



The centrality of sense of self in psychological flexibility processes: What the neurobiological and psychological correlates of psychedelics suggest[☆]

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The legs, for example, of that chair – how miraculous their tubularity, how supernatural their polished smoothness! I spent several minutes - or was it several centuries? - not merely gazing at those bamboo legs, but actually being them - or rather being myself in them; or, to be still more accurate (for “I” was not involved in the case, nor in a certain sense were “they”) being my Not-self in the Not-self which was the chair.

-Aldous Huxley detailing an experience on LSD, 1954

Psychedelic rites of passage have been performed across many cultures throughout history. For example, native North Americans appear to have explored the psychotropic properties of peyote nearly six millennia ago (El-Seedi, Smet, Beck, D. Possnert, & Bruhn, 2005). While formal Western exploration of psychedelic substances reaches back into the 1800's, the possible therapeutic effects of psychedelic substances became a research focus only in the 1950's with an examination of the psychological uses of LSD and psilocybin (Bogenschutz & Ross, 2018). An interest in this area quickly grew. By 1965 there were more than 1000 published clinical studies on psychedelic-assisted therapy, reporting largely promising outcomes across a wide range of psychological conditions involving over 40,000 subjects (Malleson, 1971).

These early studies did not lead to a sustained change in how therapy is done or understood, however. In part this was because the legal and cultural reaction to the rapid spread of the use of psychedelic substances interfered with the kind of scientific analysis that was needed. Instead, what was left behind was intriguing preliminary data, a number of practitioners who felt that psychedelics could be a helpful tool in exploring severe psychological distress, and an interest in the ways that psychedelic substances could advance neuroscience and our understanding of what is often called ‘the mind’ (Bogenschutz & Ross, 2018; Pollan, 2018).

Today, there is a growing and renewed interest in utilizing chemically facilitated peak experiences as a means of therapeutic exploration and progress. While some physiologically-oriented thinkers are interested in studying the effect of these substances in the absence of specific therapeutic guidance — the dominant view of psychological professionals appears to be that there is little use in thinking of psychedelic

substances as acute, stand-alone prescriptions. Though many studies focus on physiological responses and their mediating effects on subsequent neurological and behavioral activity, it seems clear that the role of verbal/cognitive events and their contextual sources cannot be ignored as clients undergo an intensive and intentional psychedelic process (Carhart-Harris et al., 2018). Perhaps for those reasons, journalistic, scientifically peer-reviewed, and anecdotal accounts all seem to agree that therapeutic sessions utilizing psychedelic substances is best supported by preparation, expectation management, environmental design, verbal and physical guidance, and therapeutic follow-up and interpretation of experienced events (Pollan, 2018). In that context, a well-crafted and empirically based theoretical model of verbal/cognitive events as they bear on psychedelic experience is needed.

In the early days of the psychosocial exploration of psychedelic substances, models of psychosocial guidance were largely drawn from psychoanalytic and psycholytic approaches, but in recent times a growing number of laboratories and practitioners have turned to more contemplative and meditative models, including third-wave cognitive-behavioral approaches, as a framework for structuring the therapeutic use of psychedelic substances. Of these, Acceptance and Commitment Therapy (ACT) (Hayes, Strosahl, & Wilson, 2012) appears to be among the most prominent (Malone et al., 2018; Pollan, 2018; Ross et al., 2016), but to our knowledge no detailed account has yet been presented on the relationship of the psychological flexibility model that underlies ACT to psychedelic experience. We intend in this paper to consider the implications of the growing database on the neurobiological and psychological effects of psychedelic substances and what it suggests for an understanding of psychological flexibility processes as mechanisms of change.

Contextual behavioral science (CBS) is the intellectual field in which ACT has been developed. CBS seeks the development of principles that allow the prediction-and-influence of the situated actions of whole organisms with precision, scope, and depth (Hayes, Barnes-Holmes, & Wilson, 2012). The concept of depth means that there should be no well-developed area of scientific knowledge that exists at one level of analysis that contradicts knowledge of that kind found at another. For

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example, neurobiological evidence about thinking should not contradict psychological evidence about thinking – or if it does something is wrong with the underlying theory and principles. Whatever else it entails, psychedelic experience involves verbal/cognitive domains and thus from a CBS point of view it seems possibly useful to consider psychedelic experience in terms of the setting events and cognitive acts that bear on the basic verbal unit studied in ACT and CBS more generally, namely relational framing.

There are two possible benefits of such an approach. Given the complexity and mystically-oriented research history of psychedelic experiences, it seems helpful to tie psychedelic research to fundamental, naturalistic processes at the psychological level – the level of scientific analysis that focuses on the actions of whole organisms situated within environing conditions considered both historically and situationally. Such an approach is especially important when experiences stretch our capacity to observe and describe them, as is demarked by such words that are common in this area of study, such as mystical, oneness, transcendent, or spiritual. From a scientific point of view progress on the research and practical agenda in psychedelic studies requires a firm grasp on a non-reductionistic and naturalistic approach.

Transcendental notions and reified constructs are ever-present risks when human behavior is the scientific subject-matter. Progression of a naturalistic science of psychology has historically been slowed by constructs that depart from naturalistic observation by focusing on transcendental dualism, recursive reification, and nominalization, especially when they are allowed to impact ontological assumptions (Kantor, 1963) and learning that lesson of history is important for psychedelic studies. The other possible benefit of trying to construct a more adequate basic relational framing account of the effects of psychedelic experiences is that if it comports with both ACT principles and neurological data, it may help providers and researchers better use the ACT model in psychedelic therapy.

1. Basic behavioral issues in sense of self

As Aldous Huxley's opening quote demonstrates, changes in sense of self and perspective-taking involving time, place, and person, have often been said to be central to psychedelic experience. Recent empirical reviews of the area agree (e.g., Nour, Evans, Nutt, & Carhart-Harris, 2016) and thus we will first consider a brief history of the concept of self in relational frame theory and argue for its utility as a naturalistic way understanding psychological change in psychedelic therapy. We will then examine the relation of these ideas to ACT and the psychological flexibility model.

1.1. Relational frame theory

Then traditional behavioral approach to verbal/cognitive events cast them as a relatively straightforward extensions of direct-acting contingencies, modified by a verbal community. In Skinner's view, verbal behavior was special only in the limited sense that it was based on the socially mediated reinforcement, provided by an audience trained precisely so as to do so (Skinner, 1957). This approach, while useful in shaping simple effective language events such as manding (loosely speaking, 'requesting') and tacting (loosely speaking, 'describing') in those with limited verbal repertoires, had difficulty in distinguishing symbolic thinking from operant learning more generally. As an indication, even the interaction of a laboratory animal and an experimenter was said to exemplified a verbal interaction on the part of the animal that comprised a "small but genuine verbal community" (Skinner, 1957, p. 108).

Within a behavioral perspective, a broader and more successful approach to verbal/cognitive events began with the discovery of stimulus equivalence (Sidman, 1971; 1994) in which a unidirectional stimulus relation (responding to one stimulus in terms of another) led to a two-way stimulus relation that combined into stimulus networks.

Over the decades that followed, a whole series of findings emerged that led behavioral psychology in a new direction. These studies included research on rule-governance, and the insensitivity to direct-acting contingencies which it often produced (summarized in Hayes, 1989); the transfer of antecedent and consequent stimulus functions through equivalence classes (e.g., Hayes, Brownstein, Devany, Kohlenberg, & Shelby, 1987; Hayes, Kohlenberg, & Hayes, 1991); and finally the identification of a much larger set of derived relational performances of which stimulus equivalence was only an exemplar (Steele & Hayes, 1991).

Most complex non-human animals can learn to relate stimuli based on their formal properties (e.g., to pick the larger of two objects), but young human children can readily relate stimuli arbitrarily given cues to do so. Relational frame theory (RFT: Hayes, Barnes-Holmes, & Roche, 2001) explained this body of findings with the simple claim that derived relational responding is a learned operant. In the early days of RFT this was shown correlationally, but a body of experimental work gradually emerged showing the phenomenon (Hayes et al., 2001; Roche, De Houwer, & Dymond, 2013). Today, the evidence for relational operants is widely accepted in behavioral circles. For example, key texts used to train board certified behavior analysts (Cooper, Heron, & Heward, 2019) now include chapters on generative learning through derived relations based on relational operants. Furthermore, the basic importance of these verbal/cognitive processes is underlined by the fact that once children begin to show two-way ("mutually entailed") derived stimulus relations, the ability to isolate a single discernible behavior functions through traditional functional analysis is greatly reduced (Dixon, Belisle, & Stanley, 2018) suggesting that attention to relational framing is a necessary part of verbal/cognitive development (Dixon, 2015).

