# Reflective thought, religious belief, and the social foundations hypothesis

Jonathan Morgan*[a, b]
Connor Wood [b, c]
Catherine Caldwell-Harris [d]

[a] Graduate Division of Religious Studies, Boston University, Boston, MA, USA.
[b] Institute for the Bio-Cultural Study of Religion, Needham, MA, USA.
[c] Boston University School of Theology, Boston University, Boston, MA, USA.
[d] Department of Psychology, Boston University, Boston, MA, USA

*- corresponding author
Email: jrmorgan@bu.edu.
Address: Boston University, Graduate Division of Religious Studies, 145 Bay State Rd, Boston, MA, 02215

## 1. Introduction

The past five years have seen a growing interest in the relationship between cognitive styles and religious belief. At the heart of this research lies a consistently positive association between reflective thought and religious disbelief. Numerous correlational studies and even a few experimental priming studies support this relationship, but it is not uncontested. Beyond empirical disputes or adjustments to this association, however, a key challenge is to explain why this relationship holds. In this chapter, we will review the documented associations between religious belief and cognitive style, along with the most common interpretations of these relationships. From there we will explore open questions and present a novel interpretation: the social foundations hypothesis.

### 1.1 The empirical work

Empirical work on religiosity and cognitive style originated with Aarnio and Lindeman's (2005, 2007) surveys of students in Finland. With measures including religious and paranormal belief, Aarnio and Lindeman found mixed results connecting religiosity to thinking styles. Their 2005 study demonstrated that analytical thinking was negatively related to paranormal beliefs, but not significantly predictive of religious beliefs. But their 2007 follow-up found a strong preference for intuitive thought among religious believers. This early work on cognitive style and religiosity relied on the Rational-Experiential Inventory (Pacini & Epstein, 1999), a self-report measure of an individual's preference for intuitive or analytical thought, but nevertheless set the stage for later research.

In the past five years, there has been a stronger and more consistent research effort tracking the relationship between religiosity and cognitive style. Many of these studies use the Cognitive Reflection Test (CRT; Frederick, 2005) as a measure of cognitive style. The CRT consists of three math problems with intuitively compelling, but incorrect, answers. For example: "A bat and a ball cost $1.10 in total. The bat costs $1.00 more than the ball. How much does the ball cost?" The immediate and intuitively compelling response is 10 cents, but pausing to reflect will reveal this is wrong. This test suggests that those participants with a preference for reflective thought will pause, override the quick intuitive answer, and use analysis to determine the correct response. The CRT therefore serves as a proxy measure of cognitive style, because the more correct answers a participant gives, the greater her preference for reflective thought.

Shenhav and colleagues (2012) used the CRT in a series of studies that found support for the connection between preference for intuitive thought and religious belief. In the first of their studies, participants who gave more intuitive answers were more confident in their belief in God ($r$ = .18; Shenhav et al., 2012, pg. 424). This relationship held while controlling for age, gender, education, income, IQ, and conservatism (which has been shown to strongly predict belief in God; Layman & Carmines, 1997). Including conservatism dropped the correlation to 0.08, but intuitive thought remained significant in relation to religious belief.

This relationship was further supported by an empirical study in which the researchers used a writing task to induce a temporary preference for intuitive or reflective thought. When the writing task asked participants to describe "a time when your intuition led you in the right

direction and resulted in a good outcome," these individuals later reported stronger belief in God, compared to those who described "carefully reasoning through a situation" (Shenhav et al., 2012, pg. 426). In a complementary set of studies, Gervais and Norenzayan (2012) showed that priming individuals to favor reflective processing tended to promote religious disbelief.

Additional studies have clarified these findings by examining specific aspects of the relationship between cognitive style and religious belief. For example, Pennycook and colleagues (2012) included measures of the type of religious belief, rather than simply focusing on the strength of belief. As before, the more correct answers participants gave on the CRT, the less likely they were to believe in a personal, anthropomorphic God. But these more analytical thinkers were not only atheists; instead, they endorsed a variety of less conventional views of God, such as deism, pantheism, or different forms of agnosticism.

To assess cognitive style beyond the CRT, Pennycook (2013) used a series of syllogisms designed to elicit belief bias, or the tendency to prefer intuitively appealing, but technically invalid, conclusions (cf. Markovits & Nantel, 1989). The conclusions of the syllogisms are logically valid but contradict our common understanding of the world. For example, "All mammals can walk. Whales are mammals. Therefore, whales can walk. Logically valid or invalid?" (Pennycook, et al., 2013, pg. 806). Although the intuitive answer is "false" (since in reality whales cannot walk) in this test the correct answer is "true," because the conclusion logically follows from the given premises. Similarly to the CRT, correct answers on this test indicate a tendency to engage in careful, analytical processing when faced with a novel problem. Confirming the established relationship, religious skeptics tended to make fewer errors on this task. Furthermore, religious skeptics also spent more time on the problems than religious believers, a finding that fits the conception of reflective processing as slower and more effortful.

Further advancing our understanding of this dynamic, Browne and colleagues (2014) tested the relationship between the CRT and religious beliefs, but included a one-item measure of "spiritual epistemology." This measure gauged an individual's willingness to accept spiritual experiences as important sources of knowledge. Analytical scores on the CRT were negatively associated with participants' willingness to accept spiritual experiences, and in turn spiritual epistemology item predicted the strength of participants' faith ($r$ = .42). Browne and colleagues argued that this mediating role of spiritual epistemology demonstrates that the pathway from cognitive style to religiosity partially depends on the types of knowledge people favor when constructing their worldviews.

This interpretation is further supported by a study from Pennycook and colleagues (2014) on the role of conflict sensitivity. That team used a base-rate neglect task, which tests subjects' propensity to overestimate the likelihood of scenarios that are intuitively appealing, but which are less probable than a logically simpler scenario. In this case, the intuitive/reflective conflict focused on salient stereotypes about social groups. De Neys and Glumicic (2008) provide an example:

> In a study 1000 people were tested. Among the participants there were 4 men and 996 women. Jo is a randomly chosen participant of this study.

> Jo is 23 years old and is finishing a degree in engineering. On Friday nights, Jo like to go out cruising with friends while listening to loud music and drinking beer.
>
> What is most likely?
> a. Jo is a man
> b Jo is a woman
>
> (p. 1252)

Analytical thinkers were more efficient than intuitive thinkers at using the base-rate information to select the correct answer (b), even though the personal information offered seems more stereotypically appropriate for a man. This conflict sensitivity also predicted religious belief: the more likely individuals were to detect conflicts while reasoning, the less likely they were to be religious. Based on these findings, Pennycook and colleagues suggest that a mechanism driving the relationship between analytical thought and religious disbelief may be "the likelihood of implicitly detecting conflict between nonmaterial religious beliefs and our understanding of the material world" (Pennycook et al., 2014, pg. 9). This interpretation stands alongside that from Browne et al.'s (2014) research. Both focus on the propositional, cognitive content of religious beliefs and the degree to which individuals assess this content as reliable or conflicting with other, more naturalistic, worldviews. We will explore this interpretation in more detail below, but first we will review some of the empirical work that challenges the relationships we have described so far.

### 1.2 Empirical Challenges

Our review thus far could give the impression that a coherent consensus exists regarding the connection between analytical thought and religious disbelief, but – as usual in science – there is in fact considerable disagreement among researchers. For example, Razmyar and Reeve (2013) suggest that cognitive ability, not cognitive style, is the primary driver in this relationship. An individual's cognitive ability describes her capacity to use analytical reasoning in solving problems, while her cognitive style refers to her tendency to engage those analytical processes (Stanovich & West, 2008). With this difference in mind, Razmyar and Reeve (2013) found that cognitive ability had a moderate to strong inverse relationship to religiosity. If cognitive ability was controlled for, the relationship between religiosity and cognitive style was small or nonexistent.

