Trends in Cognitive Sciences

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Review

How experience shapes extraordinary beliefs

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The ubiquity of extraordinary beliefs across human societies, such as conspiracy theories, pseudoscience, and supernatural beliefs, is a long-standing puzzle in cognitive science. Prevailing accounts emphasize cognitive biases and social dynamics but often neglect a key factor: experience. We synthesize recent evidence and identify three pathways by which experience can shape these convictions: by filtering which beliefs feel perceptually plausible, by sparking new beliefs through anomalous and emotionally charged events, and by being engineered through immersive cultural technologies that simulate sensory evidence. These pathways function alongside cognitive biases and social processes, helping explain why certain extraordinary beliefs recur, why they often accompany vivid rituals, and why they can feel convincing despite evidence that challenges their veracity.

Highlights

Across human societies, people develop extraordinary beliefs that seem to ignore or contradict available evidence, including conspiracy theories and beliefs in supernatural forces.

Recent evidence suggests that experience biases us toward accepting some extraordinary beliefs over others, sparks the formation of new extraordinary beliefs, and is leveraged by cultural technologies to generate sensory evidence for extraordinary beliefs that would otherwise lack it.

The key role of experience, in tandem with prior approaches, supports multidimensional models of belief change. It reinforces the importance of studying experience as a factor in the cognitive and evolutionary foundations of religion and opens new directions for pragmatic interventions against pseudoscience and conspiracy theories.

The origins of extraordinary beliefs

Across human societies, people consistently develop beliefs in supernatural beings and powers, conspiracy theories, and pseudoscience [1]. Such **extraordinary beliefs** (see Glossary) have puzzled cognitive scientists for apparently ignoring or defying available evidence against their veracity. For instance, van Prooijen notes how conspiracy theories are usually 'implausible in light of logic or scientific evidence' [2]. Bloom, similarly, remarks on the strangeness of religious beliefs: 'We can see dogs and trees; we cannot (in any literal sense) see God' [3]. Nonetheless, extraordinary beliefs are common. Survey data from the Pew Research Center suggest that 65% of US adults believe in the existence of spirits[i], while 10% believe that the Earth is flat[ii]. Similarly, people in nearly every documented society believe that other people can cause misfortune through witchcraft and sorcery [4]. Several groups have even adopted rituals to make themselves bulletproof or invisible, which they enact before engaging in warfare [5].

Given the ubiquity of these kinds of beliefs, it is probable that they arise from universal cognitive mechanisms [6]. This presents a puzzle for cognitive scientists. If, as much evidence suggests, human brains have evolved to accurately model and predict their environments [7], why should they so easily generate and adopt extraordinary beliefs? In addition to its theoretical relevance, understanding extraordinary beliefs also has clear practical importance. While many of these convictions are benign or perhaps even beneficial, beliefs such as vaccine denial and QAnon appear harmful [8]. The pernicious effects of such beliefs are well established, and hundreds of millions of dollars have been accordingly spent attempting to combat the spread of misinformation and conspiracy theories [9].

Our ordinary beliefs tend to be constrained by perceptual inputs [10]. If someone believes their bike seat is locked in place and then finds that the seat is sliding downward as they ride, they will probably update their belief. But the relationship between sensory evidence and extraordinary beliefs is much less apparent. To explain their formation, cognitive and evolutionary scholars instead often point to two interacting sets of processes. First, many view such beliefs as byproducts of otherwise useful **cognitive biases**, such as **agency detection** [11] and **intuitive**

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dualism [12]. Second, scholars study the social dynamics that promote extraordinary beliefs [13,14]. Research suggests, for example, that people adopt beliefs in part because of the benefits of reputational signaling [15] and the influence of prestigious individuals or other sincere believers [16]. Many theories explain extraordinary beliefs through a mix of these two approaches [14,17].

Despite their influence, approaches rooted in cognitive biases and social dynamics confront several limitations. They struggle to explain how extraordinary beliefs originate, as opposed to how they are transmitted and maintained; why particular extraordinary beliefs recur across societies; and why such beliefs are commonly associated with certain engaging practices (Box 1). Recent evidence suggests these puzzles can be resolved by considering a third factor: experience. By 'experience', we mean the subjective thoughts and feelings, bodily sensations, and sensory inputs perceived by an individual. Here, we synthesize several growing literatures to argue that many patterns in extraordinary beliefs emerge from three experience-based pathways, in tandem with cognitive biases and social dynamics (Figure 1).

