loop Model can be considered a classification scheme whereby thalamocortical connectivity is considered a dimension with its high end represented by hyperconnectivity and its low end represented by hypoconnectivity. On this dimension of connectivity, ASCs can be placed based on whether they are thalamocortically hyper or hypoconnected as follows: (1) Thalamocortical Hyperconnected States such as those induced by propofol, LSD, ketamine, D-Amphetamine, MDMA, and flicker light stimulation; (2) Thalamocortical Hypoconnected States induced through multi-modal Ganzfeld[19] and potentially meditation, trance, and hypnosis (Amaya, et al., 2023b; Avram et al., 2021, 2022; Hove et al., 2016; Monti et al., 2013; Moujaes et al., 2023; Schmidt et al., 2020). Some induction methods, such as psilocybin use, can be classified as either hypo or hyperconnected depending on how thalamocortical connectivity is analyzed (Gaddis et al., 2022).

The CSTC Feedback Loop Model, in summation, is a neuro/physio-based classification scheme that suggests phenomenological outcomes of ASCs are largely explained by the perturbance of CSTC feedback loops via the thalamus. It is supported by a growing body of neuroscientific literature showing how some ASC inductions reduce thalamic filtering of incoming information and increase information flow between the thalamus and cortical regions while simultaneously reducing connectivity between association cortices and the rest of the brain (Vollenweider and Preller, 2020).

4.2. Hierarchical alteration scheme

Vaitl et al. (2005) proposed an abstract neurobiological model of ASC induction we call the Hierarchical Alteration Scheme (Fig. 13; Vaitl et al., 2005). The Hierarchical Alteration Scheme illustrates that consciousness depends on the proper functioning and interplay of multiple brain systems that can be impaired such as brain tissue damage, neurotransmitter imbalance, hypo or hypersynchronization, dysconnectivity in neuronal firing, and fluctuations in arousal, as well as the effect of perceptual and cognitive alterations. This conceptual and abstract hierarchical organization helps display the interdependence of the levels and how they can be altered in parallel with any given induction method via their interconnectedness. The scheme's hierarchical nature is further exemplified by how lower levels lay groundwork through higher level changes. For example, changes in brain dynamics can lead to cascading changes in arousal and self-control, displaying a progression of influence at lower levels to higher levels.

One way to use the Hierarchical Alteration Scheme to inform ASC classification is to view each layer as a description of a state's primary mechanism of induction. In this sense, the hierarchy can be used like the method-based induction-domain classifications where each mechanism of induction is categorized by its primary association with a given level, for example: (1) Self-Control altered by techniques that affect cognition and self-regulation such as biofeedback, meditation, and hypnosis (2) Arousal altered by techniques that reduce vigilance such as drowsiness, hypnagogic states, sleep, and dreaming. (3) Sensory Input altered via perceptual hypo or hyperstimulation techniques such as rhythmic stimulation, sensory flooding, deprivation, and homogenization. (4) Neurochemical/Metabolic Processes (Chemistry) altered primarily via conditions like starvation and near-death experiences. (5) Brain Dynamics are altered primarily by conditions such as epilepsy, psychotic disorders, and psychedelic drugs. (6) Structural (brain tissue) is altered primarily by DOCs, such as coma or the minimally responsive state.

For example, one could classify MMGF as primarily a Sensory Input induction because its mechanism primarily involves sensory homogenization; however, its effects are also heavily associated with reduced

[19] Multi-modal Ganzfeld (MMGF) is an ASC induction method done through mechanical sensory homogenization. In this induction, one is subject to a visual and auditory ganzfeld (whole field) typically through wearing ping-pong ball goggles and listening to white noise. While under this induction, participants can report pseudo-hallucinatory experiences such as the perception of colors changing, the appearance of shapes, and even witnessing dream-like imagery (Wackermann et al., 2008; Schmidt and Prein, 2019).

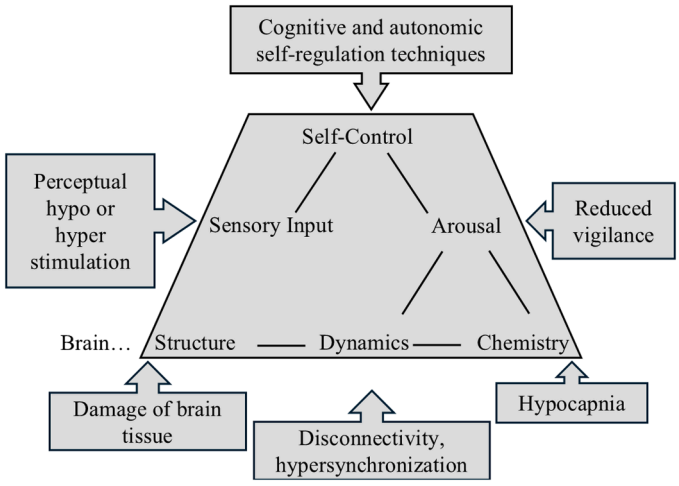

Fig. 13. *Visualization of the Hierarchical Alteration Scheme.* The Hierarchical Alteration Scheme illustrates three levels of alteration horizontally set in the pyramid and their manner of altered state induction. The lines between levels represent their strong interdependence. The first level is that of Self-Control, which can be altered by cognitive, autonomic, and self-regulation techniques. The next level is represented by Sensory Input and Arousal which can be altered via perceptual hypo/hyperstimulation and reduced vigilance respectively. The third level represents Brain Structure, Dynamics, and Chemistry which can be altered by brain tissue damage, dysconnectivity/hypersynchronization, and hypocapnia respectively. Figure recreated by the authors from the source material (Vaitl et al#, 2005).

vigilance at the Arousal level as it mimics hypnagogic states (Wackermann et al., 2008; Schmidt and Prein, 2019). Additionally, MMGF has known effects at the Brain Dynamics level, meaning it must also have an impact on the Neurochemical level (Schmidt et al., 2020; Wackermann et al., 2008). Of note, even associations between inductions and their primary level of action can be blurred. For example, psilocybin can be considered primarily associated with the Neurochemical level and the Brain Dynamics level based on its prominence in association with both the 5-HT_2A receptor and whole-brain hyperconnectivity (Mortaheb and Fort et al., 2024; Nichols, 2016). Although useful, this classification oversimplifies the complex parallel interactions among different levels.

The Hierarchical Alteration Scheme also informs further classification by describing an induction method, and its ensuing effects, at different levels of organization. LSD, for example, can be described at the Self-Control level by impacting emotional regulation, cognitive regulation, and introspection (Kaelen et al., 2015; McGlothlin et al., 1967). At the Arousal level, LSD can lead to disruptions in wakefulness, attention, and alertness (Jarvik et al., 1955; Kay and Martin, 1978). At the Sensory Input level, LSD can lead to vivid complex, and elementary imagery (Schmid and Liechti, 2018). At the Neurochemical level, LSD effects are highly associated with the 5-HT_2A receptor and changes in neurochemical signaling (Nichols, 2016). At the Brain Dynamics level, LSD is associated with whole-brain hyperconnectivity (Avram et al., 2024). At the Structural level, while LSD does not produce damage to brain tissue, prominent effects on neural networks have been reported (Schmidt et al., 2018). In sum, the Hierarchical Alteration Scheme can be interpreted as a neuro/physio-based classification scheme that can further inform classification based on how it produces organizational levels for the description of a given induction method.

4.3. Entropic Brain Hypothesis (EBH)

EBH integrates principles of physics, neurobiology, and psychoanalysis, proposing that ASCs result from changes in entropy, or disorder, of a previously stable brain state like the normal waking state (Fig. 14A; Carhart-Harris et al., 2014; Carhart-Harris, 2018). Entropy, as defined by the authors, refers to the measure of randomness or disorganization in neuronal firing and the corresponding information content of any dynamic system (Carhart-Harris et al., 2014; Carhart-Harris, 2018). As such, one can view ASCs as being classified across this singular dimension of entropy whereby ASCs are marked by changes in entropy, and the normal waking state is viewed as being at a point of criticality between high and low entropy.

