



# Absorption and spiritual experience: A review of evidence and potential mechanisms

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## ABSTRACT

Some people seem to have a 'talent' for spiritual experience: they readily sense the presence of supernatural beings, receive special messages from God, and report intense feelings of self-transcendence, awe and wonder. Here we review converging strands of evidence to argue that the trait of 'absorption' captures a general proclivity for having spiritual experiences. Participants scoring highly on the Tellegen Absorption Scale report vivid experiences of hearing God's voice during prayer, intense mystical experiences in response to psychedelics or placebo brain-stimulation, and strong feelings of presence and transcendence when confronted with natural beauty, virtual reality, or music. Several mechanisms may help to explain the relationship between absorption and spiritual experience. We suggest that absorption captures an experiential mindset that intensifies inner and outer sensory experience in ways that reflect both prior expectation and novel sensory engagement. It seems to enable that which must be imagined to feel more real.

## 1. Introduction

One of the enduring puzzles in ethnography and history is that everywhere in the world we find spiritual experts—shamans, priests, sorcerers, and sadhus—and yet nowhere in the world is there a society in which all are experts. How is it that some people come to have vivid spiritual experiences, but not others? Some people hear God speak audibly; some feel an electric union with the universe; some find themselves floating above their bodies in pure joy. Yet not all people have these experiences, despite their best efforts.

We propose that the trait of 'absorption' can help to explain why spiritual experiences come easily to some but not to others. First, we describe what is known about the trait of absorption: that it grew out of work on hypnosis and imagination and has been associated with vivid mental imagery and altered agency, and with enthusiasm for nature, literature, music and an openness to experience in general. Second, we discuss the role of absorption and prayer in voice hearing experiences among charismatic evangelical Christians. Third, we present different strands of evidence showing that absorption correlates with extraordinary experiences associated with psychedelics and placebo God-helmet manipulations. Finally, we show that absorption predicts a range of experiences closely related to spirituality, including moments of awe and wonder when encountering natural beauty, art, or music, feelings of realism in virtual reality (VR), and experiences of the paranormal. Of course, the social and cultural contexts in which these experiences occur play an important role in shaping their content and interpretation. Yet, even in spiritual contexts where these

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experiences are highly prized, not everyone seems capable of having them. We suggest that those who score highly on the absorption scale report more spiritual (or quasi-spiritual) experiences because they are better able to blur the boundaries between mind and world, between imagination and perception, so that the invisible and immaterial supernatural can come to seem more real.

## 2. The trait of 'absorption'

### 2.1. The Tellegen absorption scale

The trait of 'absorption' has a rich and complex history as a psychological construct. Ever since the publication of the Tellegen absorption scale in 1974, this questionnaire has emerged as the dominant tool for conceptualizing and measuring the trait (Tellegen & Atkinson, 1974). Originally developed as a pen-and-paper test of hypnotizability, the Tellegen absorption scale consists of 34 items that pick up an individual's tendency to become deeply engrossed in sensory or imaginative experiences (for a detailed account of the development of the scale, see Tellegen, 1981). Example items include: 'I can be greatly moved by eloquent or poetic language.', 'Sometimes I feel as if my mind could envelop the whole world.', 'My thoughts often don't occur as words but as visual images.' and 'At times I somehow feel the presence of someone who is not physically there' (full scale published in: Carleton, Abrams, & Asmundson, 2010; Jamieson, 2005). According to Tellegen (1981), people who score highly on this scale are drawn toward experiences of total attentional engagement, where practical concerns recede to the background, giving way to a receptive immersion in the experience as an end in itself. We all experience such episodes, perhaps when watching a good film or gazing pensively over the ocean as the sun drops below the horizon. Some people more than others, however, appear to gravitate towards these kinds of experiences. They seem to have a proclivity—that is, a willingness and an ability—to become deeply engrossed in sensory and imaginative experiences. When people high in absorption watch a good movie, the story might sometimes seem more real than the world around them.

The origins of the concept of absorption can be traced back to the early 1950s and 60s and the quest for the personality correlates of hypnosis and suggestibility. At the time, it was already acknowledged that some people respond more strongly than others to suggestions for experiences such as involuntary movements or hallucinations. Classical measures for determining hypnotizability had been developed, such as the Stanford Scale of Hypnotic Susceptibility (Weitzenhoffer & Hilgard, 1959), which could be administered individually or in groups (Shor & Orne, 1963). However, these scales mainly focused on behavioral responses (e.g., such as whether a participant lowered his or her hand in response to a suggestion) rather than the subjective experience of involuntariness that accompanied these behaviors. Ronald Shor—a graduate student of Abraham Maslow—was among the first to compile the Personal Experiences Questionnaire to assess people's everyday hypnotic-like experience and to determine their relation with hypnotizability (Shor, Orne, & O'Connell, 1962; Shor, 1960). Highly hypnotizable people tend to respond positively to items such as 'Have you ever found yourself staring at something and for the moment forgotten where you were?', 'Have you ever become so absorbed in listening to music that you almost forgot where you were?' and 'Have you ever felt a oneness with the universe, a melting into the universe, or a sinking into eternity?'. Shor already acknowledged an intriguing parallel between instances of hypnosis and related experiences that are characterized by a slipping of reality-orientation, such as peak experiences and mystical experiences (Shor, 1959).

Around the same time, Arvid Ås developed the Experience Inventory to assess the relation with hypnotizability (Ås & Lauer, 1962; Ås, 1962, 1963). This scale contained items like 'Have you ever had the feeling that a part of your body was not really a part of you?', 'Have you ever found a sort of fulfillment of yourself in creating something, as in crafts, science, writing, art or music?' and 'Have you ever had the experience of being caught up by music or dancing so that you became enraptured by it and had it live and express itself through you so that you as yourself seemed to cease to be during it?'. The correlations of this scale with hypnotizability were modest, though robust as they replicated well across different studies and samples.

These scales—and related work on the trait of imaginative involvement (Hilgard, 1970, 1974, 1979)—formed the starting point for the development of the absorption scale. In a series of interview studies, Hilgard et al. found that individuals who were more responsive to hypnosis also tended to enjoy experiences of fantasy involving a suspension of critical thinking and reality orientation. She observed that highly hypnotizable people tended to cultivate a rich world of daydreams, savored sensory experiences, read voraciously, and gravitated toward the arts as well as the religious and spiritual dimensions of life. Based on Hilgard's results and converging findings from independent follow-up studies (Lynn & Rhue, 1986; Perry, 1973; Silva & Kirsch, 1992), leading scholars argued for some time that imagery and fantasy played a central role in fostering hypnotic response (but see: Bowers, 1992; Comey & Kirsch, 1999; for an argument that hypnosis does not depend on mental imagery).