What follows takes as a given the idea that relational operants are central features of verbal/cognitive events, as we attempt to apply these concepts to a functional contextual approach to the self. Our purpose in building such a foundation is to prepare ourselves with concepts that may be more adequate to the challenge of interpreting and studying psychedelic experience from a non-reductionistic and yet naturalistic point of view. We argue that it is important to have concepts that are minimally contaminated with assumed abilities before considering psychedelic experience and thus that one of the best places to examine the literature on sense of self is in language development, despite its apparent distance from psychedelic experience per se.

1.2. An operant sense of self

Learning accounts have demonstrated that the verbal sense of self emerges over time (e.g. Denham et al., 2012), and is responsive to a wide range of training methods (e.g., Berenaveite, 2000; Lukas, Trevisi Fuentes, & Berking, 2019). A key developmental feature of sense of self is the development of perspective taking and Theory of Mind skills, which refers to the ability to attribute mental states to oneself, and to understand that others have beliefs, desires, intentions, and perspectives that are different from one's own. From the point of view of relational learning, perspective taking and theory of mind skills are based on a wide variety of relational framing skills, including hierarchical, coordinative, causal, and deictic verbal relations. Deictic frames are those "defined by their dependence on the perspective of the speaker." The three most widely studied deictic frames have been *I-you*, *Here-There*, and *Now-Then*. This subset of verbal behavior, when in the hands of those practitioners who treat it as a learned operant, can be trained in normally developing children (Davlin, Rehfeldt, & Lovett, 2011; Heagle & Rehfeldt, 2007; Weil, Hayes, & Capurro, 2011), in people with intellectual and developmental disabilities (Jackson, Mendoza, & Adams, 2014; Lovett & Rehfeldt, 2014; Montoya-Rodríguez & McHugh, 2017; Rehfeldt, Dillen, Ziomek, & Kowalchuk, 2007), and in others with clinical problems such as schizophrenia (O'Neill & Weil, 2014). Curricula tend to start with both arbitrary and non-arbitrary examples which

utilize *I* and *You* such as, “What do I have in my hand?” “What do you have?” or “let’s pretend I am a horse and you are a frog. Who is most likely to say ‘ribbit?’” These prompts can then be reversed with statements such as “if I were you and you were me, what would I have in my hand?” Complexity can be built by utilizing multiple deictic relations, increasingly arbitrary and complex conditional discriminations, and varied stimuli and functions.

Perspective taking and Theory of Mind skills correlate with deictic abilities (e.g., Weil et al., 2011) and across the intervention literature (see Montoya-Rodríguez, Molina, & McHugh, 2017) there is evidence that deictic skills increase general perspective-taking abilities. Nevertheless it is also known that traditional *I-you*, *Here-There*, and *Now-Then* deictic framing training is not alone sufficient to establish Theory of Mind skills (e.g., Jackson et al., 2014). Recent research (Montoya-Rodríguez & Molina-Cobos, 2019) has shown that training that considerably greater progress in establishing such skills emerges if training also includes *I-He*, and *if ... then* relations, along with training in verbs related to private events. This suggests that development of sense of self, and understanding the experiences of others, is facilitated by situating private experience in contingency relations that are seen from the perspective of “I, here, now” while recognizing that perspective taking of this kind can shift across time, place, and person. This analysis helps explain correlational studies that increased deictic ability relates in theoretically coherent ways to enjoyment in being with others (Vilardaga, Estévez, Levin, & Hayes, 2012), and empathy or failures of empathy (e.g., Levin et al., 2016). Said in another way, a naturalistic relational framing approach to sense of self helps explain the nature and importance of felt experience and its role in social functioning. Sense of self provides a context for rules such as “when I feel this then it works best if I do that” that in turn enable the emotions and actions of others to be understood and predicted.

1.3. The three relational selves as a naturalistic foundation

From these basic ideas have flowed research and convergent evidence supporting a conceptualization of self knowledge as composed of at least three parts. The “three selves” account was proposed at the very beginning of ACT and RFT (Hayes, 1984).

1. The *perspective-taking self* (self-as-context) is the verbal “I/here/now” perspective or point of view from which observations are made (McHugh, Stewart, & Priscilla, 2019). An example would be, “I can ‘step back’ and observe myself debating whether or not I am a good person.” There are many terms for this sense of self, including commonly used terms in CBS such as “observing self” or “transcendent sense of self.” As is noted by (Törneke, Luciano, Barnes-Holmes, & Bond, (2016)): “A more technical way of describing this complex behavior is to say that we learn to place our own behavior in a hierarchical relational frame with a deictic ‘I.’ In other words, everything I do, see, think, and feel is experienced as being parts of me or who I am (p. 256; italics added). This is an important point, and we will use the term “diectic I” periodically to remind the reader of it. The importance of hierarchical framing over distinction explains why a perspective-taking sense of self affords ongoing experiential self-knowledge. These more recent data (described below) are one reason we have chosen not to use the term “observing self” since it carries a strong common sense connotation of distinction.
2. The *experiential self* (self-as-process) is an ongoing process of verbal self-awareness. It involves the person engaging in momentary interactions with both their current verbal behavior and features of the current internal and external context so as to observe, describe, and differentiate these events (Hayes, 1984; Hayes et al., 2012). “Now I’m feeling sleepy” or “I see the door” would be examples. This repertoire allows ongoing public and private events to be verbally noted, distinguished, combined, appreciated, and described. The more commonly used term in CBS is “knowing self” but once again

the excessive connotation of distinction leads us to use a more hierarchically friendly term.

3. The *conceptualized self* (self-as-content) is the self-story of evaluated preferences, history, features, and attributes that are said to define oneself, especially in comparison to others. “I can be mean sometimes when I drink” or “I am smart” would be examples.

These three aspects of self are not meant to be exhaustive, however they are senses of self that are tied to a useful naturalistic system as categories of responses to one’s own responding. While all three co-evolved together and are interrelated, the perspective-taking self is arguably the most important in understanding psychological flexibility processes.

As these repertoires of deictic framing strengthen and combine with if ... then framing and description of private events, so too does the ability to imagine the perspective of other people, in other settings, and at other times and the experiences they may be having. The development of a set of deictic frames, in other words, fosters not just “seeing seeing” (Skinner, 1974) but as these frames interact with other verbal stimuli and framing abilities, a “two-way street” of an perspective-taking sense of self is opened up and languaging, thinking, or common experiences may become expansive across people, place, and time.

1.4. Linking the three selves to ACT and psychological flexibility

Studies done with the existing measures of self from an RFT point of view (McHugh et al., 2019, p. 170 list seven such instruments) show that these measures correlate with psychological health and psychological flexibility in coherent ways. Both specific measures focused on self (e.g., the “Self-as-Context Scale”; Zettle et al., 2018) correlate with psychological flexibility and mental health, as do more comprehensive measures of the tripartite RFT model of self (e.g., Moran, Almada, & McHugh, 2018).

A particularly interesting example of research in this area is a study by Atkins and Styles (2016) that scored the actual talk of physicians, lawyers, nurses, and administrators participating in an interview as part of a leadership development program. What we are calling here the “perspective-taking self” was operationalized as references that placed “I/Here/Now” awareness in a relation of distinction from private experience (thoughts, emotions, sensations) such as “I noticed I was both angry and sad at the same time”, and “There’s an awareness that comes when I step back to see what’s going on.” Such talk predicted psychological well-being six months later, controlling for baseline levels. Conversely, self stories (the operational approach used to measure the conceptualized self) did not predict outcomes. A later study replicated these findings and showed a similar effect when “other-as-context” was scored (Styles & Atkins, 2018).