Criticality is then a property of a system poised for transition between order and disorder. Super criticality represents chaotic and random neuronal activity which can be seen in seizures, severe mental health episodes, and some ASCs (Carhart-Harris et al., 2014). High entropy can mark the emergence of psychedelic states and low entropy can mark DOCs such as coma and the vegetative state. This point of criticality marks the division between Primary States and Secondary States of ASCs (Carhart-Harris et al., 2014). Primary States are defined as high entropy ASCs involving regressed cognition such as those experienced through LSD, DMT, ketamine, psilocybin, and potentially breathwork (Lebedev et al., 2016; Lewis-Healey et al., 2024; Schartner et al., 2017; Viol et al., 2017). Secondary States are, therefore, low entropy, or entropy suppressed, states involving narrow cognition and, at their most extreme, bring about reduced consciousness (e.g., DOCs). The normal, waking state is maintained at existing just before the Point of Criticality and therefore relies on entropy suppression to maintain itself.

A follow-up on EBH proposed that the subjective quality of any conscious state (i.e., qualia; e.g., the vividness of color or the feeling of pain) can be indexed by measuring the magnitude of entropy in a given spontaneous parameter of brain activity, such as EEG (Carhart-Harris, 2018). This equates uncertainty and information content as almost equal, suggesting the Primary States as both high in entropy and high in phenomenological content. EBH is extended as imposing upper and lower bounds of criticality from which ranges of states can arise to comprise the Critical Zone where the state exists as balancing flexibility and stability, yet it is maximally sensitive to perturbation (Fig. 14B). Moving to this formulation of EBH where the point of criticality becomes the Critical Zone allows for a more nuanced understanding of how entropy indexes Primary and Secondary States by introducing more space for states to occupy as illustrated by the State Range.

In sum, the general themes of EBH are as follows (Rankaduwa and Owen, 2023): 1) Conscious states are classified by the degree of the system's entropy; 2) higher entropy equals greater uncertainty over the system from an external perspective of any observer or technique; 3) the two main states are Primary and Secondary, where Primary represents the primitive, regressed cognition of the pre-ego and Secondary represents the normal, waking state; 4) The ego uses entropy suppression to modulate activity and finesse world representations to maintain Secondary Consciousness; 5) Primary States involve higher criticality than Secondary States where psychedelic states are a paradigmatic example of Primary Consciousness (Carhart-Harris et al., 2014; Carhart-Harris, 2018).

4.4. Bayesian predictive coding models

The concept of predictive coding can be traced back to the work of Hermann von Helmholtz who formulated that unconscious inference allows one to infer the causes of incoming sensory data (Helmholtz, 1867). The ensuing view that most of our brains' computations are based on probabilistic learning and statistical inference has become popular in neuroscience under the catch-all term "Bayesian Brain Hypothesis" (Friston, 2012). Multiple authors formulated hypotheses on how corresponding computational principles might be affected in ASCs, opening the potential for classification of ASCs based on these principles (Carhart-Harris and Friston, 2019; Corlett et al., 2009, 2019). In particular, Predictive Coding Models have become popular as a framework for how Bayesian inference is realized in hierarchically organized cortices.

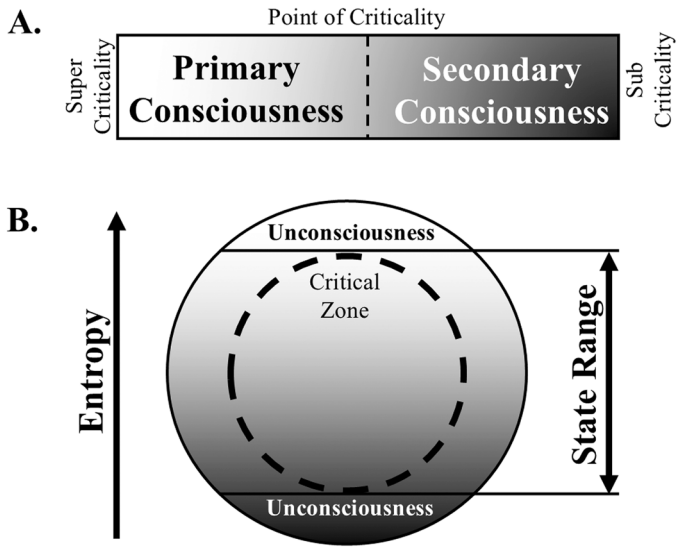

Fig. 14. *Visualization of the Entropic Brain Hypothesis.* The figure illustrates the basic principles of the entropic brain hypothesis. A) A gradient from white (high entropy) to black (low entropy) represents the dimension of entropy and its change. Primary Consciousness represents the area where Primary States can be mapped via high entropy, and Secondary Consciousness represents the area where Secondary States at low entropy can be mapped. These two types are divided by the point of criticality where the system is balanced between flexibility and stability, yet maximally sensitive to perturbation. The normal, waking state exists just before this point. B) The bottom figure represents revisions to EBH. The gradient now visualized as a circle where the Point of Criticality has become a zone existing between high entropy unconsciousness and low entropy unconsciousness. Within this Critical Zone the state is still maximally sensitive, and the range of possible states (State Range) exists between the upper and lower bounds of this zone. This visualization shows greater variation and space for Primary and Secondary States to occupy as marked by the State Range. Figure recreated by the authors from the source material (Carhart-Harris et al#, 2014; Carhart-Harris, 2018).

In short, the cortical hierarchies are thought to implement a generative model which predicts future events in order to make perception and action efficient. Predictions are propagated as top-down signals throughout the hierarchy to be compared to sensory bottom-up information. This comparison happens on every hierarchical level in terms of Bayes' Theorem: predictions (beliefs or expectations) are priors, which are combined with sensory input/observation (likelihood) to compute the actual experienced percept (posterior probability). This computation is thought to make the interpretation of noisy sensory information particularly efficient. When predictions from the inner generative model diverge from actual sensory input, prediction errors are generated and transmitted up the hierarchy as ascending prediction errors, which are then used for learning and the updating of priors (Friston, 2005). In sum, the interpretation of any given sensory input can be considered as the "best-guess" interpretation of noisy sensory signals, given previous learning. Thereby, it is thought that an organism adapts to its dynamic environment in an energy efficient way by more accurately interpreting sensory irregularities.

Predictive models of brain function have been formulated with different degrees of detail and focus. As illustrated in Fig. 15A, hierarchical cortices interact by bottom-up and top-down glutamatergic signal transmission. Bastos et al. (2012) suggested detailed circuitries and specify the neuronal populations within a cortical column, which are thought to realize the central computations on every level of the hierarchy (Bastos et al., 2012). Mostly superficial and deep layer pyramidal cells are thought to implement the computation of Bayes' Theorem, in a balance of inhibitory and excitatory circuitries. Additionally, the balance of NMDA and AMPA receptor signaling in forward and backward projections is thought to be relevant in maintaining normal perception (Corlett et al., 2019; Sterzer et al., 2018).

When predictive mechanisms become unbalanced, the underlying computational principles could explain altered processing seen in psychosis or under the influence of psychedelics, leading to phenomena such as perceptual anomalies (Carhart-Harris and Friston, 2019; Corlett et al., 2019; Sterzer et al., 2018), ego dissolution phenomena (MacLean et al., 2011), delusional beliefs (Corlett et al., 2009; Sterzer et al., 2018), and/or hypersuggestibility (Lebedev et al., 2023). Consequently, Bayesian Predictive Coding Models can be used to classify ASCs in terms of their specific computational aspects (i.e., model parameters) which are altered to produce different types of ASCs. As recent mathematical formulations of Predictive Coding Models are biologically inspired, the affected model parameters can either be termed as biological mechanism (e.g., NMDA-receptor overstimulation) or in computational terms such as changes in the precision of priors.

Here, we will focus on three popular Bayesian Predictive Coding Models used to explain different types of ASCs, namely the Bayesian Framework for ASCs (Corlett et al., 2009), the Relaxed Beliefs Under Psychedelics (REBUS) and Anarchic Brain (Carhart-Harris and Friston, 2019), and the Strong Prior Account (Corlett et al., 2019). All of these models share the view that ASCs are characterized by a disruption in the balance of top-down (predictive) and bottom-up (sensory) signaling; however, they focus on different model parameters.

Originally referred to as the Bayesian Framework for Psychosis, Corlett et al. (2009) aimed to explain the emergence of delusions and hallucinations in terms of predictive coding such that psychotomimetic symptoms (e.g., ASC phenomena) arise with either top-down or bottom-up domination in hierarchical processing (Corlett et al., 2009). This framework allows for the comparison of both pharmacologically and non-pharmacologically induced ASCs. For example, amphetamine (single dosing) and sensory deprivation are considered to induce top-down dominated processing, whereas ketamine, LSD, and cannabinoids are considered to enhance bottom-up signaling. Taken together, the model of Corlett et al. (2009) is of historic importance, although today multiple of its described mechanisms are better understood with more details (i.e., model parameters) that go beyond the mere focus on top-down or bottom-up dominant states.