Many of the items on the Tellegen absorption scale emphasize the inner landscape of fantasy and mental imagery, as reflected in items such as 'If I wish, I can imagine (or daydream) some things so vividly that they hold my attention in the way a good movie or story does' (Jamieson, 2005). Tellegen was clear from the beginning that absorption also encompasses engaging responses to external stimuli, e.g., as represented by items such as: 'I can be deeply moved by a sunset'. But even when the inducing stimulus is external, such as in the case of a sunset, it is the inner world that responds—the sight of the sunset rouses the emotions. The object of attention evokes internalized associations and elaborations of meaning. This elaborative component also relates to the cross-modal quality of many absorption experiences. The crackling of a wood fire sparks the imagination; a sound conjures a particular scent; organ music evokes a sense of lifting into the air. The inner world of fantasy and cross-modal, affective associations are central to many of the scale items (Carleton et al., 2010). Indeed, the literature suggests that people high in absorption tend to have active imaginations. Absorption correlates with reports of daydreaming and mind-wandering (Crawford, 1982; Hoyt et al., 1989) as well as fantasy-proneness in everyday life (Lynn & Rhue, 1986, 1987, 1988; Rhue & Lynn, 1989; Rivers, Wickramasekera, Pekala, & Rivers, 2016). One study reported that high, compared to low, absorption participants had an easier time adopting an effortless state of inward attention

in a directed daydreaming session (Råmonth, 1985). A number of studies also found positive correlations between absorption and mental imagery ability (Campos & Perez, 1988; Crawford, 1982; Hilgard, Sheehan, Monteiro, & Macdonald, 1981; McConkey & Nogrady, 1986; McConkey & Nogrady, 1986; Monteiro, Macdonald, & Hilgard, 1980; Sheehan, McConkey, & Law, 1978; Spanos, McPeake, & Churchill, 1976; Spanos, Cross, Menary, Brett, & de Groh, 1987; Sweeney, Lynn, & Belleza, 1986).

Whatever the object of attention—whether a daydream, a sunset, or a piece of music—the events probed by the absorption scale are marked by an experiential (as opposed to instrumental) mindset (Tellegen, 1981; Wild, Kuiken, & Schopflocher, 1995). The episode is experienced as an end in itself, dissociated from the pragmatic, instrumental concerns of everyday life. The word ‘absorption’ derives from the Latin *absorbere*, ‘to swallow up’. This sense of swallowing evokes the fundamentally receptive quality of absorption as it was understood by Tellegen (1981). The absorbed individual seems to be drawn effortlessly to the experience, without a sense of willful exertion or goal-directed striving. Here again the connection to hypnosis may be instructive. Hypnotic responses are characterized by a feeling of involuntariness (Bowers, 1982; Bowers, Laurence, & Hart, 1988). When highly hypnotizable participants respond to hypnotic suggestions, these responses are typically experienced as automatic, effortless, and involuntary (Polito, Barnier, Woody, & Connors, 2014). They feel as if they happen of their own accord.

The sense of involuntariness is a phenomenological hallmark of hypnosis—so much so that it has come to be known as the ‘classic suggestion effect’ (Bowers, 1982; Weitzenhoffer, 1978). Researchers have proposed various models to explain this central feature of hypnosis. Most emphasize some form of dissociation between executive control functions and higher-order monitoring or feedback processes which typically contribute to a feeling of authorship over one’s own actions (Dienes & Perner, 2007; Kirsch & Lynn, 1997; Landry, Lifshitz, & Raz, 2017; Terhune & Hedman, 2017). Surrendering the feeling of control seems to play a key role in allowing highly hypnotizable participants to modulate fundamental features of their perception beyond what would otherwise be possible by way of conscious, willful self-regulation (Lifshitz, Bonn, Fischer, Kashem, & Raz, 2013; Terhune, Cleeremans, Raz, & Lynn, 2017). In a similar way, we speculate that the receptive, experiential mindset associated with absorption may help to explain its power to alter deeply ingrained processes of perception—how an imagined stimulus can sometimes feel more real than the material sensory world, or an external stimulus can abruptly reconfigure the usual boundary between self and world.

Similar to hypnotizability, the trait of absorption has been theorized to index an ability and willingness to become engrossed in the contents of awareness while relinquishing a sense of active control. Tellegen (1981) discussed this “experiential set” at length in a commentary on a biofeedback study by Qualls and Sheehan (1981). In this study, high absorption participants were relatively unsuccessful at relaxing when they were instructed to explicitly monitor their relaxation (by attending either to their own relaxation level or to a biofeedback signal from their frontalis muscle). They found it easier to relax when they were simply asked to relax in whatever way they felt most comfortable. Low absorption participants showed the opposite pattern—they achieved relaxation more easily by explicitly monitoring their performance. Based on these findings (along with the content of the absorption scale items themselves), Tellegen argued that the tendency to adopt an experiential mode of intrinsically-motivated, effortless involvement may be central to the trait of absorption. Along these lines, one study showed that the correlation between hypnotizability and absorption is strongest when hypnotizability is indexed by subjective reports of involuntariness, as opposed to more traditional measures of behavioral response (Cardeña & Terhune, 2014). On the other hand, an early EEG study reported that high, compared to low, absorption participants were better at focusing their attention during a counting task, which suggests a capacity for experiential involvement even in response to pragmatic task demands (Davidson, Schwartz, & Rothman, 1976). The question of how absorption relates to effortless involvement remains ripe for future research.

## 2.2. Relationship to other psychological constructs

There is a multi-faceted relationship between absorption and other psychological constructs. Low scores on the Tellegen absorption scale have been associated with both low imagery abilities and low hypnotizability, while high scores correlate with strong imagery and high hypnotizability (Balthazard & Woody, 1992; McConkey, Wende, & Barnier, 1999; Sutcliffe, Perry, & Sheehan, 1970). People with medium to high absorption scores may be confused about how to interpret the meaning of the items; some researchers have argued that their responses appear to be guided by contextual cues (Council, Kirsch, & Hafner, 1986). For instance, the relationship between absorption and hypnotizability looks robust when the two constructs are measured in related experimental contexts (Cardeña & Terhune, 2014; Jamieson, 2005). However, when absorption is measured in a context that does not evoke hypnosis or imagination, the correlation with hypnotizability is weaker (Barnier & McConkey, 1999; Council, 1993). This suggests that participants’ responses on the scale may be guided by their recent experiences or by their expectations about the underlying construct. Overall, there appears to be a modest correlation between absorption and hypnotizability as measured using gold-standard behavioral methods (Jamieson, 2005).

In addition to fantasy-proneness, imagery ability, and hypnotizability, absorption has also been related to synaesthesia (Chun & Hupe, 2015; Glicksohn, Steinbach, & Elimalach-Malmilyan, 1999; Rader & Tellegen, 1987), empathy (Wickramasekera & Szlyk, 2003; Wickramasekera, 2007), creativity (Manmiller, Kumar, & Pekala, 2005), flow (Marty-Dugas & Smilek, 2018), emotional brain processing (Benning, Rozalski, & Klingspon, 2015), feelings of self-transcendence (Cardeña & Terhune, 2014), and experiences of dissociation and hallucinations (Glicksohn & Barrett, 2003; Perona-Garcelán et al., 2013, 2016). There is some indication that participants scoring highly on absorption may be more prone to reporting distorted memories (Platt, Lacey, Iobst, & Finkelman, 1998), but this relationship strongly depends on the specific false memory task that is used (Patihis, Frenda, & Loftus, 2018).

