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Cardeña, Etzel

Published in:
12th simposio da fundaçao Bial. Aquém e além do cerébro. Behind and beyond the brain

2019

Document Version:
Publisher's PDF, also known as Version of record

Link to publication

Citation for published version (APA):
Cardeña, E. (2019). Derangement of the senses or alternate epistemological pathways? Altered consciousness and human potentials. In *12th simposio da fundaçao Bial. Aquém e além do cerébro. Behind and beyond the brain* (Vol. 12th, pp. 117-142). Bial Foundation, Portugal.

Total number of authors:
1

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LUND UNIVERSITY

PO Box 117
221 00 Lund
+46 46-222 00 00

DERANGEMENT OF THE SENSES OR ALTERNATE EPISTEMOLOGICAL PATHWAYS? ALTERED CONSCIOUSNESS AND HUMAN POTENTIALS [1]

Etzel Cardeña [1/*]

Le poète se fait voyant par un long, immense
et raisonné dérèglement de tous les sens.
(The poet becomes a seer through a long, immense
and systematic derangement of the senses)

Arthur Rimbaud, in a letter to Paul Demeny, May 15, 1871

The outrageously precocious 16-year-old Arthur Rimbaud, about to demolish the conventions of the poetry of his time, wrote that a visionary artist needed to embark into a long and systematic derangement of the senses. He then proceeded to embody the worst stereotype of a bohemian, imbibing various types of drugs and having drunken brawls with his lover, the also poet Paul Verlaine, who ended up shooting him in the wrist. At 21, after changing forever the nature of poetry, Rimbaud retired from the world of letters to become a trader in coffee beans, rifles, and slaves. Despite Rimbaud's recommendation to an incipient poet, some would interpret his story as a cautionary tale for those seeking to affect their consciousness, but this paper focuses on the positive changes related to alterations of consciousness, granting that at times some alterations are related to deleterious medical and/or psychological effects. I will first clarify basic concepts about altered consciousness, discuss strengths and weaknesses of the "normative" waking state of consciousness, review research on how altered consciousness relates to enhanced psychophysiological functions, and then discuss whether alterations of consciousness can provide alternate valid epistemological pathways to that of the normative state of consciousness.

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[1] This is an abbreviated version of a paper with a similar title (Cardeña, 2018a). I am thankful for Prof. Caroline Watt's editorial assistance.

* Lund University, Sweden.

Altered Consciousness

In his treatise on religious experiences, William James set up the agenda for the study of alterations of consciousness, along with their potential functions:

> "Our normal waking consciousness, rational consciousness as we call it, is but one special type of consciousness, whilst all about it, parted from it by the filmiest of screens, there lie potential forms of consciousness entirely different... at a touch they are there in all completeness, definite types of mentality which probably somewhere have their field of application and adaptation." (James, 1902/1958, p. 298)

But even earlier, in his magisterial and best-selling *Principles of Psychology* (1890) James sought to integrate the ordinary with other states of consciousness, for instance in his chapter on the Self, in which he covered both its traditional sense and its alterations in dissociation and possession. A comprehensive psychology that would integrate our understanding of various states of consciousness was, however, stillborn, with academic psychology choosing a behaviorist stance that proscribed the study of conscious experience, and a clinical psychology too eager to split asunder human nature into sane or pathological. Only the marginalized psychical research/parapsychology community continued to systematically investigate the characteristics and potential functions of altered consciousness (e.g., Sidgwick, 1915).

Mainstream psychology would have to wait for decades until the political and intellectual movements of the 60s embraced the exploration of states of consciousness through psychedelics, meditation, and other means. A short but very rich article by Arnold Ludwig (1966) contributed a definition of "altered states of consciousness" and Charles Tart (1975) and Robert Ornstein (1986) arguably became the most important theoreticians in the area. Despite these contributions and the many empirical studies since, a discussion of altered consciousness as a necessary component in the social and biological sciences has been mostly absent, although there are signs of some integration of the topic into psychology (Cardeña, Lynn, & Krippner, 2017) and other disciplines (Cardeña & Winkelman, 2011).