Building on the Bayesian Framework for ASCs, Corlett et al. (2019) more recently proposed the Strong Prior Account of ASCs, suggesting that hallucinations occur when prior beliefs (i.e., top-down signaling) exert strong influence on perception (Corlett et al., 2019). In this model, hallucinations are thought to primarily originate from increased precision of priors (i.e., when priors are considered as Gaussian, this corresponds to a narrower distribution; Fig. 14B). Consequently, perception is dominated by these overly precise priors, which result in perceptual distortions and hallucinations.

Carhart-Harris and Friston (2019) formulated a predictive coding model to explain the effects of psychedelic drugs, called the Relaxed Beliefs Under Psychedelics (REBUS) and the Anarchic Brain model. It combines the central idea of the EBH, i.e., that increases in entropy lead to ASCs (see above; Carhart-Harris et al., 2014), with Bayesian predictive processing. The REBUS model suggests that priors with less precision (i.e., flatter Gaussian distributions; Fig. 15B), but higher influence, can lead to perceptual misinterpretations when interacting with strong unfiltered sensory bottom-up signals (Carhart-Harris and Friston, 2019). Furthermore, the model posits that this "relaxation" of priors increases the brain's computational flexibility to allow for the updating of priors that may be overly strong (i.e., maladaptive or rigid) in psychiatric illnesses.

Taken together, Bayesian Predictive Coding Models offer the opportunity to classify ASCs in terms of neurobiological, neurochemical and computational mechanisms (Carhart-Harris and Friston, 2019; Corlett et al., 2009, 2019). The existing models for ASCs are formulated with different degrees of granularity, reflecting the progress in understanding the effects of different model parameters on the biological and

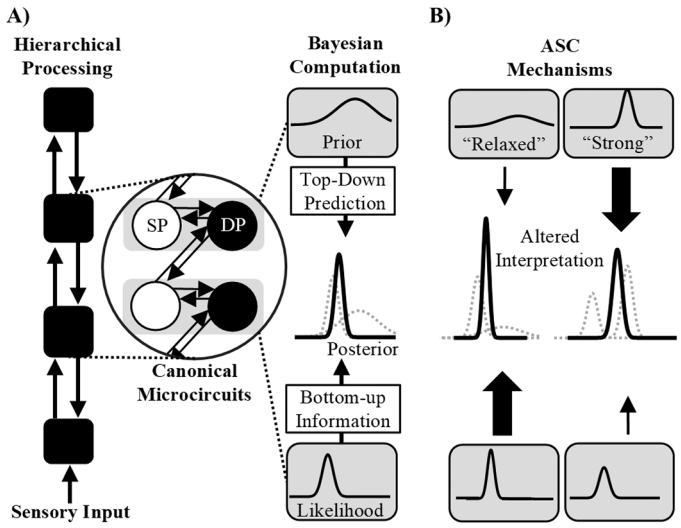

Fig. 15. *Visualization of the General Predictive Coding Model.* A) In an average wakeful state sensory input enters the brain's cortical hierarchy as bottom-up signals. In the specification of the most relevant circuitries of predictive coding, termed canonical microcircuits (Bastos et al., 2012), neuronal populations (circles) of superficial (SP) and deep layer pyramidal (DP) cells are considered computationally relevant. In a dynamic interplay of bottom-up and top-down signaling, their interaction is thought to implement the computation of Bayes' Theorem in an exchange between each level of the cortical hierarchy. At its core, this computation corresponds to the calculation of the difference signal (prediction error) between top-down predictions (based on priors) and sensory bottom-up information (likelihood). The application of Bayes' Theorem results in the posterior, corresponding to the interpretation of a stimulus. The prediction error is consequently used to update the brain's generative model by updating prior beliefs in terms of probabilistic learning. B) Within this computational formulation, different computational aspects (i.e., model parameters) can be altered during ASCs. Carhart-Harris and Friston (2019), speculated that the effects of psychedelics are likely to be explained by "relaxed" priors (less precision), which result in stronger ascending prediction errors. In combination with stronger sensory bottom-up signals (i.e., sensory flooding due to altered thalamic function), perceptual interpretation is less supported by previously learned world knowledge and hallucinations are more likely to occur. In contrast, Corlett et al. (2019) suggest that hallucinations and delusions can be explained by an increased precision of priors. Here, it is thought that the enhanced impact of priors biases perception towards expectations and therefore promotes misinterpretations of sensory signals. These different suggestions illustrate that predictive coding models provide a framework for the classification of ASC phenomena based on different neurobiological or computational parameters (e.g., reduced bottom-up signaling due to NMDA blockage, modulation of the precision of priors or likelihood, strength of bottom-up or top-down effects, and altered propagation of prediction error).

computational level. Thereby models developed starting from mere groupings based on one parameter (e.g., top-down or bottom-up domination) can inform more complex classification by considering multiple model parameters, such as specific neurotransmission, entropy measures, and modulation of priors' precision on different levels of the hierarchy. Future extensions of these models might incorporate active inference to explain the effects of repetitive, monotonous induction methods, such as chanting or the whirling dervish ritual, which create highly predictable sensory stimulation and thereby facilitate entrance into ASCs (Brown et al., 2013; Vilas et al., 2022).

5. Core Features of ASCs: A Provisional Eight-Dimensional Framework

Across the reviewed state-based classification schemes some concepts reappear. To better understand these commonalties, we informally extracted 113 terms from their respective state-based classification schemes via explicitly named features or terms that best represented what a given classification was trying to convey as different features of ASCs. We then organized the extracted terms based on conceptual meaning rather than specific wording (see Appendix A for a list of the original terms and how they were coded for the analysis). After assigning a frequency to each term, they were organized into eight clusters in a face-valid manner where synonymous or overlapping constructs were assigned to shared categories to reduce terminological redundancy. The clusters were then visualized into word clouds using RStudio (Fig. 16; RStudio Team, 2020). Here, the size of the terms reflects the frequency of these concepts across the reviewed classification schemes. Additionally, Table 2 shows how these eight clusters appear across the reviewed state-based classification schemes.

This method complements recent work by Yaden et al. (2024) but differs in its broader historical scope and clustering across frameworks beyond psychedelic questionnaire data. In the present review, we go beyond ASCs induced by psychedelics and aim to provide an overview and synthesis for all types of ASCs. For example, while Yaden et al. (2024) cluster terminology across selected questionnaires used in psychedelic drug studies, we cluster terminology across frameworks that span the whole history of ASC research. Finally, while Yaden et al. (2024) performed clustering on questionnaire terms, it was done in a purely face-valid manner whereas our clustering is supplemented by coding key words and terms (see Appendix A). Ultimately, these reviews complement each other when aiming to search for clinically relevant phenomenology.

(1) Perception and Imagery. Most classification schemes consider distortions of perceptions, such as auditory and visual hallucinations, as integral parts of ASC experiences with gustatory, olfactory, tactile, and kinesthetic changes also mentioned (Dittrich, 1998; Farthing, 1992; Ludwig, 1966; Pekala et al., 1986; Studerus et al., 2010; Tart, 1975/1983; Vaitl et al., 2005). These changes in the Perception and Imagery feature are viewed as quintessential to many ASC experiences, e.g., psychedelics are sometimes referred to as hallucinogens (Nichols, 2004; Osmond, 1957). Some authors emphasize the difference of a percept being considered as real compared to the ability of a person to identify it as an illusory perception. This differentiation is sometimes referred to as the distinction between hallucinations and pseudo-hallucinations (Hare, 1973; Jaspers et al., 1913/1963; Königsmark et al., 2021).