Other studies have linked absorption with the personality trait of ‘openness to experience’ (Glisky, Tataryn, Tobias, Kihlstrom, & McConkey, 1991) which hangs together with a propensity for imaginative daydreams, artistic sensitivity, awareness of emotional responses, willingness to try new activities, and intellectual curiosity (McCrae & Costa, 1983). However, absorption does not seem to

correlate with the social liberalism or intellectual dimensions of the openness to experience trait (Glisky et al., 1991). Absorption has also been related to engagement in the arts (Wild et al., 1995), attachment to nature (i.e., an affinity for other forms of life; Brown & Katcher, 1997; Kaplan, 1995), and positive emotions while listening to music (Rhodes, David, & Combs, 1988). Others have argued that the absorption trait shows considerable overlap with constructs such as dissociative experiences (i.e., detaching from reality, one's usual sense of self, or one's immediate surroundings; Carleton et al., 2010) and thinness of mental boundaries (i.e., the extent of connection among a broad range of perceptual, affective, imaginative, and unconscious mental processes; Houran, Thalbourne, & Hartmann, 2003) or the related concept of transliminality (i.e., the propensity for psychological material to cross into or out of consciousness; Lange, Thalbourne, Houran, & Storm, 2000).

Most of the observed associations between absorption and other traits are based on self-report, and some of these findings may be explained partly by conceptual overlap between the items in the different scales (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). For example, the absorption scale contains several items asking about emotional engagement with natural beauty, so it is not surprising that absorption correlates with attachment to nature. Similarly, some items of the absorption scale (e.g., 'I sometimes "step outside" my usual self and experience an entirely different state of being.') seem to tap into one's proneness for dissociative experiences, hence explaining the relation with dissociation. It is unclear from the existing evidence whether these relationships would hold even if the overlapping items were removed. When it comes to the relationship between absorption and spiritual experience that we explore at length below, it is important to note that the Tellegen scale contains only one item (out of 34) that directly asks about spiritual experience: 'I think I really know what some people mean when they talk about mystical experiences'.

### 2.3. The structure of absorption

It might be tempting to think that the Tellegen absorption scale captures a unitary trait that could potentially be defined in terms of a single underlying psychological, cognitive or neurobiological mechanism. However, the available evidence does not neatly support this claim. On the one hand, heritability studies have shown that about 50% of diversity in absorption scores can be attributed to genetic diversity (Tellegen et al., 1988), an estimate that is similar to other personality traits, such as extraversion or neuroticism (Bouchard & Loehlin, 2001). Moreover, a possible biological basis of absorption has been proposed to involve genes coding for the expression of the 5-HT<sub>1A</sub> (serotonin) receptor (Ott, Reuter, Hennig, & Vaitl, 2005). These findings should be interpreted cautiously however, as the robustness of findings relating genes to the expression of personality traits is a contentious and controversial topic (Ioannidis, 2003).

On the other hand, there has been much debate over the validity and structure of the absorption construct. Researchers have suggested different factor solutions as well as potential improvements to the original dichotomous (true/false) response format (Glicksohn & Barrett, 2003; Jamieson, 2005; Tellegen, 1992). Some have argued that the Tellegen absorption scale consists of multiple subscales probing different types of experiences (Jamieson, 2005). Most agree that the absorption scale measures a number of latent interrelated variables, but different studies have suggested different factor solutions (Glicksohn & Barrett, 2003; Jamieson, 2005). One factor analysis, for example, yielded five broad factors: synaesthesia; altered states of consciousness; aesthetic involvement in nature; imaginative involvement; and apparent experiences of extra sensory perception (Jamieson, 2005).

After suggesting different factor solutions in earlier publications, Tellegen (1981) himself proposed eight content clusters: imaginative and oblivious involvement; affective response to engaging stimuli; responsiveness to highly inductive stimuli; vivid re-experiencing of the past; expansion of awareness; powerful, inductive imaging; imaginal thinking; and cross-modal experiencing. In a subsequent publication, however, Tellegen revised his view by suggesting that absorption could be characterized as a continuum along two axes related to an 'internal vs external focus' (labeled 'sentience') and a 'narrowing versus expansion of consciousness' (labeled 'proneness to imaginative and altered states; Tellegen, 1992). It remains unclear, however, how these different factors individually relate to the full-scale score, or to the various dispositions and experiences that have been associated with the overall trait. In general, researchers have struggled to identify a clear underlying structure to the absorption construct, as has also been true for hypnotizability (Laurence, Beaulieu-Prévost, & Du Chéné, 2008; Woody, Barnier, & McConkey, 2005), placebo responsiveness (Darragh, Booth, & Consedine, 2015; Lifshitz, Sheiner, Olson, Thériault, & Raz, 2017), and indeed for many stable features of personality (Enck, Bingel, Schedlowski, & Rief, 2013). For a thorough critical analysis of the absorption construct, we refer interested readers to the classic and still very relevant review by Roche and McConkey (1990).

Although the absorption scale purports to measure a stable personality trait (with a test-retest reliability hovering above 0.85; Kihlstrom et al., 1989; Tellegen, 1982), Tellegen has argued that this trait will manifest differently depending on the context (1981). Personal histories, motivational contexts, social cues, and bodily affordances all likely mediate how the general trait of absorption will emerge in a particular situation. However, as plausible as this may seem, hardly any research has specifically investigated how the trait of absorption might manifest differently across contexts within the same individual.

In their seminal paper, Tellegen and Atkinson (1974) were clear that the absorption scale should be considered as a beginning rather than an end point for further refinement and extension as a measure of personality. However, in the subsequent half-century, the original 34-item scale has become the gold standard for measuring 'absorption'. In our own work we have developed additional measures to capture absorption, such as the 'sensory delight scale', containing items like 'After a great book or movie, the characters stay with me for days', 'I like the feeling of moving under water' or 'Sometimes the world seems intensely present to me.' (Luhmann et al., unpublished data). Overall, we observed strong correlations with the original absorption scale—but this alternative measure still awaits further empirical validation (e.g., using a confirmatory factor analysis).

## 2.4. Absorption revisited

What can we learn from this brief discussion on the history of the concept of absorption? First, rather than thinking about absorption as a unitary construct, it seems likely that the scale captures a set of interrelated propensities, such as experiential involvement, cross-modal processing, vivid fantasy, openness to experiences, and proclivity for altered states of consciousness. It remains unclear why these propensities tend to hang together. Nonetheless, we note that in many of the subjective events described by the scale items, the experience is reported as more vivid or intense than ordinary experiences, and as happening without effort or control. Second, experiences related to the trait of absorption can be triggered by a wide range of different activities: reading a novel, listening to a concert, walking through nature, meditating, daydreaming and so on. In the present paper, we will focus specifically on how the trait of absorption relates to experiences that are deemed religious or spiritual by the person undergoing the experience (Taves, 2009).

