



Exposure to Credibility-Enhancing Displays Predicts Adoption of Conspiracy Beliefs

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Exposure to Credibility-Enhancing Displays Predicts Adoption of Conspiracy Beliefs

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Abstract

Conspiracy beliefs appear endemic to human culture. These beliefs cause real harm to the individuals who espouse them and to their communities. To date much of the scholarly focus on conspiracy beliefs has been limited to a set of cognitive factors implicated in the adoption of these beliefs (e.g., intelligence, cognitive thinking style). Recent developments in a related field (the Cognitive Science of Religion) offer a potentially more accurate model of belief which considers cultural-evolutional biases that modulate the transmission of information. This study investigated the role that one type of learning bias, the credibility-enhancing display (CRED), has on conspiracy belief transmission. CREDs were found to be the strongest predictor of conspiracy belief in a nationally representative sample of 1024 participants from the United States. Additionally, exposure to CREDs increased believers' conviction about their beliefs. Conservatism, and reduced cognitive reflection to a lesser extent, also predicted conspiracy belief, in concordance with existing literature.

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Chapter I

Introduction

Conspiracy beliefs are ubiquitous. They have been documented in every known culture: modern industrial societies, traditional hunter-gatherer communities, and rural subsistence cultures (van Prooijen & Douglas, 2017; West, 2003). Some commonly held conspiracy beliefs in the United States are that the FDA deliberately suppresses natural cures at the behest of the pharmaceutical industry or that global warming is a hoax. Adoption of conspiracy beliefs carries real consequences for both believers and society at large (Douglas et al., 2017; Douglas & Sutton, 2018). Conspiracy beliefs are associated with increased out-group prejudice and intergroup conflict (Bilewicz et al., 2013; Jolley & Douglas, 2014). These beliefs exacerbate political radicalization, populism, and religious fundamentalism (Goreis & Voracek, 2019; van Prooijen et al., 2015). Conspiracy beliefs also erode faith in civil institutions and can lead believers to reject recommendations by public health experts. Adoption of conspiracy beliefs is negatively correlated with a number of health-related measures because believers are less likely to follow traditional medical advice such as using sunscreen, contraceptives, or obtaining immunizations (Douglas et al., 2019; Jolley & Douglas, 2014; Oliver & Wood, 2014). A fuller understanding of the factors that contribute to conspiracy beliefs could be used to craft policies that improve public health and civil outcomes.

To date much of the scholarly focus on conspiracy beliefs has been limited to a set of cognitive factors implicated in the adoption of these beliefs (e.g., intelligence,

cognitive thinking style). In this study I will first outline the current models which seek to explain how conspiracy beliefs proliferate and describe why these models are fundamentally flawed. There exists a potentially more robust model of belief (the Dual-Inheritance Model) which has recently emerged in a related field (the Cognitive Science of Religion). After describing the components of this model, I will explain why and how this model is applicable to conspiracy belief. This study examines one component of the Dual-Inheritance Model: the credibility-enhancing display (CRED), a kind of learning bias. The goal of this study is to ascertain the effect that CREDs have on conspiracy belief.

Contemporary of Models of Conspiracy Belief and their Limitations

A conspiracy belief is a hypothesized pattern linking an object or event to (i) a powerful hidden agent which (ii) is capable of performing intentional action and (iii) intends to cause harm (Shermer, 2011; van Prooijen & van Vugt, 2018). There are two competing models of belief which seek to explain the prevalence of these beliefs in terms of cognitive differences: the byproduct model and the adaptive-conspiracy model.

Both models of conspiracy belief are primarily focused on a set of psychological traits and cognitive biases which are thought to mediate the adoption of these beliefs. Commonly researched traits include Agency Detection Capacity (the capacity to attribute stimuli to the intentional action of some agent), Illusory Pattern Perception (the tendency to over-perceive relationships between stimuli), Cognitive Style (Reflective vs Intuitive), and a variety of other biases related to System-1 (intuitive) cognitive processes (Ariely, 2010; Kahneman, 2013; van Prooijen & van Vugt, 2018).

Predictably Irrational: The Byproduct Model of Conspiracy Belief

The byproduct model (Figure 1) asserts that conspiracy beliefs are a non-functional byproduct which emerges from a constellation of evolved psychological mechanisms (e.g., Agency Detection, Illusory Pattern Perception). According to this model the interaction between a specific suite of cognitive biases allows conspiracy beliefs to emerge and become self-supporting.

According to the Dual-Process model of human cognition, judgments are made by two distinct kinds of mental processes, System-1 and System-2 (Kahneman, 2013). System-1 processes are implicit, fast, intuitive, emotion-driven, and reactive. System-2 processes are explicit, (comparatively) slow, analytical, reflective, and rational. Intuition-based system-1 processes are responsible for many kinds of biases and errors in judgement such as humans' persistent failure to take into consideration base rates, or our biases toward loss-aversion and hyperbolic discounting (Ariely, 2010; Kahneman, 2013).

Individuals differ in the extent to which they rely on these two processes when making judgments. Data from field and experimental studies suggest that individual cognitive differences in reflective and intuitive thinking play a modest role in mediating the adoption of conspiracy beliefs (Douglas et al., 2016; Swami et al., 2014; van Prooijen, 2017). For example, individuals who have adopted conspiracy beliefs tend to erroneously perceive patterns in random stimuli at significantly higher rates than non-believers (Brotherton & French, 2014; van Prooijen et al., 2018). Differences in cognitive thinking style also appear to play a role in the transmission of conspiracy belief.

Proponents of the byproduct theory point to evidence from cross-cultural studies which

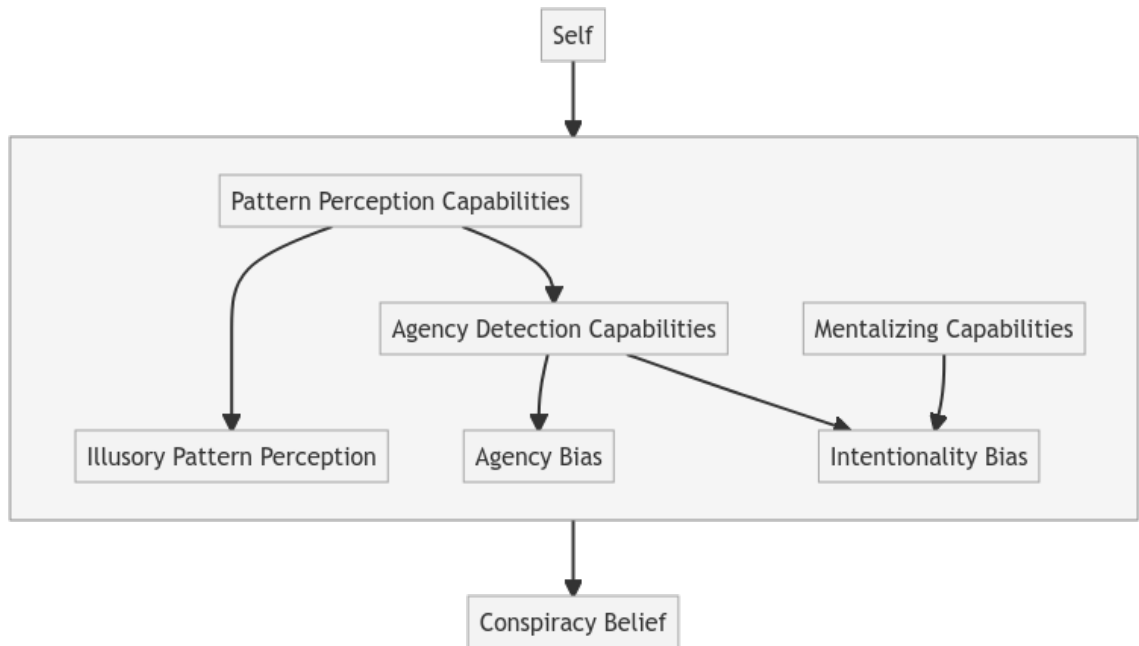


Figure 1. Byproduct Model of Conspiracy Beliefs.

According to the Byproduct Model conspiracy beliefs are a non-functional byproduct (spandrel) of several related psychological mechanisms.

support the notion that reflective cognitive style (system 2) predicts increased skepticism of conspiracy theories (Douglas et al., 2017; Pytlik et al., 2020; Ståhl & van Prooijen, 2018; Swami et al., 2014; van Prooijen, 2017).

Better Safe than Sorry: The Adaptive-Evolutionary Model of Conspiracy Belief

Unlike the cognitive byproduct model, the adaptive-evolutionary model of conspiracy beliefs asserts that conspiracy beliefs are not a byproduct, they are an adaptive response. The adaptive-evolutionary conspiracy model (Figure 2) posits that conspiracy beliefs are simply a subset of a larger adaptive mechanism which humans evolved in response to inter-group violence. By carefully attending to threat-cues from out-group members ancient hominin were better able to anticipate and preemptively react to threats from hostile agents in their environment (Brotherton, 2021; Douglas et al., 2017; Prooijen, 2018; van Prooijen & van Vugt, 2018). Under this view human's capacity to construct and transmit narratives about the agency and intent of others is a survival tactic. The prevalence of conspiracy beliefs in the absence of (or contrary to) evidence can be explained in part by error-management theory. Our attention has been shaped by evolution to be sensitive to threats because the costs associated with mistakenly perceiving a threat where none exists (type-1 error) outweigh the cost of failing to identify a real threat (type-2 error) (LoBue & DeLoache, 2010; Shibasaki & Kawai, 2009).

Proponents of the adaptive-evolutionary model point to the relative dearth of “positive conspiracies” as an example of how that attentional threat bias shapes the focus of our attention. Humans are simply not that interested in uncovering the motives of hidden agents who are non-malicious (e.g., anonymous donors secretly funding charities).