This connection between cognitive ability and religiosity integrates well with the broader literature suggesting a negative relationship between religiosity and intelligence (Zuckerman et al., 2013). But it directly contradicts the many other studies that have controlled for cognitive ability (e.g., Pennycook et al., 2013; Pennycook et al., 2012; Shenhav et al., 2012). Furthermore, much of the research connecting intelligence and religious belief equates intelligence *per se* with analytical intelligence (cf. Zuckerman et al., 2013). The problem this poses is apparent in Pennycook et al.'s (2012) study, in which controlling for analytical cognitive style dropped the correlation coefficients between intelligence and religious belief from –.24 ($p < .05$) to –.02 ($p > .28$) (as cited in Zuckerman et al., 2013, p. 342). The weight of evidence would suggest that

cognitive style – that is, the proclivity to engage in reflective thought – is related to religious beliefs above and beyond intelligence or cognitive ability.

As Pennycook (2014) argues, this discrepancy could be attributed to a number of differences across these studies. Most likely, the discrepancy arises from the different measures used to assess cognitive ability and religiosity. Razmyar and Reeve (2013) assessed religiosity through a range of measures that included overall religiosity and spirituality, religious attendance, religious practices, and prayer frequency, along with fundamentalism and scriptural acceptance. All the other studies focused on the cognitive content of religiosity – that is, religious beliefs. Therefore, it is possible that Razmyar and Reeve (2013) have exposed a more complex dynamic between an individual's rationality and his religiosity, of which the cognitive style/religious belief dimension is just one part.

Another challenge came more recently from Finley, Tang, and Schmeichel (2015), who suggested that the association between analytical thought and religious belief may be more fragile than it seems. They found that the order in which the measures were given had a strong effect on whether the relationship emerged. In one study, they administered the CRT before assessing religious belief, and the established trend emerged: higher CRT scores corresponded with disbelief. In a second study, however, they measured religious belief first and then administered the CRT afterward. The result was non-significance (Finley et al., 2015, pg. 5-6). Together, these studies hinted that the established relationship between analytical thought and religious disbelief may be primarily the result of an order effect, and therefore may not be as robust as previously thought.

However, Pennycook and colleagues (2016) responded with a comprehensive meta-analysis, which included 35 studies and a total subject sample size of 15,078. This survey reaffirmed the relationship between religious disbelief and analytical thought, with an overall $r = -.183$. In order to affirm that this relationship was not a product of order effects, they also included another series of experiments in which the CRT and measures of religious belief were administered in separate sessions, and found similar associations to the meta-analysis (Pennycook et al., 2016). This response suggests that, regardless of the modest correlation coefficients, the association between religiosity and cognitive style is a consistent phenomenon, not a product of measurement order. Further studies have found the relationship among a Muslim majority sample (Yilmaz, Karadöller, & Sofuoglu, 2016) and are beginning to trace individual and demographic differences that may moderate the relationship (Yonker, Edman, Cresswell, & Barrett, 2016). The open question therefore is not *if* the relationship exists, but rather *why*.

## 2. Interpretations

The early interpretations of this relationship (e.g., Shenhav et al., 2012) argued that religious beliefs emerge from intuitive cognitive biases in favor of mind/body dualism (Bering, 2011), anthropomorphism (Waytz, Cacioppo, & Epley, 2014), and teleology (Kelemen, 2004) to name a few. Relying on a version of dual process theory in which analytical and intuitive processes are reciprocally inhibitory, these interpretations suggest that analytical cognitive processes override the intuitive biases that underlie spiritual worldviews, thus resulting in disbelief.

This interpretation has been commonplace within the cognitive science of religion, informing works such as McCauley's (2011) *Why Religion is Natural and Science is Not*, which argues that "default" cognitive tendencies foster religious beliefs. In a slightly more nuanced account, Baumard and Boyer (2013) acknowledge that while religious beliefs likely arise from natural intuitions, the beliefs themselves have the character of reflective thought. Therefore, Baumard and Boyer suggest, religious beliefs are not simply intuitive impulses, but instead are reflective explanations for common intuitions. Despite some variations between researchers, this family of explanations argues that religious belief rests on intuitive foundations that can be undermined by analytical processing (see also Oviedo, 2013).

Pennycook's (2014) analysis extends beyond this hypothesis to explicitly argue that the supernatural content of religious beliefs is the primary target of the nonbelievers' reflective processing. As highlighted above, Pennycook suggests that the analytically minded are more likely to sense and attempt to resolve conflicts between religious beliefs and a naturalistic view of the material world (Pennycook et al., 2014). This supposition fits with Browne et al.'s (2014) interpretation that an individual's "spiritual epistemology" partially mediates the relationship between reflective thought and religious disbelief. Rather than assuming that reflective thought undermines intuitive foundations, both of these accounts focus on the representational conflict between intuitive cognitive outputs that leads to further reflection among analytically inclined individuals.

### 2.1 Expanding the Interpretation: Social Density and Cognitive Styles

One important finding that has been largely overlooked in the literature surveyed thus far is that, rather than being merely a factor of individual differences, cognitive styles vary across large-scale cultures in predictable ways. North Atlantic (Western European) societies exhibit analytical cognitive preferences compared with the rest of the world (Henrich, Heine, & Norenzayan, 2010). Members of these "WEIRD" – Western, Educated, Industrialized, Rich, and Democratic – societies prioritize individual autonomy, deprioritize social context, and focus on isolated elements rather than relationships in both perception and cognition. Meanwhile, inhabitants of East Asian cultures such as China and Japan are more holistic in their cognitive styles (Nisbett et al., 2001). Members of these societies typically attend more carefully to social context, see wholes more quickly than parts, and focus on relations between elements. Members of WEIRD societies tend to be *field-independent*, while East Asians are more likely to be *field-dependent* (Witkin & Goodenough, 1977). Moreover, even within specific societies, cognitive styles vary among subgroups. For example, Talhelm et al. (2015) found that political liberals have more analytical cognitive styles than political conservatives in both the United States and China. In a separate study, inhabitants of rice-growing regions in China were found to have more holistic cognitive styles than residents of wheat-growing regions (Talhelm et al., 2014).

Why would individual-level cognitive differences track such apparently unrelated macro-level phenomena? Varnum et al. (2010) offer a concise explanation: *social orientation.* That is, people who are more socially interdependent exhibit more holistic cognitive styles, while people who are more socially independent think more analytically. Since rice agriculture requires more intensive, interdependent coordination than wheat farming, rice farmers develop holistic, less analytical cognitive preferences (Talhelm et al., 2014). Along similar lines, political

conservatives tend to be more socially collectivistic, or "hivish," while liberals are more individualistic (Haidt, 2013). It is therefore not surprising that conservatives think more holistically.[1]

In these cases, a single key discriminator – social orientation – explains large-scale differences between the WEIRD world and East Asia; between political liberals and conservatives; and between wheat farmers and rice farmers in China (Varnum et al., 2010). In each instance, the more individualistic group is more cognitively analytic, while the more collectivistic group is more cognitively holistic. These studies collectively demonstrate a tight relationship between social orientation and cognitive style. Importantly, the relationship here is likely reciprocal: an analytically minded person will often seek out more individualistic groups. But, of course, that new social context will influence his preference for a particular cognitive style in turn.

It is important to point out that the instruments used in the cross-cultural literature on thinking dispositions and religion are different from those typically used to study religion and cognitive style. The CRT – used in most studies of religion and cognitive style – is intended to measure *reflection*, or the effortful overriding of intuitive cognitive responses (Frederick, 2005). It is thus a measure of deliberate, "Type II" processing, or how well test-takers deliberate and effortfully use working memory – which is distinguished from implicit and intuitive "Type I" processing (Evans & Stanovich, 2013; Morgan, 2016). By contrast, the instruments used to measure thinking dispositions in most cross-cultural studies (see, e.g., Nisbett et al., 2001) are more properly measures of cognitive *mode* (Evans & Stanovich, 2013). For instance, Talhelm et al. (2015) used the Triad Task (Ji, Zhang, & Nisbett 2004) to discriminate between holistic/relational and analytical/categorical thinkers. The Triad Task consists of groups of three related words, of which subjects select the two that they feel most belong together. *Categorical* pairings (e.g., "train" + "bus") are considered analytical and abstract, while *relational* pairings ("train" + "tracks") reflect a more holistic and concrete cognitive mode. However, note that neither choice necessarily involves effortfully overriding intuition.