Experiential pathways

We propose three pathways through which experience can influence the development of extraordinary beliefs. First, it can act as a filter, favoring beliefs that accord with sensory inputs. Second, anomalous experiences can trigger cognitive biases that lead to the formation or reinforcement of extraordinary beliefs. Finally, societies develop experiential technologies that induce immersion and promote extraordinary beliefs. Such pathways vary in the type of sensory input involved – from ambiguous and causally opaque (Pathway 2) to rich and culturally scaffolded (Pathway 3) – but all evidence indicates a critical role for experience in structuring and maintaining extraordinary beliefs.

Box 1. Limitations of accounts rooted in cognitive biases and social dynamics

Explanations of extraordinary beliefs have often invoked cognitive biases, such as agency detection, and social dynamics, such as preferentially learning from individuals who publicly demonstrate the sincerity of their beliefs [13]. However, such explanations confront three key limitations.

First, accounts based on cognitive biases and social dynamics fail to explain recurrent low-level features of many extraordinary beliefs. For example, arguments focused on the use of beliefs as coalition signals predict that the most successful beliefs should be those that best signal group commitment. According to several accounts, these should be maximally extreme or unverifiable beliefs [105,106]. Yet under such models, it is not clear why people who reject the spherical nature of the Earth would tend to specifically agree that it is flat, or why Christians usually claim that Jesus speaks to them rather than, say, buying them food. Features such as these also cannot easily be explained by approaches that focus on cognitive biases, which typically predict high-level features of such beliefs, such as beliefs in invisible agents [107] and not low-level features, like the physical characteristics of those agents.

Second, existing accounts struggle to explain why extraordinary beliefs emerge in the first place. Coalition signaling accounts, for example, provide explanations for why people endorse beliefs but not how they arise in the first place [14]. Cognitive bias accounts have been better positioned to solve this problem. For instance, the hyperactive agency detection device (HADD) has been proposed as the source of beliefs in invisible agents, triggered by biased attributions of agency to the environment [18]. But this again raises the issue of experience, given that these biases must be triggered by sensory information before they can scaffold the formation of extraordinary beliefs.

Finally, existing accounts do not clearly explain many of the immersive practices associated with extraordinary beliefs. Theories of costly signaling and credibility-enhancing displays, for example, predict that extraordinary beliefs should be associated with costly practices that signal group commitment or display sincerity of belief. Yet they do not explain many features that seem minimally costly but persist and recur, such as the use of incense and ritualized postures during prayer [45]. Likewise, they do not provide clear explanations for why religious practitioners often ingest hallucinogens that induce vivid hallucinations and a sense of sacred knowledge, rather than the most dysphoric psychoactive compounds they can find [72]. We argue that such practices are explained by how they induce immersive experiences that provide sensory evidence toward extraordinary beliefs.

Glossary

Agency detection: the capacity and tendency to interpret stimuli as produced by an intentional being – for instance, seeing grass move and intuiting that the movement comes from a snake.
Coalitional signaling: behavior that communicates loyalty, shared values, or other forms of commitment to a group.
Cognitive biases: consistent and unconscious deviations from rational reasoning – for instance, the inclination to engage in teleological reasoning, in which people are likely to interpret purposeless events in terms of their putative functions or purposes.
Extraordinary beliefs: beliefs, including in supernatural entities, conspiracy theories, and pseudoscience, that are commonly thought to ignore or defy available evidence against their veracity.
Incarnation: the physical, environmental, or mental embodiment of supernatural entities through immersive experiential practices.
Intuitive dualism: the spontaneous tendency to see minds and bodies as ontologically distinct.
Lucid dream: a dream in which one becomes aware that they are dreaming.
Plurimediality: the integration of multiple media forms, such as words and images, within a single work or experience; an opera is plurimedial, for instance, because it combines both visual and auditory features.
Teleological reasoning: the tendency to interpret natural phenomena in terms of purpose or design – for instance, reasoning that lakes exist so fish can swim in them.