Included in my use of *altered consciousness* are three different but interrelated concepts: *altered* (or alternate, see Zinberg, 1977) *state of consciousness, altered trait of consciousness,* and *induction procedures* to elicit altered states. Natural concepts are "fuzzy" and have vague boundaries (Lakoff, 1973) and these three are not an exception. I endorse Tart's (1975, p. 5) definition of a distinct (or discrete) altered state of consciousness (ASC) as a "unique, dynamic pattern or configuration of psychological structures, an active system of psychological systems," which differs qualitatively from the individual's ordinary state of consciousness, and can be recognized by the individual him/herself (e.g., someone recognizing a near-death-experience as a very different state from the ordinary one) or sometimes by an observer (e.g., in a variety of more -or-less nonconscious states; Noirhomme & Laureys, 2011).

Whereas ASCs are by definiton transitory and reversible, typically lasting from seconds to some days, an *altered trait (of consciousness)*, a term probably coined by the historian of religion Huston Smith (1995), denotes lasting changes of consciousness in which the baseline state of consciousness has been permanently changed. For instance physiological and cognitive changes that occur only during or shortly after meditation may become a part of the normative state of consciousness of those who have maintained a serious meditation practice for a very long time (Goleman & Davidson, 2017). There are also qualitative differences in the baseline state of consciousness across people that do not involve any practice, such as synesthesia (i.e., experiencing a stimulus in more than one modality, such as always seeing a color associated to a musical tone), which occurs in the normal, waking state of a few people whereas the majority may never experience it or only when in an ASC (Marks, 2014).

And how might ASCs be induced? The list of methods by Ludwig (1966) remains a good introduction: reduction or increase of exteroceptive stimulation and/or motor activity (e.g., decrease in restricted environment stimulation or REST; intense movement and sound in prolonged energetic dancing rituals); increased or decreased alertness or mental involvement (or, more generally, use of higher cognitive processes to affect the normative state, as in meditation and hypnosis); and presence of somatopsychological factors (including psychoactive drugs as well as more recent techniques such as transcranial magnetic stimulation; Dieguez &

Blanke, 2011). Tart (1975) further discussed how personality/cognitive and external variables can disrupt or maintain the equilibrium of a state of consciousness, as in the case of remaining asleep by maintaining a quiet and dark environment. A method of induction is, however, but one variable in the potential alteration of a state of consciousness. Other, interacting, variables include cognitive dispositions, set and setting, cultural facilitation, and so on (Tart, 1975). Laughlin, McManus, and d'Aquili (1992) pointed out as well that whereas some cultures are polyphasic and value alterations of consciousness and facilitate their manifestation through rituals and others techniques, monophasic ones, like contemporary Western cultures, prioritize the waking, normative state and marginalize or minimize alterations of consciousness.

To illustrate the interaction of induction procedures with personality traits, a hypnotic induction may have large experiential and neurodynamic effects on people who have the disposition to respond strongly to hypnosis (i.e., high hypnotizables) but have small and/or contrary effects in those who do not (i.e., low hypnotizables) (e.g., Cardeña et al., 2013). And not only are traits and states interactive processes, but conscious experience is ever changing, and even within the "same" state there may be noticeable changes. For example, people responsive to minimal-suggestion hypnosis may initially experience unusual somatic alterations, while later on they will report mostly imaginative and transcendent experiences (Cardeña, 2009). And even within the "same" group, for instance high hypnotizables, there may be important variations. Research reveals that among highly responsive individuals there are at least two main groups, one that tends to experience imagery in response to suggestions, whereas the other tends to experience lack of cognitive control (Terhune & Cardeña, 2010). Unfortunately very few studies on potential altered consciousness have distinguished and systematically evaluated altered traits, altered states, and their potential interaction with induction procedures.

The Limitations of the Normative State

The focus of this paper is on the potential benefits of alterations of consciousness, but it is pertinent to first discuss the normative, waking

state, ignoring for the moment individual and cultural differences. For a discussion of some individual differences in the baseline, waking state, such as having a lot of or little imagery see Hurlburt & Schwitzgebel (2007). For cultural differences, mediated by environmental pressure, a good example is that the hunter-gatherer Semaq Beri show much better olfactory sensitivity than the neighboring sedentary Semelai, for whom subtle animal odors do not have much survival value (Majid & Kruspe, 2018).