Because it indexes thinking dispositions without requiring that an intuitive response be over-ridden by an analytical response, the Triad Task may be quite useful for understanding how cognitive styles are connected to religious belief. For instance, Talhelm et al. (2015) found that conservatives make more relational pairings on the Triad Task than liberals do. Social and political conservatives have also been found to offer more intuitive (less reflective) answers on the CRT than liberals do (Deppe et al., 2015; Iyer et al., 2012). Similarly, in a study of religious ideology, two of the present authors found that theologically conservative religious believers make significantly more relational pairings on the Triad Task than more liberal or agnostic respondents (Wood & Morgan, unpublished data). The same demographic factors (i.e., religiousness and conservatism) thus serve as convergent predictors for both kinds of cognitive

[1] Confusingly, conservatives in the United States often call themselves "individualists," but this is somewhat misleading. Moral psychologists have consistently found that social conservatives across cultures exhibit more loyalty to in-groups and acceptance of group-level authority than liberals or progressives do (e.g., Haidt, 2012; Jenson, 1998). Social conservatives are thus "collectivistic" in a cultural psychological sense, not a Marxian one.

style measures. This suggests that the CRT and the Triad Task may be tracking similar (though not identical) underlying cognitive patterns.

On a theoretical level, analytic reflection requires rule-based thinking and formal logic, which in turn depends on strict categories rather than relational associations. Hence, people whose preferred cognitive mode is abstract categorization (the Triad Task) may also be more likely to override intuitive responses with rule-based cognitive effort (the CRT). In both cases, analytical people (liberals, the nonreligious, WEIRDs, etc.) are less likely to be deeply embedded in tight in-group oriented social relationships than more holistic/intuitive people (conservatives, religious adherents, rice farmers, etc.). A key reason appears to be that "stronger social networks…produce a more holistic orientation toward the world" (Nisbett et al., 2001, p. 303). Thus, social environment, in part influenced by religiosity, may predict both cognitive style and cognitive mode.

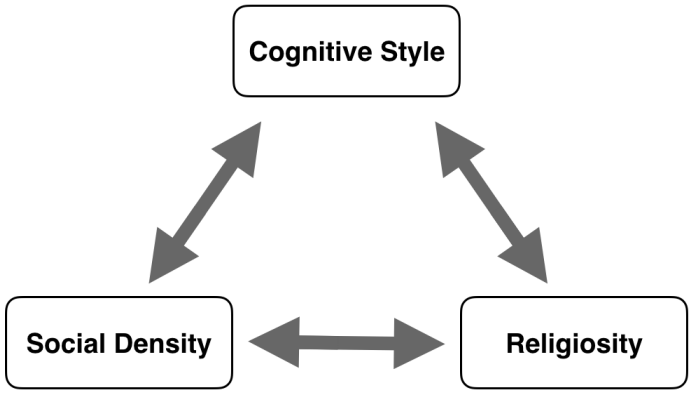
### 2.2 The Social Foundations Hypothesis

The relationship between cognitive style and religious belief is most usefully understood as one strand of a larger social fabric. This means that religiosity may be correlated with intuitive style because a third variable causes both. A plausible third variable is whether the larger culture is *individualistic* or *collectivistic* (in the sense developed by cross-cultural psychologists, e.g., Triandis & Suh, 2002). Persons who have grown up with individualist values are likely to find it easy to adopt an analytical style, at least in some situations (Ji, Zhang, & Nisbett, 2004). But individualism is also associated with factors that promote secularity, such as skepticism, independent thought, and external locus of control. For instance, Twenge et al. (2015) noted that religiosity among American young adults has decreased in tandem with increasing individualism.

In principle, the culture in which a person is raised can be an independent third variable separately influencing religiosity and analytical style. In practice, however, many situations probably do not reflect simple, linear causality. Growing up in a household with individualist values means that children will be exposed to and acquire the values of analytical thinking and independent thinking. The values of independent thinking will, in turn, bring along with them implicit or explicit permission to choose a level of religiosity which accords with the child's temperament, cognitive style and personal experiences. Thus, households that value *independent* thinking are at the same time statistically likely to be households that value *analytical* thinking – and ones that permit low religiosity.

The "third variable" argument, then, posits that possessing an analytical thinking style does not cause low religiosity through linear causality, but that analytical thinking, individualistic values, and permission to make up one's own mind about religion co-occur together in households and in the larger culture. This observation lies at the root of the view we advocate, which we call the *social foundations hypothesis*. We argue that a feedback loop exists between social density, religiosity, and cognitive styles (see Figure 1). Social density is a broad concept that subsumes many aspects of our sociality that vary cross-culturally. These include the relative tightness/looseness of social norms (Gelfand et al., 2011); the reliance on social roles with obligatory functions (Douglas 1970); and the preference for independent versus interdependent social orientations (Varnum et al., 2010).

**Figure 1. The Social Foundations Hypothesis**




We refer to cultures with tight social norms, interdependent self-construal, respect for hierarchy, and obligations to in-group as cultures high in social density. In socially dense societies, an intuitive cognitive style confers benefits that facilitate learning and adhering to social norms, respecting authority, and aligning one's own goals with expectations of parents and authority figures. By not questioning or analyzing rules and requirements, individuals fit into a social structure where respect for hierarchy and group harmony are necessary for smooth social functioning. These habits are particularly important under harsh and precarious living conditions, when natural disasters can strike and people must depend on an extensive social network of strong alliances. Hence, religiosity – a concomitant of social density – often increases following severe natural disasters or economic crises (Chen, 2010; Norris & Inglehart, 2011; Sibley & Bulbulia, 2012).

Importantly, an analytical cognitive style can be disadvantageous in a socially dense society. Analytical thinking encourages noting contradictions, including inspecting cultural teachings for self-relevance and questioning social mores. A consequence of an analytical thinking style may thus be less prosocial behavior, in terms of adherence to conventional norms and cooperating with others in uncalculating way (Pennycook, 2015; Rand, 2016). Individuals with an analytic cognitive style may tend to put their own goals before group goals. The result is that "the nail that sticks out is hammered flat;" that is, in a socially dense society, analytically minded individuals can be subject to group sanctions or may simply fail to establish beneficial cooperative relationships.

According to the social foundations hypothesis, then, the relationship between cognitive style and religious belief is not causal, but emerges as part of a more complex dynamic. In some contexts, the influence of cognitive style on religiosity may be mediated by social density

variables. Additionally, religiosity may reciprocally influence cognitive style by promoting a more dense form of sociality that fosters intuitive processing. The weak form of the hypothesis suggests that this feedback loop exists and influences the relationship between cognitive style and religiosity. The strong form of the hypothesis argues that social density is the primary driver of this relationship.

### 2.3 Religious beliefs are not like other beliefs

As described above, the most common explanations for the inverse relationship between analytic cognition and religiousness have focused on the propositional content of religious beliefs. If religious beliefs arise naturally as byproducts of default cognitive processes such as agency detection or teleological reasoning, then analytical reflection may interrupt the intuitive processes that undergird those beliefs (Shenhav et al., 2012). Alternatively, if religious beliefs are ontologically problematic propositional claims, then analytical thinking may help people detect the inherent conflicts between natural causal reasoning and supernatural faith claims (Pennycook et al., 2014).

A drawback of the standard explanation is that, cognitively speaking, religious beliefs are not the same as other beliefs. Unlike everyday propositional beliefs, religious beliefs appear to be a special kind of social postulate or shared "as-if" statement (Seligman, Weller, & Simon, 2008; N. van Leuuwen, 2014). This imaginative character of religious beliefs is intimately related to their social functions, as Emile Durkheim (1912/2008) pointed out. From a Durkheimian perspective, when a Muslim believer recites the Shahada ("There is no god but Allah, and Muhammad is his prophet"), he is not just making a straightforward claim about how he thinks the world actually is. Instead, he is also making tacit statements about his identity, his social allegiances, and which authorities he accepts as legitimate. As N. van Leeuwen (2014) points out, these statements also have a perceived moral or normative force. That is, for Muslim believers, the Shahada not only indicates how things are, but points to how things *ought* to be.