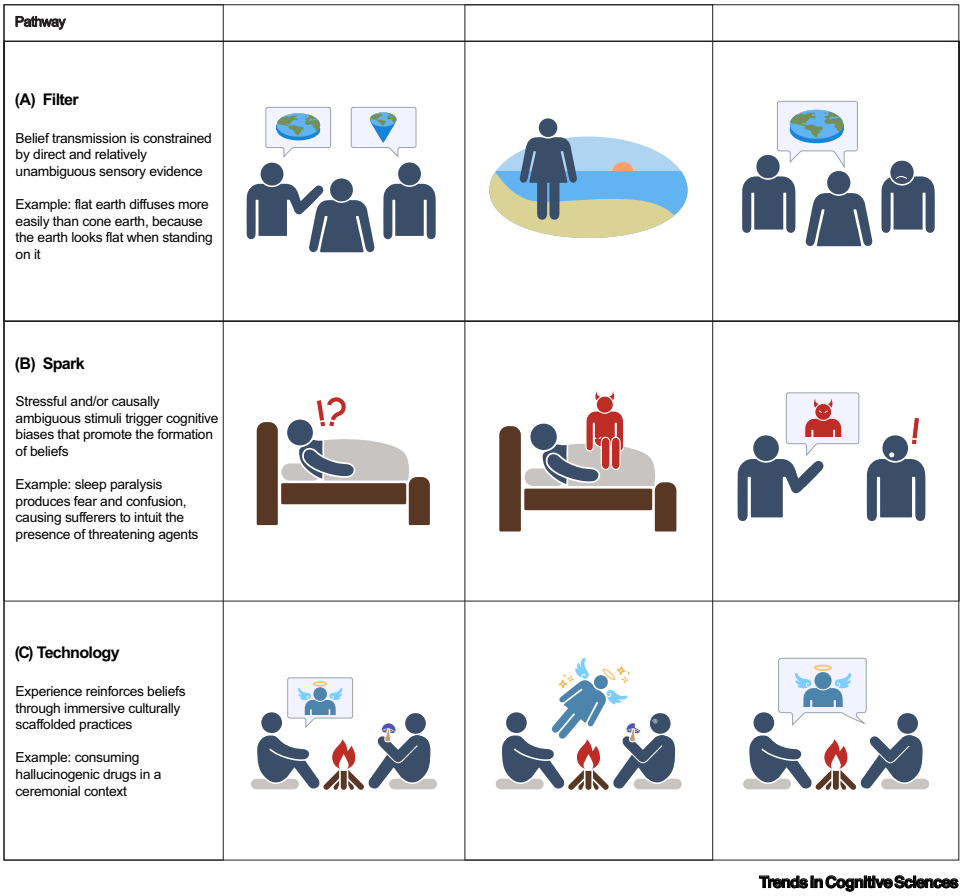

Figure 1. Three experiential pathways for extraordinary belief. Experience, in tandem with cognitive biases and social dynamics, influences the development of extraordinary beliefs. We propose three pathways through which experience can exert this influence. These pathways integrate experience, social dynamics, and cognitive biases to explain common features of extraordinary beliefs. (A) In Pathway 1, experience acts as a filter for the social transmission of beliefs. For example, beliefs in flat Earth diffuse more easily than beliefs in cone Earth, even though both beliefs are incorrect, because the planet looks flat when standing on it. (B) In Pathway 2, experience sparks the recruitment of cognitive biases that promote the formation and transmission of beliefs. The stress and unclear causality of sleep paralysis, for instance, trigger agentic and teleological biases that lead people to interpret the sensation as a threatening figure sitting on their chest. (C) In the third pathway, experience is leveraged as a cultural technology; immersive cultural practices promote beliefs by producing sensory evidence and triggering cognitive biases. For example, a specialist might tell an initiate that certain substances contain supernatural spirits. If consuming the substance induces the experience of meeting a spirit, then the initiate is likely to accept the belief suggested by the specialist.

Experience constrains transmission of extraordinary beliefs

The first pathway by which experience produces and constrains extraordinary beliefs is perceptual credibility: beliefs that can explain sensory inputs are more likely to be adopted and spread. In this pathway, experience serves as a filter. Just as with apparently ordinary beliefs, people compare extraordinary beliefs with sensory inputs to test their plausibility [18,19]. Beliefs that better account for perceptual inputs are more likely to be retained, while those that fail to account for sensory inputs will be less likely to spread throughout a population [20].

Consider the flat Earth theory, a popular and sticky conspiracy belief. Believing in a flat Earth requires one to reject extensive scientific evidence, authoritative testimony, and community endorsement. Yet among the numerous arbitrary alternatives to a round Earth, such as a cone-shaped or toroidal

Earth, all of which would apparently serve **coalitional signaling** functions equally well, skeptics reliably converge on the belief in a flat Earth. This convergence appears to reflect the perceptual flatness of the Earth's surface; skeptics can point to direct sensory evidence favoring their belief. In fact, the visual flatness of the Earth is frequently invoked by conspiracy theorists as definitive evidence of the flat Earth theory [21,22]. As early as 1885, William Carpenter proclaimed that 'Every man in full command of his senses knows that a level surface is a flat or horizontal one…it is clear that things are not as they [astronomers] say they are' [23]. Mark Sargent, a prominent member of the modern flat Earth community, decried science at a flat Earth convention for taking 'what should have been easy observations and twisting them to suit your needs' (M. El Attal, M.A. thesis, Tilburg University, 2021). Social motivations may encourage relying on this naive realism over expert testimony, but people regularly turn to realism, rather than arbitrary invention, as grounds for belief.