In his paper on "Basic Problems of Consciousness," Natsoulas (1981, p. 162) characterized the normative waking state as prioritizing "distinctions among *what is, what might be, what is not,* and *what cannot be,"* thus having survival value, although he also posed the question "Does the normal waking state consistently involve the pursuit of truth about the world?" (p. 164). In a less nuanced discussion of the topic, Kallio and Revonsuo (2003, pp. 141-142) concluded that any other state than the normative one "creates phenomenal contents of consciousness that misrepresent or create delusional beliefs of the surrounding world and oneself." This assertion assumes that the waking state does not misrepresent reality, a conclusion that has been vigorously challenged in many fronts.

Even while granting that the ordinary state must have adaptive value or humans would have perished, the naïve realism perspective equating the contents of the waking state of consciousness with an accurate representation of "reality" has been seriously challenged by philosophers for milennia. More recently, some important theoretical physicists have concluded that one of the implications of quantum mechanics is that we cannot apprehend reality, which remains "veiled", but only verify the results of particular ways of measurement (d'Espagnat, 2006), and that some form of mentality is intrinsic to that measurement (Kastrup, Stapp, & Kafatos, 2018). Second, various cognitive and philosophical models have concluded that the content of ordinary consciousness should not be taken literally. For instance cognitive psychologist Donald Hoffman (2009) has shown through evolutionary game theory that it is detrimental to have a very precise apprehension of "reality" given the processing demands that would be required. Instead, he concludes that waking consciousness is only required to maintain basic adaptive behaviors, and concludes that

our perception is a simulation (for other views of conscious contents as illusions see Frankish, 2017). Consistent with the view of very limited capacities are analyses showing that conscious awareness can only process a very small fraction of incoming sensory stimulation (Wilson, 2002), which is itself very limited (e.g., humans can perceive only a very small fraction of the electromagnetic spectrum).

The human waking state seems particularly primed to detect relatively large, changing stimuli (Ornstein, 1986), exerting some organization and control (but not much, as evidenced by the difficulties in deliberately maintaining a focus of attention for more than a few moments), biased towards supporting previous expectations, beliefs, and so on. The waking state is geared to attending to expectable or survival-relevant changing stimuli over subtle, unchanging, or trivial unusual ones (Bruner & Postman, 1949; Ornstein, 1986), usually while exhibiting a strong egocentric bias (e.g., Pronin, Lin, & Ross, 2002).

Typically missing from the discussion of the limitations of waking consciousness is the hypothesis adumbrated by James that other states of consciousness may have their function and perhaps circumvent some of the limitations of the waking state. Various religious traditions have also questioned the waking state as an ultimate purveyor of reality, concluding, among other things, that when we are awake we are really in some ways asleep because we do not realize the true nature of things, or that we apprehend reality through the "veil of Maia" of our desires (Hinduism), or through "a glass darkly" (Christianity' St. Paul). Earnest followers of these traditions have often adopted ascetic and introspective practices, which may induce alterations of consciousness, to become aware of general and personal cognitive biases. Ludwig (1966) distinguished between maladaptive and adaptive functions of ASC. The former are not discussed in this paper. For adaptive expressions he listed healing, social functions such as cohesion, and offering different modes of knowledge. I will concentrate on his first and third categories, presenting in the remaining of the paper examples of altered consciousness associated with enhanced psychophysiological functioning and with plausible alternate perspectives on "reality" (social functions of altered consciousness are discussed in Whitehead, 2011). Five caveats are worth stating:

1) I do not claim that altered consciousness is the only way to achieve some of the enhancements I describe below.

2) The relation between potential alterations of consciousness and associated effects does not necessarily assume a causal effect, unless this has been specifically evaluated in a study.

3) I will not be covering "small" changes to consciousness that may slightly improve mood or enhance the experience of life such as the use of caffeine or psychedelic microdosing (Cardeña, 2011; Kitchens, 2018).

4) Many studies have not collected data on which specific alterations occurred.

5) The literature of traditional practices in the East and West have mentioned some of the abilities listed below for which there is scientific evidence, but they have also listed others such as mentally destroying statues or living for hundreds of years for which I could find no empirical evidence (for a review see Cardeña, in press).

Altered Consciousness and Enhanced Psychophysiological Functions

Overviews of exceptional psychophysiological functions have been published, in relation to religious practices by Thurston (1925/2013), and in relation to sports and contemplative practices by Murphy (1992). Although they made implicit or explicit connections to altered consciousness in many cases, that was not the focus of their work. In this section I review research on consciousness alterations and unusual psychophysiological manifestations.