## 3. Prayer and the presence of God

We take “spirituality” to be both straightforwardly simple and utterly complex. The basic concept refers not to beliefs, but to a felt sense of what James (1985, p. 31) called “the more” or, as he famously defined religious experience, “the feelings, acts, and experiences of individual men, in their solitude, as far as they apprehend themselves to stand in relationship with whatever they may consider the divine.” “Spirituality” is the modern name for religious experience but without dogma or doctrine. In a recent survey, Kripal (2014, p. 63) defines spirituality as “a modern orientation to religion that locates religious authority within, as opposed to outside, the individual.” Even so, subjective spirituality is a complex category (Proudfoot, 1985). On the one hand, it is clear that bodily experiences occur with phenomenological continuity across persons and cultures in a manner associated with things spiritual (Cardena, Lynn, & Krippner, 2000; McNamara & Butler, 2014; Newberg & Newberg, 2006; Yaden, Haidt, Hood, Vago, & Newberg, 2017). On the other hand, as Orsi (2012) and others point out, cultural understandings shape what counts as spiritual experience. Our approach is to follow Ann Taves’s emphasis on attribution: that spiritual experience is experience deemed spiritual (Taves, 2009). The work presented here looks for a relationship between absorption and events which individuals deem spiritual. We draw from several sources.

### 3.1. Study one (Luhmann, Nusbaum, & Thisted, 2010)

In 2010, Luhmann reported on years of ethnographic fieldwork at a new charismatic evangelical church: two years of Sunday morning services, a weekly evening Bible-study house-group, conferences, retreats, coffees, trips and casual conversations. Sociological data suggests that the church is representative of the major demographic shift in the religious practice in the United States since 1965, towards spiritualities more focused on an intimate and embodied experience of God (e.g., Miller, 1997; Pew Research Center, 2006). Luhmann interviewed 28 congregants about their experience of God, and administered the absorption scale prior to the interview. Ten were male, 18 female; 17 were white, seven African American, and four Asian; 23 were between 20 and 30 years old and five were over 30. The oldest was in her early fifties. This distribution was representative of this predominantly young, somewhat diverse congregation.

We found in this study that a person’s absorption score was not significantly correlated to the length of time he or she prayed on a daily basis. That is, the scale did not correlate with prayer practice per se. But the way a person answered the absorption questions was significantly related to the way they experienced prayer. The more absorption statements someone marked as true, the more focused they felt, so that time seemed to change when they prayed ( $r = 0.54$ ); the more they had vivid images and sensations during prayer ( $r = 0.56$ ); the more they were able to experience God as person-like ( $r = 0.66$ ). The church presented God as person-like, in addition to being a mighty deity. Those with high absorption scores were much more likely to report that they experienced God as if God really is a person—someone they could talk to easily, who talked back, with whom one could laugh, at whom one could get angry. People with low absorption scores said that they could not.

Moreover, people who did not experience God in the vivid way the church thought they should, also did not think that the Tellegen scale described them. A man who had wanted and expected a mountaintop experience but didn’t have one marked “true” for only four of the items. A man who glumly said he hadn’t had these powerful experiences (and who later asked his housegroup to pray for him that he would hear God speak “with a booming voice”) marked “true” for only five. He even wrote next to one item, “there are such people?” A woman who said she’d be afraid of prophecy marked “true” only next to thirteen. By contrast, the woman who was clearly regarded as the best and most effective prayer practitioner, someone who was held up by her community as an example of a “prayer warrior”, marked “true” for thirty-three of the thirty-four items. When she finished writing on the questionnaire that afternoon in the ethnographer’s office, she looked up and said, “The man who created this scale lived inside my head.”

The absorption scale also predicted unusual sensory-like experience—the sort of events often explained as communication from God. If people answered “true” to at least half the items on the absorption scale, their chances of reporting that they had heard God’s voice or felt God’s touch or seen the wing of an angel or had a sensory-like perception of something supernatural (like hearing God say “I will always be with you” from the back seat of a car) was six times as high as for those who said “true” to less than half the statements.

### 3.2. Study two

These findings were also replicated in not-yet-published work with an adult Christian population. A more detailed account of the experimental procedures can be located in [Luhrmann \(2012\)](#), [Luhrmann and Morgain \(2012\)](#), and [Luhrmann, Nusbaum, and Thisted \(2013\)](#). In 2007–8, Luhrmann and her team brought in 129 Christian adults largely recruited from four local new charismatic evangelical churches before randomizing them to prayer practice or lectures on the gospels. 97 were women, 32 men, with an average age of 44. In the initial interview, they took a series of surveys and participated in a long interview about spiritual experience. Participants' absorption score correlated with their response to the Daily Spiritual Experiences Scale ( $r(110) = 0.34, p < .001$ ).<sup>2</sup> This scale ([Underwood & Teresi, 2002](#)) asks sixteen questions about ordinary spiritual experience, followed by frequency judgments. Questions include: "I experience a connection to all life"; "I feel God's love for me, directly"; "I feel God's love for me, through others." Absorption correlated with responses to the Posey Losch Hearing Voices Scale ( $r(127) = 0.59, p < .001$ ). This scale ([Posey & Losch, 1983](#)) gives specific examples of hallucination-like events when someone has heard a voice; participants are asked whether something similar has ever happened to them. While most items are secular (e.g., "Sometimes when I am just about to fall asleep, I hear my name as if spoken aloud") one is clearly not (I have heard God's voice ... not that he made me know in my heart ... but as a real voice"). Absorption correlated with participants' responses to that question ( $r(127) = 0.31, p < .001$ ). Absorption correlated with the frequency with which people reported in the interview that they heard from God ( $r(86) = 0.21, p = .045$ ); the frequency with which they reported thoughts from God ( $r(113) = 0.34, p < .001$ ) and images from God ( $r(108) = 0.30, p < .001$ ); the sense of the presence of God ( $r(124) = 0.18, p = .048$ ); out of body events ( $r(123) = 0.37, p < .001$ ); mystical experiences ( $r(124) = 0.24, p = .008$ ); and the intense adrenaline rush often described as a Holy Spirit Experience ( $r(124) = 0.22, p = .013$ ). The higher the absorption score, the more likely participants were to say that they had heard a voice when alone ( $r(127) = 0.43, p < .001$ ). These correlations are striking because hearing from God and thoughts from God are events that pastors describe as normative at the churches from which these Christians were recruited. Nevertheless, they are more common among those who score more highly in absorption. Absorption was also associated with scores on the Vividness of Visual Imagery Questionnaire (VVIQ; [Marks, 1973](#)): ( $r(127) = 0.32, p < .001$ )—in line with previously reported associations between absorption and mental imagery ([Roche & Mcconkey, 1990](#)). Absorption did not correlate significantly with whether congregants heard from God through scripture or circumstance (scripture:  $r(126) = 0.001, p = .99$ ); circumstance  $r(123) = -0.026, p = .60$ ); these events are normative within the church and do not depend on striking experiences. Absorption also did not correlate significantly with speaking in tongues or being slain in the spirit, both of which are behavioral performances that reflect church norms (slain in the spirit  $r(124) = -0.03, p = .73$ ; tongues  $r(123) = 0.1, p = .28$ ).