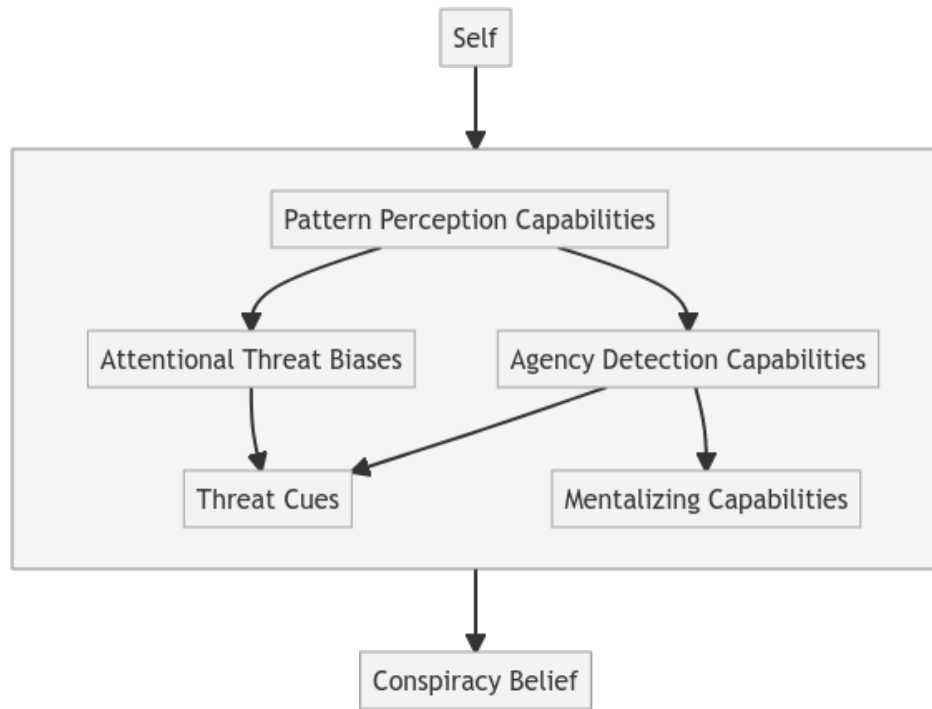


Figure 2. Adaptive-Evolutionary Model of Conspiracy Belief.

According to the Adaptive-Evolutionary Model our capacity to develop and transmit conspiracy beliefs emerged as adaptive response to out-group threats.

Ultimately both the byproduct and adaptive-evolutionary model of conspiracy belief center on a series of hypothesized interactions between evolved psychological mechanisms. Our capacity to perceive patterns, attribute intent to other agents, and draw conclusions from stimuli in our environments all contribute to our capacity to form conspiracy beliefs and transmit them to others. But both models of belief fall short as predicative frameworks for understanding how and why particular conspiracy narratives spread in the real world.

Predictive Shortcomings of the Current Models of Conspiracy Beliefs

If conspiracy beliefs were adopted probabilistically by individuals according to some set of cognitive processes, then we would expect to see conspiracy narratives spread without regard to national, ethnic, religious, political, or other social boundaries. Abundant field data suggests that the opposite is true: individual conspiracy narratives are generally appealing only to specific social groups (Alper et al., 2020; Andrade & Hussain, 2018; Douglas et al., 2019; Motta et al., 2020; Romer & Jamieson, 2020; Swami, 2012).

Neither the cognitive byproduct model nor the adaptive-evolutionary model provides an adequate explanation for why conspiracy narratives so rarely transmitted successfully across social boundaries. Researchers seeking to develop more robust models of belief can leverage findings from a field of study which is closely related to conspiracy belief: the Cognitive Science of Religion.

The Cognitive Science of Religion: A Closely Related Field

The Cognitive Science of Religion (CSR) is a relatively recent field of study which examines religious beliefs and behaviors through the perspective of cognition. Early models of religious belief assumed that these beliefs were spandrels: byproducts of a set evolved psychological mechanisms and cognitive biases (Barrett, 2004; Barrett & Lanman, 2008; Boyer, 2004). An alternative theory, the adaptive-evolutionary model, couched belief as an evolutionary adaptation which facilitated the promotion of prosocial behavior and helped humans manage threats (Wilson, 2007).

Shared Foundations of Religious and Conspiracy Beliefs

Conspiracy and religious beliefs are strikingly similar in terms of their evolutionary origins, belief content, and transmission mechanisms. Both systems involve an epistemically unwarranted belief that requires an individual be capable of perceiving and attributing intent to hidden agents (Douglas et al., 2019; Lobato et al., 2014; Shermer, 2011; Stone et al., 2018). Religious and conspiracy narratives are both sense making systems: they provide a framework through which believers come to make sense of the world around them. Both forms of belief are also monological: they consist of a series of self-supporting and mutually reinforcing ideas which renders them difficult to refute (Miller, 2020; Swami et al., 2011).

Both systems of belief appear to satisfy the same set of psychological needs: epistemic, existential, and social (Butter, 2020; Douglas et al., 2017, 2019). In situations where an individual's epistemic needs are not met (i.e. situations of uncertainty, where causality is confused), or when there is a perceived existential threat (i.e. where one lacks control, or feels powerlessness), both kinds of belief are known to increase (Atran &

Norenzayan, 2004; Douglas et al., 2019; Prooiien, 2018). Social crises, such as wars or pandemics, often coincide with sharp increases in both forms of belief (Andrade & Hussain, 2018; Bentzen, 2021; Jutzi et al., 2020; Šrol et al., 2021; van Prooiien & Douglas, 2017).

Scientific investigation into the evolutionary origins of religious and conspiracy beliefs have generally proceeded along parallel tracks. Both fields of study adopted an initial theoretical orientation toward their respective belief systems rooted in the assumption that these beliefs were a byproduct of evolved cognitive features (e.g., Illusory Pattern Perception, Intentionality Bias). Both fields of study later developed adaptive-evolutionary models which posited that these beliefs either confer some advantages or persist because they have been leveraged by social groups to motivate prosocial behaviors.

Both domains of research have a long history of cross-pollination: many of the concepts used to describe mechanisms implicated in adoption of conspiracy beliefs, such as Hyperactive Agency Detection Capabilities, were originally conceived of by researchers investigating religious belief in the early years of research (Barrett, 2004).

Shared Cognitive Factors Mediating both Religious and Conspiracy Beliefs

Researchers investigating the cognitive underpinnings of religious and conspiracy beliefs have established a significant corpus of research documenting the extent that specific psychological traits and cognitive biases are associated with both forms of belief. False perception of patterns, over-attribution of agency on natural or random events, and intuitive (as opposed to reflective) cognitive style are all associated with increased religiosity and adoption of conspiracy beliefs (Daws & Hampshire, 2017; Pennycook et

al., 2012, 2014; Prooijen, 2018; Riekkari et al., 2013; Shenhav et al., 2012; van Prooijen, 2017; Wiseman & Watt, 2006).

One trait which has generated significant research interest in both fields of study is intelligence. A large number of studies have established a negative correlation between intelligence and adoption of religious and conspiracy beliefs (Ashton & Lee, 2021; Douglas et al., 2016; Dutton, 2014b, 2014a; Dutton & Van der Linden, 2017; Koenig et al., 2005; Lewis et al., 2011; Lindeman et al., 2016; Lynn et al., 2009; Meisenberg et al., 2012; Nyborg, 2009; Pennycook et al., 2016; Ritchie et al., 2014; van Prooijen, 2017). Meta-analyses conducted in 2013 and replicated in 2020 estimate the intelligence-religiosity relation (IRR) to be between $-.20$ and $-.25$ (Zuckerman et al., 2013, 2020). The relationship between intelligence and adoption of both forms of belief holds true when using other proxies of intelligence, such as income and educational attainment (Douglas et al., 2016; Lantian et al., 2021). Increased years of education strongly predict a decrease in the adoption of conspiracy and religious beliefs (Douglas et al., 2016; Oliver & Wood, 2014; van Prooijen, 2017). Several plausible theories exist which attempt to account for the negative relationship between intelligence and adoption of religious or conspiracy beliefs (Dutton & Van der Linden, 2017; Kanazawa, 2012; Nyborg, 2009; van Prooijen, 2017; Woodley of Menie & Dunkel, 2015). Under the Cognitive-Behavioral Bias model it is not raw intelligence that mediates adoption of these beliefs, it is the fact that intelligence is associated with a greater capacity to suppress intuitive (system-1 based) judgements while operating under cognitive load (Pennycook et al., 2014).

One common measure used to evaluate individuals' capacity to override incorrect intuitive judgements is the Cognitive Reflection Test (CRT). Individuals with lower

reflective scores on the CRT are more likely to hold religious beliefs and report increased confidence in their beliefs than individuals with higher reflective scores (Shenhav et al., 2012). Low reflective scores on the CRT also predict increased adoption of conspiracy beliefs (Alper et al., 2020). Studies using other well-validated measures of cognitive thinking style (intuitive vs reflective) such as the Stroop Test (where individuals must rapidly identify the colors of words printed which are in conflict, such as the word red printed with green ink) and the Rational/Experimental Multimodal Inventory also provide evidence for a strong relationship between intuitive thinking style and adoption of both forms of belief (Daws & Hampshire, 2017; Swami et al., 2014).

Another important psychological concept related to both kinds of beliefs are a class of errors involving Illusory Pattern Perception. Illusory Pattern Perception occurs when an individual mistakenly identifies a pattern in random stimuli (e.g., coin flips, dots under Brownian motion). Religious and conspiracy beliefs are both associated with an increase in these kinds of errors (van Prooijen et al., 2018). Individuals with religious beliefs, for example, are more likely to exhibit pareidolia (the false detection of faces in random noise) than non-believers (Riekkari et al., 2013).

Given the close relationship between religious and conspiracy belief systems it should come as no surprise that both systems are positively correlated; adoption of one predicts the other (Darwin et al., 2011; Newheiser et al., 2011; Stieger et al., 2013; Swami et al., 2011). Although much is known about what biases and traits are associated with the adoption of religious and conspiracy beliefs, critics have pointed out shortcomings with the cognitive bias and adaptive-evolutionary models of belief.

Religious and Conspiracy Belief Transmission: The Problem of Culture

If religious beliefs are the product of cognitive processes, why aren't specific religious narratives equally appealing to different groups of people? Millions of individuals in used to believe in agents like Zeus or Odin, but no longer. A decade ago Gervais and Henrich laid out a series of *reductio ad absurdum* arguments against the prevailing wisdom at the time that the emergence and persistence of religious belief could be explained solely by cognitive models of belief. These arguments are collectively referred to as the Zeus Problem (Gervais et al., 2011; Gervais & Henrich, 2010). Did humans undergo some cognitive change that rendered the idea of Zeus less believable than Allah or Yahweh? Are cognitive differences the reason individuals living in India and Brazil today each view one set of god concepts as more believable than the other? Of course not, and critics of cognition-only models were quick to point out that these models could not be used to predict why individuals would choose to adopt one specific belief over another. Cognitive differences may explain what makes someone more likely to believe in the existence of supernatural agents in general, but to determine which agent in particular an individual would find attractive (Zeus, Yahweh, Quetzalcoatl) one must take their cultural context into account.

The cognitive science of religion has undergone a dramatic shift in recent years as scholars recognized that innate cognitive mechanisms alone are insufficient to explain how beliefs emerge and spread. This shift in perspective has been profound. Although it was a prevalent view during the earlier years of CSR today essentially no researchers view these cognitive models as a “near-complete explanation of religion” (Sterelny, 2018). The important of cultural context on belief cannot be understated.