Somatic systems

The literature on the clinical uses of hypnosis contains many experiments as well as case studies giving evidence of what T. X. Barber (1984) called "changing 'unchangeable' bodily processes," in which the "unchangeability" is contrasted with what tends to occur in the waking state. With respect to dermatological conditions, an old but still worth citing case is Mason's (1952), who treated a patient with a genetic condition (congenital erythodermia) believing it to be psychosomatic. The photos in his paper show that a severe and pervasive condition that had not responded previously to any treatment started healing dramatically in a matter of days. More generally, but less attention-grabbing, is a study by

Spanos, Williams, and Gwynn (1990) showing a hypnotic intervention to be the only effective treatment against warts as compared with salicylic acid, placebo, or no treatment. There is also considerable evidence that hypnosis may affect directly and indirectly the gastric system, particularly in the treatment of irritable bowel syndrome (Schaefert, Klose, Moser, & Häuser, 2014). A general review by Benham and Younger (2008) found evidence that hypnotic interventions can affect blood pressure, enlarge breasts, improve gastric motility, improve asthma, affect allergic reactions, treat dermatological conditions, affect the immune system, perhaps affect wound healing, and improve gastric conditions, but deplored the lack of a programmatic evaluation of mediation processes.

There have also been single observations of unusual healings of intractable conditions related to altered consciousness, such as an inoperable brain condition that seemed to heal in conjunction with having a near-death-experience (Dossey, 2011). It is important to mention that to call such cases "spontaneous remission" just provides a label rather than an explanation. Furthermore, apparently successful non-allopathic healing ministrations have been related to alterations of consciousness, although there has been little systematic research on the topic (Krippner & Achterberg, 2014; see also Esalen Center for Theory and Research's online "Database of Extraordinary Human Function," https://www.esalen.org/ctr/scholarly-resources/database).

Heart rate control

Laboratory studies with single individuals (e.g., Green & Green, 1977) and small groups (e.g., Wenger, Bagchi, & Anand, 1961) of long-term yoga practitioners have reported their ability to willingly induce heart fibrillation, and slow down or even momentarily stop the heart rate. A meta-analysis reported that Yoga practice can affect heart rate variability, although many of the studies conducted had methodological limitations (Tyagi & Cohen, 2016).

Stigmata and bleeding control

Stigmata, very rare and apparently spontaneous and uncontrolled wound marks or bleeding, typically in the locations identified with Christ's (depicted) crucifixion, have been observed in dozens of individuals

throughout history (Thurston, 1925/2013), some of them reporting an intense attentive and emotional focus on Christ's ordeal (Murphy, 1992). A few cases have been evaluated systematically to rule out fraud and general medical conditions such as hematidrosis (e.g., Margnelli, 1999).

Genuine stigmata do not seem to be under the person's control, but there are reports of precise beginning or stopping of bleeding with an Eastern meditator (Murphy, 1992) and a Western one (Green & Green, 1977). Hypnosis research also provides some evidence of the ability to control the vascular system. For instance, specific hypnotic suggestions to experience a phlebotomy evoked similar physiological reactions to those of participants undergoing the procedure, but mere hypnosis or rest did not produce that effect (Casiglia et al., 2017). There have also been observations and a laboratory study of Islamic Sufi dervishes inflicting themselves severe body damage with razor, glass, and similar materials, exhibiting little or no bleeding and very rapid healing (Hall, 2011). The Sámi Nordic tradition describes healers who can stop the bleeding of other humans and sentient beings (Sexton & Buljo Stabbursvik, 2010), but I could not find an experimental study of this claim.

Reduced metabolism

Ascetic yogis have claimed to reduce or even suspend their need for food, water, and even oxygen. Kothari, Bordian, and Gupta (1973) tested a yogi buried in a pit for eight days without access to water or food, who seemed to stop his heart until just before being brought out, at which point he was emaciated. There have also been case and group studies with yogis showing decrease of O_2 consumption between 40% (Craig Heller, Elsner, & Rao, 1987) and 32% (Telles, Reddy, & Nagendra, 2000). There is also evidence of an altered trait in that baseline respiration rate among long-term meditators with retreat practice was significantly lower than that of non-meditators (Wielgosz, Schuyler, Lutz, & Davidson, 2016).