### 3.3. Study three

In 2013, Luhrmann's team administered similar surveys to Christian undergraduates in Chennai, India; Accra, Ghana; and Los Angeles, US (this work is also unpublished). In Chennai, the undergraduates were women at the Women's Christian College (30 students); in Accra, male and female undergraduates at Central University, a college associated with a major charismatic evangelical church (30 students); and male and female undergraduates at Vanguard College in southern California, a university associated with the evangelical tradition (60 students). In Chennai and Accra, students were recruited in their dormitories by research assistants. In the U.S., students were recruited from sociology classes by colleagues. For these subjects too, the higher the absorption score, the higher the score on the Posey Losch Hearing Voices scale; ( $r(105) = 0.42, p < .001$ ), including the item about hearing God speak ( $r(106) = 0.23, p = .019$ ) and to the scale about ordinary spiritual experience (the Daily Spiritual Experiences Scale) ( $r(99) = 0.23, p = .02$ ). The higher they scored in absorption, the more they reported the following spiritual experiences, presented with a request for a frequency judgment ( $r(103) = 0.37, p < .001$ ):

Have you ever heard God speak to you in a way you felt you heard outside your head?

Have you ever had a vision, that is, seen something not quite in your mind, that you felt was given to you by God or a supernatural being?

Have you ever had a dream you felt was sent by God?

Have you ever felt God (or an angel) near-tangibly present, as if he were standing there by your side?

Have you ever felt a demonic presence as if it was there in the room with you?

Have you ever had an experience of uncontrollable shaking or trembling during prayer, or been slain in the spirit?

Have you ever had a feel of overwhelming emotion during prayer?

Have you ever had a sense of intense power shoot through you during prayer?

Have you ever had an out-of-body experience, in which you were separated from your body?

Have you ever felt that a supernatural force, like the Holy Spirit or a demon, took control of your body, so that you were not making the choice of whether to move but still you moved?

Have you ever had the experience of being awake but unable to move?

These are experiences often judged to be spiritual experiences within charismatic evangelical practice.

<sup>2</sup> Note that the dfs vary between the different analyses due to missing data points.

### 3.4. Study four and five (MTurk studies)

In 2016, Luhrmann and Cordelia Erickson-Davis asked 137 participants recruited through Amazon's Mechanical Turk to fill out scales on absorption, connectedness to nature, and the paranormal. (Other scales, not analyzed here, were the Shields Body Awareness; the Interpersonal Reactivity Index; the Blanche Adult Sensory Processing Scale; the Metacognition MCQ 30, the Trait MetaMood Attention to Feelings subscale; the Self Consciousness Scale; the Moral Foundations scale; the Revised Disgust Scale; the Locus of Control Scale; the Perceived Stress Questionnaire; and a novel scale on sensory experience). Absorption correlated with responses to the Connectedness to Nature Scale (Mayer & Frantz, 2004) ( $r(112) = 0.46, p < .001$ ). The scale presents a series of items designed to capture individual's affective relationship to nature. With statements like: "I often feel a sense of oneness with the natural world around me," this scale can be said to have a quasi-spiritual dimension. Absorption correlated with responses to a scale about beliefs about paranormal experience with items like "I am completely convinced that ESP does/does not exist" (The Australian Sheep Goat scale; cf., Thalbourne & Delin, 1993) ( $r(112) = 0.51, p < .001$ ).

In 2017, Luhrmann and her team asked 200 adults on Mechanical Turk to fill out a series of scales on absorption and spiritual experience. (Other scales, not analyzed here, included the Trait MetaMood Attention to Feelings subscale, the Metacognition MCQ30, the Varieties of Inner Speech Questionnaire Revised, and two novel scales on dualism and concepts of mind.) Absorption correlated with responses to the Daily Spiritual Experience Scale ( $r(197) = 0.36, p < .001$ ) and to the Posey Losch Hearing Voices scale ( $r(197) = 0.39, p < .001$ ). It also correlated with response to the list of spiritual experiences above in study four ( $r(197) = 0.32, p < .001$ ).

Together these studies suggest that absorption captures a propensity or talent for having vivid spiritual and religious experiences.<sup>3</sup> People who easily get caught up in their imagination or become engrossed in novel engaging stimuli are also more likely to report sensory-like spiritual experiences, such as hearing the voice of God or feeling the Holy Spirit rush through them. A central feature of these experiences seems to be their spontaneous and effortless nature and the feeling of 'realness' that accompanies the experience. The ethnographic record suggests that, although one can pray or meditate to encourage spiritual experiences, these experiences cannot be had on command (Luhrmann, 2012). When they do happen, they feel unchosen, as if they occurred 'by grace'.

## 4. Psychedelics, mystical experiences, and placebo God-helmets

Research on psychedelics further supports the relationship between absorption and spiritual experience. A meta-analysis of 23 controlled studies involving 409 laboratory administrations of psilocybin (the active psychedelic ingredient in magic mushrooms and truffles) found that absorption was the second most important predictor of positive and mystical-type experiences (Studerus, Gamma, Komter, & Vollenweider, 2012). Only drug dose explained more of the variance (albeit quite a bit more, with ~60% of the variance explained by dose as compared to ~20% by absorption). A more recent longitudinal, online self-report study with several hundred participants similarly found that, besides dose, the trait of absorption was the most important determinant of many aspects of the acute psychedelic experience, including the likelihood of mystical, challenging, and hallucinatory experiences (Haijen et al., 2018). Absorption has also been associated with the strength and frequency of synaesthesia-like experiences induced by psilocybin (Studerus et al., 2012), ayahuasca (Bresnick & Levin, 2006), and LSD (Terhune et al., 2016), and with reports of near-death like experiences following an intravenous dose of DMT (Timmermann et al., 2018).

People who score high in absorption may be particularly willing and able to take on the positive expectations that accompany a carefully guided psychedelic session (e.g., first reflecting on one's life and setting an intention for the journey; see Lemercier & Terhune, 2018; Lifshitz, Sheiner, & Kirmayer, 2018). Supporting this view, one study used hypnosis to induce MDMA-like experiences and found that absorption predicted the strength of the effect (Hastings, 2006). We can speculate that those high in absorption may be more positively inclined towards the intense and destabilizing nature of psychedelic trips, given that they more regularly experience vivid episodes of mental imagery and may be more willing to surrender control over their subjective world.