A key piece of evidence for this claim is that religious beliefs depend on unique contexts and are influenced by social authority, while factual beliefs are not (Van Leeuwen, 2014). Van Leeuwen defines "factual beliefs" as those that do not vary by setting. Factual beliefs govern people's expectations about what will occur; and are vulnerable to or informed by empirical evidence. For instance, Sarah believes that, if she drops a wafer, gravity will cause it to fall to the ground. This factual belief holds no matter where she is, what she is doing, or what her cultural identity is. She believes it because her lifetime of experience has shown her that things with mass reliably fall to the ground when dropped. However, Sarah also happens to believe that the particular wafer in question is the literal body of Christ, because it is a communion wafer, consecrated by a priest. Hence, Sarah's religious beliefs obtain for a narrower range of contexts than her factual beliefs do. Moreover, unlike factual beliefs, we can draw important inferences about her social identity from them – for example, that she is Catholic, not Protestant. And, finally, there is no empirical – that is, objectively measurable or observable – distinction between a consecrated wafer and an unconsecrated one. Her belief in the literal transubstantiation of the wafer is not subject to quotidian sensory evidence, but instead indexes her social identity and highlights the authorities she treats as legitimate (specifically, Catholic hierarchs and tradition). Unlike factual beliefs, then, belief in transubstantiation is "inferentially inert" – that is, not used by believers to draw

actionable inferences about practical reality – outside very circumscribed contexts (Bulbulia, 2008, p. 97).

Thus, although neutral or instrumental propositions can be accepted or rejected based on objective evidence, a persons' religious beliefs come loaded with subtext and rich associations that bear on group identity and moral norms (Atran & Ginges, 2012; Berger, 1967; Haidt & Kesebir, 2010). They also require imaginative assent. After all, a consecrated communion wafer does not look objectively different than other wafers. So it takes an act of imagination to affirm that it has indeed been transubstantiated into something divine. As Palmer and Steadman (2008) have argued, that imaginative affirmation links the parishioner with everyone else who shares it, while separating her from outsiders (for whom the wafer is really just a wafer).

Sharing an imaginative viewpoint therefore bonds people in a way that sharing straightforward facts does not, because an imaginative viewpoint can be *chosen*. This is why, as anthropologists have pointed out, religious beliefs serve as powerful tools for binding religious communities and instilling contingent moral norms (Geertz, 1993; Rappaport, 1999). Objective facts can be verified or falsified by anybody and therefore are not as practical for indicating group membership.[2] Only imaginative conventions – which have to be affirmed or chosen – can discriminate fellow believers from outsiders. Thus, religious beliefs function as a social signal of one's in-group. Because religious beliefs are not like factual beliefs, a religious person may decline to analyze them for contradictions with the natural world.[3] Our cognitive-anthropological framework thus posits a correlation between (1) imaginative or subjunctive postulates and (2) social affiliation. Affirming your group's imaginative claims is a form of motivated cognition that strengthens social ties within the in-group (Ditto, Pizarro, & Tannenbaum, 2009).

### 2.4 Preliminary Evidence for the Social Foundations Hypothesis

Recent research supports the social foundations hypothesis by investigating the interrelationship between analytical thought, social cognition, and religious belief. A growing number of studies have found an inverse correlation between analytical thought and social cognition (Baron-Cohen et al., 2001; Jack et al., 2013; Jack et al., 2014). A parallel line of research has demonstrated positive associations between religiosity and various aspects of social cognition, such as "mentalizing" or inferring others' mental states (Banerjee & Bloom, 2013; Caldwell-Harris, 2012; Gervais, 2013; Liu, 2010; Norenzayan, Gervais, & Trzesniewski, 2012). Considered together, these findings lend credibility to the social foundations hypothesis by suggesting that

[2] However, within some cultural contexts, such as the contemporary US, broad theories grounded in objective facts, such as evolution and climate change, can also come to function as indices of group membership (see Kahan, 2016).

[3] This decision to forego analytical reflection may be particularly effective for signaling commitment when the religious belief contradicts a dominant culture's ontological claims (Sosis & Alcorta, 2003). How insulated beliefs are from critical analysis is thus a function of (1) how sacred an individual considers such beliefs to be (Ginges & Atran, 2009), which likely depends on ritual participation (e.g. Sheikh, Ginges, Coman, & Atran, 2012); and (2) the tightness or looseness of her social context (Gelfand et al., 2011). Individual differences also play a crucial role.

analytical thought may inherently conflict with the processing of *social* information, and that this basic cognitive conflict may undergird the negative correlation between analytical cognitive modes and religiosity.

Jack and colleagues (2016) recently published a series of eight studies that elucidate these relationships. Following previous work (e.g., Jack et al., 2013; Shamay-Tsoory, Aharon-Peretz, & Perry, 2009) Jack et al. first distinguished between two types of social cognition: mentalizing and moral concern. Mentalizing refers to Theory of Mind, or an individual's capacity to discern the intentional mental states of others. Past theorists (e.g., Norenzayan et al., 2012) have suggested that religious beliefs arise as an extension of our tendency to infer these mental states. Moral concern, on the other hand, is a "broad category which includes empathic concern, interpersonal connection, prosocial behavior and aspects of moral reasoning" (Jack et al., 2016, p. 2).

Building off of this distinction, Jack et al. (2016) examined the relationship between these different types of social cognition, religious belief, and analytical cognitive style, finding that moral concern – especially empathic concern – was the strongest predictor of religious belief, $r = 0.26$, $p < 0.001$ (Jack et al., 2016). Mentalizing, on the other hand, was *not* associated with belief – a finding that raises questions for the postulated link between Theory of Mind and religious belief (see also Lindeman, Svedholm-Häkkinen, & Lipsanen, 2015). Importantly, moral concern was also negatively related to analytical thought ($r = -0.11$, $p < 0.001$). Throughout these studies, Jack et al. (2016) found that controlling for this negative relationship between moral concern and analytical thought significantly weakened the link between analytical thought and religious belief, in some cases reducing it to non-significance. In the final pooled analysis, moral concern showed significantly greater bivariate and partial correlations with religious belief than did CRT scores, although both remained significant predictors (Jack et al., 2016).

These findings suggest that a third-variable explanation may illuminate the relationship between reflective thought and religious belief. As the social foundations hypothesis argues, the simple association between religiosity and cognitive style may be secondary to a more foundational relationship between religiosity and core social factors. Jack et al. (2016) posit that the association between religious belief and cognitive reflection, holding across individuals, is subordinate to a more central, robust relationship between religious belief and empathic moral concern (overall $r = 0.24$). We extend this hypothesis to the between-groups level by positing that the number and extent of social obligations (that is, moral claims on behavior) experienced by an average member of a society predicts both cognitive style and religiosity (see, Bainbridge, 2005).

Further supporting this claim, substantial evidence indicates that cognitive profiles can be directly influenced by religious ideologies rooted in culture, such that different religious beliefs and practices are associated with differences in various cognitive processing styles (Hommel et al., 2011). One study, measuring perceptual styles, found that Italian Roman Catholics and Israeli Jews were more attuned to global features of their visual field than their non-religious compatriots – an example of a holistic processing mode. However, in the Netherlands, this association reversed: Dutch Calvinists were more analytically attuned to local specific features of their visual fields, while atheists were more holistic in their perceptual/cognitive styles (Colzato

et al., 2010). Importantly, both Catholic and Jewish beliefs prioritize collectivistic social values, while Calvinist theology is more individualistic.

Other studies have found similar reversals in regards to cognitive control processes, such as attention regulation (Colzato, Hommel, van den Wildenberg, & Hsieh, 2010; Colzato, van den Wildenberg, & Hommel, 2008) response selection and inhibition (Hommel et al., 2011) and delay of gratification behaviors (Paglieri et al., 2013) to name a few (cf. Hommel, & Colzato, 2010). These cognitive processes are distinct from the reflective processes captured by the CRT, but the capacity to isolate specific factors during perception and cognition is a crucial aspect of analytical thinking. The research survey immediately above indicates that differences in this capacity are predicted by the differing types of religiosity, particularly individualistic or collectivistic forms of religion.