Another distinction can be found between changes in how the outside world is sensed and changes in fantasy or mental imagery, while both might be more or less under volitional control (Farthing, 1992). A further common distinction within the cluster is made between simple and complex content, e.g., the 11-ASC has both the Elementary Imagery factor and the Complex Imagery factor (Studerus et al., 2010). Simple visual phenomena are typically described to include basic shapes, colors and patterns, while more complex visual phenomena include dream-like imagery with various content, such as seeing archaic dream motifs (Grof, 1972; Wackermann et al., 2008) or perceiving fantastical beings or gods (Gallimore and Luke, 2015; Grof, 1972; Leary et al., 1964/2000; Lilly, 1972/2017; Luke, 2011; Tramacchi, 2006). Specifically complex visual content is often thought to interact with other aspects of ASCs, for example with mystical experiences or affect such as in the case of unfamiliar visual content causing anxiety.

(2) Bodily Sense. Various ASC classification schemes mention

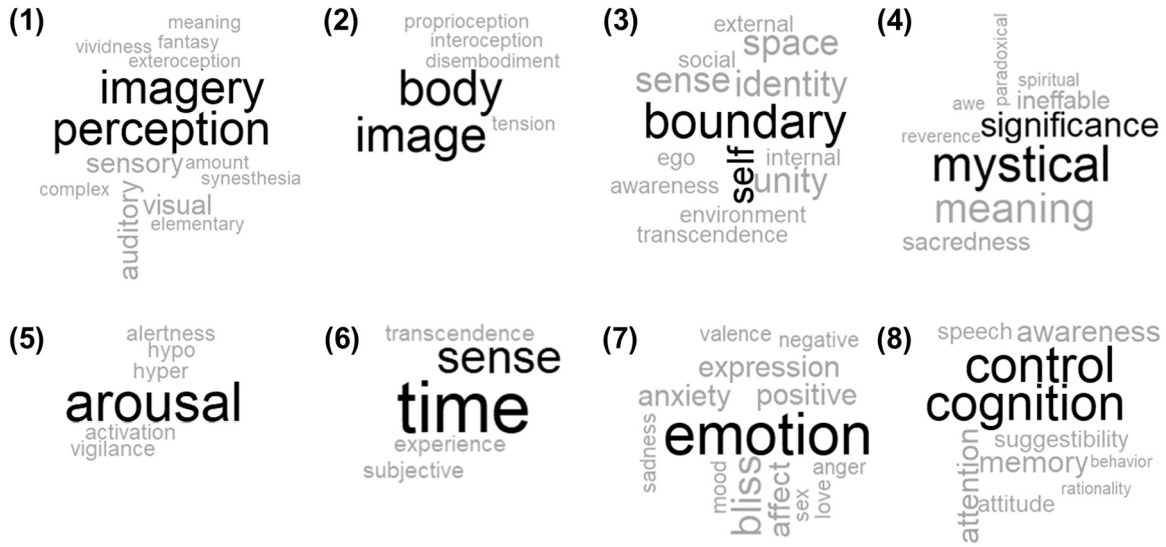

Fig. 16. *Core Features of ASCs: A Provisional Eight-Dimensional Framework.* The figure represents word-cloud clustering to visualize the common core features of changed subjective experience implicated under ASCs as they are covered across the reviewed classification schemes. 113 extracted terms generated eight clusters/core features which could be termed as follows: (1) Perception and Imagery, (2) Bodily Sense, (3) Self-Boundary, (4) Mystical Significance, (5) Arousal, (6) Time Sense, (7) Emotion, and (8) Control and Cognition. The size of the terms reflects the frequency of these concepts across the reviewed classification schemes.

changes in the sense of one's own body and/or implicate bodily systems such as proprioception and interoception (Dittrich, 1998; Farthing, 1992; Ludwig, 1966; Metzner, 2005a; Pekala et al., 1986; Studerus et al., 2010; Tart, 1975/1983). For example, the PCI and 5D-ASC include items assessing experiences like feeling expanded beyond one's body boundaries (Dittrich, 1998; Pekala et al., 1986; Studerus et al., 2010). Intense ASCs, such as those brought about by strong psychedelic drugs or near-death-experiences, can sometimes lead to out-of-body experiences which exemplify Bodily Sense alterations (Fritz et al., 2023; Lilly, 1972/2017; Timmermann et al., 2018). For instance, Lilly described feeling disembodied during a near-death experience, later resembling his LSD experience (Lilly, 1972/2017). While such anecdotes abound, there is still debate around whether there is enough empirical data to consider out-of-body experiences an essential component of near-death experiences (Fritz et al., 2023, 2024; Parnia, 2014). Together, investigations on changes in the Bodily Sense feature, and its interrelatedness with the Time Sense and Self-Boundary features, can offer insights into ASC mechanisms and consciousness research (Hruby et al., 2024; Kent and Wittmann, 2021).

(3) Self-Boundary. The dissolution of self-boundary, sometimes referred to as a sense of unity or oneness, is a central theme across multiple ASC classifications[20] (Dittrich, 1998; Farthing, 1992; Ludwig, 1966; Pahnke, 1963; Pekala et al., 1986; Studerus et al., 2010; Tart, 1975/1983; Wilber, 1975). Diverse terminology describing this experience can be found across the literature such as losing the sense of self (Millière et al., 2018), oneness with life or the universe (Grof, 1972), depersonalization and derealization (Lindahl and Britton, 2019; Millière et al., 2018; Sleight et al., 2023), ego-loss (Leary et al., 1964/2000; Nour et al., 2016), ego-dissolution (Dittrich, 1998; Klee, 1963; Nour et al., 2016), ego disintegration (Nour et al., 2016; Sachar et al., 1970), ego-death (Grof, 1980; Nour et al., 2016), or unity (Pahnke, 1963; Studerus et al., 2010). When such experiences include positive valence, it has been more broadly, and metaphorically, termed Oceanic Boundlessness (Dittrich, 1998). Conversely, Dread of Ego Dissolution is used when these experiences involve negative affect (Dittrich, 1998). Lilly previously referred to this relationship between Self-Boundary dissolutions and emotional valence in the formation of the Positive and Negative Classical Satori States (Lilly, 1972/2017).

The concept of unity experiences is closely linked to the Self-Boundary feature as it often describes a sense of oneness with the environment that can arise from its dissolution. For example, Unity, according to Pahnke, can be experienced either internally or externally. Internal unity refers to a dissolution of the self/other boundary, leading to a feeling of merging with pure awareness (Pahnke, 1963). On the other hand, external unity involves a sense of oneness with animate or inanimate external objects (Pahnke, 1963). Modern ASC research further explores self-boundary dissolution through depersonalization and derealization experiences, which involves feelings of disconnection from the self and altered perceptions of reality (Lindahl and Britton, 2019; Millière et al., 2018; Sleight et al., 2023).

(4) Mystical Significance. A heightened feeling of significance during and after ASC experiences are described by multiple authors (Dittrich, 1998; Farthing, 1992; Ludwig, 1966; Pekala et al., 1986; Studerus et al., 2010) that can also be experienced as mystical or religious[21] (Grof, 1972; Leary, 1964; Lilly, 1972/2017; Pahnke, 1963; Wilber, 1975). The most notable examples were reported by Pahnke and replicated by Griffiths et al. (2006), where participants of the Good Friday experiment rated their psilocybin-induced experiences as among the most significant experiences of their lives (Griffiths et al., 2006; Nichols, 2016; Pahnke, 1963). There appears to be a relationship between the significance and overall intensity of an ASC, especially when the experience is perceived as meaningful in a spiritual or mystical context. For example, items such as "I experienced a kind of awe," contribute to the factor Spiritual Experience (Dittrich, 1998; Studerus et al., 2010), while "I felt very profound," and "I gained clarity into connections that puzzled me before," belong to the factor of Insightfulness. Research has shown that the mystical-type effects measured by both the 5D-ASC and MEQ are strongly intercorrelated when used to measure the same subject undergoing an ASC, such that Oceanic

[20] It is important to note that a sense of oneness and self-boundary dissolution are not inherently linked as one can feel a sense of oneness with the self-boundary still intact; however, they often coincide. For simplicity, they were reviewed together under the Self-Boundary cluster.

[21] Due to the nebulous nature of the term "mystical" (see Mosurinjohn et al., 2023) we decided to name this cluster alongside its second most frequent term (significance) for better context and clarity.

Table 2
Classification Schemes Implicated in the Core Features of ASCs. The core features of ASCs and which classification scheme mentions them as visualized in a table.