Ability to withstand cold temperature

Ascetic practices can involve enduring very cold temperatures and studies support the ability to generate exceptional body heat in such circumstances. *G Tum-mo* yoga involves the intention to generate bodily heat while meditating in very cold environments. Benson et al. (1982)

found that three long-term practitioners could raise the temperature of their fingers and toes by up to 8.3° C. A later study of the same practice suggests that the mediating mechanisms include controlled breathing and visualization (Kozhevnikov, Elliott, Shephard, & Gramann, 2013).

The holder of various world records for enduring cold temperatures, Wim Hof, has been studied in the lab. His practice of hyperventilation and attentional focus produced significantly larger changes in cortisol release and immune response attenuation than those of a control group (Kox et al., 2012). Some of these researchers (Kox et al., 2017) later trained a group in Hof's physical and meditation techniques, and, after inoculation of bacterial endotoxin, compared them to a control group. The trained individuals exhibited substantial increases in the release of epinephrine and a reduction of the cytokine inflammatory response to the endotoxin. Although this set of studies is exemplary in studying thoroughly a person with an extraordinary ability and then using his techniques to train others, Kox et al. (2017, p. 7379) falsely claim that "Hitherto, both the autonomic nervous system and innate immune were regarded as systems that cannot be voluntarily influenced" when the decades-long research on biofeedback pioneered by Miller (Dienstfrey, 1991) has shown some voluntary control of autonomic activity, and research on hypnosis (e.g., Olness, Culbert, & Uden, 1989) and meditation (e.g., Davidson et al., 2003) had found the same for immune responses.

Skin temperature control can be very precise. Hypnotically trained individuals produced opposite changes of temperature in each hand (Maslach, Marshall, & Zimbardo, 1972), and an Indian swami showed the same phenomenon between the sides of a hand (Green & Green, 1977).

Analgesia

There are many descriptions of intentional infliction of painful stimuli in the context of religious ritual with apparent imperviousness to the pain, including in the Malaysian Thaipusam festival (Simons, Ervin, & Prince, 1988), some Sufi dervish practices (Hall, 2011), and the ascetic Christian tradition (Thurston, 1925/2013). In *Vodou*, not reacting to burning and painful stimuli can be used as a demonstration of being possessed (Broch, 1985), and probably the most researched medium in history, Mrs. Piper, did not evidence pain to noxious stimuli while she

was in an altered state although in her ordinary state later she had blisters and enduring pain (Gauld, 1982). Systematic research in both hypnosis and meditation are consistent with the ability to overcome pain while in an altered state. Anand, Chhina, and Singh (1961) describe two yogis who, while meditating, could maintain their hands in 4° C water for 45-55 minutes without evidencing discomfort. Zen meditators exhibited lower pain sensitivity in a thermal pain paradigm as compared with a control group; their ability was correlated with slow respiration rate and meditation experience, and probably mediated by reduced connectivity between executive and pain-related cortices (Grant, Courtemanche, & Rainville, 2011; Grant & Rainville, 2009). In hypnosis research similar experimental pain paradigms have shown that those who are responsive to suggestions can withstand exposure to painful stimuli considerably better than those who are not (e.g., Hilgard & Hilgard, 1975/2013), and the analgesic effect is linked to specific cortical dynamics (Rainville et al., 2002). The analgesic effects of hypnotic suggestions in laboratory and clinical samples were found to be medium to strong in a meta-analysis (Montgomery, DuHamel, & Redd, 2000) and small in a meta-analysis of mindfulness meditation (Hilton et al., 2017). So far I have emphasized phenomena with a more central somatic component and will now discuss those with a more direct cognitive component.

Perceptual sensitivity

Murphy (1992) listed reports by athletes and contemplative practitioners of extraordinary sensory abilities after intense focusing activities, including enhanced vision, hearing, touch, smell, taste, and even synesthesia. There is some experimental evidence for enhanced visual perception. Participants in a mindfulness meditation retreat increased their discrimination sensitivity to two tasks involving light flashes, whereas a control group did not (Brown, Forte, & Dysart, 1984). In another study, practitioners in a focusing meditation retreat exhibited significant increases in perceptual sensitivity/stimuli discrimination (related to hours of practice) across time and in comparison with a waiting-list group (MacLean et al., 2010).