A similar logic may apply to the content of supernatural beliefs. For example, common beliefs about supernatural agents may be favored because they more easily align with sensory evidence. Across diverse cultures, people more often report that deities communicate with them than that deities carry out physical tasks [24]. Evangelical Christians, for instance, may believe that Jesus speaks kind words to believers, but they are presumably less likely to believe someone who claims Jesus wrestled them or gave them a pat on the back. These patterns plausibly reflect the anomalous experiences that people are more likely to have – for instance, auditory hallucinations, as opposed to complex tactile hallucinations [25]. As with flat Earth theory, the spread of beliefs in supernatural agents partly hinges on their alignment with sensory experience.

Experience sparks cognitive biases that promote new extraordinary beliefs

The second pathway involves the interpretation of anomalous sensory events. In contrast to the first pathway, experience here does not simply constrain belief formation but sparks it. Extensive evidence suggests that causally opaque experiences, particularly those that are stressful or emotionally charged, generate ambiguous sensory data that are resolved by cognitive biases, leading to the formation or reinforcement of extraordinary beliefs. This process involves an interaction between sensory experience and predispositions for agency detection and **teleological reasoning**: unexpected sensory inputs recruit such explanatory tendencies, contributing to the formation and reinforcement of extraordinary beliefs [26–30].

A vivid example is sleep paralysis, or the experience of restricted voluntary movement during transitions into or out of sleep. A review of sleep paralysis prevalence in the general population found that 8% of people reported having experienced sleep paralysis at some point in their life, though estimates from individual studies range from 2% to 60% [31]. Although cultural background influences interpretations of sleep paralysis [32], individuals across societies consistently associate such experiences with threatening presences of unseen agents, which are linked to paranormal and supernatural beliefs [33] and incorporated into world folklore [34]. Several correlational studies have found that individual rates of paranormal and supernatural belief are linked to the frequency and intensity of sleep paralysis episodes [33,35–38]; this pattern was corroborated in a systematic review of 42 studies on sleep paralysis and associated variables [39]. While no experimental study has been conducted to test whether sleep paralysis can trigger or reinforce extraordinary beliefs, it is telling that even secular individuals often report feeling the presence of invisible agents [32]. This suggests that elements of the experience of sleep paralysis, independent of one's prior beliefs, spark perceptions that external agents are involved.

One plausible explanation is that sleep paralysis produces stress and confusion due to an apparent loss of bodily control; usually, being awake corresponds with a sense of bodily agency. This recruits cognitive biases to account for the strange experience. Psychological experiments

indicate the roles of stress, uncertainty, and causal opacity in recruiting teleological and agential tendencies. Time pressure makes participants more likely to develop teleological accounts for complex phenomena [40], while uncertainty predisposes them toward false agency intuitions [41,42]. People are also more likely to spontaneously develop superstitions when dealing with stress [43]. In general, a combination of causal opacity and stress appears to promote reliance on a set of biases that can easily reinforce or generate seemingly extraordinary beliefs, potentially explaining why beliefs about magic, witchcraft, and sorcery focus on inexplicable misfortune [4]. Even causal opacity alone may trigger the use of biased reasoning: both humans and monkeys infer causal models from objectively random data with no encouragement [44,45]. Experiences like sleep paralysis are thus ripe for extraordinary explanations. Presumably, this would be even more true in non-industrial societies, where people cannot call upon neurobiological accounts to explain away their experiences.

Sleep paralysis is a useful case study, but broader surveys also suggest that a variety of non-ordinary experiences – including some that clinicians would often categorize as signs of pathology – are common across the general population [46]. For instance, a recent survey of 11 000 respondents from Brazil found that nearly half reported experiencing extrasensory perception (ESP), while 73% reported having had a **lucid dream**, among other strikingly high rates of various anomalous experiences [47]. If experiences like lucid dreams, hallucinations, and a sense of supernatural presence occur so robustly across the general population, associated extraordinary beliefs are likely triggered and reinforced by such experiences. This possibility also fits with long-standing accounts of delusion formation in psychosis, which hold that psychotic delusions can be explained as attempts to make sense of the excessive salience of internal representations, such as mental imagery and inner monologues [48].