## 3. Reflective Self-Interest and Intuitive Cooperation

One benefit of the social foundations hypothesis is its capacity to connect with other branches of the cognitive science of religion. A prime example is the large and growing literature that has found a positive relationship between religion and prosociality, especially *parochial altruism* or costly help for in-group members (Ahmed, 2009; Norenzayan, 2016; Xygalatas et al., 2013). Why would religiosity benefit in-group prosociality? As discussed above, strong social ties appear to encourage motivated acceptance of social subjunctives or arbitrary beliefs, such as religious claims, that are often linked with moral norms by convention. Accepting these arbitrary conventions benefits parochial cooperation because it signals in-group membership in a way that agreeing on objective facts could not (Atran & Henrich, 2010). It thereby improves trust by boosting people's ability to predict each other's strategic decisions, since people can usually accurately predict what others will do when those others appear to accept the social norms of the in-group (Bulbulia, 2008). When everybody can successfully predict that everyone else will abide by norms in a given situation, trust and cooperation are likely to increase (e.g., Lewis & Weigert, 1985; Mayer, Davis, & Schoorman, 1995).

A further reason intuitive or holistic cognitive modes are beneficial for generating social coordination is because they place the control of social commitment signals *outside of conscious awareness* (Bulbulia & Sosis, 2011). From a game-theoretic perspective, putting affirmation of social subjunctives under the control of non-conscious processes is adaptive because holding up one's end of the social bargain does not always pay off. That is, there are often transient strategic motives for individuals to defect or renege on moral norms in specific circumstances. However, if enough people defect enough of the time, the social arrangements fall apart because no one trusts anyone else. Everybody ends up losing. Thus, tight social living provides a strong motivation to *unreflectively cooperate* most of the time, even if cheating could offer temporary benefits.

For example, say that Richard's neighbor has stacked bundled firewood for sale out by the road. The neighbor is a busy guy, so he leaves a coffee can next to the wood into which passersby can stuff $5 per bundle. Face-to-face, Richard would have a self-interested motive to play fairly with his neighbor, since they live next to each other and any foul play would harm their future relationship. But when the neighbor is nowhere to be seen, there is not as much immediate

strategic incentive for Richard to pay the $5. Whether he pays or not, his relationship with the neighbor – and all the future benefits that might come with it – will probably remain unchanged. If Richard deliberates about the decision, he might well decide to take some free wood. But if he is simply committed to cooperation as a social norm, then he will probably just pay the $5 without any reflection. In a community of people where everyone is implicitly committed to the norm of cooperation, people will likely continue to be willing to trust their neighbors and leave wood untended. But in a community where people cooperate only when self-interested strategic calculation says they should, trust will quickly plummet. No one will leave out wood to buy by the road.

A significant body of work has provided theoretical and empirical evidence that religious commitments, sincerely displayed, serve as heuristic indicators that a person will be more likely to cooperate (with in-group members) reflexively, rather than deliberatively (Shaver & Bulbulia, 2016; Irons 2001; Sosis & Bressler, 2003). That is, members of religious communities come to hold the cognitive heuristic that a co-religionist who exhibits credible displays of sincere religious belief will tend to follow through on her obligations *regardless of whether it benefits her in every precise instance* (Henrich, 2009; Rand et al., 2016). The reason that such a heuristic can become stabilized in a population, we argue, is precisely because holding sincere religious beliefs is a tautologically honest indicator that the person who holds them is likely not to critically question social conventions. To an extent, her socially normative responses will thus be *automatized*, and thus out of the purview of analytical calculation – even if the socially normative action represents an uncompensated pure cost in the given instance. As a result, people exhibit higher levels of trust towards targets who display credible signals of religious commitment, sometimes even if their religious traditions do not match (Hall et al., 2015).

A recent body of research further supports this posited connection between intuitive cognition and implicit cooperation by demonstrating that analytical cognition tends to prompt strategically self-interested responses in strategic payoff interactions. In a meta-analysis of priming and economic cooperation games, Rand (2016) found that priming intuitive cognition induced subjects to be significantly more likely to cooperate even when doing so imposed a strategic cost. Analytical cognition, on the other hand, induced a more rational and calculating strategy: subjects who had been primed to think more analytically were more likely to only cooperate when doing so would benefit them in future rounds of the game.

In a set of evolutionary models, Bear and Rand (2016) showed that selection pressures are mathematically unlikely to stabilize a positive correlation between analytic reflection and greater likelihood of cooperation. In all realistic scenarios, reflection is correlated with opportunistic defection. That is, evolutionary logic implies that analytic cognition will be beneficial – and thus spread in a population – only when it is used to opportunistically override intuitive cooperative instincts, enabling its wielders "to evaluate more complex trade-offs between self-interest and altruistic concerns" (Pennycook, Fugelsang, & Koehler, 2015, p. 6). The only type of cooperation that analytical cognition appears capable of motivating to a greater extent than intuition is low- or no-cost cooperation (Corgnet, Espín, & Hernán-González, 2015).

Therefore, it is reasonable to expect that only certain social contexts, such as cosmopolitan settings where most interactions are one-time engagements with strangers, will reward the

reflective evaluation between self-interest and cooperative instincts. Religious communities, which often foster tight implicit association through social conventions, will preclude such self-interested interactions. Of course, religious communities vary in the degree to which they require such tight associations, a variance which can explain the growth or stagnation of the communities (Iannaccone, 1994). The social foundations hypothesis therefore predicts that tighter religious communities will foster more intuitive cognitive styles, more holistic thinking dispositions, and a greater commitment to orthodox belief.

Note that "cooperation" does not necessarily imply "behaving in an objectively moral or good fashion." Social conventions are often harmful or unfair. People who exhibit genuine commitment to the social heuristics of their in-group will follow such conventions – ones that harm outsiders, for instance – just as readily as those which benefit everyone. Thus, the fact that religious believers are more likely to be unreflectively cooperative does not constitute an argument in favor of religion (or at least not a very good one), because it leaves underdetermined what "being cooperative" actually *means* in any given religious context. Cooperation might mean suicide bombing, for instance (Atran, 2011). Conversely, it could mean tithing, feeding the poor, and volunteering. The content of religious conventions thus varies radically by context.

But regardless of context, unfalsifiable religious beliefs will tend to be supported by intuitive or heuristic cognition, and weakened by analytical thinking. The social foundations hypothesis argues that this is not only because religious beliefs are cognitively natural products of teleological or anthropomorphic reasoning, but – more primarily – because they are social subjunctives that require motivated affirmation as signals of affiliation and moral commitment. As such, they credibly signal the believer's intention to automatically play by the agreed-upon rules of the social game – whatever game that happens to be.

## 4. Future Directions

With the social foundations hypothesis, we posit a feedback loop between social density, religiosity and cognitive style. By emphasizing the importance of various forms of social organization, this hypothesis also helps to connect the religion and cognitive style literature with other research, as we have demonstrated. The social foundations hypothesis remains an empirical claim requiring further corroboration. Therefore, we make the following predictions to demonstrate its heuristic potential:

- The endorsement of orthodox religious beliefs will be correlated with the density of an individual's social context.
- In turn, the tightness of an individual's social context will predict her cognitive style: the tighter the context, the more intuitive her thought will be.
- Social density will account for a substantial portion of the variance within the relationship between cognitive style and religious belief.
- Affirmation of religious beliefs will predict unreflective – that is, uncalculating – adherence to the contingent social norms of the religious in-group.
- Within individualistic cultures, preferences for reflective thought will be correlated with field-independent, thinking dispositions.

- Priming an individual with holistic and intuitive cognitive styles will increase an individual's tendency to sacralize, or impute sacredness to target concepts (e.g. Sheikh et al., 2012).
- In repeated instances of prosocial economic games, preference for intuitive thought will predict an individual's skill at detecting cheaters.
- The relationship between religion and self-regulation will be mediated by social density and preference for intuitive thought.

While we take the evidence for the social foundations hypothesis to be convincing, there are likely objections that could be raised.

One of our main points is that the relationship between cognitive style and religiosity is strongly, if not entirely, mediated by social density. This explanation does not directly contradict that of Brown et al. (2014) and Pennycook et al. (2014), which emphasizes the representational content of religious beliefs; but it does significantly challenge the strength of this direct association. However, it could be argued that analytical thought is still the primary driver, even if social density mediates its relationship to religiosity. For instance, analytically minded individuals may tend to disaffiliate from socially dense communities and those who prefer intuitive styles may tend to seek out and create dense social networks. Especially in individualistic societies, community membership is fluid, allowing a person's choice of community to be influenced by their cognitive style. Thus, social selection effects may be the driver of the association between social density and cognitive style. This possibility does not contradict the social foundations hypothesis, since the hypothesis is built around a feedback loop that permits cognitive style to reciprocally influence social density. However, the social foundations hypothesis maintains that social density is the primary driver of this feedback loop. Evidence in favor of this claim is offered by findings (e.g., Talhelm et al. 2014) that show historical geographical associations between economic modes and cognitive style. It is unlikely that Qing Dynasty villagers migrated to regions where the farming economies matched their cognitive styles. It is much more likely that particular farming styles – collectivistic rice farming or individualistic wheat farming – influenced the cognitive style of practitioners over the long-term.

