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BRIEF REPORT

Divine Intuition: Cognitive Style Influences Belief in God

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Some have argued that belief in God is intuitive, a natural (by-)product of the human mind given its cognitive structure and social context. If this is true, the extent to which one believes in God may be influenced by one's more general tendency to rely on intuition versus reflection. Three studies support this hypothesis, linking intuitive cognitive style to belief in God. Study 1 showed that individual differences in cognitive style predict belief in God. Participants completed the Cognitive Reflection Test (CRT; Frederick, 2005), which employs math problems that, although easily solvable, have intuitively compelling incorrect answers. Participants who gave more intuitive answers on the CRT reported stronger belief in God. This effect was not mediated by education level, income, political orientation, or other demographic variables. Study 2 showed that the correlation between CRT scores and belief in God also holds when cognitive ability (IQ) and aspects of personality were controlled. Moreover, both studies demonstrated that intuitive CRT responses predicted the degree to which individuals reported having strengthened their belief in God since childhood, but not their familial religiosity during childhood, suggesting a causal relationship between cognitive style and change in belief over time. Study 3 revealed such a causal relationship over the short term: Experimentally inducing a mindset that favors intuition over reflection increases self-reported belief in God.

Keywords: reasoning, religion, religiosity, reflection, atheism

A 2007 survey by the Pew Forum on Religion & Public Life (2008) found that 92% of Americans believe in God, with 71% holding this belief with "absolute certainty" (p. 163). Worldwide, estimates suggest that approximately 88%–93% of the population believes in a God or gods (Zuckerman, 2007). Some have argued that belief in God is intuitive, a natural (by-)product of the human mind given its cognitive structure (Bering, 2011; Bloom, 2005; Boyer, 2001; Guthrie, 1993; Preston & Epley, 2005) and social context (Atran, 2002; Wilson, 2002). More specifically, humans may have a number of early-developing, and possibly innate, cognitive tendencies that support belief in God and other supernatural entities. These include the overattribution of intentional causation and purpose to events (Dennett, 1989; Guthrie, 1993; Kelemen, 2004; Kelemen & Rosset, 2009; Waytz, Cacioppo, & Epley, 2010) and the tendency to posit the existence of disembodied minds (Bering, 2006; Bloom, 2004, 2007; Gray, Gray, & Wegner, 2007). Others have proposed that the belief in God provides explanations that reduce uncertainty (Preston & Epley, 2005, 2009), particularly when unexpected events are personally meaningful (Lupfer, Tolliver, & Jackson, 1996). Moreover, belief in God may reduce anxiety related to such uncertainties (Inzlicht, McGregor, Hirsh, & Nash, 2009; Inzlicht & Tullett, 2010).

Despite the prevalence of belief in God, not all people believe, and believers vary widely in their confidence (Zuckerman, 2007). Some have attempted to explain such variation in terms of cultural transmission, focusing on how individuals' beliefs are affected by their social contexts rather than on the distinctive psychological features of individual believers (Gervais & Henrich, 2010; Gervais, Willard, Norenzayan, & Henrich, in press; Henrich, 2009). While we do not deny that cultural transmission models can explain much of the observed variation, it is also possible that individual differences in cognitive style, independent of social context, play an important role in shaping theological beliefs (cf. Aarnio & Lindeman, 2005, 2007).