A small number of studies show that changes produced by ACT are associated with or are mediated by changes in sense of self as RFT predicts. For example, Yu, Norton, Almarzooqi, and McCracken (2017) showed that the beneficial impact of ACT on chronic pain could be predicted by beneficial changes in the perspective-taking self. Because it is quite similar to the concept of “decentering” (Naragon-Gainey & DeMarree, 2017) there is a larger body of such work now linked to third wave methods more generally (Bernstein et al., 2015).

As we have noted, a perspective-taking self can also be viewed in terms of frames of distinction or hierarchy. Both of these ideas have always been in the ACT literature but without clarity about the relational framing underlying them, and without testing the differences between the two. For example, many classic ACT metaphors or exercises regarding this aspect of self, such as a chessboard with pieces on it or a house with furniture in it, are hierarchical; while others such as the observer exercises are framed in terms of distinction (Hayes et al., 1999). Recently RFT researchers have shown that an empowering sense of self is best fostered not solely by distinguishing it from the content of experience, but also by viewing the perspective-taking self as in a

hierarchical relation with the content of experience (Foody, Barnes-Holmes, Barnes-Holmes, & Luciano, 2013). It is more powerful to see the perspective-taking self repertoire as “containing” all self-content, and not to view it as abstract and entirely distinct from content. This particular point seems important in exploring the ‘expansive’ qualities of self experienced while behavior is influenced by psychedelics.

The hierarchical-versus-distinction approach to the perspective-taking self has since been shown to interact with other psychological flexibility processes. For example, defusion exercises have more behavioral impact if they are linked to framing one's own behavior through hierarchical deictic relations (Gil-Luciano, Ruiz, Valdivia-Salas, & Suárez-Falcón, 2017; López-López & Luciano, 2017)). It is now becoming increasingly common for ACT interventions to emphasize a hierarchical set when establishing self-processes e.g., (Ruiz & Perete, 2015; Törneke, Luciano, Barnes-Holmes, & Bond, 2016).

Taking the existing evidence as a whole, the tripartite view of self-processes has held up well over its 35 years of existence, has grown in measured steps (Barnes-Holmes, Hayes, Dymond, & O'Hora, 2001, pp. 51–71), and appears to be a key feature of the psychological flexibility processes. In recent times, the hierarchical view of the perspective-taking self appears to be an important advancement of understanding of processes of change.

2. Psychological correlates of Psychedelic experiences and naturalistic units of analysis

Several of the most interesting features of psychedelic experience seem to hinge upon a complex verbal repertoire. Laboratory animals will not regularly self-administer LSD after initial dosing sessions and these substances often can be used to produce conditioned taste aversions (Griffiths, Brady, & Bradford, 1979; Julien, 1988). Non-human primates seem to self-administer regularly only under conditions of isolation and stimulatory deprivation (Siegel & Jarvik, 1980). The reported effects of interest in psychedelic experience are often centered around psychological events that are verbal in nature (Pollan, 2018).

Capturing the qualitative and quantitative nature of the psychological effects of psychedelics can be challenging particularly given the limited experimental history, the broad spectrum of substances for which the term psychedelic might apply, the traditional use of non-naturalistic language in the area of psychedelic research, and the idiosyncratic nature of relational networks and learning histories. However, the effects of psychedelics do seem to fall into thematic categories which can be reasonably be captured by direct interaction, observation, verbal report, and questionnaires such as Five-Dimensional Altered States of Consciousness (5D-ASC) rating scale, Hallucinogen Rating Scale (HRS) and the Mystical Experience Questionnaire (MEQ) (Bouso, Pedrero-Pérez, Gandy, & Alcázar-Córcoles, 2016; Studerus, Gamma, & Vollenweider, 2010). Although varied in their reliability, data from these various sources seem to center around a limited set of consistent acute effects across cultural samples and substances (Bouso et al., 2016). These categories of psychological effects tend to hinge upon reactions that are often explained in ways that are not naturalistic, such as the ego, transcendence, alternate dimensions of reality, or even the actions of the soul. In part for that reason, a detailed, and basic analysis of the cognitive basis of self appears to be an important psychological step to understanding the effects of psychedelic peak experiences in a way that comports with natural science. The following sections will discuss how an analysis can be constructed that stays closer to observed events and that might then be used as we explore the neurological correlates of psychedelic experiences.

2.1. Ego dissolution/mystical experiences/spiritual transcendence/experience of unity

One of the most consistent effects of psychedelic substances is an

alteration of sense of self away from a judgmental self-narrative and toward a perspective-taking self. The terms used to describe this effect vary however effects on sense of self are typically referred to as “ego dissolution” (Nour et al., 2016), “positively experienced depersonalization” (Schmid et al., 2015), “decentering” (Franquesa et al., 2018), and “oceanic boundlessness” (Müller et al., 2017). These psychedelic effects seem to alter the perspective-taking self and the deictic and other frames from which it is derived. These effects may take the forms of: an increased sense of union with others, a reduced sense of self-identity, a reduced sense of self-importance or other forms of self-judgment, and an openness and sense of connection across time and place. The self-report measures of changes to the perspective-taking self include rating scales for such items as “I felt at one with the universe” (Nour et al., 2016). This area is defined by a profound change in sense of time, place, and person reflected in an experience of unity with all things/the universe/living creatures/humanity/across an infinite time scale. Psychedelic substances considerably enhance this sense of “Oceanic Boundlessness” (Schmid et al., 2015) as is reflected in relative agreement with statements like: “I felt as if I no longer had a body”, “I felt connected to a higher power,” “I felt one with my surroundings”, “I experienced past, present, and future as a oneness” “The boundaries between myself and my surroundings seemed to blur” and “Everything around me seemed to be animated with life”. Experiences of this sort are one of the most common experiences associated with psychedelic use, especially at higher doses and their putative therapeutic impact currently appears to be related to an effect on the perspective-taking self in ways which can be informed by, and which parallel mindfulness practices (Smigielski, Scheidegger, Kometer, & Vollenweider, 2019).

A growing list of studies show that psychedelics can have therapeutic effects on a long list of mental health problems e.g., (Bogenschutz & Ross, 2018; dos Santos, Osório, Crippa, & Hallak, 2016). Changes in sense of self, ego dissolution, or oceanic boundlessness correlate with these successful treatment outcomes (Carhart-Harris et al., 2012). Those who have mystical experiences with psychedelics – experiences of oneness across time, place, or person – are especially likely to experience changes in perspective and values, such as greater openness, in long-term follow-ups (MacLean, Johnson, & Griffiths, 2011). More qualitative reviews of patients who have positive effects from psychedelic treatment also point to the role of an increased sense of connection with others, as well as acceptance of emotions (Watts, Day, Krzanowski, Nutt, & Carhart-Harris, 2017). The changes in affect, quality of life, and increased mindfulness are all linked to weakening of the conceptualized self (Uthaug et al., 2018).

Interestingly, the neurobiological predictors of response to psychedelic therapy appear to be almost opposite to the changes seen with SSRIs and other “anti-depressants” but are much more in line with ACT theory. For example, psychedelics increase emotional responsiveness in depression whereas SSRIs dampen down emotion responsivity (Carhart-Harris et al., 2017). Carhart-Harris et al. (2012) found in an fMRI study that among other changes, psilocybin decreased activity in the anterior and posterior cingulate cortex (the ACC and PCC) and the medial prefrontal cortex (mPFC). Those reductions in activity were significantly correlated with the intensity of the subjective effects. Clear connectivity reductions between the mPFC and PCC also occurred.

The mPFC is a key part of our “narrative circuitry” that extends sense of self across time into a person with traits and aspirations (Johnson et al., 2006; Macrae, Moran, Heatherton, Banfield, & Kelley, 2004). The PCC is one of the more active areas of the normal brain and is associated with the “default mode network” (DMN) that is often excessively activated even at rest. Both of these regions are linked to self-referencing and self-construct (Buckner, Andrews-Hanna, & Schacter, 2008; Gusnard, Akbudak, Shulman, & Raichle, 2001) and to monitoring functions in the brain. When under the influence of psychedelic substances the steepest drops in blood flow correlate with the steepest drops in the DMN (Pollan, 2018).