Psychedelics also appear to enhance experiential dispositions related to absorption. It has been found, for instance, that LSD can increase suggestibility and mental imagery (Carhart-Harris et al., 2015). Similarly, inhaling nitrous oxide appears to enhance suggestibility (Whalley & Brooks, 2009). Interestingly, a high dosage of psilocybin resulted in a long-lasting increase (more than one year later) in the personality trait of openness to experience (MacLean, Johnson, & Griffiths, 2011)—a trait that is consistently related to absorption (Glisky et al., 1991). Furthermore, the intensity of a mystical experience at the time of psilocybin administration predicted the subsequent increase in openness.

These findings fit well with recent work from the van Elk lab in which high absorption participants responded strongly to a manipulation designed to induce mystical-type experiences (Maij & van Elk, 2018; Maij, van Elk, & Schjoedt, 2018; van Elk, 2014). Inspired by the work of Granqvist et al. (2005), these studies used a placebo 'god helmet', which was described to participants as capable of inducing mystical experiences through electromagnetic stimulation of the temporal lobes. Although the god helmet was a sham—there was no electrical current running through the electrodes—many participants nonetheless reported unusual sensory-like experiences. Across different studies using this paradigm (Granqvist et al., 2005; Maij & van Elk, 2018; Maij et al., 2018; van Elk,

<sup>3</sup> It is important to note that we performed a large number of correlation analyses on these datasets, and some of the significant findings we report here would not survive correction for multiple comparisons. On the other hand, the consistency of results across multiple samples and studies is encouraging. We are presently working to confirm these exploratory findings in a large-scale preregistered study, and look forward to reporting the results before long.

2014), absorption predicted the frequency and intensity of extraordinary experiences people reported, as measured by the Mysticism Scale (Hood, Morris & Watson, 1993). In addition, participants who scored more highly on absorption more frequently pressed a button to indicate the presence of a mystical-type experience while wearing the god helmet (Maij & van Elk, 2018). These findings seem to suggest that people who are high in absorption may be more likely to interpret ambiguous sensations in light of their prior expectations, effectively leading them to experience signal where there is only noise. From these self-reports alone, however, we cannot ascertain whether high absorption participants were actually experiencing different sensations (i.e., through a top-down effect on low-level perceptual processes, as is readily demonstrated following hypnotic suggestion) or simply ascribing a different meaning to the same ambiguous sensations (i.e., reflecting a higher-order attribution process).

Intriguingly, the studies using the sham god helmet found that the words and phrases participants used to describe their experiences often showed a remarkable overlap with the items from the Tellegen Absorption scale. For instance, one participant reported ‘I had a strong feeling that some other being was present who was watching me’, which closely resembles an item from the absorption scale: ‘At times I somehow feel the presence of someone who is not physically there’. Another participant noted ‘I felt like I was dreaming or meditating, I had no control over my thoughts and feelings.’ That sounds like another item from the Tellegen scale: ‘Sometimes thoughts and images come to me without the slightest effort on my part’ (Jamieson, 2005). Many people compared their experiences during the god helmet session with past spiritual experiences, e.g., when using psychedelics or following prolonged periods of meditation (Maij & van Elk, 2018; Maij et al., 2018). We note that participants gave these subjective reports prior to completing the absorption scale, which was administered several days after the session with the god helmet. While experiences of the sham brain stimulation may have influenced the subsequent absorption ratings, the observed overlap between participants’ spontaneous subjective reports and the items from the absorption scale suggests that at a deeper level they may tap into the same underlying mechanisms.

## 5. Quasi-spiritual experiences: Awe, virtual reality, and the paranormal

In this section we address a number of related, quasi-spiritual experiences that have been reliably linked to the trait of absorption. While these events are not necessarily considered spiritual per se, they seem to gesture to the same general domain of human experience, where a typically hidden dimension of reality—whether an immaterial agent, a virtual landscape, or a metaphysical force—seems to be perceived in a way that feels vividly sensory and, in many cases, profoundly meaningful.

Recent studies demonstrate that absorption predicts the intensity of feelings of awe and self-transcendence when viewing awe-inducing stimuli (Maij & van Elk, 2018; Maij et al., 2018) or when presented with engaging music (van Elk, Karinen, Specker, Stamkou, & Baas, 2016) or rhythms (Rhodes et al., 1988; Rock, 2009). Across a series of studies, including both lab-based manipulations (e.g., participants watching an awe-inducing video of vast natural scenes) and field settings (e.g., participants visiting an art exhibition in a church), we found that absorption was positively related to self-reported feelings of awe (van Elk et al., 2016; although another study reported the opposite effect, with absorption negatively related to awe; Reinerman-Jones, Sollins, Gallagher, & Janz, 2013). In these studies, feelings of awe were measured using different items such as ‘To what extent did watching the video induce the experience of something beautiful?’, ‘To what extent were you impressed by watching the video?’, or ‘during the experience I felt a strong connection to humanity as a whole’. High absorption participants reported strong feelings of awe irrespective of the specific stimuli they were presented with. In another study, participants listened to a repetitive drumming track following a guided ‘shamanic journey’ visualization, and a control group simply sat quietly with their eyes open for 15 min (Rock, 2009). In both groups, absorption scores predicted increases in the ‘altered meaning’ dimension of the Phenomenology of Consciousness Inventory—which includes items such as ‘I had an experience which I would label as very religious, spiritual, or transcendental’ and ‘I had an experience of awe and reverence toward the world’.

People who score highly in absorption are also more likely to hold paranormal beliefs and report paranormal experiences (Glicksohn & Barrett, 2003; Glicksohn, 1990; Gray & Gallo, 2015; Parra & Gimenez, 2017; Spanos, Cross, Dickson, & DuBreuil, 1993). For example, seeing auras—coloured lights emanating from bodies and objects—is more common among those high in absorption (Parra, 2010; Zingrone, Alvarado, & Agee, 2009). Participants who report alien contact or abductions have also been shown to score more highly than controls on both the absorption scale and on a scale measuring paranormal experiences (French, Santomauro, Hamilton, Fox, & Thalbourne, 2008).

Interestingly, several studies have also shown that absorption predicts greater levels of ‘presence’ in VR studies, indicating that high absorption people feel deeply immersed in the virtual environments (for review, see: Kober & Neuper, 2013). It has also been found that high absorption participants experienced VR as more ‘real’ than low absorption participants (Ling, Nefs, Brinkman, Qu, & Heynderickx, 2013). Especially when the context is not particularly immersive (i.e., low visual resolution; no possibility to navigate freely) high absorption participants experience the scenario as more real and feel more ‘presence’ than do low absorption participants (Sas & O’Hare, 2003). In highly immersive VR settings (e.g., high resolution HMD) the relationship sometimes disappears (Murray, Fox, & Pettifer, 2007), possibly because of a ceiling-effect of felt presence. These findings again show that absorption captures a proclivity for experiencing the unreal as more real—especially when the sensory input from the environment is ambiguous.