Attention control and cognitive deautomatization

Meditation practices include self-generated attempts to exert greater control or awareness of attentional and related cognitive processes. Enhancements have been found for, among others, selective attention (Jha et al., 2007), continuing to pay attention to repetitive stimuli (Antonova et al., 2015; Kasamatsu & Hirai, 1966), and vigilance/sustained attention (MacLean et al., 2010). The findings, however, have not been completely consistent (Cardeña, Sjöstedt, & Marcusson-Clavertz, 2015; Lao, Kissane, & Meadows, 2016), perhaps due to comparing different types of meditation and amount of hours spent in them (Goleman & Davidson, 2017).

Furthermore, meditation and hypnosis have been shown to reduce or even sometimes annul what had been previously been considered automatic, unchangeable cognitive processes, including the Stroop effect (Raz, Moreno-Íñiguez, Martin, & Zhu, 2007), synesthesia (Terhune, Cardeña, & Lindgren, 2013), and "attentional blink" (Slagter et al., 2007).

Creativity

Creative insights in science and the arts have been related to alterations in consciousness, including deep relaxation and transitional awake-sleep-awake states (Mavromatis, 1987), dreaming (Hartmann, 1996), and "microdosing" on psychedelics (Kitchens, 2018). A few controlled studies support a relation between creative insights and more associative, less rigid cognitive states, including: a) visual arts originality while taking psychedelics (e.g., Krippner, 1985), b) improved creative drawing after hypnotic suggestions (Council et al., 2007), and c) enhanced creative problem solving while mildly intoxicated with alcohol (Benedek et al., 2017).

Positive affect

Although not universally so, mystical-type states of consciousness are typically described as blissful and serene, whether they arise spontaneously, through the use of hallucinogens or following hypnotic or meditation procedures (Cardeña, 2005; Griffiths et al., 2006; Wulff, 2014). As a participant in a hypnosis experiment describing her simultaneous experiences put it: "All the feelings that are good just surround me... It's

really great" (Cardeña, 1988, p. 128). A sense of equanimity and positive affect seems to become a more permanent feature in the case of long-term meditators (Easterlin & Cardeña, 1998/1999), which may parallel reduced amygdala reactivity even while not meditating (Desbordes et al., 2012).

Personality change

Altered traits may follow even one experience of an altered state of consciousness. A study on the effects of controlled ingestion of psilocybin showed an increase of the trait *openness to experience*, mediated by having a more comprehensive mystical experience (MacLean et al., 2011). Long-term increases in spirituality, concern for others and the environment, appreciation of life, and decreases in fear of death, materialism, and competitiveness have resulted after near-death (Greyson, 2014) and different types of mystical experiences (Wulff, 2014).

Diagnosis and Treatment

An area deserving further study is whether medical conditions diagnosed later may be inferable from the earlier content of dreams. Studies supporting this contention include cardiac dysfunction (Smith, 1987), cancer, (Burk, 2015), and a case study of viral encephalitis (Sacks, 1973). It may be that somatic dysfunction at a very subtle level and not detectable at a conscious level nonetheless affects dream content. There is also the possibility that dreams may precognize an event into the distant future and before, perhaps, there is any detectable somatic marker (see below).

There is much more research on the use of hypnosis and meditation in the treatment of diverse medical and psychological conditions. Besides producing analgesia and changes in epidermic and gastric systems, there is consistent evidence that hypnosis can be helpful in the treatment of anxiety, depression, stress, sleep disorders, posttraumatic symptomatology, smoking, and obesity (Cardeña et al., 2009; Mendoza & Capafons, 2009). Different meditation approaches have also been profitably used to treat, among others, depression, anxiety, stress, and borderline personality disorders (Goleman & Davidson, 2017). And ingestion of psychedelics in clinical and naturalistic settings has been beneficial in the treatment of alcoholism, anxiety related to death, depression, smoking, and obsessive-compulsive symptoms (Garcia-Romeu, Kersgaard, & Addy, 2016).