These brain regions and processes are also among those that are

calmed by mindfulness meditation (Fletcher, Schoendorff, & Hayes, 2010). Experimental research has shown that mindfulness meditation narrows the conditions under which the mPFC is activated and reduces the connections to brain structures underlying analytic and judgmental cognition (Fang et al., 2010). For example, when those trained in mindfulness meditation are asked to focus on present-moment experience they show reduced activation of the mPFC and its connectivity, suggesting that they do not engage as much self-narrative and judgment as do persons without mindfulness training when focusing on the present. Based on these data, Siegel (2007) suggests that without mindfulness training “we are often unable to remove ourselves from the narrative chatter of our busy minds and distinguish ongoing story narration and mental time travel from immediate experience of the present moment” and as a result we are unable to live in the present.

In a highly parallel way, Carhart-Harris and colleagues concluded that psychedelic substances dampen the filtering functions imposed by self-narrative centers in the brain and that the “subjective effects of psychedelic drugs are caused by decreased activity and connectivity in the brain’s key connector hubs, enabling a state of unconstrained cognition” (2012, p. 2138). For example, psilocybin decouples the medial temporal lobe and high-level cortical regions, and these neurobiological effects paralleled the sense of loss of an “ego-based” sense of self (Lebedev et al., 2015). Other studies of brain response when exposed to psychedelic substances has emphasized that these substances interfere with perceptual boundaries between the self and the environment, interfering with the modular organization of the processing of inputs (Dixon, Belisle, & Stanley, 2018). Brain entropy and changes in sense of self in turn predict greater emotional openness, weeks after exposure to psychedelics (Tagliazucchi et al., 2016).

Stated in language drawn from the RFT “three selves” analysis, these findings overall suggest that psychedelics reduce the role of the conceptualized self and its dominance over inputs to the experiencing self, and further alter how a perspective-taking self and experiencing self operate in their relation to experience. We will have more to say about this below, but we do not want to leave this section without noting the importance of future work using actual measures of the conceptualized self and fusion with it, expansive self-concepts, perspective-taking, empathy, and ongoing self-knowledge, since the precision of the relation of neurobiological data to these psychological processes depends on the adequacy of measurement.

2.2. Sensory experiences and synesthesia

Psychedelic substances seem to alter stimulus control and motivational functions. It is common for person taking psychedelics to report ‘synesthesia’ such as sounds affecting visual stimulation, or other unusual perceptual experiences (Schmid et al., 2015). Those taking psychedelics tend to agree that “sounds seemed to influence what I saw”, “I saw regular patterns with closed eyes or in complete darkness” and “I saw whole scenes roll by with closed eyes or in complete darkness”. Some of these effects may be described in terms of alterations in motivational operations, rule-following, and stimulus functions that relate to present-moment awareness. The existing research is not sufficient to specify in detail how these differences apply across substances and people, so for present purposes it seems more important to characterize the known neurobiological effects of psychedelics in a general way. There are at least two classes of effects that seem psychologically important. First, psychedelics alter the normal “gating” functions in areas of the brain that pass sensory or sensorimotor information to the cortex. Second, and they reduce the impact of areas of the brain that link sense of self to these gating functions (Vollenweider & Geyer, 2001).

It is important not to hold these conclusions too tightly, since the brain can be used as a kind of over-extended metaphor as levels of analysis are compared. Furthermore, the implications of neurobiological data are very often spoken of in non-technical ways that makes it difficult to draw out their precise implications for behavioral science.

For example, the word “self” in research of this kind is often a common-sense term, unlike the treatment of the issue we are trying to provide here. Issues of time and place, which are part of the deictic I/perspective-taking self/self-as-context in an ACT/RFT approach will be categorized, measured, and spoken of in a different and often more common sense way. Still, in broad terms, psychedelic substances appear to decrease the activation of areas of the brain that support an evaluative, conceptualized sense of self (the “ego”) and that filter, regulate, and constrain stimulus inputs, and they enhance senses of self that are expansive across time, place, and person. It is worth noting that contemplative practice produces similar changes in the brain in several key areas, albeit in less dramatic fashion (Fletcher et al., 2010).

Of less interest to the present paper, it should be noted in passing that there are data regarding psychedelics and their ability to increase neuroplasticity. Some researchers have claimed that “... the drug-induced experience and its integration in the psychotherapeutic process is the crucial mechanism that enables neuroplasticity and behavioral changes.” (Vollenweider & Kometer, 2010). More recent cellular studies suggest that the effect may be more basic, since psychedelics promote neurogenesis at the cellular level both with cultured neural cells and neurons in developing organisms (Ly et al., 2018). This beneficial effect appears to be quite broad, however, and neuroplasticity as a concept, seems to parallel learning science as a commonsense biological truism. When we learn, our brains change.

2.3. A sense of insightfulness

Rules derived while under the influence of psychedelics are often reported to have a ‘noetic quality’—a sense that some truth about oneself or the world has been ‘revealed’ (Pollan, 2018). Items for this psychological effect may be measured by levels of agreement with statements like “I felt very profound”, “I had insights into connections that had previously puzzled me”, “I had very original thoughts”. It is not uncommon in scientific and journalistic reports of peak psychedelic experiences, to find that participants will report that they learned something profound within that experience—even as they perhaps acknowledge that their account may seem silly, nonsensical or cliché. For example, one may find that the phrase ‘love is everything’ is much more than just something one might find on a Hallmark card, and may leave their experience knowing this to be a fundamental truth in the world (Pollan, 2018).

These kinds of accounts seem to suggest that contact with the experiencing self and the perspective-taking self are altered, and the functions of verbal stimuli are likewise. When altered, verbal stimuli which might have otherwise emerged from the perspective-taking self, may enter into hierarchical, and other relations which make those verbal stimuli seem as though they are coming from someplace ‘higher’ such as from a ‘heaven’ ‘God’ or a superior alien species from another time, place, or dimension. From a neurological perspective, this phenomenon seems to present some interesting challenges. Anecdotally, mind-altering substances often have the effect of making self-statements seem to be believable while experiencing the direct effects of the substance—but seldom do we find these ideas to be ‘good’ when we see them from a more sober state of mind. That psychedelic substances seem to carry forth the ‘goodness’ of a given rule or thought through extended periods of time and despite self and outsider scrutiny, is of note. This phenomenon seems to be therapeutically important, and to be something for which a naturalistic psychological account would be helpful in furthering our understanding of the therapeutic process. These verbal stimuli may be so profound as to produce extended changes in life values (often measured by psychological scales) such as a greater concern for others, concern for the environment, creativity, or more focus on the good of others (Lerner & Lyvers, 2006).

2.4. Anxiety and acceptance

It is not by accident that Aldous Huxley, a vocal advocate of the recreational and therapeutic use of LSD in the 50s and 60s, titled his 1954 book on the subject “The Doors of Perception: Heaven and Hell.” Psychedelics occasionally produce intensely negative experiences – such as fear of losing control, dying, or being shamed by your loved ones. Historically they have been thought to be highly influenced by the environmental supports provided to the person before, during, and after the psychedelic experience (Malleson, 1971), but even in controlled settings psychedelics occasionally produce intense anxiety (Schmid et al., 2015). In controlled setting these generally resolve in the form of acceptance of the experience (Pollan, 2018). The potential to contact intensely negative visual, tactile/gustatory, verbal, and auditory stimuli present the opportunity for a kind of “hand-over-hand” acceptance exercise, and thus highlight the importance of the verbal environment at all stages, from preparation to follow-up.

The transformation of the functions of perceived negative experiences (e.g., from relatively bad and avoided, to relatively good and embraced) is an important area of empirical exploration regarding the psychological effects of psychedelics. From a CBS approach there appears to be a shift from experiential avoidance to experiential acceptance. Here the mechanisms of change may be rooted in the cultural context. For example, psychedelic experiences are often cast as teaching moments that are to be approached with openness.

3. Implications for the psychological flexibility model

The written literature on ACT and RFT began in an obscure article published over 35 years ago (Hayes, 1984) claiming that the sense of transcendence that was characteristic of spiritual experience could be related to a learned verbal skills of perspective taking. An extended quote seems warranted in order to link the beginnings of ACT and RFT to the implications of psychedelic experience for the RFT approach to sense of self, and the psychological flexibility model underlying ACT.