	Perception and Imagery	Bodily Sense	Self-Boundary	Mystical Significance	Arousal	Time Sense	Emotion	Control and Cognition
Categories of a Typology of Mysticism			X	X		X	X	X
Subjective-Intensity Scheme				X				
General Characteristics of ASCs	X	X		X		X	X	X
The Arica System	X			X			X	
Cartography of Ecstatic and Meditative States					X			
Varieties of Transpersonal Experience				X				
The Spectrum of Consciousness			X	X				
Subsystems of ASCs	X	X	X			X	X	X
Etiology-Independent Structures of ASCs	X	X	X	X	X		X	X
Empirical-Phenomenological Approach	X	X		X	X	X	X	X
Dimensions of Changed Subjective Experience in ASCs	X	X		X	X	X	X	X
General Heuristic Model of ASCs		X	X			X	X	X
Arousal-Hedonic Scheme					X		X	
Four-Dimensional Descriptive System			X		X			X
Three-Dimensional Sphere (3DS) Models						X	X	X
Total	**6**	**6**	**6**	**9**	**6**	**7**	**10**	**9**

Boundlessness shows a strong, positive correlation with total mystical scores (Liechti et al., 2017).

Sometimes, mystical experiences are reported as ineffable due to their felt incongruence with the objective reality (Ludwig, 1966; Pahnke, 1963). Language limitations often hinder the full articulation of these expereinces, leading to the use of metaphoric, archaic, or religious terminology which can introduce conceptual difficulties (Grof, 1972; Leary, 1970; Pahnke, 1963). Glicksohn (1993) discussed the literature suggesting that ineffability might come with a neurocognitive shift to right-hemispheric dominance, favoring non-language dependent cognition, however, hemispheric asymmetries did not gain major attention in contemporary neuroimaging work on ASCs.

Psychometric tools capture the variation of these mystical experiences. For example, the PCI's minor dimension of Altered Meaning is mainly comprised of items related to mystical interpretations. Similarly in the MEQ, the concept of Sense of Sacredness is formulated, which implicates feelings of awe and relevance that must involve, per their definitions, elevated feelings of meaning (MacLean et al., 2012; Pahnke, 1963; Pekala et al., 1986). The aim of these measures is to quantify the personal significance that is often associated with such experiences. However, the term "meaning" is not always used to refer to the significance or personal relevance of an experience. For example, the 11-ASC factor Changed Meaning of Percepts relates to interpretation regarding perceptual processes, and therefore relates more to the Perception and Imagery feature (Dittrich, 1998; Studerus et al., 2010). Taken together the conceptualizations of changed meaning in the literature varies and thereby emphasizes the non-independence of perception and imagery, mystical interpretations, and the general evaluation of an event as important for oneself.

(5) Arousal. Across ASC classification schemes, changes in awareness, reactivity, vigilance, and wakefulness are described in a varied manner (Dittrich, 1998; Farthing, 1992; Fischer, 1971; Metzner, 2005a; Vaitl et al., 2005). While the term "arousal" lacks precision in distinguishing between emotional and physiological arousal, it is clustered here based primarily on its conceptual and psychometric use in relation to how energetic one feels.

While Fischer and Metzner frame arousal similarly, what differs is Metzner's inclusion of the Hedonia dimension, Metzner suggests that arousal together with emotion are sufficient to categorize ASCs (Fischer, 1971, 1992; Metzner, 2005a). Through the dimension of Activation, defined as the readiness of an individual to interact with their environment, Vaitl et al. (2005) also refer to the importance of arousal. This concept of readiness relates to wakefulness, as discussed by Farthing, who defines the dimension of Changes in Arousal as including specific arousal states, such as hypnagogic states related to sleep (Farthing, 1992).

The concept of arousal is also captured in questionnaire items measuring wakefulness or vigilance. For example, the 5D-ASC includes the dimension of Vigilance Reduction to assess how awake one is (Dittrich, 1998). Of note, the Arousal feature could also be referred to as Wakefulness or Alertness given the varied use of terminology across the literature.

(6) Time Sense. The impact of ASCs on subjective time has been extensively documented in various writings and classification schemes. Early 20th-century philosopher Walter Benjamin and author Aldous Huxley both described the time-altering effects of substances like hashish and mescaline, highlighting a sense of timelessness and eternity (Benjamin et al., 2006; Huxley, 1928/2009a; Wittmann, 2018). Grof's work categorized ASC experiences, such as Temporal Expansion, where one's sense of time encompasses past, present, and future (Grof, 1972). Changes in the Time Sense feature are represented in psychometric measurements like the MEQ, capturing experiences of time standing still or feeling endless where it is sometimes referred to as eternity or infinity (MacLean et al., 2012; Pahnke, 1963). The 5D-ASC and PCI also measure changes in the Time feature, with the former assessing both positive and negative valences of this phenomenon (Dittrich, 1998; Pekala et al., 1986; Studerus et al., 2010).

Empirical evidence suggests that changes in the Time Sense feature are not limited to pharmacological inductions but are observed across various ASC induction methods, including sensory deprivation, sensory homogenization, and meditation (Berkovich-Ohana et al., 2013; Glicksohn et al., 2017; Kübel et al., 2021). These distortions are intricately linked to the Self-Boundary and Bodily Sense features, indicating a weakening of the sense of body boundaries (Dittrich, 1998; Pahnke, 1963; Studerus et al., 2010). Recent research has demonstrated such weakening together with a distortion of time sense in Floatation-REST (Restricted Environmental Stimulation Therapy; Hruby et al., 2024) which are comparable to the weakening of body boundaries during meditation in meditation-naïve (Dambrun, 2016) and experienced meditators (Linares Gutiérrez et al., 2022) with the latter also reporting a diminished sense of time (Berkovich-Ohana et al., 2013; Droit-Volet and Dambrun, 2019). In sum, the Time Sense feature represents an aspect of ASCs that are heavily interrelated with Self-Boundary dissolutions and changes in Bodily Sense.

(7) Emotion. Emotional experiences are central to many ASC classification schemes (Berkovich-Ohana and Glicksohn, 2014; Dittrich, 1998; Farthing, 1992; Lilly, 1972/2017; Ludwig, 1966; Metzner, 2005a; Paoletti and Ben-Soussan, 2020; Pekala et al., 1986; Studerus et al., 2010). Both positive emotions such as love, bliss, joy, sexual excitement, and negative emotions such as sadness, fear, pain, and anxiety are

commonly reported during ASCs. The conceptual importance of the Emotion feature in ASCs is notably explored by Lilly where he attempted to map states in regard to their subjective intensity and emotional valence (Lilly, 1972/2017). For instance, the Positive Classical Satori State represents a peak blissful experience while the Negative Classical Satori State is defined as a feeling of hell. This demonstrates how the Emotion feature is deeply interrelated with the Mystical Significance feature.

Psychometrically, Pahnke demonstrates this interrelatedness of the Emotion and Mystical Significance features. For example, two dimensions mentioned in the Categories of a Typology of Mysticism, which would later lead to various forms of the MEQ, are Deeply Felt Positive Mood and Persisting Positive Changes in Attitude and Behavior which evidence how positive emotions are measured as part of a mystical experience (Barrett et al., 2015; Pahnke, 1963; Stocker et al., 2024). This is seen in the Good Friday Experiment where participants described intense joy, bliss, and love under psilocybin (Pahnke, 1963). The 5D-ASC similarly assesses the Emotion feature via the Oceanic Boundlessness dimension (positive) and the Dread of Ego Dissolution dimension (negative). These are represented more specifically by factors such as Blissful State and Anxiety (Dittrich, 1998; Studerus et al., 2010). The PCI also assess the Emotion feature through the minor dimensions of Joy, Love, and Sexual Excitement (positive) and through the minor dimensions of Anger, Fear, and Sadness (negative; Pekala, 2013; Pekala et al., 1986). Of interest, research has shown interrelatedness between ratings of emotion such that positive mood measures in the MEQ show a strong, positive correlation with Oceanic Boundlessness in the 5D-ASC (Liechti et al., 2017).

(8) Control and Cognition. Various alterations in cognitive functions, including memory distortions, impaired rational thought, increased suggestibility, and reduced volitional control, are frequently reported across ASC literature. These effects, broadly understood as changes to cognition, are often interrelated yet conceptually independent, encompassing a range of higher-order processes. Within the 5D-ASC, for example, difficulties in decision-making or in maintaining coherent thought are evaluated, particularly in states like alcohol intoxication, though these features are less prominent in "classic psychedelic states." In addition, decreased volitional control is reflected in subjective reports of lacking agency or feeling controlled "like a marionette" (Dittrich, 1998; Studerus et al., 2010).