Societies leverage immersive experience to promote extraordinary beliefs

The third pathway by which experience shapes extraordinary beliefs differs from the previous two in that it is not about passively encountering sensory data (as with Pathway 1) or spontaneously interpreting ambiguous anomalies (as with Pathway 2). Instead, it involves the deployment of specialized practices that simulate or amplify the kinds of evidence that would support extraordinary beliefs (Box 2). Across societies, people develop technologies – such as prayer [46], rituals

Box 2. The ontogeny of extraordinary beliefs

Many scholars have suggested that innate cognitive biases, like intuitive dualism and social learning biases, predispose children to credulously accept the supernatural beliefs and ritual practices of their parents [108,109]. A growing body of literature challenges this assumption, suggesting that children are actually less likely than adults to endorse the existence of supernatural agents [110]. Nonetheless, such skepticism is often assumed to be overcome through indirect cultural input, including testimony from authoritative figures, credibility-enhancing displays, and other signals of genuine belief and investment from adults [111], rather than sensory evidence.

Compared with the religious experiences of adults, ethnographic and experimental data on the religious experiences of children are unfortunately limited. But in many cultures, young children are encouraged to participate in rituals that appear to have strong experiential effects. Ju/'hoansi children were included in trance dances as soon as they could walk; mothers even held their infants as they danced and chanted in women's circles [112]. Children in several Aboriginal Australian societies engaged in ceremonial cycles until adulthood, which often involved dancing and singing to induce altered states of consciousness [113]. More generally, many societies have maintained immersive initiation rituals focused on the revelation of supernatural entities, particularly for adolescent boys [114]. These sometimes even involve the guided or enforced use of hallucinogenic compounds, as with initiation rituals among the Sotho based around *Boophone disticha*, a powerful psychotropic substance [115]. Many pieces of cave art from the Upper Paleolithic have also been identified as being made by children aged 2–12 years [116]. Given that many commentators have interpreted the production of cave art as sympathetic magic, totemism, or other forms of supernatural practice, it is possible that these depictions reflect the engagement of children in immersive religious rituals throughout the deep history of our species [117]. As with adults, then, children's extraordinary beliefs may stem, in part, from experiences that generate sensory evidence toward those beliefs.

involving psychotropic drug use [49], and spirit **incarnation** – that appear optimized for experiential immersion and therefore provide users with sensory evidence that can substantiate extraordinary beliefs. These processes draw on similar dynamics as the other pathways: they produce sensory inputs (as in Pathway 1) and often involve ambiguity or emotional intensity that recruits biased interpretations (as in Pathway 2). But rather than waiting for such experiences to occur spontaneously, people develop technologies that stimulate them [50].

Prayer

William James argued that prayer, the practice of addressing internal or external words to a supernatural figure, 'is the very soul and essence of religion' [44]. Although prayer techniques vary across religious systems, the basic practice characterizes religious traditions of many different scales and degrees of formality [45]. As of 2018, roughly 50% of adults worldwide reported praying at least once per day[iii].

One potential reason for prayer's ubiquity and appeal is that it reliably produces sensory and perceptual experiences that people interpret as supernatural. A recent cross-cultural study identified a strong correlation between the amount of time spent in prayer and the frequency of supernatural events, especially experiences of mundane events as generated by a spirit or god rather than the self [51]. Several experimental studies have compared the cognitive effects of long-term prayer with other religious practices, like Bible study, as well as secular alternatives and nonparticipation, finding that prayer increases the reported frequency of spiritual experiences [52–55]. Ethnographic research on a variety of traditions has also found that prayer sharpens mental imagery and thus generates clearer experiences of supernatural figures [26,27].

Few surveys have assessed the longitudinal effects of prayer on belief. However, one study found that the experience of anomalous peace and joy during prayer motivated more regular religious practice by participants [28]. Given these findings and those mentioned previously, it is plausible that prayer bolsters religious commitment by providing users with apparent evidence toward the underlying belief system.

Importantly, prayer techniques seem to achieve experiential effects by demanding that practitioners act in ways that alter many different sensory modalities at the same time. While praying, people may light incense, twist rosary beads around their wrist, sit down in a meditative pose, and recite words or mantras in their head [29,30]. Prayer techniques also commonly demand that users pray as if the supernatural entity were physically present, which increases the likelihood of interpreting internally generated thoughts, emotions, or images as externally caused [31]. These techniques induce and turn attention toward sensory stimuli that favor agentic cognitive biases and fit into pre-existing cultural expectations about the kinds of experiences that qualify as divinely inspired.

Different sensory experiences induced during prayer boost belief not only independently but in tandem. Prayer is commonly **plurimedial** – that is, sensory representations align to support a particular mental representation, like the presence of a supernatural entity [56]. Plurimedial prayer is consistently more effective at making people feel like they are communicating with a supernatural entity than alternative forms [31,51], an effect that seems attributable to the many sensory incarnations of the deity to which one is exposed.