What seems to have been missed in most behavioral accounts is that seeing seeing cannot be all there is to self-awareness. It is also critical to the verbal community that this behavior occurs from a given and consistent perspective, locus, or point of view. ... This behavior might emerge in several ways. First, words such as “here” and “there” are acquired which do not refer to a specific thing but to a relation to the child’s point of view. ... Second, children are taught to distinguish their perspective from that of others. ... Finally, it is also possible that a sense of locus emerges by a process of elimination or by metaphorical extension. ... The events constantly change. In our terms, the seeing and the seeing seeing change. Only the locus does not. Thus, the one consistency between the word “you” in such questions and behavior is not seeing or seeing-seeing but the behavior of seeing that you see from a locus or perspective. Thus, in some real sense, “you” are the perspective.

The behavior of seeing-seeing from a perspective is a very odd behavior. For the person engaging in the behavior, it is not truly possible to see it as an object. It is only experienceable in its effects, the feelings associated with it, or as a kind of fleeting after image when we attempt to grab it and look at it directly. If we were to see our own perspective (i.e., as an object) from what perspective would we see it? (Hayes, 1984, pp. 102–103).

In a subsequent section of that same paper it was argued that this sense of self as an observer in turn has value because “It seems more possible from this perspective to see a rule, without having to follow that rule” and that in turn will undermine “an often unsuccessful struggle to get rid of certain reactions deliberately” and instead “allow the direct contingencies themselves to take more control” (pp. 106–109). In other words, said in ways that have emerged since, a hierarchical deictic I fosters psychological flexibility, including defusion, acceptance, and doing what works.

The primacy of self processes that were imagined in that 1984 article, are plausible or even established in the present day. That can be seen in the several streams of data we have examined in this paper from a psychological flexibility and RFT point of view, but it is remarkable how closely these ideas and data parallel the neurobiological and psychological impact of psychedelics. Examining this possible consilience was the primary purpose of the present paper, and indeed it appears that the neurobiological level, psychedelics dampen down self-narratives and their restrictive impact on other sources of information, and enhance an expansive deictic or perspective-taking sense of self, leading to other improvements in psychological flexibility processes. People who use psychedelic substances in guided therapeutic sessions show a more positive psychotherapeutic response if they show changes in the underlying neurobiology of sense of self, as well as self-reported reduction in an “ego based” sense of self (that seems quite similar to the conceptualized self), expansion of a perspective-taking sense of self, and positive changes in other flexibility process such as acceptance, values clarification, or valued action.

Stated more directly, the data on psychedelics supports a model of psychological flexibility that emphasizes the central importance of the perspective-taking self or deictic ‘I’. Consider, for example, how changes in the mPFC increase a sense of transcendence and oneness, a reduction of self-narrative, and a greater capacity to experiencing ongoing emotions and sensations and their relation to the environment more deeply and meaningfully. In flexibility terms, this would translate to the idea the perspective-taking self empowers an experiencing self, as well as greater acceptance, defusion, and contact with the present moment – the four “mindfulness” processes in psychological flexibility.

The “hexagon model” of psychological flexibility it not quite adequate to the representation of these findings. That graphical tool has never integrated well with the three-selves analysis from RFT, for two major reasons. One is that an experiencing self is basically left out, and the other is that the centrality of a perspective-taking sense of self is also under-emphasized. The data on the centrality of these two processes to positive psychedelic experience suggests the possibility of a reworking of the model. One graphical metaphor for doing so, is shown in Fig. 1.

This model has been described as the “Chinese version of the hexagon” (Zhu, 2019). In this approach, the perspective-taking self is

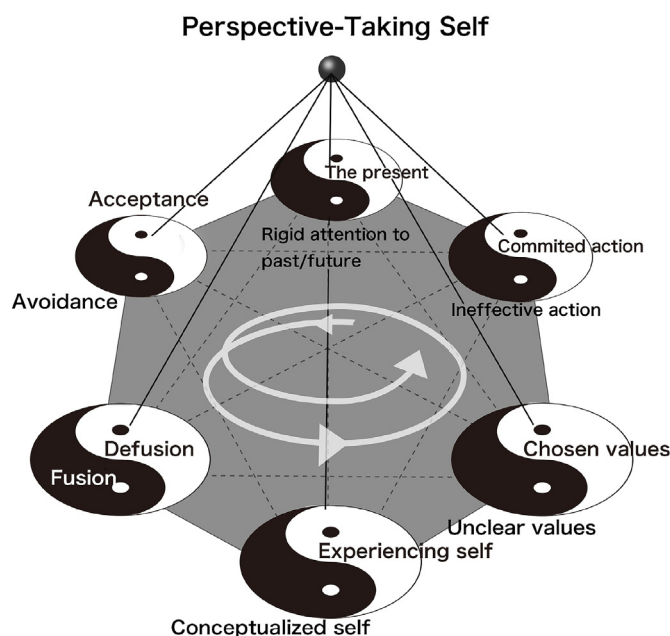


Fig. 1. The Chinese version of the ACT Hexagon, in which the hierarchical nature of a perspective-taking self is emphasized.

viewed as hierarchically framed with all other flexibility and inflexibility processes. Each of these paired sets of inflexibility and flexibility processes are represented as a “ying-yang” dialectic. In order to denote the fact that the functions of all processes are based on context, positive flexibility processes are represented with a dark spot within, to remind us that flexibility is not positive in all areas; negative flexibility processes are presented with a light spot within, to remind us similarly that these processes are not negative in all areas. The hierarchical nature of a perspective-taking self is shown as empowering healthy dialectical transitions between inflexibility and flexibility in each of the six domains.

Unlike the typical hexagon model, this representation gives each aspect of the tripartite model of self a place, while elevating the perspective-taking self to the one process that “rules them all.” In the area specific of sense of self area, this model presents a dialectic is between the conceptualized self and the experiencing self. The reason that values and committed action are moved as compared to the traditional hexagon, and the reason for the spiral in the middle is the following.

We have previously argued (e.g., Hayes, 2019) that flexibility processes are best thought of as emerging from awareness per se, which empowers completing the four mindfulness processes as one moves toward values and committed action. In this “Chinese version” the same basic line of thinking applies as a perspective-taking sense of self allows the present moment to be contacted, in an open (accepting and defused) way, observing and describing ones own experience (the experiencing self), as a foundation for chosen values and committed action. That is what the internal spiral depicts.

It is worth noting in passing that this Chinese version of the model can also be traced to eastern thought. The relationship between ACT flexibility processes and the dialectical approach of Taoism has been discussed by Hurley & Callahan, (2008), who conclude “Third wave CBT’s, such as ACT, show promise for this synergy of Eastern and Western thought. Like Taoism, ACT focuses upon a healthy resolution of the dichotomies of life, acceptance of a situation, and the acknowledgment that language is not the ultimate truth.” In a similar way the centrality of the perspective-taking self is key to understanding such things as the metaphor of three Buddhas in the *Platform Sutra* of Hui-neng, the Sixth Patriarch, who is revered as one of the two great figures in the founding of Ch’an (Zen) Buddhism (Zhu, 2019). Both RFT and ACT are drawn from Western science traditions, and thus these connections with the ancient spiritual and wisdom traditions of Taoism or Zen Buddhism are more a matter of consilience than causal intellectual sequence, still they are worthy of note.

The perspective-taking self has long been argued to be central to avoidance and acceptance in ACT (Hayes & Wilson, 1994) and one positive aspect of Fig. 1 is that it depicts this idea clearly. Fusion involves engaging with our own language ‘as content’ which also means interaction with experience as evaluated, not just as experienced – a process that is fostered by perspective taking. Early experimental work on acceptance understandably focused on specific rules or acceptance exercises for participants (Eifert & Heffner, 2003) but being able even to notice material to be accepted is facilitated by perspective-taking.

The ideas presented in this chapter require more empirical attention. For example, we need to know how best to establish and measure an perspective-taking self and then to use that repertoire-altering skill to foster over flexibility skills. As better measures of that sense of self appear, more attention needs to be directed to it as a potentially pivotal process in psychological distress. In addition, research should foster a robust understanding of the conditions that lead to meaningful improvement related to the development of the deictic I and how these improvements affect experiential avoidance and acceptance. Psychedelic use under specific conditions may be a way to expedite this research with relatively low time commitments for users with complex histories of engaging in fusion and experiential avoidance.