Those studying conspiracy beliefs today face the same class of problem that scholars of religious belief confronted a decade ago. If adoption of conspiracy beliefs were simply a product of individual variation in personality traits or cognitive biases then any particular belief ought to be equally appealing to individuals regardless of their national, ethnic, religious, political, and social affiliation. Instead we find that, like transmission of religious beliefs, the transmission of conspiracy beliefs tends to be circumscribed by social and cultural boundaries (Alper et al., 2020; Andrade & Hussain, 2018; Douglas et al., 2019; Motta et al., 2020; Romer & Jamieson, 2020; Swami, 2012).

Within the past decade a new model of belief has emerged within the Cognitive Science of Religion as researchers have begun to incorporate findings from the field of cultural evolution in order to better understand how individuals come to adopt religious beliefs: the dual-inheritance model. Unlike the byproduct or adaptive models of religious belief the dual-inheritance model provides researchers the ability to generate predictions about the adoption of *specific* religious beliefs. Given the similarities between religious and conspiracy beliefs cognitive underpinnings, the dual-inheritance model is eminently applicable to study of conspiracy beliefs.

The Dual-Inheritance Model of Religious Belief

The dual-inheritance model of religious belief conceives of belief as the product of the interaction of two types of biases: content biases and context biases. Innate cognitive traits (e.g., agency bias, illusory pattern perception, anthropomorphization, etc.) create content biases. Content biases shape humans' mental representations of religion's hidden agents. They are the reason the same concepts continue to reappear in different times and cultures as new religions are formed (e.g., intentional agents without bodies).

Context biases, on the other hand, are a product of cultural evolution and are mediated by cultural learning mechanisms. The cultural transmission of information is, in turn, shaped by cultural learning processes such as prestige biases, conformist biases, and credibility-enhancing displays (Gervais et al., 2011). Context biases explain why and how particular concepts spread within and among different communities. Context biases limit an individual's knowledge about candidate religious agent concepts and shape their perceptions about the plausibility of the existence of each religious agent (Gervais & Henrich, 2010; Henrich, 2009) .

Together the two kinds of biases described by the dual-inheritance model determine what kinds of religious beliefs will emerge and how these beliefs will proliferate. A reciprocal relationship can exist between content and context biases. Certain religious rituals and practices such as prayer in a dark room, meditation, or ritual coordinated behavior can engender experiences which help entrench belief and ensure transmission fidelity as these beliefs are passed down to each subsequent generation. These practices can reinforce belief by generating experiences which can be interpreted as evidence in support of these beliefs (Atran & Henrich, 2010; Sterelny, 2018; Van Leeuwen & van Elk, 2019).

Towards a Dual-Inheritance Model of Conspiracy Belief

Religious and conspiracy beliefs are both rooted in the same set cognitive biases and psychological traits. Under a dual-inheritance model of belief these factors engender content biases, and partially explain why some individuals are more susceptible to these kinds of beliefs. Culture and context are still required to predict which specific beliefs will be salient for a given individual. A dual-inheritance model of conspiracy belief could

be described as follows: content biases arising from innate cognitive mechanisms (e.g., Illusory Pattern Perception, Agency Detection, Attentional Threat Biases) shape what kinds of conspiracy narratives are intuitively appealing, particularly in situations of uncertainty and stress. Context biases determine what conspiracy narratives individuals are exposed to, and the likelihood that each particular narrative will be successfully transmitted (as shown in Figure 3).

Content Biases shaping Conspiracy Beliefs

Content biases account for certain common features of conspiracy narratives and explain why conspiracy belief increases in situations of stress such as natural disasters, wars, rapid societal change, and pandemics (Andrade & Hussain, 2018; Jutzi et al., 2020; Šrol et al., 2021; van Prooijen & Douglas, 2017). Reflective cognitive ability is impaired when under stress (citation), making these kind of intuitive sense-making narratives more appealing.

Innate cognitive features (e.g., agentive thinking, out-group degradation, proportionality bias) also explain why individuals with certain personality traits are more likely to adopt conspiracy beliefs in general. Individuals with intuitive (as opposed to reflective) cognitive style may lack the ability to critically engage with their beliefs and become stuck in an epistemic trap of circular reasoning or faulty logic. Intuitive cognitive style is associated with increased adoption of conspiracy beliefs (Alper et al., 2020; Douglas et al., 2017; Swami et al., 2014; van Prooijen, 2017).

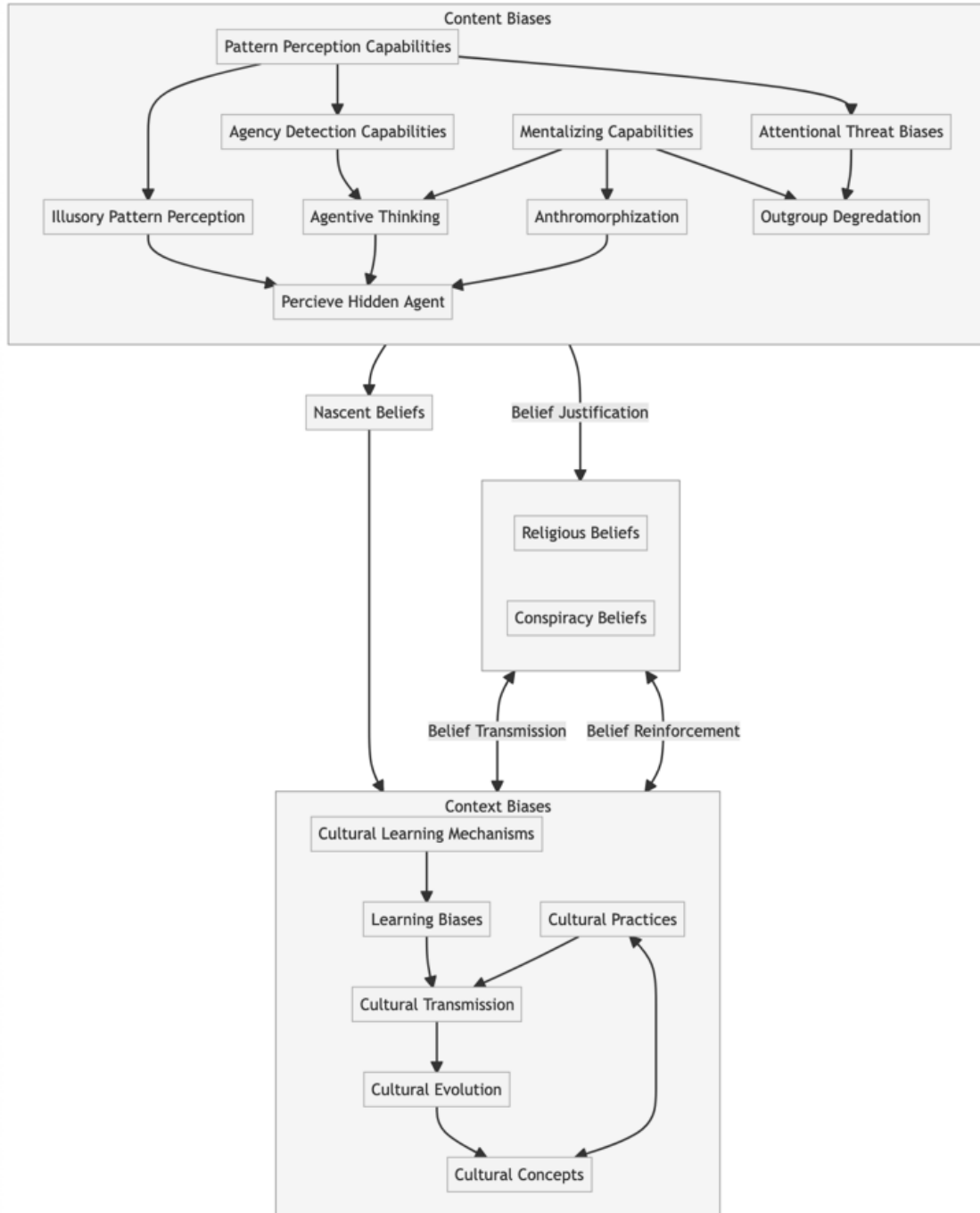


Figure 3. Dual-Inheritance Model of Belief.

Evolved cognitive traits underpin content biases which shape generic features of nascent beliefs. Context biases influence what beliefs are acceptable or viewed as plausible within a community. Over time articulated beliefs emerge as product of cultural evolution. Cultural learning mechanisms mediate the transmission of these beliefs.

Right-wing or conservative political views are also significant predictors of conspiracy belief (Alper et al., 2020; Douglas et al., 2017; Galliford & Furnham, 2017; Garrett & Bond, 2021; Linden et al., 2021; Romer & Jamieson, 2020). This relationship is hypothesized to be the result of differences in how individuals respond to ambiguous, threatening, or negative stimuli.

In general, it is content biases that allow individuals to conceive of malicious hidden agents and make these concepts an appealing explanation for individuals striving to make sense of adverse and complex events.

Context Biases shaping Conspiracy Beliefs

Context biases mediate the transmission of conspiracy beliefs by circumscribing which belief narratives are available to any given individual, which narratives are presumed to be true by a given population, and by shaping individuals' perceptions of the relative veracity of the claims made by proponents of nascent conspiracy beliefs. Cow dung has been popularly touted in India, but not Brazil, as "miracle cure" for COVID-19 not because Brazilians and Indians differ substantially in their cognitive abilities or personality traits, but because each of these groups was exposed to a vastly different array of context biases (Daria & Islam, 2021).

Conspiracy beliefs, like religious beliefs, do not spring into the world fully formed. It takes many generations of iteration before nascent religious beliefs are transformed into a coherent, articulated ideology (Sterelny, 2018). During this process ideas are selectively discarded, misremembered, or reinterpreted. Conspiracy beliefs, like religious beliefs, are sense-making narratives subject to cultural-evolutionary pressures. A similar iterative process occurs for conspiracy narratives. The QAnon conspiracy did

not spring into existence as a cohesive package: it began as a series of “happenings” – participatory and collaborative story-building sessions on the internet message board 4chan. It took years before a (semi)coherent narrative emerged out of the rambling and disjointed threads posted to the niche board (Aliapoulios et al., 2021; Papasavva et al., 2020).