Importantly, while control is a subset of cognition, it emerged so prominently in ASC literature that it sometimes appears alongside cognition rather than within it. This is evident primarily in the 11-ASC scoring scheme where Impaired Control and Cognition is a distinct factor suggesting their conceptual entanglement. This is also supported by our informal synthesis of core features across state-based schemes where control and cognition appear to be discussed with similar frequency and importance. As such, the cluster Control and Cognition[22] is meant to represent the particular importance of control, or volition, in ASCs when talking about broad changes to cognition.

Several researchers attempt to parse the functions of cognitive changes under ASCs in varying ways. Ludwig separates Alterations in Thinking, Hypersuggestibility, and Loss of Control which is similar to the distinction of different cognitive functions found in Farthing's work (Farthing, 1992; Ludwig, 1966). The PCI assesses the Cognitive feature through major dimensions like Internal Dialogue (e.g., as a result of decreased volitional control), Rationality, Control, and Memory (Pekala, 2013; Pekala et al., 1986). Farthing mentions Changes in Attention, Changes in Inner Speech, Changes in Memory, Changes in Higher-Level Thought, Changes in Self-Control, and Changes in Suggestibility as separate, orthogonal dimensions (Farthing, 1992). Tart separates Memory from Evaluation and Cognitive Processing, but does not further subdivide dimensions relating to Cognition (Tart, 1975/1983). Metzner implicates Cognition via the dimension of Alterations in Thinking and Attitude, which represents a broader attempt at classifying changes to cognition under ASCs (Metzner, 2005a).

Of additional interest is where ASC classification schemes overlap in their contextualization of Cognition. Ludwig, through the General Characteristics of ASCs, discusses cognitive alterations as "subjective disturbances," where "archaic modes of thought predominate," echoing Jaynes' bicameral mind hypothesis and Carhart-Harris' entropic brain hypothesis (Carhart-Harris et al., 2014; Jaynes, 1976/2000; Ludwig, 1966). While Jaynes suggests archaic consciousness through the bicameral mind hypothesis, Ludwig and Carhart-Harris propose ASCs as a regression to a primal state, marked by impaired reality perception and blurred cause-effect distinctions. According to Jaynes, lack of volitional control may lead to internal speech proliferation associated with archaic consciousness, implying susceptibility to inner dialogue perceived as divine commands (Farthing, 1992; Jaynes, 1976/2000).

Taken together, the Control and Cognition feature is a "catch-all" cluster for diverse cognitive functions affected by ASCs. It is plausible that diverse cognitive impairments can occur during ASCs. While most classification schemes discuss some of them, there is no proper consensus on whether they should be considered as defining features of ASCs or rather are simply epiphenomena of other features. Nonetheless, the prominence of volitional disruption across these state-based schemes suggests that future attempts at classification may benefit from explicitly addressing the intersection of control and cognition.

6. Discussion

This review synthesized the development of classification schemes for ASCs, tracing their evolution across three major domains: subjective experience (state-based), induction methods (method-based), and underlying neurophysiological mechanisms (neuro/physio-based). In total, we reviewed 23 ASC classification schemes: 15 state-based, four method-based, and four neuro/physio-based. Our aim was to clarify how historical, conceptual, and empirical developments have shaped ASC classification and to unify overlapping, but previously disconnected frameworks, to lay a foundation for future research.

The conceptualization of human consciousness, and our understanding of its alterations, whether in psychopathology or induced states, has co-evolved alongside developments in the philosophy of mind, psychology, and medicine, as well as broader societal influences, including religious and cultural worldviews. Contributions to the field have come from a wide range of authors across disciplines and with varying degrees of scientific rigor. Some, like Timothy Leary, offered more conceptual and culturally influential ideas, while others, such as Adolf Dittrich or Ronald Pekala, pursued empirical, data-driven approaches to classification (Dittrich, 1975; Leary, 1964; Pekala and Levine, 1981). As a result, the scientific quality and methodical grounding of the classification schemes discussed in this review are variable. This diversity in origins and approaches laid the foundation for how ASCs would later be framed within more clinical and neuroscientific paradigms. For example, the work of Stanislav Grof influenced some modern neuroscientific models (Carhart-Harris et al., 2014).

As psychology and neuroscience co-evolved, early classifications of ASCs were increasingly shaped by clinical frameworks. Early neurophysiological models were often rooted in psychopathology, exemplified by the terms "model psychoses" or "psychotomimetic" referring to ASCs induced by psychedelic drugs (Costines and Schmidt, 2024; Hofmann, 1959; Osmond, 1957). These ideas reflected the broader *Zeitgeist* of psychiatry at the time, in which some ASC experiences were compared to symptoms of schizophrenia or depersonalization (Blankenburg, 1971/2012; Scharfetter, 1981, 1995). More recent approaches have moved beyond purely psychopathological framings

[22] It is important to note that this cluster could have also been called Volition and Cognition as the term volition is often used interchangeably with control. Some psychometric instruments, like the PCI, place the terms side by side, as evidenced by the major dimension of Volitional Control.

toward formalized neurocognitive models, reflecting broader shifts in neuroscience. Frameworks such as the Cortico-Striato-Thalamo-Cortical (CSTC) Feedback Loop Model, Entropic Brain Hypothesis (EBH), and Bayesian Predictive Coding Models interpret ASCs in terms of changes in neural dynamics, connectivity, and information processing (Carhart-Harris et al., 2014; Carhart-Harris and Friston, 2019; Corlett et al., 2019; Vollenweider and Geyer, 2001; Vollenweider and Preller, 2020). Taken together, the historical development of ASC classification reflects the prevailing *Zeitgeist* in terms of terminology, conceptualization, purpose, and emphasis on mechanistic explanation.

While state-based classification schemes remain the most conceptually distinct due to the irreducible nature of first-person phenomenology, method-based and neuro/physio-based schemes increasingly overlap in their shared grounding in physical mechanisms. Understanding how these three classification types interrelate remains crucial for ongoing research, particularly in clinical contexts where the therapeutic effects of ASCs may depend on the interaction between induction method and phenomenological quality.

6.1. On method and neuro/physio-based classification schemes

In this review, we suggested the consideration of method-based classification schemes as those that describe how to induce an ASC. The described schemes focus on the methods or techniques used to induce ASCs rather than the subjective experiences or neuro/physiological mechanisms. Neuro/physio-based classifications, while similar, differ in that they focus on specifying neurobiological and physiological mechanisms underlying ASCs which can be used to suggest their classification.

It is important to note the critical difference between state-based and method-based classification schemes. Method-based schemes detail physical and/or physiological processes, while state-based approaches describe “how it feels” to experience an ASC. It is further important to note the distinction between a description of a physical process and the description of the quality of an experience. It is not possible to fully explain how something feels like by describing a physiological process, as subjective experiences are bound to the first-person perspective. Whatever language or physical descriptions are used, it is not possible to make such a description fully explanatory. For example, describing “pain” as the firing of C-fibers fails to capture the experience of pain itself (Levine, 1983). While a physical process can be fully explained, e.g., by mathematical formulations and laws of physics; this is not the case for subjective experiences. This distinction is of critical importance to ongoing debates in the philosophy of mind, particularly concerning such concepts as "qualia," the "hard problem of consciousness," and the "explanatory gap" (Chalmers, 1995). It is crucial to acknowledge the epistemic constraints inherent in the endeavor to elucidate subjective experiences through descriptions of physical processes alone. This epistemic limitation needs to be considered when discussing how to improve and further develop classification schemes for ASCs. Namely, it will not be possible to reduce the state-based classification schemes to descriptions of underlying neuro/physiological processes. However, it might be possible to gain detailed descriptions of the physiological processes that give rise to a specific subjective experience.

On the other hand, method-based and neuro/physio-based schemes can, in principle, be reduced to physical processes. This is the case as they both describe physical processes that happen during the subjective experience of ASC phenomena. While method-based schemes focus on external conditions that induce ASCs, neuro/physio-based schemes rather describe internal biological processes during these experiences. The case of drugs and the description of their pharmacological action on the brain can be seen as a bridge between both types of schemes; moreover, descriptions of stimuli that induce ASC phenomena can detail physiological reactions, (e.g., entrainment effects seen in neural activity upon stroboscopic light stimulation; Notbohm and Herrmann, 2016). Together, these illustrate that method-based and neuro/physio-based classification schemes can, in principle, be reduced to one scheme given they both describe physical processes, and their distinction is not clear-cut.