To take another example, the role of perspective-taking in committed action also needs more research attention (Trindade, Marta-

Simões, Ferreira, & Pinto-Gouveia, 2018). Noticing that actions are or are not values based, requires skills that go beyond the conceptualized self, into skills that are based in the experiencing and perspective-taking senses of self. A hierarchical deictic I arguably helps the person notice the functional of actions in a broader way – both actions the move toward values and those that move away from values. Committed action is an area of special importance because it is the behavior bottom line of the model, but also because it involves the person interacting with multiple ACT processes at once and then engaging in behavior that is aligned with their values in the context of all other processes. Exploring the relationship of committed action to the development and utilization of the perspective-taking self would aid in validation of current applied practices and in the development of future measurement approaches.

In emphasizing the importance of hierarchical framing of a perspective-taking sense of self we should not yet dismiss distinction framing as also being of importance to this effect. The perspective-taking self “... involves one relating to one’s own private psychological content as distinct and separate to themselves” (Moran et al., 2018). That bit of distinction appears to be necessary to prevent the perspective-taking self from becoming just another form of the experiencing self. The data on psychedelic substances as well as the data on flexibility processes themselves suggest that the perspective-taking self and experiencing self are related but not the same. Future research could usefully examine the effects of targeting these areas in particular sequences or noting their natural unfolding in a dynamical system (e.g., Hayes et al., 2019).

The RFT tripartite view of self is alive and well, and all three are of known importance clinically speaking. As is noticed by (Moran et al., 2018) in their study of adolescent mental health, “higher levels of the Self-as-Context, higher levels of Self-as-Process, and a less conceptualized self were found to be related to lower levels of distress.” At the same time, the data we have been reviewing, suggests that the deictic I, or perspective-taking self is of transformational importance.

Contextual behavioral science (CBS) research has emphasized the precision and scope of its concepts and models. The present paper is an exploration of the depth of those concepts and models. The overlap between psychological flexibility concepts and psychedelic experiences provides a unique opportunity for CBS-oriented practitioners and research to help guide psychedelic research – a field that does not yet have a coherent approach to psychological phenomena – while at the same time learning more about how flexibility processes apply across levels of analysis. The psychological level of analysis is not the same as the neurobiological level but ultimately these two need to coherent adn there is a unique opportunity to establish strategic partnerships in the work on psychedelics. Aligning with researchers to explore how psychedelics impacts a range of psychological events could create the conditions for CBS to expand its empirical investigations on senses of self and psychological flexibility and the linkage of these processes and principles to the underlying neurobiology that supports them. In addition there is every early indication that ACT and the psychological flexibility model may provide a powerful and helpful guide to the therapeutic use of psychedelics substances. Psychedelics provide an opportunity for interdisciplinary work that can assist CBS in refining theoretical models and fostering an understanding of self as part of a coherent functional contextual worldview, while doing clinical good at the same time.

References

- Atkins, P. W. B., & Styles, R. G. (2016). Measuring self and rules in what people say: Exploring whether self-discrimination predicts long-term wellbeing. *Journal of Contextual Behavioral Science*, 5(2), 71–79.
- Barnes-Holmes, D., Hayes, S. C., Dymond, S., & O’Hora, D. (2001). Multiple stimulus relations and the transformation of stimulus functions. In S. C. Hayes, D. Barnes-Holmes, & B. Roche (Eds.), *Relational frame theory: A post-skinnerian account of human language and cognition*. New York: Plenum.