In a second possible objection, recent research has argued that systematic thinkers have better empathic accuracy than intuitive thinkers (Ma-Kellams & Lerner, 2016), contrary to our view that intuitive thinking sensitizes people to social and moral obligations. However, empathic accuracy, as measured by Ma-Kellams and Lerner (2016), is an aspect of social cognition closer to *Theory of Mind* than to moral concern, as described by Jack et al. (2016). Therefore it seems likely that different styles of social cognition relate to different cognitive styles, which in turn are advantageous in different social contexts. Importantly, the cooperative styles we highlighted above depend not on direct empathy (the ability to intuit what others' motivations and thoughts are) but instead on the *tacit or heuristic acceptance of subjunctive postulates, such as religious beliefs, which index social norms*. It may be the case that reflectively fostered empathy helps navigate social contexts involving mostly new interactions, where the social norms cannot be taken for granted. Future research should remain attentive to these various forms of social cognition and cooperative techniques.

## 5. Conclusion

A substantial body of evidence connects religious beliefs and cognitive styles. The consistent finding is a modest but reliable association between reflective thought and religious disbelief. The explanations for this association vary. Early interpretations suggested that religious beliefs depend on intuitive cognitive defaults, which are undermined by reflective thought (Baumard & Boyer, 2013). More recent interpretations suggest that the relationship between reflective thought and religious disbelief emerges from the heightened conflict sensitivity associated with reflective cognition, which would detect dissonance between a naturalistic worldview and the supernatural claims of religious beliefs (Pennycook et al., 2014). As we have argued above, both of these explanations focus attention on religious beliefs as propositional claims about reality. Clearly, this is part of what drives this association. However, we argue that the association between cognitive style and religiosity only makes sense as part of a larger dynamic that fundamentally includes social context.

To summarize our argument, religious beliefs are not simply straightforward beliefs about objective things (although they may function that way in many circumstances; see Dawkins, 2006). Rather, they are instances of *motivated cognition* that serve, among other things, as strategic social heuristics. Credible evidence that a person sincerely holds a given religious belief therefore indicates that he will tend to unreflectively abide by the moral norms of his religious community (although of course this expectation is only probabilistic). In general, sincere affirmation of religious belief is therefore a reliable social signal indicating that a person is not likely to critically or opportunistically reevaluate moral expectations or obligations. Such reevaluation would constitute the overriding of a heuristic response, and it takes analytical cognition to override heuristics and de-emphasize social tradeoffs. In other words, religiosity is intimately tied to social density in a way that depends on intuitive cognitive processes, and this dynamic is the foundation for the relationship between cognitive style and religious belief.

**References**

Aarnio, K., & Lindeman, M. (2005). Paranormal beliefs, education, and thinking styles. *Personality and Individual Differences*, *39*, 1227–1236.

Aarnio, K., & Lindeman, M. (2007). Religious people and paranormal believers: Alike or different? *Journal of Individual Differences*, *28*(1), 1–9. doi.org/10.1027/1614-0001.28.1.1

Ahmed, A. M. (2009). Are Religious People More Prosocial? A Quasi-Experimental Study with Madrasah Pupils in a Rural Community in India. *Journal for the Scientific Study of Religion*, *48*(2), 368–374. doi.org/10.1111/j.1468-5906.2009.01452.x

Atran, S. (2011). *Talking to the Enemy: Religion, Brotherhood, and the (Un)Making of Terrorists* (Reprint edition). New York: Ecco.

Atran, S., & Ginges, J. (2012). Religious and sacred imperatives in human conflict. *Science (New York, N.Y.)*, *336*(6083), 855–857. doi.org/10.1126/science.1216902

Atran, S., & Henrich, J. (2010). The Evolution of Religion: How Cognitive By-Products, Adaptive Learning Heuristics, Ritual Displays, and Group Competition Generate Deep Commitments to Prosocial Religions. *Biological Theory*, *5*(1), 18–30. doi.org/10.1162/BIOT_a_00018

Bainbridge, W. S. (2005). Atheism. *Interdisciplinary Journal of Research on Religion*, *1*(2).

Banerjee, K., & Bloom, P. (2013). Would Tarzan believe in God? Conditions for the emergence of religious belief. *Trends in Cognitive Sciences*, *17*(1), 7–8. doi.org/10.1016/j.tics.2012.11.005

Baron-Cohen, S., Wheelwright, S., Spong, A., Scahill, V., Lawson, J., & others. (2001). Are intuitive physics and intuitive psychology independent? A test with children with Asperger Syndrome. *Journal of Developmental and Learning Disorders*, *5*(1), 47–78.

Baumard, N., & Boyer, P. (2013). Religious Beliefs As Reflective Elaborations on Intuitions: A Modified Dual-Process Model. *Current Directions in Psychological Science*, *XX*(X), 1–6. doi.org/10.1177/0963721413478610

Bear, A., & Rand, D. G. (2016). Intuition, deliberation, and the evolution of cooperation. *Proceedings of the National Academy of Sciences*, *113*(4), 936–941. doi.org/10.1073/pnas.1517780113

Berger, P. L. (1967). *The Sacred Canopy: Elements of a Sociological Theory of Religion*. Doubleday.

Bering, J. (2011). *The Belief Instinct: The Psychology of Souls, Destiny, and the Meaning of Life*. W. W. Norton & Company.

Browne, M., Pennycook, G., Goodwin, B., & McHenry, M. (2014). Reflective minds and open hearts: Cognitive style and personality predict religiosity and spiritual thinking in a community sample. *European Journal of Social Psychology*, *44*(7), 736–742. https://doi.org/10.1002/ejsp.2059

Bulbulia, J. (2008). Meme Infection or Religious Niche Construction? An Adaptationist Alternative to The Cultural Maladaptationist Hypothesis. *Method & Theory in the Study of Religion, 20*(1), 67–107. doi.org/10.1163/157006808X260241

Bulbulia, J., & Sosis, R. (2011). Signalling theory and the evolution of religious cooperation. *Religion*, *41*(3), 363–388.

Caldwell-Harris, C. L. (2012). Understanding atheism/non-belief as an expected individual-differences variable. *Religion, Brain & Behavior*, *2*(1), 4–23. doi.org/10.1080/2153599X.2012.668395

Chen, D. (2010). Club goods and group identity: Evidence from islamic resurgence during the Indonesian financial crisis, earlier version with model. *Journal of Political Economy*, *118*, 300–354.

Colzato, L. S., Beest, I. van, van den Wildenberg, W. P. M., Scorolli, C., Dorchin, S., Meiran, N., … Hommel, B. (2010). God: Do I have your attention? *Cognition*, *117*(1), 87–94. doi.org/10.1016/j.cognition.2010.07.003

Colzato, L. S., Hommel, B., & Shapiro, K. L. (2010). Religion and the attentional blink: depth of faith predicts depth of the blink. *Frontiers in Psychology*, *1*, 147. doi.org/10.3389/fpsyg.2010.00147

Colzato, L. S., van den Wildenberg, W. P. M., & Hommel, B. (2008). Losing the Big Picture: How Religion May Control Visual Attention. *PLoS ONE*, *3*(11), e3679. doi.org/10.1371/journal.pone.0003679

Corgnet, B., Espín, A. M., & Hernán-González, R. (2015). The cognitive basis of social behavior: cognitive reflection overrides antisocial but not always prosocial motives. *Frontiers in Behavioral Neuroscience*, *9*. Retrieved from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4633515/

Dawkins, R. (2006). *The God Delusion*. Mariner Books.