In order to identify neuro/physiological correlates of specific subjective ASC phenomena it will be specifically beneficial to focus on method-based classification schemes. With a better understanding of the setting (i.e., physiological and/or environmental conditions), the set (i.e., internal factors captured with state or trait measures), and the induction method (e.g., psilocybin or stroboscopic light stimulation) researchers can better use ASCs for basic or applied investigation. The key question, however, is not identifying sufficient neural processes, but rather the minimal necessary neural mechanisms required for a specific experience. For example, hallucinations can occur when psychedelic drugs activate 5-HT_2A receptors and cause downstream changes in neural activity; however the same, or highly similar, phenomenology can be experienced during stroboscopic light stimulation (Amaya, et al., 2023a; Bartossek et al., 2021) or by sensory homogenization (Schmidt et al., 2020; Schmidt and Prein, 2019; Wackermann et al., 2008). Since these non-pharmacological induction methods do not directly stimulate 5-HT_2A receptors, it appears that such receptor stimulation is not a necessary neural correlate of visual hallucinations. With this information, neuroscience can look for other neural mechanisms which are shared by all three conditions. For example, recent studies have highlighted the potential significance of alterations in the thalamocortical loop as a neural correlate for visual hallucinations, as an example of a description on the computational level (Amaya, et al., 2023; Metzinger, 2004; Schmidt et al., 2020).

Taken together, method-based classification schemes have gained the least attention in comparison to state or neuro/physio-based classification schemes. While ultimately method- and neuro/physio-based schemes might be reduced to the maximally complete description of physical processes that accompany an ASC, state-based classification schemes will remain distinct, due to their private nature (i.e., first-person perspective) of subjective experiences. A more detailed understanding of these classification schemes may help to identify correlations between subjective experiences and underlying physiological processes, thus improving the classification of ASCs.

6.2. Generation and expansion of classification schemes

Classification schemes are designed as tools to address specific questions or problems, and their utility often depends on the context of the inquiry. For example, one may find the Subjective-Intensity Scheme useful in contextualizing work on subjective experiences in pharmacologically induced ASCs. However, their context-specific nature highlights the need for expanding and refining classification schemes. One candidate for possible expansion in this review involves the Vaitl et al. (2005) Induction-Domain Classification Scheme previously covered (see Induction-Domain Classification Schemes; Vaitl et al., 2005). For a brief review, the nomenclature from Vaitl et al. (2005) conceptualized a clustering of ASC induction methods, such as those that are psychologically or pharmacologically induced. However, psychological inductions seem to be extremely variable in their mechanisms of induction as they include sensory deprivation, homogenization, sensory overload, rhythm-induced trance (e.g., drumming and dancing), relaxation, meditation, hypnosis, and biofeedback. Since research has shown that perceptual deprivation shares similarities with both hypnagogia (i.e., the transition period from wakefulness to sleep) and hypnosis, it is clear that their induction is not primarily driven by sensory homogenization, meaning there is room for the classification scheme to expand and become more descriptive (Marcusson-Clavertz et al., 2012; Moujaes et al., 2023; Wackermann et al., 2008).

Classifications of pharmacologically induced ASCs, by contrast, are void of this issue by usually involving some sort of further classification to distinguish their mechanism of action, such as the Neuroscience-based Nomenclature (NbN) and other specific drug classification

schemes (Volgin et al., 2019; Zohar et al., 2015). The lack of mechanistic distinctions between psychological inductions compared to their pharmacological counterparts necessitates further classification beyond merely being psychologically induced with different practices. Empirical work on sensory inductions involving sensory overload via stroboscopic light stimulation, sensory homogenization via MMGF, and sensory deprivation via Floatation-REST exemplifies how they can exist as a further classification of psychological inductions (Amaya, et al., 2023a; Amaya, et al., 2023b; Hruby et al., 2024; Montgomery et al., 2024; Schmidt et al., 2020; Schmidt and Prein, 2019).

In order to advance classification schemes, it would be beneficial to gather extensive empirical data, in the sense of data driven phenomenology. This refers to a systematic quantitative exploration of all types of ASC phenomena. One possibility is to gather data from large samples and move away from laboratory or questionnaire studies towards citizen science. In brief, citizen science refers to the engagement of the general public in scientific research (Vohland et al., 2021). While data quality via this method is typically lower, the sheer amount of data can allow new types of analyses and iterative improvement and testing of questionnaire items. Aside from the existing platforms where trip reports are collected (e.g., Erowid), recent initiatives aim to collect data more systematically (e.g., The Altered eXperience Project; Schmidt et al., 2023). Over time, these approaches could become an important resource for mapping the diverse range of altered experiences in ASCs to find reliable commonalities between them.

Generating new, and extending current, classification schemes is also relevant for potential clinical applications of ASCs, such as in psychedelic assisted psychotherapy (see also Yaden et al., 2024). Significant, and sometimes, ineffable experiences in ASCs can be challenging to understand giving the prominence of mystical and religious language used to describe them (Leary, 1970). Yet, these experiences appear relevant in modern psychiatry, particularly in studies involving psychedelic compounds (Griffiths et al., 2008; MacLean et al., 2011; Rotz et al., 2023; Timmermann et al., 2024; Yaden and Griffiths, 2021). This suggests the importance of these experiences under psychedelic drugs for positive clinical outcomes. Such empirical work aligns with Aldous Huxley's notion of a universal need for self-transcendence through these supposed "doors of perception," (Huxley, 1954/2009a). Andrew Weil further expanded on this idea, suggesting a biological drive to alter consciousness surpassing even the urge for sexual gratification (Grof, 2019; Weil, 2004). Together, the generation and expansion of classification schemes could assist in unraveling ineffable experiences to pinpoint their precise phenomenology components for clinical benefit (for a more comprehensive overview see Mosurinjohn et al., 2023).

There are also several classification schemes that are less well known but deserve mention. The historical perspective on contributions from the German literature could be more thoroughly integrated into the main discussion to provide a richer context for contemporary classification efforts. For example, Passie (2007) summarizes several notable approaches in German that are briefly mentioned here as they do not have sufficient international attention to warrant reviewing them to a greater extent (Passie, 2007). Among these are Müller-Freienfels' *Psychologie der Erregungszustände* (Müller-Freienfels, 1910), Siegfried Behns' work that provided a suggestion for classification which was extended by Gruehn (Gruehn, 1926; Passie, 2007); Rosenfeld's *Enzyklopädie der Bewusstseinsstörungen* (Rosenfeld, 1929), Thomas' work that differentiated between *überwache* and *unterwache*, that is, over-awake and under-awake states (Thomas, 1973), and Fromm's work that elaborated on the description of primary and secondary processes that are rooted in Freudian theory, similar to other classification schemes such as the Entropic Brain Hypothesis (Carhart-Harris et al., 2014; Fromm, 1977; Grof, 1976).

Alexander ("Sasha") and Ann Shulgin describe a simple rating method that contributed to their foundational work[23] in characterizing psychoactive drug effects (Shulgin and Shulgin, 1990). They rated subjective effects of drugs on five levels of intensity to denote the strength and clarity of the experience. Overall, this method is similarly reductionistic as both Leary's Subjective-Intensity Scheme and the Arica System of John Lilly (Leary, 1964; Lilly, 1972/2017). Similarly, modern psychedelic drug research uses simple ratings of positive and negative drug effects as global indices of psychedelic experience (Holze, Becker, et al., 2023). While these methods allow a systematic comparison between subjective effects, they are somewhat too simplistic to be considered a classification system of ASCs and therefore are not discussed further here.

Of note, there is a noticeable lack of attention to non-Western perspectives on ASCs, which could provide valuable cross-cultural insights into altered states. Considering the exclusion of these perspectives, our review does not provide a full history of every ASC classification scheme. Instead, it represents a contemporary endeavor aimed at consolidating and simplifying present-day terminology through a comprehensive narrative review.