The evolution of conspiracy narratives surrounding the COVID-19 virus have similarly evolved. Early in the pandemic stories circulated widely on social media that the virus itself was a hoax, and that videos on news and social media (e.g., emergency medical facilities being constructed, patients being intubated, coroner vans being loaded) were fake. As the pandemic continued these views became increasingly less tenable, news outlets and media personalities who espoused these ideas altered their focus. New narratives emerged about how an elite cabal was using mask mandates and social distancing rules to prepare the world for a tyrannical global government. Other common narratives included that pharmaceutical companies were hiding certain “miracle cures” to protect their profits, or that doctors were colluding with pharmaceutical companies: falsely diagnosing patients in order to receive kickbacks from pharmaceutical companies and/or the government. Numerous variations on these themes came and went. Conspiracy beliefs are not static, but individual narratives do “rhyme” since they are rooted in the same sources of distrust, anxiety, and false identification of patterns. Once a vaccine for COVID-19 was widely available yet another set of narratives emerged and continue to evolve to this day. A common narrative seen on social media within the last few months are that the vaccine makes the virus more dangerous, or that it causes people to get sick by triggering viral shedding. These beliefs were and are widespread: more than 30% of

individuals continue to believe in multiple false statements about COVID-19, a rate that has remained fairly stable over time (Earnshaw et al., 2020; Hamel et al., 2021; Motta et al., 2020).

To date no research has been done on the evolution of conspiracy narratives qua narratives or examined the role that cultural transmission plays in the adoption of these beliefs. This study will focus on one kind of learning bias: the credibility-enhancing display (CRED).

InCREDible Beliefs: How We Know What Is(n't) So

To facilitate effective learning humans (among other species) preferentially attend to individuals who exhibit specific learning bias cues. These cues powerfully shape how, and from whom, we learn (Herrmann et al., 2007; Horner et al., 2010; Kendal et al., 2015; Price et al., 2017; Tennie et al., 2009). Field and experimental tests have established that humans of all ages pay preferential attention to models exhibiting cues such as confidence, sex, age, skill, and exhibition of CREDs (Chudek et al., 2012; Chudek & Henrich, 2011; Henrich, 2016; Henrich & Broesch, 2011; Jiménez & Mesoudi, 2019).

Of particular interest to scholars of religious belief is the CRED. A CRED is an action or display that would be costly for an agent to exhibit if their privately held beliefs differed from those they express publicly (Henrich, 2009). Henrich's classic example involves blue mushrooms: if an individual wishes to demonstrate that they believe a particular blue mushroom is edible, nutritious, and delicious they should consume a lot of them and feed them to their children in public (Henrich, 2016). These acts are a credible

signal of the individuals' beliefs about the benefits of the mushrooms and should carry more weight than someone who verbalizes agreement but refuses to consume them.

CREDs and Religious Belief

Significant research interest has been generated by CREDs within the field of the Cognitive Science of Religion. Religious beliefs are frequently accompanied by a variety of CREDs such as abstention from specific foods or drinks, adherence to strict sexual or social norms, adopting unique sartorial rules, undergoing ritualistic mutilation or painful body modification via tattooing, scarification, and piercing (Henrich, 2009). Perhaps the ultimate CRED is dying for one's religious belief. Martyrs are highly venerated, in part, because they serve as examples of authentic belief. When an individual chooses to die rather than renounce their beliefs, they send a strong signal to others that their publicly expressed faith was sincerely held.

A large number of studies conducted in the last decade have provided evidence that CREDs play a major role in the transmission of religious belief. Individuals who witness higher levels of religious CREDs as children are significantly more likely to acquire and retain belief in supernatural agents into adulthood (Lanman, 2012; Lanman & Buhrmester, 2017). The importance of CRED exposure during childhood on adult religious belief has been documented in several countries including the Netherlands, the Czech Republic, Slovakia, and the United States (Maij et al., 2017; Willard & Cingl, 2017). Additional evidence for the role that CREDs play on mediating religious belief comes from the large (n=54,905, 53 countries) World Values Survey which found that exposure to religious CREDs during childhood was significantly associated with

continued belief in the existence of religious hidden agents as an adult (Gervais & Najle, 2015).

More recently researchers have begun to explore the role that religious CREDs have on religious disaffiliation. A study of formerly believing atheists ($n=5,153$) found that exposure to religious CREDs significantly predicted the age at which individuals lost their belief. Increased exposure to religious CREDs during childhood was associated with a “delay in the age of atheism” for individuals who were reared in a religious environment but later abandoned their beliefs (Langston et al., 2020). Contrary to the conventional view that reflective cognitive style is of paramount importance for religious disbelief (i.e. analytical atheism), CRED exposure was found to be a far better predictor religious disbelief than cognitive style (Gervais et al., 2021). Estimates of the relative strength of the contributions that CREDs have on religious belief compared to other more commonly studied features (e.g., intelligence, intuitive cognitive style) vary. In a large nationally-representative sample scores on Lanman & Buhrmester’s religious CRED exposure scale were twice as powerful in predicting religious belief (measured via Jong’s Supernatural Beliefs Scale) as individuals scores on the Cognitive Reflection Test (Gervais et al., 2021). Exposure to CREDs also appears to influence the strength of the conviction that individuals have in their beliefs. Exposure to high levels of CREDs during childhood increases the certainty that individuals feel about their beliefs in religious hidden agents as adults (Lanman & Buhrmester, 2017). To date the data on CREDs and religious belief supports two distinct theories: increased exposure to CREDs increases the likelihood that individuals will come to accept a particular belief (belief adoption), and

increased CRED exposure also increases individual's convictions about their beliefs (belief reinforcement).

CREDs and Conspiracy Belief

To date no study has been conducted on the relationship between CREDs and conspiracy belief. Given the significant entanglement between religious and conspiracy belief systems it is plausible that CREDs play a similar role in facilitating the transmission of conspiracy beliefs as they do for religious beliefs.

Study Aim and Hypothesis

This study investigates the role CREDs play on transmission of conspiracy beliefs. The first prediction is that increased exposure to conspiracy-belief related CREDs increases the likelihood of conspiracy belief adoption.

The second prediction is that exposure to conspiracy belief-related CREDs increases individuals' convictions about the veracity of their beliefs. It's important to distinguish belief adoption from belief conviction, it could be the case that there is some marginal difference in the role that CREDs play on weakly-held beliefs vs strong convictions.

The final prediction is that the effectiveness of CREDs on conspiracy belief adoption is mediated by cognitive style. Evaluation of CREDs is a relatively low-cost way to evaluate second-order beliefs (e.g., a belief about other individuals' beliefs). Individuals with highly reflective cognitive style may shift away from CRED-based cues because they recognize that these cues, in and of themselves, cannot be used to determine the veracity of any given claim.

Significance of Study

Adoption of conspiracy beliefs is associated with a variety of negative outcomes for the individuals who hold them and their surrounding communities. A fuller understanding of the factors which influence conspiracy belief will help focus future research and provide crucial data to policymakers who desire to improve public health and civic outcomes. If it is discovered that context biases (e.g., credibility-enhancing displays) to play a role in the proliferation of conspiracy narratives, this would create new avenues for researchers to develop interventions targeted to these transmission vectors. Conversely, if context biases do not play a role in the transmission of conspiracy beliefs, and cognitive factors are solely to blame, then future research should be focused on the development of programs tailored as such (e.g., educational strategies to improve critical thinking skills).

Chapter II

Method

Approval for this study was obtained by the Harvard Committee on the Use of Human Subjects. Participants for the study were obtained via Qualtrics which provides a platform for researchers desiring nationally representative population samples. An initial cohort of participants was used to construct and validate a COVID-19 Conspiracy CRED Exposure Scale (see Procedures Section). The final version of this scale was administered to a second cohort of participants in order to determine what effect CRED exposure had on participants COVID-19 conspiracy beliefs.

Participants

A nationally representative sample of 1,024 participants from the United States was used for this study. Figures 5 and 6 shows some selected demographic information. The composition of the participants in the study is outlined in Appendix 1.

Measures

Covid-19 Conspiracy CRED Exposure: A scale of COVID-19 CRED exposure was developed based on Lanman and Buhrmester's religious CRED exposure scale and surveys of COVID-19 related conspiracies conducted over the past two years (Earnshaw et al., 2020; Lanman & Buhrmester, 2017; Miller, 2020). Participants were asked to rate the extent to which they have observed those close to them engage in activities associated with COVID-19 conspiracy beliefs using a seven-point Likert scale. The preliminary scale was reduced according to data analysis protocol, and the final version of the

measure was used for the primary analysis. Question wording for the preliminary and final versions of the scale can be found in Figure 10.

Conspiracy Mentality Questionnaire (CMQ): A 5-item measure which assesses individual differences in general conspiracist ideation (Bruder et al., 2013). Evidence from a large (n=7766) cross-cultural study indicates that elevated CMQ scores strongly predict agreement with all 33 of the common conspiracy beliefs on the Conspiracy Theory Questionnaire (Bruder et al., 2013; Darwin et al., 2011).

Cognitive Reflection Test (CRT): A widely used measure which assesses individuals' propensity to engage in analytic vs intuitive thinking. Although this measure is extremely common (over 50% of participants recruited via Mechanical Turk have encountered at least one question from the CRT) there is no evidence that repeated exposure impacts the CRT's predictive validity (Bialek & Pennycook, 2018; Haigh, 2016).

Outcome – Belief: Adoption of conspiracy belief was assessed using four binary responses measuring participants' agreement with statements of common COVID-19 conspiracy beliefs (Earnshaw et al., 2020; Miller, 2020). See Figure 6 for complete wording of questions. Participants were asked to agree or disagree with each statement, and the measure combined into a composite score, with higher values indicating increased agreement with conspiracy beliefs.

Outcome – Conviction: The strength of participants convictions about their beliefs was assessed using four Likert-style questions about common COVID-19 conspiracy beliefs (Earnshaw et al., 2020; Miller, 2020). Participants scores were

summed to compute a final conviction score, with higher values indicating increased agreement with conspiracy beliefs (Figure 6).