- Berenaveite, M. (2000). Exploring the benefits of group psychotherapy in reducing alexithymia in coronary heart disease patients: A preliminary study. *Psychotherapy and Psychosomatics*, 69(3), 117–122.
- Bernstein, A., Hadash, Y., Lichtash, Y., Tanay, G., Shepherd, K., & Fresco, D. M. (2015). Decentering and related constructs: A critical review and metacognitive processes model. *Perspectives on Psychological Science*, 10(5), 599–617. <https://doi.org/10.1177/1745691615594577>.
- Bogenschutz, M. P., & Ross, S. (2018). Therapeutic applications of classic hallucinogens. Current topics in behavioral neurosciences. 36(361).
- Bouso, J. C., Pedrero-Pérez, E. J., Gandy, S., & Alcázar-Córcoles, M.Á. (2016). Measuring the subjective: Revisiting the psychometric properties of three rating scales that assess the acute effects of hallucinogens. *Human Psychopharmacology*, 31, 356–372.
- Buckner, R. L., Andrews-Hanna, J. R., & Schacter, D. L. (2008). The brain's default network: Anatomy, function, and relevance to disease. *Annals of the New York Academy of Sciences*, 1124, 1–38. <https://doi.org/10.1196/annals.1440.011>.
- I, D. J. N. Carhart-Harris, A. R. L., Erritzoe, D., Williams, T., Stone, J. M., Reed, L. J., Colasanti, A., et al. (2012). Neural correlates of the psychedelic state as determined by fMRI studies with psilocybin. *Proceedings of the National academy of sciences of the United States of America*: Vol. 109, (pp. 2138–2143). 6.
- Carhart-harris, R. L., Roseman, L., Bolstridge, M., Demetriou, L., Pannekoek, J. N., Wall, M. B., et al. (2017). Psilocybin for treatment-resistant depression: fMRI-measured brain mechanisms. *Scientific Reports*, 1–11 (September), report.
- Carhart-Harris, R. L., Roseman, L., Haijen, E., Erritzoe, D., Watts, R., Branchi, I., et al. (2018). Psychedelics and the essential importance of context. *Journal of Psychopharmacology*, 32(7), 725–731. <https://doi.org/10.1177/0269881118754710>.
- Cooper, J. O., Heron, T. E., & Heward, W. L. (2019). *Applied behavior analysis* (3rd ed.). Upper Saddle River, NJ: Pearson.
- Davlin, N. L., Rehfeldt, R. A., & Lovett, S. (2011). A relational frame theory approach to understanding perspective-taking using children's stories in typically developing children. *European Journal of Behavior Analysis*, 12(2), 403–430. <https://doi.org/10.1080/15021149.2011.11434392>.
- Denham, S. A., Bassett, H. H., Mincic, M., Kalb, S., Way, E., Wyatt, T., et al. (2012). Social-emotional learning profiles of preschoolers' early school success: A person-centered approach. *Learning and Individual Differences*, 22(2), 178–189.
- Dixon, M. R. (2015). *PEAK relational training system: Equivalence module*. Carbondale, IL: Shawnee Scientific Press.
- Dixon, M. R., Belisle, J., & Stanley, C. R. (2018). *Derived relational responding and intelligence: Assessing the relationship between the PEAK-E pre-assessment and IQ with individuals with autism and related disabilities*. 419–430.
- Eifert, G. H., & Heffner, M. (2003). The effects of acceptance versus control contexts on avoidance of panic-related symptoms. *Journal of Behavior Therapy and Experimental Psychiatry*, 34(3–4), 293–312.
- El-Seedi, H. R., Smet, P. A., D, G. M., Beck, O., Possnert, G., & Bruhn, J. G. (2005). Prehistoric peyote use: Alkaloid analysis and radiocarbon dating of archaeological specimens of Lophophora from Texas. *Journal of Ethnopharmacology*, 101(1–3), 238–242.
- Fang, C. Y., Reibel, D. K., Longacre, M. L., Rosenzweig, S., Campbell, D. E., & Douglas, S. D. (2010). Enhanced psychosocial well-being following participation in a mindfulness-based stress reduction program is associated with increased natural killer cell activity. *Journal of Alternative & Complementary Medicine*, 16(5), 531–538.
- Fletcher, L. B., Schoendorff, B., & Hayes, S. C. (2010). Searching for mindfulness in the brain: A process-oriented approach to examining the neural correlates of mindfulness. *Mindfulness*, 1(1), 41–63. <https://doi.org/10.1007/s12671-010-0006-5>.
- Foody, M., Barnes-Holmes, Y., Barnes-Holmes, D., & Luciano, C. (2013). An empirical investigation of the role of self, hierarchy, and distinction in a common act exercise. *Psychological Record*, 65(2), 231–243.
- Franquesa, A., Sainz-Cort, A., Gandy, S., Soler, J., Alcázar-Córcoles, M.Á., & Bouso, J. C. (2018). Psychological variables implied in the therapeutic effect of ayahuasca: A contextual approach. *Psychiatry Research*, 264(March), 334–339. <https://doi.org/10.1016/j.psychres.2018.04.012>.
- Gil-Luciano, B., Ruiz, F. J., Valdivia-Salas, S., & Suárez-Falcón, J. C. (2017). Promoting psychological flexibility on tolerance tasks: Framing behavior through deictic/hierarchical relations and specifying augmental functions. *Psychological Record*, 67(1), 1–9. <https://doi.org/10.1007/s40732-016-0200-5>.
- Griffiths, R. R., Brady, J. V., & Bradford, L. D. (1979). Predicting the abuse liability of drugs with animal drug self-administration procedures: Psychomotor stimulants and hallucinogens. In T. T. Thompson, & P. B. Dews (Vol. Eds.), *Advances in behavioral pharmacology*. Vol. 2.
- Gusnard, D. A., Akbudak, E., Shulman, G. L., & Raichle, M. E. (2001). Medial prefrontal cortex and self-referential mental activity: Relation to a default mode of brain function. *Proceedings of the National academy of sciences of the United States of America*: Vol. 98.
- Hayes, S. C. (1984). Making sense of spirituality. *Behaviorism*, 12(2), 99–110.
- Hayes, S. C. (1989). *Rule-Governed behavior: Cognition, contingencies, and instructional control*. New York: Plenum Press.
- Hayes, S. C. (2019). *A liberated mind: How to pivot toward what matters*. New York: Penguin/Avery.
- Hayes, S. C., Barnes-Holmes, D., & Roche, B. (2001). *Relational frame theory: A post-skinnerian account of human language and cognition*. New York: Kluwer Academic/Plenum Publishers.
- Hayes, S. C., Bissett, R. T., Korn, Z., Zettle, R. D., Rosenfarb, I. S., Cooper, L. D., et al. (1999). The Impact of Acceptance versus control rationales on pain tolerance. *Psychological Record*, 49, 33–47.
- Hayes, S. C., Brownstein, A. J., Devany, J. M., Kohlenberg, B. S., & Shelby, J. (1987). Stimulus equivalence and the symbolic control of behavior. *Mexican Journal of Behavior Analysis*, 13, 361–374.
- Hayes, S. C., Hofmann, S. G., Stanton, C. E., Carpenter, J. K., Sanford, B. T., Curtiss, J. E., et al. (2019). The role of the individual in the coming era of process-based therapy. *Behaviour Research and Therapy*, 117, 40–53. <https://doi.org/10.1016/j.brat.2018.10.005>.
- Hayes, S. C., Kohlenberg, B. S., & Hayes, L. J. (1991). The transfer of specific and general consequential functions through simple and conditional equivalence classes. *Journal of the Experimental Analysis of Behavior*, 56, 119–137.
- Hayes, S. C., Strosahl, K. D., & Wilson, K. G. (2012). *Acceptance and commitment therapy: The process and practice of mindful change* (2nd ed.). New York, NY: Guilford Press.
- Hayes, S. C., & Wilson, K. G. (1994). Acceptance and commitment therapy: Altering the verbal support for experiential avoidance. *The Behavior Analyst*, 17(2), 289–303.
- Heagle, A. I., & Rehfeldt, R. A. (2007). Teaching perspective-taking skills to typically developing children through derived relational responding. *Journal of Early and Intensive Behavioral Intervention*, 3(1), 1–34.
- Hurley, E., & Callahan, J. (2008). Integrating eastern philosophy into western psychology: A primer for students of applied psychology. *Modern Psychological Studies*, 13, 50–59.
- Huxley, A. (1954). *The doors of perception: Heaven and hell*. New York: Harper Perennial.
- Jackson, M. L., Mendoza, D. R., & Adams, A. N. (2014). Teaching a deictic relational repertoire to children with autism. *Psychological Record*, 64(4), 791–802.
- Johnson, M. K., Raye, C. L., Mitchell, K. J., Touryan, S. R., Greene, E. J., & Nolen-Hoeksema, S. (2006). Dissociating medial frontal and posterior cingulate activity during self-reflection. *Social Cognitive and Affective Neuroscience*, 1(1), 56–64. <https://doi.org/10.1093/scan/nsl004>.
- Julien, R. M. (1988). *A primer of drug action (Fifth)*. New York: W.H. Freeman.
- Kantor, J. R. (1963). *The scientific evolution of psychology*. Principia Press.
- Lebedev, A. V., Lövdén, M., Rosenthal, G., Feilding, A., Nutt, D. J., & Carhart-harris, R. L. (2015). Finding the self by losing the self: Neural correlates of ego-dissolution under psilocybin. *Human Brain Mapping*, 36(8), 3137–3153.
- Lerner, M., & Lyvers, M. (2006). Values and beliefs of psychedelic drug users: A cross-cultural study. *Journal of Psychoactive Drugs*, 38(2), 143–147. <https://doi.org/10.1080/02791072.2006.10399838>.
- Levin, M. E., Luoma, J. B., Vilardaga, R., Lillis, J., Nobles, R., & Hayes, S. C. (2016). Examining the role of psychological inflexibility, perspective taking, and empathic concern in generalized prejudice. *Journal of Applied Social Psychology*, 46(3), 180–191. <https://doi.org/10.1111/jasp.12355>.
- López-López, J. C., & Luciano, C. (2017). An experimental analysis of defusion interactions based on deictic and hierarchical framings and their impact on cognitive performance. *Psychological Record*, 67(4), 485–497. <https://doi.org/10.1007/s40732-017-0250-3>.
- Lovett, S., & Rehfeldt, R. A. (2014). An evaluation of multiple exemplar instruction to teach perspective-taking skills to adolescents with Asperger Syndrome. *Behavioral Development Bulletin*, 19(2), 22–36. <https://doi.org/10.1037/h0100575>.
- Lukas, C. A., Trevisi Fuentes, H., & Berking, M. (2019). Smartphone-based emotion recognition skills training for alexithymia: A randomized controlled pilot study. *Internet Interventions*, 17.
- Ly, C., Greb, A. C., Cameron, L. P., Wong, J. M., Barragan, E. V., Wilson, P. C., et al. (2018). Psychedelics promote structural and functional neural plasticity. *Cell Reports*, 23(11), 3170–3182.
- MacLean, K. A., Johnson, M. W., & Griffiths, R. R. (2011). Mystical experiences occasioned by the hallucinogen psilocybin lead to increases in the personality domain of openness. *Journal of Psychopharmacology*, 25(11), 1453–1461.
- Macrae, C. N., Moran, J. M., Heatherton, T. F., Banfield, J. F., & Kelley, W. M. (2004). Medial prefrontal activity predicts memory for self. *Cerebral Cortex*, 14(6), 647–654. <https://doi.org/10.1093/cercor/bhh025>.
- Malleon, N. (1971). Acute adverse reactions to LSD in clinical and experimental use in the United Kingdom. *British Journal of Psychiatry*, 118, 229–230.
- Malone, T. C., Mennenga, S. E., Guss, J., Podrebarac, S. K., Owens, L. T., Bossis, A. P., et al. (2018). Individual experiences in four cancer patients following psilocybin-assisted psychotherapy. *Frontiers in Pharmacology*, 9, 256–256.
- McHugh, L., Stewart, I., & Priscilla, A. (2019). *A contextual behavioral guide to the self*. Oakland, CA: Context Press.
- Montoya-Rodríguez, M. M., & McHugh, L. (2017). Teaching perspective-taking skills to an adult with down syndrome: A case study. *Journal of Contextual Behavioral Science*, 6(3), 293–297.
- Montoya-Rodríguez, M. M., Molina, F. J., & McHugh, L. (2017). A review of relational frame theory research into deictic relational responding. *Psychological Record*, 67(4), 569–579.
- Montoya-Rodríguez, M. M., & Molina-Cobos, F. J. (2019). Training perspective taking skills in individuals with intellectual disabilities: A functional approach. *Journal of Contextual Behavioral Science*, 14, 1–10. <https://doi.org/10.1016/j.jcbs.2019.08.003>.
- Moran, O., Almada, P., & McHugh, L. (2018). An investigation into the relationship between the three selves (Self-as-Content, Self-as-Process and Self-as-Context) and mental health in adolescents. *Journal of Contextual Behavioral Science*, 7, 55–62.
- Müller, F., Lenz, C., Dolder, P., Lang, U., Schmidt, A., Liechti, M., et al. (2017). Increased thalamic resting-state connectivity as a core driver of LSD-induced hallucinations. *Acta Psychiatrica Scandinavica*, 136(6), 648–657. <https://doi.org/10.1111/acps.12818>.
- Naragon-Gainey, K., & DeMarree, K. G. (2017). Decentering attenuates the associations of negative affect and positive affect with psychopathology. *Clinical Psychological Science*, 5(6), 1027–1047. <https://doi.org/10.1177/2167702617719758>.
- Nour, M. M., Evans, L., Nutt, D., & Carhart-Harris, R. L. (2016). Ego-dissolution and psychedelics: Validation of the ego-dissolution inventory (EDI). *Frontiers in Human Neuroscience*, 10(June), 1–13. <https://doi.org/10.3389/fnhum.2016.00269>.
- O'Neill, J., & Weil, T. M. (2014). Training deictic relational responding in people diagnosed with schizophrenia. *Psychological Record*, 64(2), 301–310.
- Pollan, M. (2018). *How to Change Your Mind: What the new science of psychedelics teaches us*