De Neys, W., & Glumicic, T. (2008). Conflict monitoring in dual process theories of thinking. *Cognition*, *106*(3), 1248–1299. doi.org/10.1016/j.cognition.2007.06.002

Deppe, K. D., Gonzalez, F. J., Neiman, J. L., Jacobs, C., Pahlke, J., Smith, K. B., & Hibbing, J. R. (2015). Reflective liberals and intuitive conservatives: A look at the Cognitive Reflection Test and ideology. *Judgment and Decision Making*, *10*(4), 314.

Ditto, P. H., Pizarro, D. A., & Tannenbaum, D. (2009). Motivated Moral Reasoning. In B. H. Ross (Ed.), *Psychology of Learning and Motivation* (Vol. 50, pp. 307–338). Academic Press.

Douglas, M. (1970). *Natural symbols: Explorations in cosmology*. London: Barrie & Rockliff.

Evans, J. S. B. T., & Stanovich, K. E. (2013). Dual-Process Theories of Higher Cognition Advancing the Debate. *Perspectives on Psychological Science*, *8*(3), 223–241. doi.org/10.1177/1745691612460685

Finley, A. J., Tang, D., & Schmeichel, B. J. (2015). Revisiting the Relationship between Individual Differences in Analytic Thinking and Religious Belief: Evidence That Measurement Order Moderates Their Inverse Correlation. *PLOS ONE*, *10*(9), e0138922. doi.org/10.1371/journal.pone.0138922

Frederick, S. (2005). Cognitive Reflection and Decision Making. *Journal of Economic Perspectives*, *19*(4), 25–42. doi.org/10.1257/089533005775196732

Geertz, C. (1993). Religion as a cultural system. In *The Interpretation of Cultures: Selected Essays* (pp. 87–125). Fontana Press.

Gelfand, M. J., Raver, J. L., Nishii, L., Leslie, L. M., Lun, J., Lim, B. C., … Yamaguchi, S. (2011). Differences Between Tight and Loose Cultures: A 33-Nation Study. *Science*, *332*(6033), 1100–1104. doi.org/10.1126/science.1197754

Gervais, W. M. (2013). Perceiving Minds and Gods How Mind Perception Enables, Constrains, and Is Triggered by Belief in Gods. *Perspectives on Psychological Science*, *8*(4), 380–394. doi.org/10.1177/1745691613489836

Gervais, W. M., & Norenzayan, A. (2012). Analytic Thinking Promotes Religious Disbelief. *Science*, *336*(6080), 493–496. doi.org/10.1126/science.1215647

Ginges, J., & Atran, S. (2009). Noninstrumental Reasoning over Sacred Values: An Indonesian Case Study. In B. H. Ross (Ed.), *Psychology of Learning and Motivation* (Vol. 50, pp. 193–206). Academic Press. Retrieved from http://www.sciencedirect.com/science/article/pii/S0079742108004064

Haidt, J. (2013). *The righteous mind: why good people are divided by politics and religion*. New York: Vintage Books.

Haidt, J., & Kesebir, S. (2010). Morality. In *Handbook of Social Psychology*. John Wiley & Sons, Inc.

Hall, D. L., Cohen, A. B., Meyer, K. K., Varley, A. H., & Brewer, G. A. (2015). Costly Signaling Increases Trust, Even Across Religious Affiliations. *Psychological Science*, 0956797615576473. doi.org/10.1177/0956797615576473

Henrich, J. (2009). The evolution of costly displays, cooperation and religion. *Evolution and Human Behavior*, *30*(4), 244–260. doi.org/10.1016/j.evolhumbehav.2009.03.005

Henrich, J., Heine, S. J., & Norenzayan, A. (2010). The weirdest people in the world? *The Behavioral and Brain Sciences*, *33*(2-3), 61–83; discussion 83–135. doi.org/10.1017/S0140525X0999152X

Hommel, B., & Colzato, L. S. (2010). Religion as a Control Guide: On the Impact of Religion on Cognition. *Zygon®*, *45*(3), 596–604. doi.org/10.1111/j.1467-9744.2010.01116.x

Hommel, B., Colzato, L. S., Scorolli, C., Borghi, A. M., & van den Wildenberg, W. P. M. (2011). Religion and action control: Faith-specific modulation of the Simon effect but not Stop-Signal performance. *Cognition*, *120*(2), 177–185. doi.org/10.1016/j.cognition.2011.04.003

Iannaccone, L. R. (1994). Why Strict Churches Are Strong. *American Journal of Sociology*, *99*(5), 1180–1211. doi.org/10.1086/230409

Irons, W. (2001). Religion as a hard-to-fake sign of commitment. In R. Nesse (Ed.), *Evolution and the capacity for commitment* (pp. 292–309). New York: Russell Sage Foundation.

Iyer, R., Koleva, S., Graham, J., Ditto, P., & Haidt, J. (2012). Understanding Libertarian Morality: The Psychological Dispositions of Self-Identified Libertarians. *PLOS ONE*, *7*(8), e42366. doi.org/10.1371/journal.pone.0042366

Jack, A. I., Dawson, A. J., Begany, K. L., Leckie, R. L., Barry, K. P., Ciccia, A. H., & Snyder, A. Z. (2013). fMRI reveals reciprocal inhibition between social and physical cognitive domains. *NeuroImage*, *66*, 385–401. doi.org/10.1016/j.neuroimage.2012.10.061

Jack, A. I., Friedman, J. P., Boyatzis, R. E., & Taylor, S. N. (2016). Why Do You Believe in God? Relationships between Religious Belief, Analytic Thinking, Mentalizing and Moral Concern. *PLOS ONE*, *11*(3), e0149989. doi.org/10.1371/journal.pone.0149989

Jack, A. I., Robbins, P., Friedman, J. P., & Meyers, C. D. (2014). More than a feeling: counterintuitive effects of compassion on moral judgment. In J. Systma (Ed.), *Advances in Experimental Philosophy of Mind* (pp. 125–180). New York: Bloomsbury.

Jenson, J. (1998). *Mapping social cohesion: The state of Canadian research*. OttawaPaper SRA-321. Retrieved from http://www.cccg.umontreal.ca/pdf/CPRN/CPRN_F03.pdf

Ji, L.-J., Zhang, Z., & Nisbett, R. E. (2004). Is it culture or is it language? Examination of language effects in cross-cultural research on categorization. *Journal of Personality and Social Psychology*, *87*(1), 57–65. doi.org/10.1037/0022-3514.87.1.57

Kelemen, D. (2004). Are Children "Intuitive Theists"? Reasoning About Purpose and Design in Nature. *Psychological Science*, *15*(5), 295–301. doi.org/10.1111/j.0956-7976.2004.00672.x

Layman, G. C., & Carmines, E. G. (1997). Cultural Conflict in American Politics: Religious Traditionalism, Postmaterialism, and U.S. Political Behavior. *The Journal of Politics*, *59*(3), 751–777. https://doi.org/10.2307/2998636

Lewis, J. D., & Weigert, A. (1985). Trust as a Social Reality. *Social Forces, 63*(4), 967–985. doi.org/10.1093/sf/63.4.967

Lindeman, M., Svedholm-Häkkinen, A. M., & Lipsanen, J. (2015). Ontological confusions but not mentalizing abilities predict religious belief, paranormal belief, and belief in supernatural purpose. *Cognition*, *134*, 63–76. doi.org/10.1016/j.cognition.2014.09.008

Liu, C.-C. (2010). The relationship between personal religious orientation and emotional intelligence. *Social Behavior and Personality*, *38*(4), 461–468. doi.org/10.2224/sbp.2010.38.4.461

Ma-Kellams, C., & Lerner, J. (2016). Trust Your Gut or Think Carefully? Examining Whether an Intuitive, Versus a Systematic, Mode of Thought Produces Greater Empathic Accuracy. *Journal of Personality and Social Psychology*, doi.org/10.1037/pspi0000063

Markovits, H., & Nantel, G. (1989). The belief-bias effect in the production and evaluation of logical conclusions. *Memory & Cognition*, *17*(1), 11–17. doi.org/10.3758/BF03199552

Mayer, R. C., Davis, J. H., & Schoorman, F. D. (1995). An Integrative Model Of Organizational Trust. *Academy of Management Review, 20*(3), 709–734. doi.org/10.5465/AMR.1995.9508080335

McCauley, R. N. (2011). *Why religion is natural and science is not*. New York: Oxford University Press.