## 6. Discussion

The ability to experience as real what must be imagined is at the heart of religion (Luhmann, 2012; van Leeuwen & van Elk, 2018). God and spirit are invisible, at least in many traditions. God speaks, but the speaker cannot be heard. The spirit can be glimpsed, but then disappears. The deity exists in wooden form, but something must awaken in the wood to allow darshan (Eck,



1998). We call these events and beings supernatural because they are not present to the senses in an ordinary way. In this paper, we have shown that the capacity to experience such events and beings may be enhanced by this trait, absorption, which seems to allow the individual to become caught up in their imagination like a daydream and to experience something immaterial as present and real. (These comments are not meant to dismiss the possible reality of the spiritual world, but rather to identify what human capacities might enable someone to experience it directly.)

To be clear, absorption likely predicts an individual's involvement with other activities that demand the use of the imagination—fiction reading, story-telling, dancing, the act of being lost in a book (Nell, 1988); any activity that invites an individual to be caught up in a dreamed-up world different from the everyday. This observation adds weight to those arguments (Astuti & Harris, 2008; Van Leeuwen, 2014) that suggest that religious conceptions share much with fiction and pretend play.

Absorption seems to facilitate the individual's capacity to experience the imagined object in a way that feels *sensory*—to hear a spirit's voice, or see its wing tip. There appear to be at least two dimensions of this process. On the one hand, those who score highly in absorption may allow prior expectation to influence what they experience so that it feels perceptual, an account consistent with emerging prediction-based approaches to perception and hallucination-like experiences (Powers, Kelley, & Corlett, 2016). On the other hand, those who score highly in absorption may allow themselves to be captured by novel external experiences, and by the suggestions of others, so that ambiguous events become experienced as sensory experiences of the invisible other. These somewhat contradictory orientations are reminiscent of hypnosis, where the subject is often simultaneously encouraging inner imagination and relaxing agentic control (“letting go” to follow the suggestions of the hypnotist; see Raz & Lifshitz, 2016). A similar contradiction is also present in daydreams. The more vividly one turns inward, the more the inner landscape seems to point beyond oneself; as a daydream grows more intense, the inner imaginative experience feels both more involuntary and more real.

If absorption facilitates the sensory-like experience of the unseen, that experience gives to the faithful sensed evidence that there is an invisible being who cares for one or threatens one or is in some way connected to one's life. That is what spiritual experience in general does: it gives confidence that there is more to the material world than the individual sees before them, and in doing so, it can help to deliver the joy and satisfaction that so many find in faith. James (1985, p. 504) argues that all religious practices identify an uneasiness, a sense that something in the human is awry; and all offer a solution that alters the sense of wrongness. Positive spiritual experiences, he argues, (the voice, the vision, the sense of awe) serve to “express the appearance of exteriority of the helping power and yet account for our sense of union with it; and they fully justify our feelings of serenity and joy.”

Of course, not all experience deemed supernatural is positive, and spiritual experience is not identical with traditional religious commitments. In a well-known paper, Saucier and Skrzypińska (2006) demonstrate that subjective spirituality and tradition-oriented religiousness are empirically highly independent and have different correlates in the personality domain (for a similar distinction between general and personal religious beliefs, see: van Leeuwen & van Elk, 2018). We know that not every person with high absorption abilities will ultimately have spiritual experiences or that everyone who reports an intense spiritual experience scores highly on absorption. Overall, higher absorption ability is associated with more frequent and intense spiritual experiences. However, some people may score highly in absorption but will not deem their experiences to be spiritual (Taves, 2009), such as non-religious artists or avid readers with strong imaginative abilities. We also know from the ethnographic work presented here that there are people who do not score highly in absorption, yet do report frequent and intense spiritual experiences, possibly as a result of intense practice. Then there are devoted believers with lower absorption whom Saucier and Skrzypińska might identify as the tradition-oriented religious. More generally, many of the anomalous types of experiences described in this article can also occur in non-religious settings, where they may be interpreted quite differently (Cardeña et al., 2000; James, 1985). Speaking to this point, two separate studies using placebo God-helmet manipulations have shown that pre-existing spiritual beliefs contribute to the frequency, content and interpretation of the induced experiences (Andersen, Schjoedt, Nielbo, & Sørensen, 2014; Granqvist & Larsson, 2006). Absorption likely facilitates anomalous experiences in general, whether or not these experiences are deemed spiritual. The content and interpretation of these experiences then seems to be shaped by the beliefs and contexts of the experienter.

Absorption captures only one dimension of the complex human activity we call spirituality. Yet it is important if for no other reason than to remind us that faith commitments are neither automatic nor straightforward. In the excitement of recognizing that humans have evolved habits that help to make the concept of invisible others plausible (Boyer, 2001), it is all too easy to forget that religious commitments require work to maintain and that people go to great effort to signal their involvement (Sosis, 2007). Invisible others are, after all, invisible—and humans discard many intuitions that once seemed plausible after discovering no evidentiary support for them. Absorption appears to facilitate the experiential involvement that helps to make those immaterial others seem more real.

## 7. Future directions

Here we highlight four domains for future research.

The first is the relation between absorption and prior expectation. In many religious and ritual settings participants are invited to respond to the invitations made by shamans or charismatic leaders (Schjoedt, Stodkilde-Jørgensen, Geertz, Lund, & Roepstorff, 2011). In a faith healing ceremony, believers are expected to experience healing; in a psychedelic Santo Daime ritual, participants are expected to meet the spirit of Ayahuasca; in the Vineyard church, believers are expected to hear God's voice speaking to them in a personal way. Absorption appears to facilitate these expected experiences, and to enable the experiences to feel authentic. How does this work?

On the one hand, absorption seems to enable higher-order beliefs and expectations to cascade downstream through the cognitive hierarchy to shape deeply ingrained processes of perception. The science of suggestion (including research on hypnosis and placebos)

clearly demonstrates that expectations can modulate automatic perceptual processes, including processes that are typically considered impervious to willful self-regulation (Terhune et al., 2017). For example, verbal suggestions have been shown to dampen the Stroop interference effect, alter the neural correlates of colour vision, and modulate reaction-time markers of synaesthesia (Lifshitz et al., 2013). Furthermore, these top-down effects are much stronger in highly suggestible individuals, who also tend to score highly in absorption. So it is likely that people high in absorption really can experience their perceptual world differently when their context—spiritual or otherwise—suggests to them that they should.

Absorption could also be related to demand effects (Crowne & Marlowe, 1964), socially-desirable responding (Nederhof, 1985), and a general acquiescence or response bias (Schriesheim & Hill, 1981). High absorption participants may be more willing to respond in a socially desirable fashion, may be more concerned with how they appear to others, and may have an overall bias toward affirmative answers (Krummenacher, Mohr, Haker, & Brugger, 2010). So they might also be more likely to report special experiences just because they want to seem like the kind of person who has those experiences. In addition, as mentioned earlier, the context in which one fills out self-report questionnaires influences how one responds—so that correlations between absorption and hypnotizability, for example, are typically stronger when the absorption scale is filled out in a context related to hypnosis (Barnier & McConkey, 1999; Council, 1993). Self-report measures thus likely capture both the proclivity for having specific experiences and for responding in a way that confirms prior expectancies. Future studies linking absorption and spiritual experience would benefit from paying more explicit attention to context effects. Furthermore, behavioral and neurophysiological techniques could be used to tease apart the contribution of reporting bias and establish the ‘online markers’ accompanying the experiences that are reported to feel real—akin to the measures used in hypnosis and placebo research (Terhune et al., 2017).