- about consciousness, dying, addiction, depression, and transcendence. New York: Penguin Press.
- Rehfeldt, R. A., Dillen, J. E., Ziomek, M. M., & Kowalchuk, R. K. (2007). Assessing relational learning deficits in perspective-taking in children with high-functioning autism spectrum disorder. *Psychological Record*, 57, 23–47.
- Roche, B., De Houwer, J., & Dymond, S. (2013). *Advances in relational frame theory: Research and application*. Oakland: Context Press.
- Ross, S., Bossis, A., Guss, J., Agin-liebes, G., Malone, T., Cohen, B., et al. (2016). Rapid and sustained symptom reduction following psilocybin treatment for anxiety and depression in patients with life-threatening cancer: A randomized controlled trial. *Journal of Psychopharmacology*, 30, 1165–1180.
- Ruiz, F. J., & Perete, L. (2015). Application of relational frame theory account of psychological flexibility in young children. *Psicothema*, 27(2), 114–119.
- dos Santos, R. G., Osório, F. L., Crippa, J. A. S., & Hallak, J. E. C. (2016). Classical hallucinogens and neuroimaging: A systematic review of human studies: Hallucinogens and neuroimaging. *Neuroscience & Biobehavioral Reviews*, 71, 715–728. <https://doi.org/10.1016/j.neubiorev.2016.10.026>.
- Schmid, Y., Enzler, F., Gasser, P., Grouzmann, E., Preller, K. H., Vollenweider, F. X., et al. (2015). Acute effects of lysergic acid diethylamide in healthy subjects. *Biological Psychiatry*, 78(8), 544–553.
- Sidman, M. (1971). Reading and auditory-visual equivalences. *Journal of Speech and Hearing Research*, 14(1), 5–13. <https://doi.org/10.1044/jshr.1401.05>.
- Sidman, M. (1994). *Equivalence relations and behavior: A research story*. Equivalence relations and behavior: A research story. Boston, MA, US: Authors Cooperative.
- Siegel, D. J. (2007). Mindfulness training and neural integration: Differentiation of distinct streams of awareness and the cultivation of well-being. *Social Cognitive and Affective Neuroscience*, 2(4), 259–263.
- Siegel, R. K., & Jarvik, M. E. (1980). DMT self-administration by monkeys in isolation. *Bulletin of the Psychonomic Society*, 16(2), 117–120.
- Skinner, B. F. (1957). *Verbal behavior*. New York: Appleton-Century-Crofts.
- Skinner, B. F. (1974). *About behaviorism*. New York: Knopf.
- Smigielski, L., Scheidegger, M., Komater, M., & Vollenweider, F. X. (2019). Psilocybin-assisted mindfulness training modulates self-consciousness and brain default mode network connectivity with lasting effects. *NeuroImage*, 196(April), 207–215. <https://doi.org/10.1016/j.neuroimage.2019.04.009> Retrieved from.
- Steele, D. L., & Hayes, S. C. (1991). Stimulus equivalence and arbitrarily applicable relational responding. *Journal of the Experimental Analysis of Behavior*, 56, 519–555.
- Studerus, E., Gamma, A., & Vollenweider, F. X. (2010). Psychometric evaluation of the altered states of consciousness rating scale (OAV). *PLoS One*, 5(8).
- Styles, R. G., & Atkins, P. W. B. (2018). Measuring perceptions of self and others in what people say: A replication and extension of the functional self-discrimination measure. *Journal of Contextual Behavioral Science*, 9(December 2017), 45–52. <https://doi.org/10.1016/j.jcbs.2018.06.005>.
- Tagliazucchi, E., Roseman, L., Kaelen, M., Orban, C., Muthukumaraswamy, S. D., Murphy, K., et al. (2016). Increased global functional connectivity correlates with LSD-induced ego dissolution. *Current Biology*, 26(8), 1043–1050. <https://doi.org/10.1016/j.cub.2016.02.010>.
- Törneke, N., Luciano, C., Barnes-Holmes, Y., & Bond, F. W. (2016). RFT for clinical practice: three core strategies in understanding and treating human suffering. In R. D. Zettle, S. C. Hayes, P. M. D. Barnes-Holmes, & A. Biglan (Eds.). *The Wiley handbook of contextual behavioral science* (pp. 254–272). West-Sussex, UK: Wiley-Blackwell.
- Trindade, I. A., Marta-Simões, J., Ferreira, C., & Pinto-Gouveia, J. (2018). Developments on committed action: Validity of the CAQ-8 and analysis of committed action's role in depressive symptomatology in breast cancer patients and healthy individuals. *Clinical Psychology & Psychotherapy*, 25(1), e42–e50.
- Uthaug, M. V., van Oorsouw, K., Kuypers, K. P. C., van Bostel, M., Broers, N. J., Mason, N. L., et al. (2018). Sub-acute and long-term effects of ayahuasca on affect and cognitive thinking style and their association with ego dissolution. *Psychopharmacology*, 235(10), 2979–2989.
- Vilardaga, R., Estévez, A., Levin, M. E., & Hayes, S. C. (2012). Deictic relational responding, empathy, and experiential avoidance as predictors of social anhedonia: Further contributions from relational frame theory. *Psychological Record*, 409–432.
- Vollenweider, F. X., & Geyer, M. A. (2001). A systems model of altered consciousness: Integrating natural and drug-induced psychoses. *Brain Research Bulletin*, 56(5), 495–507.
- Vollenweider, F. X., & Komater, M. (2010). The neurobiology of psychedelic drugs. *Nature Reviews Neuroscience*, 11(9), 642–651.
- Watts, R., Day, C., Krzanowski, J., Nutt, D., & Carhart-Harris, R. (2017). Patients' accounts of increased “connectedness” and “acceptance” after psilocybin for treatment-resistant depression. *Journal of Humanistic Psychology*, 57(5), 520–564. <https://doi.org/10.1177/0022167817709585>.
- Weil, T. M., Hayes, S. C., & Capurro, P. (2011). Establishing a deictic relational repertoire in young children. *Psychological Record*, 61, 371–390.
- Yu, L., Norton, S., Almarzooqi, S., & McCracken, L. M. (2017). Preliminary investigation of self-as-context in people with fibromyalgia. *British Journal of Pain*, 11(3), 134–143. <https://doi.org/10.1177/2049463717708962>.
- Zettle, R. D., Gird, S. R., Webster, B. K., Carrasquillo-richardson, N., Swails, A., & Burdals, C. A. (2018). Journal of contextual behavioral science the self-as-context Scale. *Development and preliminary psychometric properties*, 10(August), 64–74. <https://doi.org/10.1016/j.jcbs.2018.08.010>.
- Zhu, Z. (2019). *A dialectical model of psychological flexibility – ACT in Chinese culture. Paper presented at China's Second ACT Summit Forum.* (Beijing, China).