Research on virtual reality (VR) technologies, including on belief change caused by VR, highlights a similar feature known as multimodality [57]. Like plurimediality, multimodality involves exposing users of VR to many different sensory signals tied to an alternative reality. As with plurimediality in

prayer, multimodality is a strong predictor of how immersive a VR experience will feel and, consequently, how strongly a VR-based intervention will affect the beliefs of a user (Box 3). Compared with less immersive media, multimodal VR interventions have been found to shift attitudes toward climate change [58], healthy versus unhealthy food [59], and product preferences [60].

Given these shared design features, prayer seems to qualify as an experiential technology that, when used effectively, creates sensory evidence that reinforces beliefs in the existence of supernatural entities. More immersive prayer techniques will engender a more powerful sense of divine communication and presence, which in turn reinforces belief in the existence of supernatural beings.

Social dynamics can reinforce and direct the use of prayer as an experiential technology, since socially derived expectations about the experience of prayer, the behaviors of spirits, and so forth can prime us to interpret certain kinds of sensory input as evidence of supernatural presence [61,62]. Additionally, prayer is often enacted as a social activity. Sharing the experience with a group can drive attention toward sensory evidence that favors the presence of supernatural beings, such as a feeling of unity with coreligionists that is experienced as divine presence [63,64]. Praying with others and engaging with coreligionists can also enforce regular practice. Several religious traditions explicitly command practitioners to pray [51] and demand that users practice in particular ways. For example, members of an Evangelical Christian community were often surprised if a churchgoer did not cry during collective prayer; these individuals felt compelled to explain why, exactly, they were not expressing the same degree of emotion [65].

Hallucinogenic drugs

Hallucinogenic drugs have been used by human societies around the world and, in some places, for thousands of years [66]. Although reliable evidence of pre-colonial, hallucinogenic use of serotonergic psychedelics seems confined to Mesoamerica and South America [67], human societies have used other hallucinogens to induce powerful altered states, including deliriants in California [68], muscarinic mushrooms in North Asia [69], and a variety of psychoactive plants

Box 3. Immersive design features in virtual reality

A widely discussed feature of VR experiences is their immersiveness – the extent to which they situate users in distinct virtual environments while reducing input from the external world [118]. Greater levels of immersiveness facilitate the user's sense of 'presence' in the virtual world [119]. A widely discussed design feature underlying immersiveness is multimodality: the alignment of different exteroceptive, proprioceptive, and interoceptive signals toward an alternative reality [57].

The immersiveness of VR experiences impacts beliefs and behaviors. Studies investigating VR's capacity to combat misinformation [120], change beliefs about climate change [58], reduce stigma toward mental illness [121], and structure consumer choices [122], among other outcomes, consistently show that the likelihood and degree of belief change is strongly correlated with the immersiveness of the intervention.

As an example, consider an experiment examining users' perceptions of the imminence of environmental risk [123]. Participants in one experimental condition watched a virtual cow live a day of its life on a meat farm. In another condition, participants donned a VR headset and entered the first-person perspective of the cow. The experimenters also had participants kneel on all fours; when a virtual cattle prod jabbed the cow, the participants heard a buzzing sound, felt the floor vibrate, and were poked in the back by a confederate. These multimodal design features led to a greater sense of embodiment and presence, as well as a heightened sense of connection to nature, generating more intense perceptions of the imminence of environmental risk for at least 1 week after the study.

Given the similarly multimodal design features of practices like prayer, hallucinogen use, and incarnation, it is striking that multimodality can facilitate belief change in VR interventions, even when participants know that the experience is artificial. One could expect that multimodality will therefore have even more powerful effects on belief if users do not have strong pre-existing reasons to deny the veracity of their experiences [124]. Although few people experience VR, it provides a useful case study for understanding how practices like prayer can produce immersive experiences and influence belief.

in southern Africa [70]. According to one database, specialists in roughly half of non-industrial human societies used psychoactive substances to induce altered states [71].

Many cross-cultural instances of hallucinogenic consumption involve interacting with supernatural entities and worlds [72]. Fittingly, many of their strongest and most robust effects reflect their immersive power; psychedelics, for example, consistently induce 'altered emotional and perceptual experiences, encounters with gods and other agentic entities…extrasensory perceptual experiences, travel, relative or ancestor encounters, purification and initiation, and violence and transfiguration' [73,74]. As with prayer, multimodal design features are also often incorporated to make such experiences more immersive. The Desana in Colombia recognized that dehydration, musical embellishments, and total darkness or a lone fire enhanced the vividness of psychedelic experiences [75], while medical studies in Western societies often note the importance of using music to guide therapeutic use [76–78].