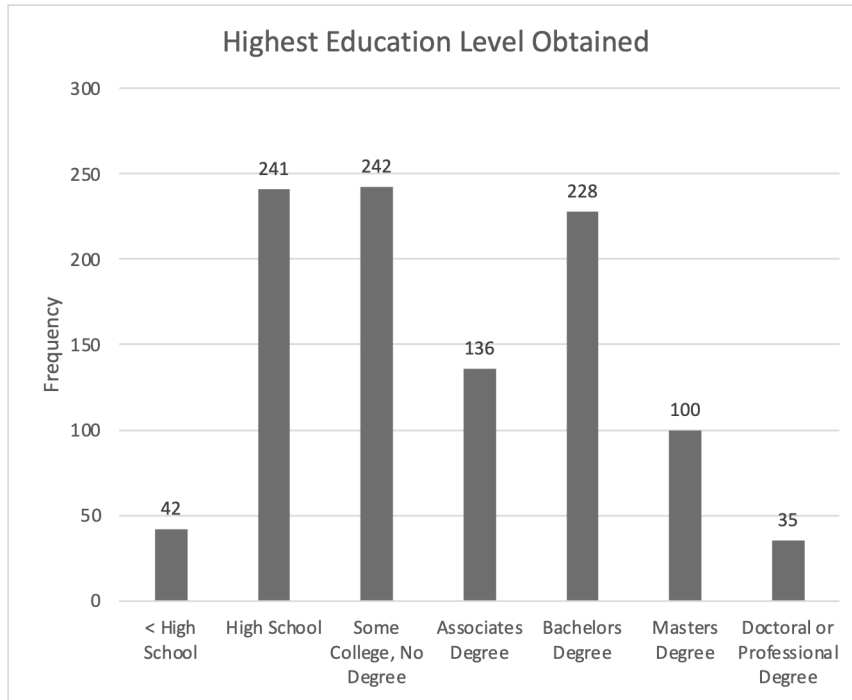


Figure 4. Highest Education Level Obtained

Participants highest education level obtained. More demographic information is available in Appendix 1

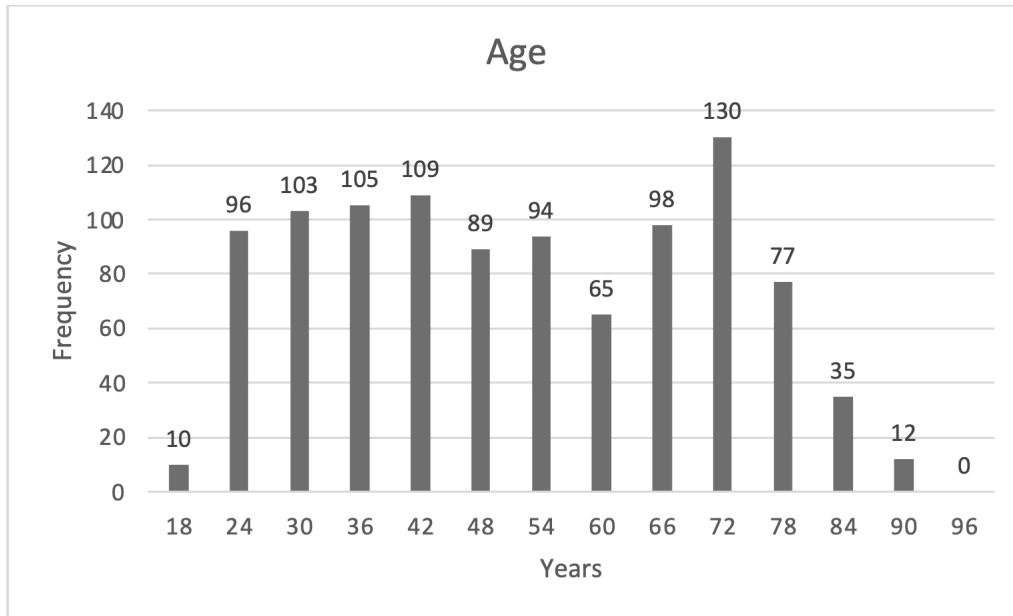


Figure 5. Distribution of Participant Ages

Participant ages ranged from 18-90 with a median age of 48. Additional demographic information available in Appendix 1.

- 1) The dangers of the COVID-19 virus were exaggerated in order to mislead the public
- 2) Experts intentionally mislead us about the COVID-19 virus for their own benefit
- 3*) We should have trusted experts when they said that the COVID-19 virus was dangerous
- 4) The COVID-19 virus was a hoax used to exert control

* Indicates question is reverse-coded

Figure 6. COVID-19 Conspiracy Belief Questionnaire

Participant belief was ascertained based on the 4 questions listed based on common COVID-19 conspiracy beliefs (Earnshaw et al., 2020; Miller, 2020)

- | |
|---|
| <ol style="list-style-type: none">1) Those close to me believe the dangers of the COVID-19 virus were exaggerated in order to mislead the public2) Those close to me believe that experts intentionally mislead us about the COVID-19 virus for their own benefit3*) Those close to me believe we should have trusted the experts when they said when they said that the COVID-19 virus was dangerous4) Those close to me believe the COVID-19 virus was a hoax used to exert control <p>* Indicates question is reverse-coded</p> |
|---|

Figure 7. Assumption Checking Questions of COVID-19 Conspiracy Belief

Participants answered each of the four binary measures. These questions were used to validate a core assumption about CREDs: that the public actions individuals demonstrate are congruent with the privately held beliefs they espouse.

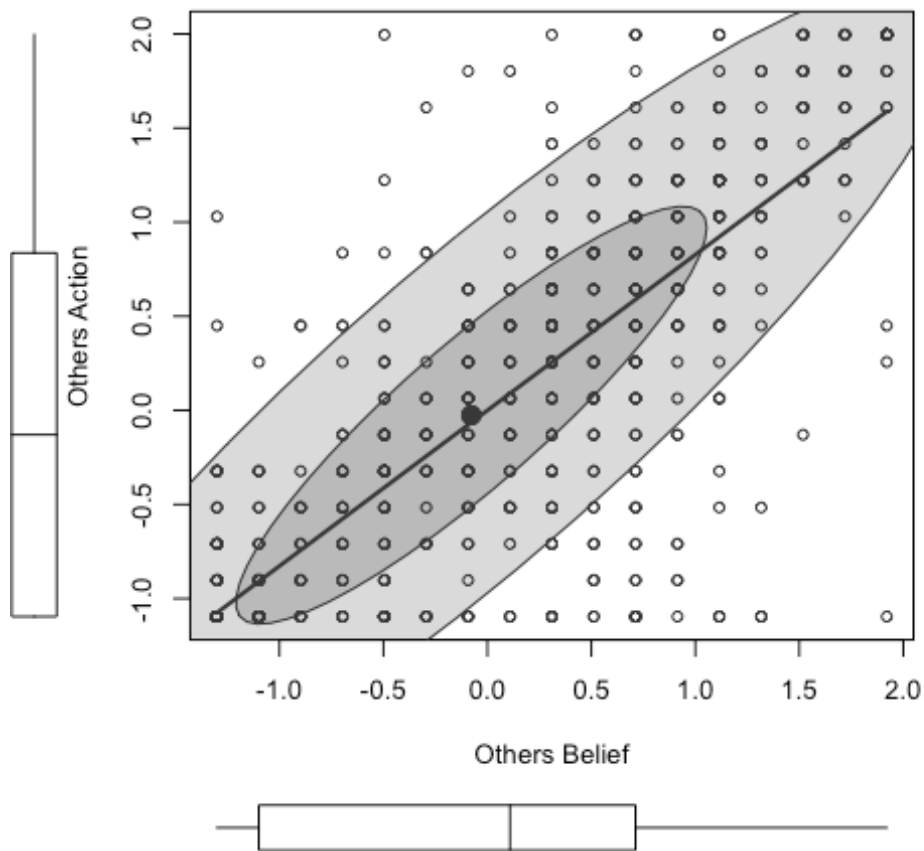


Figure 8. Comparing Beliefs and Actions of Others

To validate a core assumption about CREDs (that the public actions individuals demonstrate are congruent with the beliefs they espouse) the measures of espoused beliefs (Figure 7) and their actions (Figure 10) were compared and found to be strongly correlated ($r=.82$) which suggests those close to the participants were sincere in their beliefs about virus.

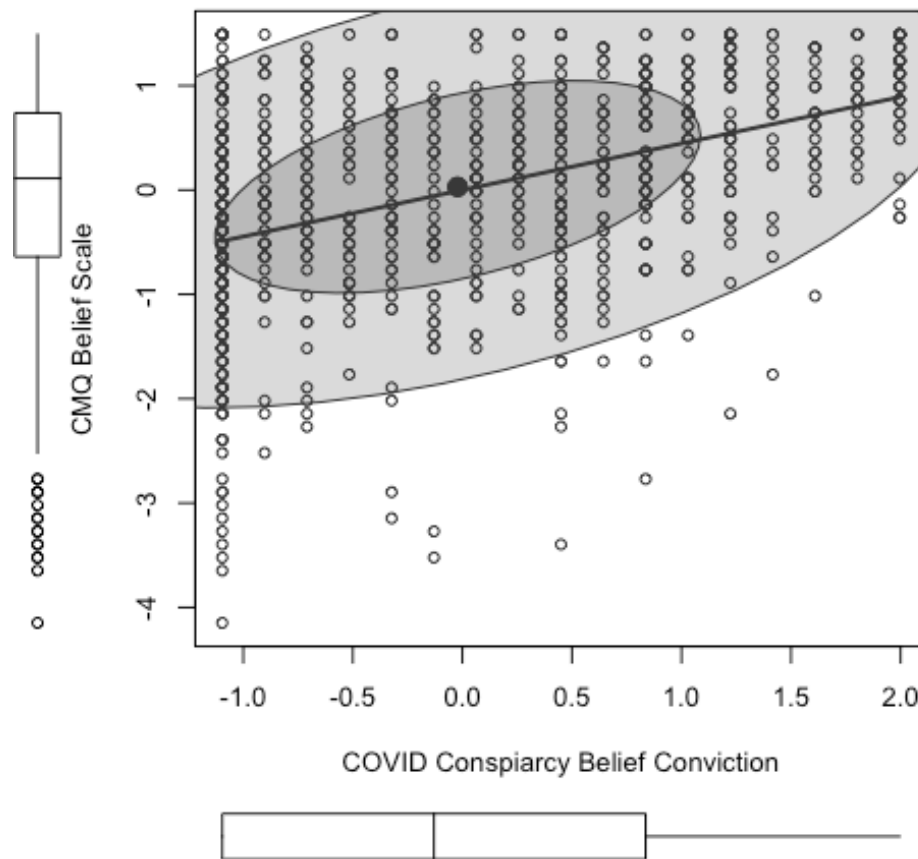


Figure 9. Comparing COVID Conspiracy Belief Conviction and CMQ Scale

Participant scores on the COVID Conspiracy Belief Questionnaire (Figure 6) are moderately correlated ($r=.446$) with scores against the CMS Questionnaire, a well-established measure of generic conspiracy belief. This reaffirms existing literature on the positive correlation between adoption of distinct conspiracy beliefs (van Prooijen & Douglas, 2018), and is in line with this studies proposed interactive model of belief.