Altered Consciousness, Noetic Experiences, and Psi Phenomena

A central component of a mystical experience is its noetic quality, which William James described as "states of insight into depths of truth unplumbed by the discursive intellect... [which] carry with them a curious sense of authority" (William James, 1902/1958, p. 380-381). In more pedestrian prose, it refers to a sense of having gotten a glimpse of a basic aspect of the nature of reality. To give another example from the research with the spontaneous experiences of high hypnotizables, a different person than the one quoted above stated: "This is the best place to be... I am out in the brightness... I am not matter anymore; just nothing physical, not even color. I'm just energy. Things don't happen here... it's a matter of being...here there's no time and no space" (Cardeña, 1988, p. 136-137).

It is very challenging but also potentially very important to try to make sense of the ontological value of such experiences. There is no doubt that some of the "epiphanies" produced by transcendent experiences are clearly false or trite, as exemplified by some of the "insights" that a person may have while intoxicated that later turn out to be absurd, or the spiritual clichés and triteness of many mediumship/channel communications (Hastings, 1991). But the question remains whether the central aspect of a mystical experience of interconnectedness is nothing more than a wish-fulfillment delusion.

Interconnectedness is an essential aspect of reality in the models of some important theoretical physicists (e.g., Bohm, 1986; d'Espagnat, 2006), in religious traditions (e.g., Wulff, 2014) and is an implication of psi phenomena (Marshall, 2015), but these strands by themselves do not provide evidence that transcendent experiences may elicit a valid glimpse of consensual reality. Greater validation would come if alterations of consciousness provided evidence that experients can accurately access information that implies the abeyance of our usual sense of temporal and spatial constraints. For this, it is important to evaluate whether individuals in altered consciousness can better access such information than in the normative state.

Parapsychology or psi is the study of such phenomena as ostensible telepathy, in which a person seems to be affected by the thoughts or emotions of someone else, unmediated by the senses or reason, as when

someone suddenly has a sense of the unexpected death of a beloved one, precisely as that event unfolds unpredictably in another place. Psi research also investigates the ostensible direct effect of intention on physical systems such as random number generators. The use of the scientific method to evaluate the potential validity of psi phenomena has a long history and many eminent scientists have supported this endeavor empirically and/or theoretically (Cardeña, 2015). Comprehensive reviews of the experimental evidence for these phenomena, underlying theories from physics and psychology as well as skeptical counterpoints, are offered in two recent comprehensive anthologies (Cardeña, Palmer, & Marcusson-Clavertz, 2015; May & Sarwaha, 2015) and a review of more than 10 meta-analyses (Cardeña, 2018a).

Research on naturally occurring ostensible psi phenomena has found that they often occur during alterations of consciousness such as dream sleep or *twilight* states between awakening and sleep (Sandwald, 1963). Although finding consistent patterns in the natural occurrence of psi phenomena is basic to ascertain their nature, it is difficult or impossible to evaluate alternative explanations in occurrences during "everyday life." To be able to discard reasonable competing explanations such as biased recollections or randomicity of an occurrence requires experimental paradigms that can control for these and other variables. Many experimental paradigms have systematically evaluated a possible link between altered consciousness and psi phenomena.

Probably the first set of meta-analyses of a relation between altered consciousness and psi scoring was Charles Honorton's (1977). He proposed that during the normative state of consciousness (the very subtle) psi information usually does not become salient given the primacy of perceptual and other processes. His cumulative analyses of research showed significant associations between what he called *internal attention states* (meditation, hypnosis, relaxation, and sensory deprivation) and accurate scoring in psi tasks. Since his publication there have been new or updated literature reviews or meta-analyses, all supporting a relation between psi and altered consciousness, including papers on psi and meditation (Roney-Dougal, 2015), hypnosis (Stanford & Stein, 1994), dreaming (Storm, Tressoldi, & Di Risio, 2010), and psychedelic experience (Luke, 2015).

The area of psi research with the longest and most consistent set of experiments supporting psi phenomena, even after improving the methodology following the guidelines co-proposed by a skeptic (Hyman & Honorton, 1986), follows a procedure called ganzfeld to enhance internal focus. It involves sitting in a comfortable chair, listening to relaxation suggestions, and being exposed to homogeneous visual and auditory stimulation, while trying to detect spatially or temporally distant information chosen randomly. Various meta-analyses of research spanning dozens of labs across the world have reported that participants in ganzfeld choose the correct stimulus at a rate that significantly exceeds chance; furthermore, although the results of experiments using a ganzfeld protocol do not differ significantly from those using other inductions such as meditation or hypnosis, they show a bigger effect than those not using any induction procedure (Storm et al., 2010). Another important meta-analytic finding is that individuals who engage in some type of mental practice (meditators but also artists) perform noticeably better than those who do not (Baptista, Derakhshani, & Tressoldi, 2015).