The second direction for future research is the effect of intense training. While there is extensive research on the effects of meditative practice (Dahl, Lutz, & Davidson, 2015) and some on the impact of imagination-rich prayer practice (Luhmann et al., 2013), we still have little evidence on the interaction between absorption and practice (Raz & Lifshitz, 2016). Several studies have shown that experienced meditators from various traditions score more highly in absorption than non-meditators or beginners (Berkovich-Ohana & Glicksohn, 2017; Davidson, Goleman, & Schwartz, 1976; Grant et al., 2013; Hölzel & Ott, 2006; Raz & Lifshitz, 2016; although one study was unable to show this relationship: Spanos, Steggle, Radtke-Bodorik, & Rivers, 1979). Another study found that people who score highly in absorption were more likely to sign up for a free meditation course, suggesting that at least part of the association between absorption and meditation may reflect pre-existing differences rather than an effect of training (Rivers & Spanos, 1981). Absorption has been shown to predict the likelihood of reporting a mystical experience during an intensive meditation retreat (Russ & Elliott, 2017). It correlates with self-reports of meditative depth—accounting for even more of the variance than years of practice (Hölzel & Ott, 2006). Absorption also correlates with physiological indexes of meditation, including decreases in heart rate (Norton, Rhodes, Hauch, & Kaprowy, 1985) and suppression of long-range temporal correlations in the EEG signal (Irrmischer et al., 2018). These findings suggest that absorption makes some forms of meditation more powerful and perhaps more appealing, but it remains to be determined whether meditative practice—or any other form of training—can influence the trait of absorption.

A third avenue for future work is the relationship between absorption and psychopathology, particularly dissociative disorders and schizotypy (Mason & Claridge, 2006; Rosen et al., 2017; van Kampen, 2012). Absorption has been related to childhood trauma, and some have theorized that it may serve as a dissociative coping mechanism akin to a kind of experiential avoidance (Perona-Garcelán et al., 2014). Indeed, the most widely-used instrument for measuring dissociative tendencies (The Dissociative Experiences Scale) has been shown to include a “dissociative absorption” factor that correlates strongly with the Tellegen Absorption scale and shows clear conceptual overlaps (Soffer-Dudek, Lassri, Soffer-Dudek, & Shahar, 2015; Spiegel & Spiegel, 2004). Crucially, however, the Dissociative Experiences Scale was designed to measure both healthy and pathological dissociation experiences, and it does not purport to cleanly diagnose dissociative disorders (although it can serve as a valuable screening instrument; Bernstein & Putnam, 1986; Cardeña, 2008). Nonetheless, the Tellegen Absorption Scale (or the dissociative absorption factor of the Dissociative Experiences Scale) have been shown to correlate with a range of pathological variables, including psychotic hallucinations (Perona-Garcelán et al., 2016), obsessive compulsive symptoms (Soffer-Dudek, 2018; Soffer-Dudek et al., 2015), as well as anxiety and general negative emotionality (Lilienfeld, 1997).

The debate around absorption and schizotypy is equally complicated, as this word carries different associations—and politics—in Europe and in the US. Claridge and his colleagues (Claridge, 1997) conceptualized schizotypy as including any unusual perceptual or experiential events, with an explicit interest in de-stigmatizing psychosis. Their measures of schizotypy overlap considerably with absorption. For example, the scale Claridge and his colleagues used to assess schizotypy includes a section with items like these: “When in the dark, do you see shapes and forms even though there is nothing there?” and “Are the sounds you hear in your daydreams unusually clear and distinct?” By contrast, the first biomedical psychiatric nosology in the US, the DSM III, identified schizotypy as a personality disorder defined more by the emotional style assumed to be related to schizophrenia. Diagnostic criteria included emotional coldness and aloofness, indifference to praise or criticism or to the feelings of others, few close relationships, and so forth. The interest in defining psychosis as fundamentally dissociative in nature emerges primarily in Europe, and carries a political interest in destigmatizing psychosis (Longden, Madill, & Waterman, 2012) although it is also true that it is hard to draw a clear phenomenological line between psychosis and dissociation (Waters & Fernyhough, 2017). Some have found a relationship between absorption and reports of hallucinations by patients with psychosis (Rosen et al., 2017). Some have argued that all unusual experience should be considered to be on a psychotic continuum (Van Os, Linscott, Myin-Germeys, Delespaul, & Krabbendam, 2009). Others disagree, arguing that the continuum actually subsumes at least two processes, one of which is more related to absorption and another more related to psychosis (Luhmann, 2017; see also Kaymaz & van Os, 2010). This remains an active debate.

Whatever the relationship between absorption and psychopathology, it is important to keep in mind that an experience or behavior only counts as pathological if it causes distress. On these grounds, we hesitate to define as pathological those spiritual or

absorption-related experiences that are socially sanctioned and may in some cases even improve the functioning or well-being of the experimenter.

Fourth and finally, future research should untangle the complex web of behavioral, cognitive, biological, and cultural mechanisms that make up the trait of absorption. At the cognitive level, important mechanisms may include the ability to conjure vivid sensory-like representations in the imagination, and an alteration of cognitive control or meta-cognitive monitoring of control, which might allow prior expectations to become more powerful (van Elk & Aleman, 2017). These mechanisms may work synergistically in specific contexts to reduce ‘reality monitoring’, blurring the distinction between events that are generated from within and those that come from outside (Johnson & Raye, 1981; Simons, Garrison, & Johnson, 2017). In this way, the imagined may come to feel more real. At the level of the brain, preliminary findings suggest that absorption may be associated with increased gray matter within the cingulo-fronto-parietal attention network (Grant et al., 2013). This makes sense given that attention networks (i.e., association cortices) appear to mediate the flow of information between brain regions involved in processing the immediate environment (i.e., sensory and motor cortices) and those involved in daydreaming, memory, and other forms of abstract self-representation (i.e., default-mode network; Huntenburg, Bazin, & Margulies, 2018). Then there is the question of how the relationship between absorption and spirituality plays out across different cultural contexts, contexts which may invite very different conceptions of what kinds of experience count as spiritual or important.

These are all complex—and yet empirically tractable—issues that we are presently working to unpack through experimental research. In so doing, we hope to illuminate not only the mechanisms of spiritual experience, but also the more basic human question of how the immaterial dimension of what must be imagined may come to feel tangibly real for us in the domain of the senses.

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