C01)	Those close to me attended anti-vaccination protests or meetings in 2020
C02*)	Those close to me always complied with social-distancing regulations in 2020
C03)	Those close to me attended anti-mask-mandate protests or meetings in 2020
C04*)	Those close to me always complied with mask-mandates in 2020
C05)	Those close to me consumed ivermectin to protect themselves against COVID-19 in 2020
C06)	Those close to me consumed hydroxychloroquine to protect themselves against COVID-19 in 2020
C07)	Those close to me consumed colloidal silver to protect themselves against COVID-19 in 2020
C08)	Those close to me consumed alkaline water to protect themselves against COVID-19 in 2020
C09)	Those close to me consumed Vitamin-C to protect themselves against COVID-19 in 2020
C10)	Those close to me avoided using electronics with 5G capabilities to protect themselves against COVID-19 in 2020
C11)	Those close to me made fun of, or joked about, people who were overly concerned about COVID-19 in 2020
C12)	Those close to me have lost a job because they refused to obtain a COVID-19 vaccination
C13)	Those close to me have lost a job because they refused to participate in required COVID-19 testing
C14)	Those close to me have been banned from one or more airlines for refusing to comply with COVID-19-related protocols
C15)	Those close to me have been removed from a flight for refusing to comply with COVID-19-related protocols
C16)	Those close to me were denied entry to a place of business for refusing to comply with COVID-19-related protocols
C17)	Those close to me were refused service at a place of business for refusing to comply with COVID-19-related protocols
C18)	Those close to me refused to participate in a public event in because they did not wish to comply with a COVID-19-related protocol which was required to attend (eg testing, providing vaccination status, mask-wearing, etc)
C19)	Those close to me refused to participate in a private event in because they did not wish to comply with a COVID-19-related protocol which was required to attend (eg testing, providing vaccination status, mask-wearing, etc)
C20*)	Those close to me have been vaccinated against COVID-19
C21)	Those close to me have made personal sacrifices for their beliefs about the COVID-19 virus
C22)	After a vaccine was available, those close to me relied on natural immunity instead of a vaccine to protect themselves against COVID-19
* Indicates question is reverse-coded	

Figure 10. COVID-19 CRED Exposure Scale

Questions were provided to participants in random order and were scored on a 5-point Likert scale. The final (abbreviated) version of the scale consisted only of questions 2, 4, 5, 13, 15, 16, 2

Procedure

Standard procedures were used to obtain a national-representative sample of adult participants from the United States.

Study Protocol

Participant responses were collected by Qualtrics via an internet survey portal. A soft launch consisting of 25 participants was conducted to ensure that the survey logic was correct. Responses from the first cohort (n=201) were then collected. The initial question battery for the Covid-19 Conspiracy CRED Exposure was reduced according to the data analysis plan. The abbreviated CRED exposure scale was given to the remainder of the participants in the study (n=823). All responses on the survey were mandatory, participants who failed to complete the survey were filtered by Qualtrics before their responses were made available to download. Standard filtering methods to eliminate robot responses were used. These methods included an attentional check question (Figure 11), and a speed threshold commonly used by Qualtrics to filter bad responses. Any participant who finished the survey in less than half of the soft-launch median time (157 seconds) was excluded from data analysis. Participants who entered an invalid zip code were also excluded from the analysis. 19 participants were dropped in total, bringing the final response count to 1005. The exclusion of these participants does not appreciably alter the study's conclusions.

Which of the following pictures shows food being eaten?

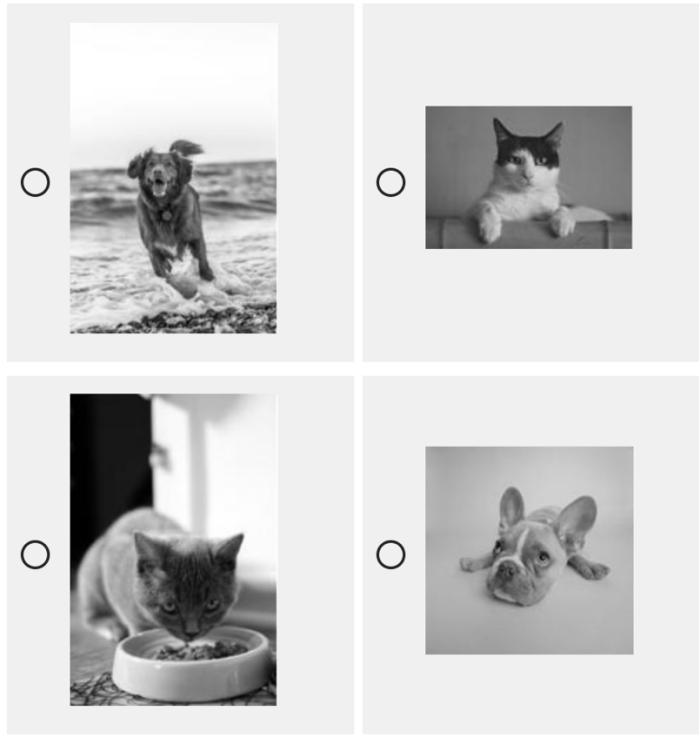


Figure 11. Attentional Check

The order of pictures was shown to participants at random to reduce the likelihood that bots who scrape surveys with a brute-force algorithm would successfully pass the attentional check question.

Data Analysis Protocol

Bayesian estimation was used to evaluate the study's hypotheses. Point estimates and credibility intervals are provided for each analysis using a highest posterior density interval of 95%. Factor analysis was used to reduce the initial question bank and craft the final, abbreviated, version of the COVID-19 CRED exposure scale. In general, the two items with the highest loadings for each factor were retained for the final version of the scale in order to reduce the survey's completion time. Assumption checking was conducted before distributing the final version of the scale to the second cohort of participants (Figures 7,8,9). Kaiser-Meyer-Olkin check for adequacy was sufficient to allow for factor analysis to be conducted (Figure 12). Bartlett's test of sphericity indicated that the number of factors present in the full version of the scale could be reduced ($\chi^2 = 3409.057$, $p = 0$, $df = 231$).

The abbreviated Covid-19 CRED exposure scale was constructed by reducing the number of questions as follows: The questions in the full version were grouped into five factors (Figure 13) based on a preliminary estimation of eigenvalues (Figure 14).

Factor MR3 consisted mainly of questions involving so-called "miracle cures" such as Ivermectin and Hydroxychloroquine. Because responses involving consumption of these products were highly correlated (Figure 15), only C5 was carried forward into the abbreviated version of the scale.

```

Kaiser-Meyer-Olkin factor adequacy
Call: KMO(r = cor(cred_responses))
Overall MSA = 0.9
MSA for each item =
  c1  c2  c3  c4  c5  c6  c7  c8  c9  c10 c11 c12 c13 c14 c15 c16 c17 c18 c19 c20 c21 c22
0.93 0.63 0.91 0.58 0.91 0.92 0.92 0.95 0.93 0.97 0.95 0.89 0.89 0.89 0.86 0.93 0.94 0.91 0.92 0.53 0.89 0.87

```

Figure 12. Kaiser-Meyer-Olkin Factor Adequacy

The KMO criterion obtained indicates the complete model has sufficient sampling adequacy (MSA = 0.9)

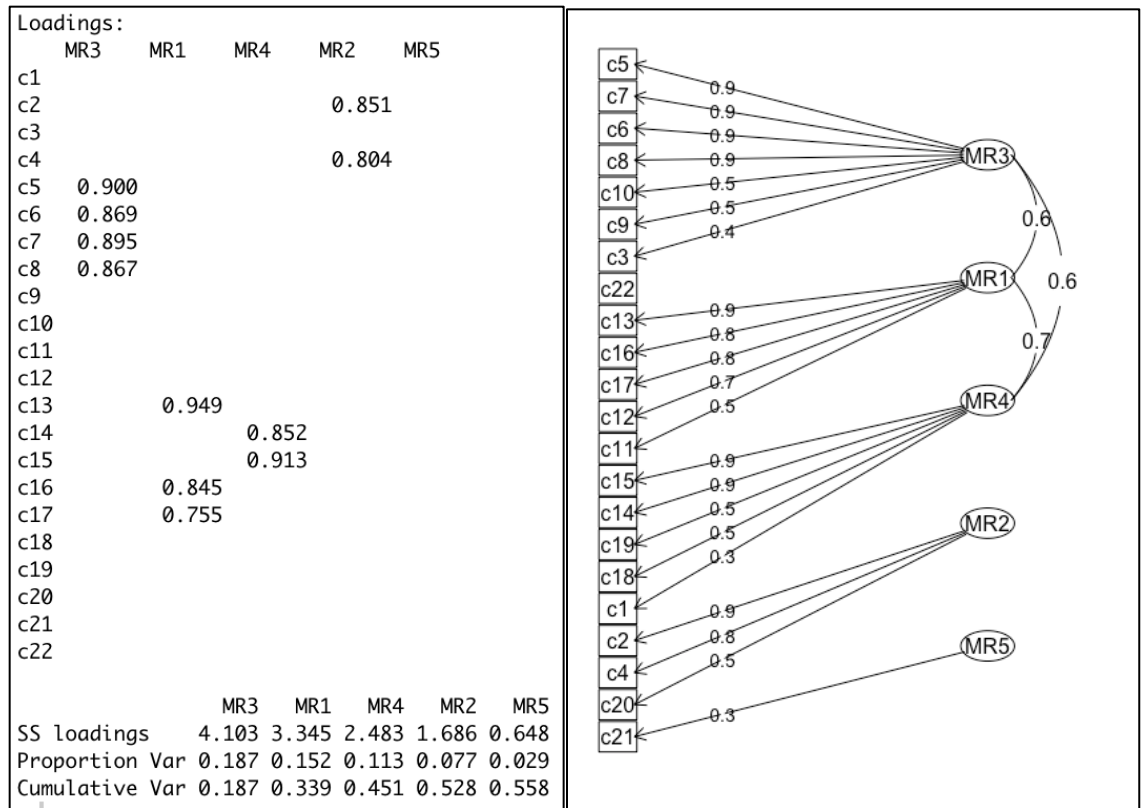


Figure 13. Factor Analysis

Factor loadings for each of the initial 22 questions displayed using a threshold value of .7 (left). Factor loadings diagram showing all loadings (Right)