The assumption of Honorton was that exposure to ganzfeld induces an alteration of consciousness, but this has been rarely evaluated systematically in the psi experiments themselves. More generally, it is known that ganzfeld can elicit alterations of consciousness that differ from being sleepy (Wackermann, Pütz, & Allefeld, 2008), and that such effects interact with traits such as hypnotizability and dissociation (Marcusson-Clavertz, Terhune, & Cardeña, 2012). Nonetheless, when a systematic evaluation of the state of consciousness has been carried out during psi experiments, there has been an association between experiencing an altered state and performing well in the psi task. The specific alterations related to psi include alterations in the sense of time, reduced body awareness, an experience of self-transcendence, increased absorption, and less arousal and internal dialogue (for a review see Cardeña & Marcusson-Clavertz, 2015). A general sense of being in an ASC among high hypnotizables has also been found to have medium to large correlations with psi scoring in two studies using similar protocols (Cardeña & Marcusson-Clavertz, 2019; Marcusson-Clavertz & Cardeña, 2011). In sum, the noetic sense that mystical experiences of interconnectedness describe real events is grounded not only on intense experiences but, more importantly, on

research data showing that altered consciousness seems to allow greater access to, or greater awareness of, information not mediated by the senses or reason, and interpretable as evidencing interconnectedness in nature.

Conclusion

The proposal by James that some forms of altered consciousness have "their field of application and adaptation" has empirical support from multiple areas of research. This review shows evidence for psychophysiological enhancements associated with alternate consciousness, and for the possibility that they may provide valid information. Thus, it is legitimate to conclude that the normative, waking state of consciousness is not optimal for all functions, but should be thought of as having a basic survival value with a number of inbuilt structural and functional limitations. The characterization by Carhart-Harris et al. (2014) of the waking state as leaning towards low entropy, low disorder, and somewhat rigid processing of information (cognitive "stickiness" in meditation terms) is consistent with a generally adaptive strategy. Other states, however, seem to bypass temporarily or more permanently some of these restrictions (although of course they may have their own inbuilt particular limitations). To give but a few instances, meditation and hypnosis increase continuity of attentional focus (Cardeña & Spiegel, 1991; Goleman & Davidson, 2017); dreams and ganzfeld procedures allow, by decreasing exteroceptive stimulation, awareness of subtle information that would otherwise go undetected (Honorton, 1976); psychedelic, near-death, and mystical experience can provide different ways of conceiving of, and feeling about, such important topics as one's death or the centrality of one's being; and dreaming and intoxication with various substances may provide looser and more metaphorical associations than the waking state, which may provide valuable insights about oneself and/or the solution of problems. Olness et al. (1989) pointed out that cyberphysiologic techniques such as hypnosis are more easily learned by children than by adults, so Huxley's idea of early hypnotic training in his novel *Island* has an anchor in research, and meditation techniques are being pioneered in some schools (Goleman & Davidson, 2017).

Although in the last few decades programmatic studies have been launched on the effect of contemplative practices and the effect of psychedelics, many other areas reviewed in this paper have been scarcely researched and are typically ignored in theoretical discussions of consciousness. This may partly reflect the rareness of some phenomena (e.g., stigmata), but it probably has more to do with not treating altered consciousness as a central component of the features of consciousness and cognition. This is unfortunate considering the potential benefits that could accrue, among them resetting the boundaries of what are considered automatic cognitive processes or "unchangeable" physiological processes, developing more powerful therapeutic interventions, evaluating the effect of intention on psychophysiological processes, increasing the likelihood of accurate psi cognition, and, ultimately, understanding better the nature of consciousness, both normative and altered. The attempt by William James, F. W. H. Myers, and others (Kelly et al., 2007), to integrate altered consciousness into general psychology is empirically warranted and deserves greater attention by researchers and theoreticians.

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