Although research on many classes of hallucinogenic drugs has yet to be conducted, research on psychedelic experiences suggests lasting effects on extraordinary beliefs, particularly supernatural beliefs. Several studies, including some longitudinal surveys of people's metaphysical beliefs before and after psychedelic use, show enduring shifts away from hard materialism. Following psychedelic experiences, people are more likely to hold non-physicalist views, including beliefs in reincarnation, communication with the dead, and the consciousness of inanimate objects [49,79–83].

Several of these studies have provided evidence that these belief changes are mediated by the vividness of psychedelic experiences [79,80] – for instance, the extent to which an experience feels mystical or emotionally synchronous with others during a ceremony. These sensations often feel not only powerful but strikingly real, as much as (and sometimes more than) reality itself [73]. Though this so-called 'noetic quality' can potentially appear in other kinds of altered states of consciousness, like dreams, it is especially common for states induced by serotonergic psychedelics. Consequently, perceptions triggered by psychedelic use can provide sensory data favoring beliefs that are not otherwise backed by strong subjective evidence.

Impressionability at baseline is also a strong predictor of belief changes, reinforcing the burgeoning view of classic psychedelics as so-called 'super-placebos' [84]. But recent discussions of the role of suggestibility in belief change from psychedelics complement an experience-based explanation. Several studies suggest that ideas suggested before and during psychedelic use manifest during user experiences; socially acquired beliefs can therefore appear and be strengthened by the effects of the practice, perhaps by turning attention toward particular features of the non-ordinary experience [85–87]. However, shifts toward non-physical beliefs appear across a variety of substances and use contexts, suggesting that experiential factors aside from social influence favor extraordinary belief formation following psychedelic use.

Incarnation

In many religions, people impersonate or appear to engage with supernatural entities (Figure 2), often going to great lengths to make these incarnations as convincing as possible. The cross-cultural prevalence of incarnation appears to reflect its use in producing and maintaining extraordinary beliefs.

A common and striking technique of incarnation is the use of elaborate disguises to imitate otherworldly entities [88]. Such disguises, and the practices associated with them, are often strikingly multimodal. The Arunta, Bororo, Mbuti, Kina, and Ona, for instance, all impersonate supernatural

Figure 2. Four examples of incarnation. (A) Yoruba masqueraders dressed in their *Egungun* costumes, which manifest the spirits of departed ancestors[iv]. (B) Bark masks worn by men from the Kina to disguise themselves as violent spirits [125]. (C) An Ojibwa shaman extracts a disease-causing object from a patient [126]. (D) Two men dressed as deities called Toshidon chastise a child for his wrongdoings[v].

entities to deceive women and children, and three of those societies also use musical instruments to imitate the voices of the spirits and make the experience more compelling (Figure 2B) [88]. In the Toshidon ritual employed off the west coast of Kyushu, Japan, adult men dress up as sky demons and go door-to-door chastising and/or rewarding the children for their behavior [89] (Figure 2D). Dressed in frightening masks wide enough to obscure the rest of their bodies – they look like untethered demonic heads, when crouched on all fours – they yell and growl at the children, forbid photography and video, and assemble in a large group around each house to make extra noise while one Toshidon leads an assessment of the child. Similarly, masqueraders in Yoruba ceremonies employ full-body costumes, practice elaborate choreography, and enter trance states throughout their performance (Figure 2A) [90].

Physical adornments are not strictly necessary for compelling incarnations. Shamans and other religious practitioners often appear to viscerally transform into otherworldly beings when engaging with the supernatural by speaking in a different voice, moving in strange ways, and even using literal illusions [91–93] (Figure 2C). Many also interact with supernatural agents in ways that seem to provide evidence of their existence, such as by speaking with them and carefully carrying them [94] or slashing blood-filled ghosts and finding blood on their hands [92]. The use of symbolic objects and imagery in rituals can also potentially scaffold the attention of participants toward sensory evidence associated with the supernatural beliefs underlying a given ceremony [95].

Researchers have acknowledged that such experiences make extraordinary beliefs more compelling, but have mostly focused on effects from social dynamics like signaling credible belief: by behaving as if supernatural agents are real, shamans and other religious specialists signal sincere belief, enhancing transmission of that belief [13,94]. Yet such incarnation practices also appear optimized for experiential immersion. Compelling performances seem to provide and turn attention toward sensory evidence of the reality of extraordinary beliefs, while less compelling performances do not, just as immersive prayer is more experientially effective than non-immersive prayer [96,97]. Figures like shamans succeed, therefore, by producing sensory evidence toward their supernatural claims.