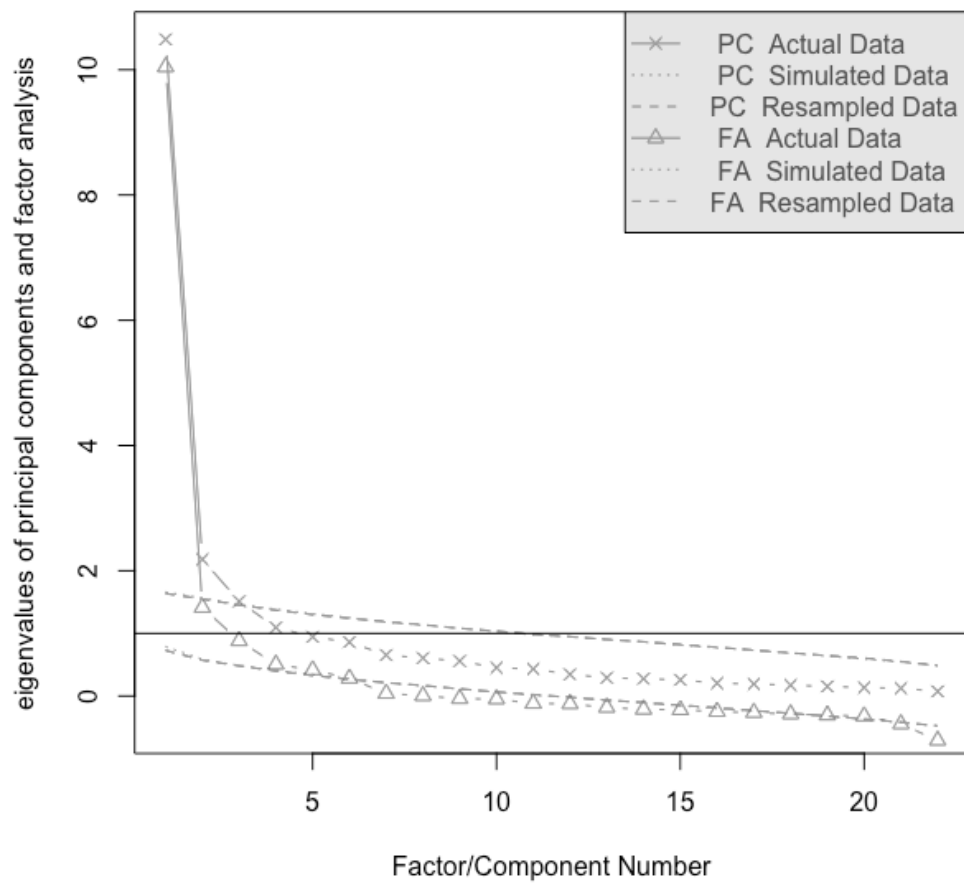


Figure 14. Scree Plot Analysis

Exploratory analysis suggests that there exist approximately 5 meaningful factors in the full version of the COVID-19 CRED Exposure Scale

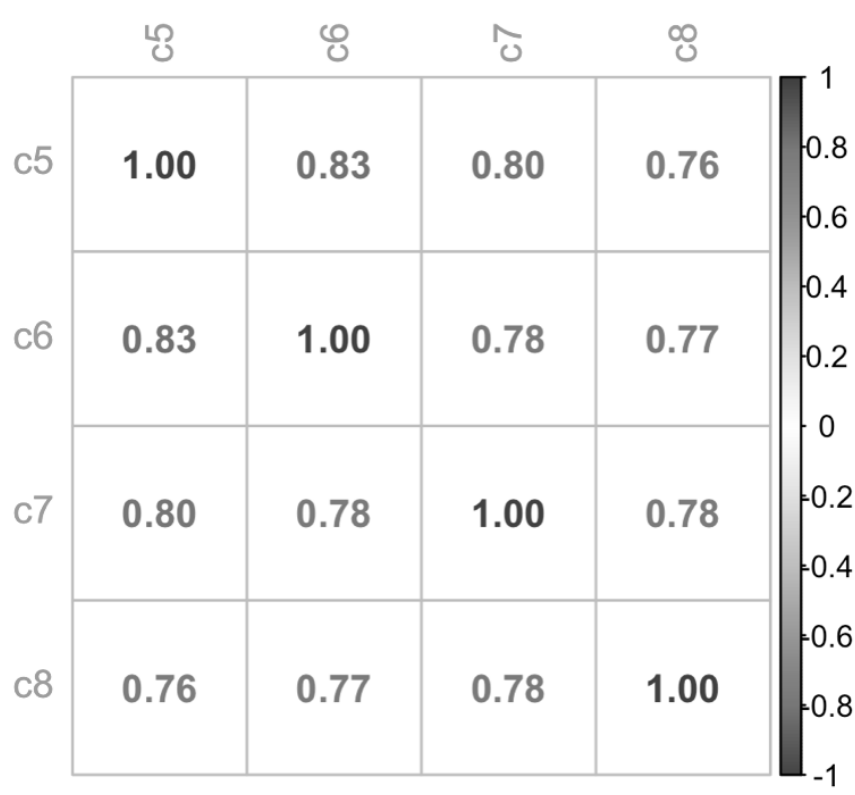


Figure 15. Miracle Cure Inter-Item Correlations

Questions about the consumption of ivermectin, hydroxychloroquine, colloidal silver, and alkaline water are highly correlated.

Factors MR1 and MR4 involved questions related to high-public and low-public CREDs (e.g., being removed from an airplane for refusing to comply with COVID-19 health and safety measures vs losing one's job for the same). Factor MR2 dealt with matters of general health and safety (e.g., wearing a mask to protect oneself and others). Factor MR5 consisted of a single question C21 ("Those close to me have made personal sacrifices for their beliefs about the COVID-19 virus") which was determined to be too vague to be useful and had a very weak SOS loading and so was dropped from the final version of the scale. Question C20 ("Those close to me have been vaccinated against COVID-19") was kept in the final version of the scale although it was not one of the two highest loadings for its factor because this specific CRED has been a major point of contention in public discussions about the virus. The final abbreviated version of the scale which consisted of 7 questions (Figure 10) was used to conduct the primary analysis.

Chapter III

Results

Three primary hypotheses were evaluated. The first hypothesis was confirmed: exposure to COVID-19 related CREDs significantly predicted increased adoption of COVID-19 conspiracy beliefs $\beta = .41, [0.36, 0.47], p(\beta > 0 \mid \text{data}) = .95$. Exposure to CREDs was the strongest predictor of belief by far: outstripping cognitive reflection, education, income, population density, and the other predictors shown below (See Table 1).

Consistent with hypothesis 2 exposure to CREDs also increased participants confidence in the veracity of their conspiracy beliefs $\beta = .48, [0.42, 0.53], p(\beta > 0 \mid \text{data}) = .95$. Again, CRED exposure was the strongest factor by far, nearly twice as robust as the next variable (conservatism) (See Table 2).

There was no significant interaction between CRED exposure and participants CRT score on either conspiracy belief adoption $\beta = .02, [-.04, 0.07], p(\beta > 0 \mid \text{data}) = .95$ or conviction of belief $\beta = .01, [0.04, 0.06], p(\beta > 0 \mid \text{data}) = .95$. It does not appear that CRT modulated the extent to which CRED exposure influenced belief adoption or conviction (See Figure 16).

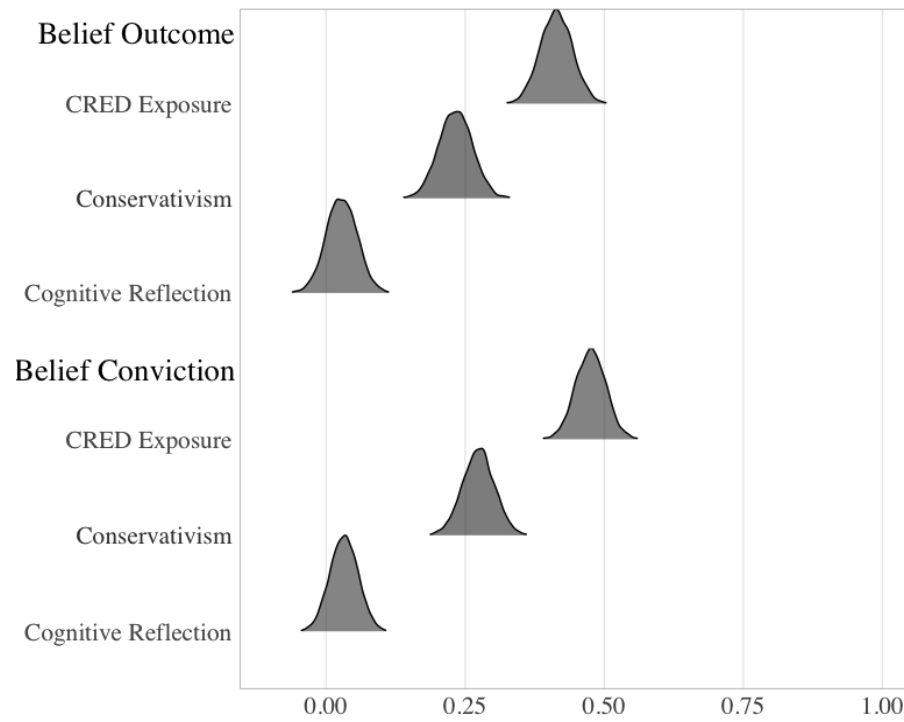


Figure 16. Standardized Betas for Belief and Conviction Measures

CRED exposure was the strongest predictor for both outcome measures, followed by conservatism and cognitive reflection

Table 1. Outcome – Belief Measure with Covariates.

	Mean	sd	2.5%	97.5%	n_eff	Rhat4
a	-0.11	0.15	-0.41	0.18	4829	1
b_cred	0.41	0.03	0.36	0.47	7408	1
b_crt	0.03	0.03	-0.02	0.09	10896	1
b_int	0.02	0.03	-0.04	0.07	11729	1
b_conservative	0.23	0.03	0.17	0.30	8359	1
b_religiosity	0.04	0.03	-0.02	0.10	8085	1
b_education	-0.02	0.03	-0.08	0.04	8613	1
b_income	0.06	0.03	0.00	0.12	9394	1
b_gender	0.04	0.05	-0.06	0.13	6975	1
b_ethnicity	0.02	0.01	0.00	0.05	6764	1
b_employment	-0.01	0.01	-0.04	0.02	7766	1
b_pop_density	-0.03	0.03	-0.09	0.02	10650	1
b_marital	-0.01	0.02	-0.05	0.03	9679	1

sigma	0.85	0.02	0.81	0.89	14058	1
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Mean is β , the standardized coefficient. sd = standard deviation of β . 2.5% and 97.5% represent the upper and lower bounds for the highest posterior density interval.

Table 2. Outcome – Conviction Measure with Covariates.