Morgan, J. (2016). Religion and dual-process cognition: a continuum of styles or distinct types? *Religion, Brain & Behavior*, *6*(2), 112–129. doi.org/10.1080/2153599X.2014.966315

Nisbett, R. E., Peng, K., Choi, I., & Norenzayan, A. (2001). Culture and systems of thought: holistic versus analytic cognition. *Psychological Review*, *108*(2), 291–310.

Norenzayan, A., Gervais, W. M., & Trzesniewski, K. H. (2012). Mentalizing Deficits Constrain Belief in a Personal God. *PLoS ONE*, *7*(5), e36880. doi.org/10.1371/journal.pone.0036880

Norenzayan, A., Shariff, A. F., Gervais, W. M., Willard, A. K., McNamara, R. A., Slingerland, E., & Henrich, J. (2016). The cultural evolution of prosocial religions. *Behavioral and Brain Sciences*, *39*. doi.org/10.1017/S0140525X14001356

Norris, P., & Inglehart, R. (2011). *Sacred and Secular: Religion and Politics Worldwide* (2 edition). Cambridge: Cambridge University Press.

Oviedo, L. (2013). Religious Cognition as a Dual-Process: Developing the Model. *Method & Theory in the Study of Religion*, 1–27. doi.org/10.1163/15700682-12341288

Paglieri, F., Borghi, A. M., Colzato, L. S., Hommel, B., & Scorolli, C. (2013). Heaven can wait. How religion modulates temporal discounting. *Psychological Research*, *77*(6), 738–747.

Pennycook, G., Cheyne, J. A., Barr, N., Koehler, D. J., & Fugelsang, J. A. (2014). Cognitive style and religiosity: The role of conflict detection. *Memory & Cognition*, *42*(1), 1–10.

Pennycook, G., Cheyne, J. A., Koehler, D. J., & Fugelsang, J. A. (2013). Belief bias during reasoning among religious believers and skeptics. *Psychonomic Bulletin & Review*, *20*(4), 806–811. doi.org/10.3758/s13423-013-0394-3

Pennycook, G., Cheyne, J. A., Koehler, D. J., & Fugelsang, J. A. (2015). Is the cognitive reflection test a measure of both reflection and intuition? *Behavior Research Methods*, *48*(1), 341–348. doi.org/10.3758/s13428-015-0576-1

Pennycook, G., Cheyne, J. A., Seli, P., Koehler, D. J., & Fugelsang, J. A. (2012). Analytic cognitive style predicts religious and paranormal belief. *Cognition*, *123*(3), 335–346. doi.org/10.1016/j.cognition.2012.03.003

Pennycook, G., Ross, R. M., Koehler, D. J., & Fugelsang, J. A. (2016). Atheists and Agnostics Are More Reflective than Religious Believers: Four Empirical Studies and a Meta-Analysis. *PLOS ONE*, *11*(4), e0153039. doi.org/10.1371/journal.pone.0153039

Rand, D. G. (2016). Cooperation, Fast and Slow: Meta-Analytic Evidence for a Theory of Social Heuristics and Self-Interested Deliberation. *Psychological Science*, 1–15. doi.org/10.1177/0956797616654455

Rappaport, R. A. (1999). *Ritual and Religion in the Making of Humanity* (1 edition). Cambridge; New York: Cambridge University Press.

Razmyar, S., & Reeve, C. L. (2013). Individual differences in religiosity as a function of cognitive ability and cognitive style. *Intelligence*, *41*(5), 667–673. doi.org/10.1016/j.intell.2013.09.003

Seligman, A. B., Weller, R. P., Puett, M. J., & Simon. (2008). *Ritual and Its Consequences: An Essay on the Limits of Sincerity* (1 edition). Oxford ; New York: Oxford University Press.

Shamay-Tsoory, S. G., Aharon-Peretz, J., & Perry, D. (2009). Two systems for empathy: a double dissociation between emotional and cognitive empathy in inferior frontal gyrus versus ventromedial prefrontal lesions. *Brain: A Journal of Neurology*, *132*(Pt 3), 617–627. doi.org/10.1093/brain/awn279

Shaver, J., & Bulbulia, J. (2016). Signaling theory and religion. In N. Clements (Ed.), *Religion: Mental Religion* (pp. 101–117). Farmington Hills: MacMillian Interdisciplinary Handbooks.

Sheikh, H., Ginges, J., Coman, A., & Atran, S. (2012). Religion, group threat and sacred values. *Judgment and Decision Making*, *7*(2), 110–118.

Shenhav, A., Rand, D. G., & Greene, J. D. (2012). Divine intuition: cognitive style influences belief in God. *Journal of Experimental Psychology. General*, *141*(3), 423–428. doi.org/10.1037/a0025391

Sibley, C. G., & Bulbulia, J. (2012). Faith after an Earthquake: A Longitudinal Study of Religion and Perceived Health before and after the 2011 Christchurch New Zealand Earthquake. *PLOS ONE*, *7*(12), e49648. doi.org/10.1371/journal.pone.0049648

Sosis, R., & Alcorta, C. (2003). Signaling, solidarity, and the sacred: The evolution of religious behavior. *Evolutionary Anthropology*, *12*(6), 264–274.

Sosis, R., & Bressler, E. R. (2003). Cooperation and commune longevity: A test of the costly signaling theory of religion. *Cross-Cultural Research*, *37*(2), 211–239.

Stanovich, K. E., & West, R. F. (2008). On the relative independence of thinking biases and cognitive ability. *Journal of Personality and Social Psychology*, *94*(4), 672–695. doi.org/10.1037/0022-3514.94.4.672

Steadman, L. B., & Palmer, C. T. (2010). *Supernatural and Natural Selection: Religion and Evolutionary Success*. Boulder: Routledge.

Talhelm, T., Haidt, J., Oishi, S., Zhang, X., Miao, F. F., & Chen, S. (2015). Liberals Think More Analytically (More "WEIRD") Than Conservatives. *Personality and Social Psychology Bulletin*, *41*(2), 250–267. doi.org/10.1177/0146167214563672

Talhelm, T., Zhang, X., Oishi, S., Shimin, C., Duan, D., Lan, X., & Kitayama, S. (2014). Large-Scale Psychological Differences Within China Explained by Rice Versus Wheat Agriculture. *Science*, *344*(6184), 603–608. doi.org/10.1126/science.1246850

Triandis, H. C., & Suh, E. M. (2002). Cultural influences on personality. *Annual Review of Psychology*, *53*, 133–160. doi.org/10.1146/annurev.psych.53.100901.135200

Twenge, J. M., Exline, J. J., Grubbs, J. B., Sastry, R., & Campbell, W. K. (2015). Generational and Time Period Differences in American Adolescents' Religious Orientation, 1966–2014. *PLOS ONE*, *10*(5), e0121454. doi.org/10.1371/journal.pone.0121454

Van Leeuwen, N. (2014). Religious credence is not factual belief. *Cognition*, *133*(3), 698–715. doi.org/10.1016/j.cognition.2014.08.015

Varnum, M. E. W., Grossmann, I., Kitayama, S., & Nisbett, R. E. (2010). The Origin of Cultural Differences in Cognition: Evidence for the Social Orientation Hypothesis. *Current Directions in Psychological Science*, *19*(1), 9–13. doi.org/10.1177/0963721409359301

Waytz, A., Cacioppo, J., & Epley, N. (2014). Who Sees Human? The Stability and Importance of Individual Differences in Anthropomorphism. *Perspectives on Psychological Science : A Journal of the Association for Psychological Science*, *5*(3), 219–232. doi.org/10.1177/1745691610369336

Witkin, H. A., & Goodenough, D. R. (1977). Field dependence and interpersonal behavior. *Psychological Bulletin*, *84*(4), 661–689. doi.org/10.1037/0033-2909.84.4.661

Xygalatas, D. (2013). What is natural and unnatural about religion and science? *Religion, Brain & Behavior*, *3*(2), 161–164. doi.org/10.1080/2153599X.2013.767043

Zuckerman, M., Silberman, J., & Hall, J. A. (2013). The Relation Between Intelligence and Religiosity A Meta-Analysis and Some Proposed Explanations. *Personality and Social Psychology Review*, *17*(4), 325–354. doi.org/10.1177/1088868313497266