Concluding remarks

Extraordinary beliefs are often treated as categorically distinct from ordinary beliefs. Existing frameworks describe them as 'reflective' or as 'credences': insulated from action, unresponsive to sensory evidence, and thus categorically distinct from 'intuitive' and 'factual' beliefs, like that chairs exist and that fast cars are dangerous [98,99]. But the evidence reviewed here suggests otherwise. Whether shaped by perceptual plausibility, triggered by anomalous experiences, or reinforced through immersive technologies, extraordinary beliefs are shaped, in part, by how well they align with sensory information about the world. Belief distinctions like 'reflective' versus 'intuitive' may therefore be best understood not as separate categories but as dimensions that comprise all beliefs, no matter how mundane or extraordinary.

Cognitive biases and social dynamics remain invaluable routes toward understanding extraordinary beliefs. However, both approaches have discounted the role of sensory evidence in the formation and maintenance of such beliefs despite the clear importance of direct experience in structuring ordinary beliefs. Our synthesis thus suggests that experience should be understood as a third factor underlying the emergence, transmission, and evolution of extraordinary beliefs, alongside and intertwined with cognitive biases and social dynamics.

Appreciating experience also clarifies how religious beliefs and practices, particularly in small-scale religions, may evolve due to experiential influences (see Outstanding questions). Boyer has noted that these traditions commonly lack an obvious set of explicit beliefs [100]. Instead, religious knowledge is dynamic and shifts as religionists use experiential technologies to pursue important goals, like alleviating illness or diagnosing the sources of misfortune. These pursuits may generate new sensory evidence that suggests novel information about the nature of unseen forces. Among the Arakmbut of Amazonian Peru, for example, religious practitioners *(wayokeri)* supply and discuss new insights derived from dreams and waking visions, which can in time spread throughout their community [101]. Research on so-called 'wild traditions' – small-scale religions akin to the traditions that would have characterized our evolutionary past [102] – suggests that experiential evidence would have been considered more reliable and therefore driven changes in belief and practice more often than in large-scale religions like Christianity. Consequently, evolutionary discussions of religion must consider the role of experience in the emergence and development of ancestral systems of supernatural belief.

Given the ongoing spread of conspiracy theories, pseudoscience, and misinformation in societies across the globe, a more nuanced picture of belief also has practical implications. Interventions attempting to combat these pernicious beliefs may benefit from prioritizing first-person testimonies alongside more common techniques, like pointing out logical fallacies in conspiracy theories and targeting cognitive biases [103]. Additionally, providing sensory evidence against such beliefs could prove useful. Pragmatically oriented research might also focus on potential differences in perceptual processing among extraordinary believers; some studies have found links between

Outstanding questions

Can interventions designed to combat conspiracy theories, pseudoscience, and misinformation succeed more effectively by leveraging sensory evidence?

What role does experience play in the early ontogeny of extraordinary beliefs? Childhood is a period of curiosity, exploration, and increased suggestibility, yet it remains unknown whether these factors also make children more prone to non-ordinary experiences or the effects of experimental technologies.

To what extent do communities centered around conspiracy theories or pseudoscience incorporate experimental technologies? The role of immersive experience in these domains of extraordinary belief, compared with supernatural belief, is understudied.

Do different religious traditions vary in the degree to which experience influences belief? Non-Abrahamic religions are less likely to make formal determinations of correct belief, which likely allows for more variety in the beliefs held by members. Distinct experiences may help to account for some of these variations.

Initial survey data suggest that the lifetime prevalence of experiences like auditory hallucinations and a sense of presence is higher than previously thought. What is the baseline rate of non-ordinary experiences among the general population?

Popular theories posit that psychedelics cause belief change by relaxing top-down priors on cognition and making users more reliant on bottom-up sensory evidence. Do models of how beliefs change under psychedelics apply to the effects of other belief-enhancing experiential technologies, like prayer and incarnation?

conspiratorial thinking and visual perception, although the causal direction of this link remains unclear [104].

At first glance, it may appear exceedingly strange that people can believe in the existence of invisible beings and question the sphericity of our planet – so much so that these phenomena seem to require a different explanation than beliefs that strike us as mundane. But we propose that when people come to hold extraordinary beliefs, there is often a perfectly ordinary reason why. Their experiences have led them to think their beliefs are true.

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Declaration of interests

The authors declare no competing interests.

Resources

[i]www.pewresearch.org/religion/2023/12/07/who-are-spiritual-but-not-religious-americans/

[ii]https://carsey.unh.edu/publication/conspiracy-vs-science-survey-us-public-beliefs

[iii]www.pewresearch.org/religion/2018/06/13/how-religious-commitment-varies-by-country-among-people-of-all-ages/

[iv]https://search.library.wisc.edu/digital/AKA53TRDELBDQ386

[v]https://ich.unesco.org/es/-00973?photoID=01442

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