	Mean	sd	2.5%	97.5%	n_eff	Rhat4
a	-0.21	0.14	-0.49	0.06	3924	1
b_cred	0.48	0.03	0.42	0.53	7602	1
b_crt	0.03	0.03	-0.02	0.08	8444	1
b_int	0.01	0.03	-0.04	0.06	8011	1
b_conservative	0.27	0.03	0.22	0.33	7390	1
b_religiosity	0.05	0.03	0.00	0.10	7806	1
b_education	-0.06	0.03	-0.12	-0.01	8037	1
b_income	0.06	0.03	0.00	0.11	8176	1
b_gender	0.01	0.04	-0.07	0.10	7496	1
b_ethnicity	0.03	0.01	0.01	0.05	5706	1
b_employment	0.01	0.01	-0.02	0.03	6793	1
b_pop_density	-0.03	0.03	-0.08	0.02	8359	1

b_marital	-0.01	0.02	-0.06	0.02	8722	1
sigma	0.78	0.02	0.75	0.82	11118	1

Mean is β , the standardized coefficient. sd = standard deviation of β . 2.5% and 97.5% represent the upper and lower bounds for the highest posterior density interval.

Chapter IV

Discussion

CRED exposure strongly predicted both the adoption of COVID-19 conspiracy beliefs (Hypothesis 1), and an increase in the confidence individuals held about their beliefs (Hypothesis 2). Individuals who were exposed to more COVID-19-related CREDs reported increased adoption of COVID-19 conspiracy beliefs, and were more confident in their beliefs, than those individuals with less exposure. No significant interaction between cognitive thinking style (as measured by the CRT), and CRED exposure was found for either belief adoption or belief conviction (Hypothesis 3). This study provides evidence that increased CRED exposure is associated with the adoption of conspiracy beliefs. Increased exposure to CREDs also increased the confidence that individuals had about the veracity of their beliefs. Finally, although it was hypothesized that the effectiveness of CRED exposure would be mediated by cognitive thinking style, this study did not find evidence for an interaction between cognitive thinking style and CRED exposure on adoption of conspiracy belief. One possible reason for this is that domain-specific knowledge about viruses and vaccines (e.g., how they each function, how vaccines are developed, tested, and approved) is not widespread. Nguyen outlines the problem individuals face when forced to make decisions outside of their own realm of expertise: it's simply not possible for humans to understand everything, we must rely on chains of trust for those things we cannot verify ourselves (Nguyen, 2020). It could be that individual differences in trust (in government, doctors, or society as a whole) interfere with individuals' capacity to evaluate CREDs and alter the relationship between cognitive reflection and belief adoption.

Although it was not a goal of the study, this study did replicate the existing literature on the relationship between conservatism adoption of conspiracy belief. Conservatism was the second strongest predictor of conspiracy belief after CRED exposure. Disparities in COVID-19 mortality rates by political orientation show that vaccine refusal is indeed a costly CRED (Table 3).

Limitations & Future Directions

The effect of CREDs on the adoption of conspiracy is a difficult phenomenon to investigate because, unlike religious beliefs, many conspiracy beliefs are not associated with any overt actions. A common conspiracy belief in the United States, for example, is that the FBI orchestrated the assassination of JFK (Butter, 2020). But individuals who believe in this conspiracy do not generally act on this belief in any appreciable way. The COVID-19 pandemic provided a unique opportunity to investigate the role that context biases have on belief adoption specifically because the conspiracy beliefs surrounding the virus were associated with specific actions that could be readily measured. Further research on CREDs and conspiracy beliefs may be limited in scope to a subset of those conspiracy beliefs which have well-defined actions associated these beliefs. Any conclusions drawn about the effect of CREDs on conspiracy belief from this study may not be generalizable to all classes of conspiracy belief.

Sterelny (2018) notes that religious beliefs are most often passed down from one generation to the next as part of an explicit socialized process. Children are taught that a specific agent exists, about the nature of the agent, how one is expected to communicate or interact with the agent, etc. Conspiracy belief transmission occurs without any such formal process. This difference may alter the extent to which CREDs mediate the

Table 3. Partisan differences in COVID-19 Beliefs and Health Outcomes.

	Democrat	Republican
Believe four or more false statements about COVID-19	14%	46%
Vaccination Status	90%	55%
COVID-19 death rate per county based on 2020 presidential election.	258	326

Right-wing individuals in the United States are substantially more likely to hold COVID-19 conspiracy beliefs, and are less likely to be vaccinated (Hamel et al., 2021). Death rates for COVID-19 as of March 2022 were 40% higher in counties who voted Republican in the 2020 presidential election (Jones, 2022)

transmission of these beliefs. Some learning biases may be modulated by an explicit instructional setting, or the marginal effect of learning biases may change over time as individuals grow older. It could be that conspiracy beliefs more “horizontal” transmission process renders these beliefs more or less likely to be modulated by CREDs.

Another limitation of this study is that the data obtained was self-reported. Participants may have downplayed, exaggerated, or mis-remembered certain actions they reported, or their own responses given the fact that the pandemic has become highly politicized. Attempts to ameliorate this included presenting questions about COVID-related beliefs and CREDs before asking participants any questions about their political views or demographic information.

The observational nature of this study was also limiting. In order to be confident that a causal relationship exists between CREDs and conspiracy beliefs further research of an experimental nature or using longitudinal data to capture artifacts from a “natural experiment”, would be required. Some third variable may have been responsible for the correlation between CRED exposure and conspiracy beliefs. For example: perhaps narcissism, implicated in the adoption of conspiracy beliefs, makes individuals more likely to exhibit performative public actions taken to defend one’s contrarian beliefs.

Conspiracy beliefs are not static, nor does belief remain static throughout a person’s life. One future avenue for researchers to investigate would be how individuals’ beliefs change over time. How does a CREDs power to persuade decay over time? Does the act of exhibiting a CRED increase one’s own conviction, and if so for how long? There are numerous opportunities for investigation (e.g., individuals who have been

banned from airlines for refusing COVID-19 related protocols, persons who participated in the January 6th insurrection because of their QAnon beliefs).

One factor of the Dual-Inheritance model which this study did not explore is the reciprocal relationship that exists between content and context biases. Under the dual-inheritance model of religious belief communities evolve cultural practices (eg. prayer in a dark room, coordinated ritual behaviors) which generate experiences that can be interpreted as evidence to support and entrench pre-existing beliefs (Van Leeuwen & van Elk, 2019). This interaction is a feedback loop: a community's belief (e.g. that a specific god exists) comes to be expressed using an action (praying to the god by candlelight) that engenders deeper belief ("I felt his presence that night while sitting in quiet contemplation"). It is possible that a similar feedback mechanism may exist for conspiracy beliefs. Many conspiracy beliefs are related to each other, and some anecdotal evidence exists that individuals who have learned about one conspiracy may feel compelled to continue in a search for novel "hidden truths" and related conspiracy theories (Clark, 2018). The effect of algorithmic recommendations on political radicalization has begun to receive some scholarly interest (Ribeiro et al., 2020), it would be interesting to see if a similar radicalization path exists for users who go "down the rabbit hole" and are exposed to increasing amounts of conspiracy-related online content.

Lastly, this study was limited to adult participants living in the United States and so suffers from a problem which continues to plague the field of psychology: an overreliance on WEIRD (Western, Educated, Industrialized, Rich, and Democratic) population samples (Henrich et al., 2010). The pervasive over-reliance on population samples from WEIRD communities is limiting for several reasons. Firstly, substantial

variation can exist in experimental results across cultures, particularly when dealing with topics that are mediated by cultural context. WEIRD population sampling is simply not representative and results from investigations that fail to include participants from non-WEIRD cultures may not be generalizable. Secondly, the field of psychology as a whole will continue to be hamstrung by conceptual myopia if we fail to consider theories, constructs, and measures developed outside of a WEIRD context. More research is now being conducted on religious beliefs in non-WEIRD populations (Gervais & Najle, 2015; Willard & Cingl, 2017). It is this author's hope that future studies of conspiracy belief will incorporate more cross-cultural investigations.

Adoption of conspiracy beliefs carries real consequences. In the case of COVID-19 conspiracy beliefs have directly contributed to substantial loss of life. Conspiracy beliefs about the virus are widespread, with more than 32% percent of individuals believing four or more false statements about COVID-19 (Hamel et al., 2021). An estimated 319,000 vaccine-preventable deaths have occurred in the United States since the widespread availability of the vaccine in early 2021 (Simmons-Duffin & Nakajima, 2022). This study is the first the author is aware of to examine conspiracy beliefs through the lens of a dual-inheritance model. This study is also the first to evaluate the relationship between credibility-enhancing displays and conspiracy beliefs. This novel information can hopefully be used to focus future research efforts. A fuller understanding of the factors that contribute to the adoption of conspiracy beliefs would allow help policy makers to craft more effective guidelines and improve public health and civil outcomes.

Our minds are not blank slates, free to pull in ideas some platonic realm. Our consciousness has been shaped by our evolutionary history as a social species. We are beset with cognitive biases and distortions that lead us to reason imperfectly. Six million years (or so) of evolutionary pressure has altered what kinds of ideas and concepts humans find intuitively appealing. The heuristics and hunches we use when making sense of our complex surroundings fail us in both predictable, and obscure, ways. Despite our individual failings our species has collectively managed to amass a large amount of knowledge and technical know-how. Humans' capacity to learn from and teach each other is astounding, but also constraining. Our knowledge of the world is largely circumscribed by the context in which we live. What (and from whom) we learn is altered dramatically by cultural-evolutionary processes that shape how information is transferred between individuals and groups. A reciprocal relationship can exist between content and context biases which can produce long-lived/persistent false beliefs. The Dual-Inheritance Model outlined in this paper provides a more complete view of the acquisition and transmission of cultural information as it relates to conspiracy beliefs. This study has elucidated a first pass at testing part of this model and outlined some plausible features that may shape the content and context biases that mediate the transmission of conspiracy belief.

Appendix 1.

Participant Demographic Information

Table 4. Participant Demographic Information.

Gender

Male 557

Female 425

Other 15

Age

Minimum 18

1st Quintile 33

Median 48

Mean 49.33

3rd Quintile 66

Max 90

Income

Less than \$10,000 92

\$10,000 to \$19,999	94
\$20,000 to \$29,999	115
\$30,000 to \$39,999	121
\$40,000 to \$49,999	105
\$50,000 to \$59,999	105
\$60,000 to \$69,999	64
\$70,000 to \$79,999	66
\$80,000 to \$89,999	39
\$90,000 to \$99,999	51
\$100,000 to \$149,999	104
\$150,000 to \$249,999	41
\$250,000 or more	27

Occupation

Working full-time	350
Working part-time	130
Unemployed and looking for work	60

A homemaker or stay-at-home parent	97
Retired	304
Student	27
Other	56
Education	
Less than high school degree	42
High school graduate (high school diploma or equivalent including GED)	241
Some college but no degree	242
Associate degree in college (2-year)	136
Bachelor's degree in college (4-year)	228
Master's degree	100
Doctoral degree	18
Professional degree (JD, MD)	17

Selected demographics from participants.

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