6.3. Summary

Throughout the history of ASC research, numerous classification schemes have been proposed. In this review, we offered an overview of these descriptions, aiming to summarize them and inspire future research endeavors while paying homage to the foundational work laid by previous researchers. By doing so, we hope to prevent redundant efforts at investigating ASCs and to avoid overlooking significant conceptual groundwork. The presented synthesis of the classification schemes in our clustering suggests approximately eight core features of ASCs. With this, we suggest an informal start to a comprehensive phenomenological state space model that can encapsulate the vastness of subjective experience under different ASCs. Importantly our synthesis, particularly as illustrated in Fig. 16, highlights the diversity of terminology used across the literature while also revealing underlying conceptual overlaps. The provided summaries of classification schemes aim to offer a concise, accessible overview of the literature and to support future questionnaire development by providing appropriate terminology and aiding in the operationalization of relevant constructs. Ultimately, this will help identify neural correlates of clinically relevant phenomenological features of ASCs. Of additional importance, while considerable attention has been paid to describing the physiological and neurobiological mechanisms of pharmacologically induced ASCs, less focus has been given to classifying non-pharmacological induction methods, or what some may call consciousness-modifying techniques. A parallel exploration of the core phenomenal features of ASCs alongside their physiological and neurological underpinnings may serve as a foundation for identifying neural correlates of consciousness. This perspective holds promise for ASC research, potentially shedding light on neural mechanisms shared with psychopathological symptoms, such as those underlying hallucinations.

Declaration of Competing Interest

We have no conflicts of interest to disclose.

[23] The collected foundational work of the Shulgins refers both to their books *Phenethylamines I Have Known and Loved (PiHKAL): A Chemical Love Story* and *Tryptamines I Have Known and Loved (TiHKAL): The Continuation* both of which are considered landmark publications in psychedelic science (Andrews and Wright, 2022; Shulgin and Shulgin, 1990, 2002).

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Appendix A

A list of all the extracted terms and how they were coded, based on conceptual meaning, for word cloud clustering.

- Perception and Imagery Cluster:
  1. Perceptual Distortions (Ludwig – perception1)
  2. Changes in Perception (Farthing – perception2)
  3. Altered Perception (Pekala – perception3)
  4. Input-Processing (Tart – sensory1)
  5. Sensory Dynamics (Vaitl – sensory2)
  6. Auditory Alterations (Dittrich – auditory1)
  7. Exteroception (Tart – exteroception1)
  8. Visual Imagery (Pekala – visual1/imagery1)
  9. Audio-Visual Synesthesia (Studerus – synesthesia1/auditory2/visual2)
  10. Imagery and Fantasy (Farthing – imagery2/fantasy1)
  11. Amount of Imagery (Pekala – amount1)
  12. Vividness of Imagery (Pekala – vividness1)
  13. Elementary Imagery (Studerus – imagery3/elemetary1)
  14. Complex Imagery (Studerus – imagery4/complex1)
  15. Changed Meaning of Percepts (Studerus – perception4/meaning1)
- Bodily Sense Cluster:
  1. Body Image Change (Ludwig – body1/image1)
  2. Changed Body Image (Farthing – body2/image2)
  3. Altered Body Image (Pekala – body3/image3)
  4. Arousal (Pekala – tension1)
  5. Body Image (Metzner – body4/image4)
  6. Disembodiment (Studerus – disembodiment1)
  7. Interoception (Tart – interoception1)
  8. Motor Output (Tart – proprioception1)
- Self-Boundary Cluster:
  1. Sense of Personal Identity (Farthing – identity1/sense1)
  2. Identity/Ego (Wilber – identity2/ego1)
  3. Sense of Self/Identity (Metzner – self1/identity2)
  4. Unity, Internal, External (Pahnke – unity1/internal1/external1)
  5. Experience of Unity (Studerus – unity2)
  6. Objectivity and Reality (Pahnke – boundary1)
  7. Social Perception (Tart – boundary2/social1)
  8. Environmental Perception (Tart – boundary3/environment1)
  9. Transcendence of Space (Pahnke – space1/transcendence1)
  10. Sense of Space (Metzner – space2/sense2)
  11. Self-Awareness (Vaitl – self2/awareness1)
- Mystical Significance Cluster:
  1. Change in Meaning or Significance (Ludwig – meaning1/significance1)
  2. Changes in Meaning or Significance of Experiences (Farthing – meaning2/significance2)
  3. Insightfulness (Studerus – insight1)
  4. Ineffability (Pahnke – ineffable1)
  5. Sense of the Ineffable (Pahnke – ineffable2)
  6. Paradoxicality (Pahnke – paradoxical1)
  7. Sacredness (Pahnke – sacredness1)
  8. Varieties of Transpersonal Experiences (Grof – mystical1)
  9. Mystical (Pahnke – mystical2)
  10. Satori States (Lilly – mystical3)
  11. A-E Level (Leary – mystical4)
  12. Mind Level (Wilber – mystical5)
  13. Spiritual Experience (Studerus – spiritual1)
  14. Rejuvenation (Ludwig – significance3)
  15. Altered Meaning (Pekala – meaning3, awe1, sacredness2, reverence1)
- Arousal Cluster:
  1. Activation (Vaitl – activation1)
  2. Vigilance Reduction (Dittrich – vigilance1)
  3. Changes in Arousal (Farthing – arousal1)
  4. Ergotropic Arousal (Fischer – hyper1/arousal2)
  5. Trophotropic Arousal (Fischer -hypo1/arousal3)
  6. Arousal (Metzner – arousal4)
  7. Altered State of Awareness (Pekala – alertness1)
- Time Sense Cluster:
  1. Time Sense (Tart – time1/sense1)
  2. Disturbed Time Sense (Ludwig – time2/sense2)
  3. Altered Time Sense (Pekala – time3/sense3)
  4. Changed Time Experience (Farthing – time4/experience1)
  5. Subjective Time (Berkovich-Ohana/Glicksohn – time5/subjective1)
  6. Time (Paoletti/Ben-Soussan – time6)
  7. Sense of Time (Metzner – time7/sense5)
  8. Transcendence of Time (Pahnke – time8/transcendence1)
- Emotion Cluster:
  1. Positive Mood (Pahnke – mood1/positive1)
  2. Positive Affect (Pekala – affect1/positive2)
  3. Joy (Pekala – bliss1)
  4. Hedonia (Metzner – bliss2)
  5. Sexual Excitement (Pekala – sex1)
  6. Love (Pekala – love1)
  7. Blissful State (Studerus – bliss3)
  8. Emotional Valence (Lilly – emotion1)
  9. Emotional Expression (Ludwig – emotion2/expression1)
  10. Emotional Feeling/Expression + (Farthing – emotion3/expression2)
  11. Emotion (Berkovich-Ohana/Glicksohn – emotion4)
  12. Emotion (Paoletti/Ben-Soussan – emotion5)
  13. Negative Affect (Pekala – affect2/negative1)
  14. Anger (Pekala – anger1)
  15. Sadness (Pekala – sadness1)
  16. Fear (Pekala – anxiety1)
  17. Anxiety (Studerus – anxiety2)
- Control and Cognition Cluster:
  1. Alterations in Thinking (Ludwig – cogntion4)
  2. High Level Thought Processes (Farthing – cognition5)
  3. Thinking/Attitude (Metzner – cognition6/attitude1)
  4. Changes in Attention (Farthing – attention1)
  5. Inward Attention (Pekala – attention2)
  6. Absorption (Pekala – attention3)
  7. Changes in Memory (Farthing – memory1)
  8. Memory (Pekala – memory2)
  9. Memory (Tart – memory3)
  10. Cognitive Processing (Tart – cognition1)
  11. Rationality (Pekala – rationality1)
  12. Impairment of Cognition (Studerus – cognition2)
  13. Impairment of Control (Studerus – control1)
  14. Loss of Control (Ludwig – control2)
  15. Changes in Self-Control (Farthing – control3)
  16. Self-Control (Vaitl – control4)
  17. Self-Determination (Paoletti/Ben-Soussan – control5)
  18. Self-Awareness (Pekala – awareness1)

19. Volitional Control (Pekala – control6)
20. Hyper-suggestibility (Ludwig – suggestibility1)
21. Changes in Suggestibility (Farthing – suggestibility2)
22. Changes in Inner Speech (Farthing – speech1)
23. Internal Dialogue (Pekala – speech2)
24. Awareness Span (Vaitl – awareness2)
25. Awareness (Berkovich-Ohana/Glicksohn – awareness3)
26. Evaluation and Cognitive Processing (Tart – cognition3)
27. Attitude and Behavior (Pahnke – attitude2/behavior1)

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