One potentially relevant aspect of cognitive style is the extent to which individuals form their judgments intuitively, as opposed to through reflection (Frederick, 2005; Stanovich & West, 1998). By *intuitive* judgments we mean judgments made with little effort based on automatic processes, and by *reflective* judgments we mean judgments in which the judge pauses to critically examine the dictates of her intuition(s), thus allowing for the possibility of a less-intuitive or counterintuitive conclusion. Reflection is typically assumed to be more effortful than intuition, and the two processes have been studied as competing components in a number of conceptually similar dual-process models (Evans, 2008; Kahneman, 2003). Under this general framework, constructs related to

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intuitive thinking include thinking that is reflexive, heuristic, associative, holistic or experiential in nature, whereas reflective thinking has been related to processes such as controlled, systematic, analytic, rule-based, or "rational" thinking. If belief in God is indeed intuitive (consistent with propositions that the underlying beliefs spring to mind automatically or effortlessly), this suggests that the extent to which one believes in God may be influenced by one's tendency to rely on intuition versus reflection. Here we tested this hypothesis. In Study 1, we examined the correlation between individual differences in cognitive style (intuitive vs. reflective) and belief in God. In Study 2, we did the same while controlling for cognitive ability (IQ) and personality. In Study 3, we tested for a causal relationship between cognitive style and belief in God by experimentally inducing mindsets favoring intuition over reflection or vice versa.

Study 1

Method

We recruited participants online ($N = 882$, 64% female; $M_{age} =$ 33 years; $SD = 11.7$; U.S. residents only; excluding participants who failed an attentiveness check; details follow) using Amazon's Mechanical Turk (www.mturk.com; see Buhrmester, Kwang, & Gosling, 2011; Horton, Rand, & Zeckhauser, 2011). Participants completed a demographic survey including questions about belief in God. We employed continuous measures of belief in God (anchored at *confident atheist* and *confident believer*), belief in an immortal soul, familial religiosity during childhood, and change in belief in God since childhood (i.e., the degree to which the participant has become a more/less confident atheist/believer since childhood). We also employed a binary forced-choice question asking whether participants had had an experience that convinced them of God's existence (Kass, Friedman, Leserman, Zuttermeister, & Benson, 1991).

Participants then completed a three-item Cognitive Reflection Test (CRT; Frederick, 2005), which we used to assess cognitive style. The three items are math problems with intuitively attractive 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 response $0.10 springs immediately to mind, but the correct answer is $0.05. Choosing the attractive but incorrect answer signals greater reliance on intuition and less reliance on reflection. The number of correct responses an individual provides has been reliably (positively) associated with scores on standardized measures of reasoning abilities (e.g., SAT and various IQ tests) and measures of thinking style revealed both through self-report (e.g., Cacioppo & Petty's (1982) Need for Cognition Scale) and through decreased bias susceptibility in classic judgment and decision-making tasks (Frederick, 2005; Toplak, West, & Stanovich, in press). We analyzed the number of intuitive responses given by each participant rather than the number of correct responses to avoid classifying nonintuitive incorrect responses (e.g., $0.08 in the example above) as intuitive.

We collected additional demographic/socioeconomic information concerning age, gender, education, income, and political orientation. Participants indicated the highest education level obtained (at present) by themselves and by their biological parents, their immediate family income level during childhood, their own income in the previous year, and how liberal or conservative they are, both socially and fiscally. To maximize the reliability and generalizability of our results, we employed an attentiveness check based on recommendations of Oppenheimer, Meyvis, and Davidenko (2009). Participants completed this attentiveness check after completing the surveys described previously, and their data were excluded from analyses if they failed to follow the directions given. Numbers of responses vary by item due to omitted responses and the fact that not all items were included in an initial version of the survey.

Results and Discussion

Participants who gave more intuitive CRT responses reported more confident belief in God on our continuous atheist–believer scale (Table 1); $F(1, 880) = 28.1$, $p < .0001$, $\beta = .18$ (all tests two-tailed unless otherwise specified; all F tests based on ordinary least-squares multiple regression models with belief in God as dependent variable). This relationship remained significant, $F(1, 725) = 11.3$, $p < .001$, $\beta = .13$, when we controlled for age, gender, education, each parent's education, current income, and family income during childhood. The effect was also robust to additionally controlling for economic and social conservatism, $F(1, 715) = 5.6$, $p = .02$, $\beta = 0.08$, despite the previously observed strong relationship between belief in God and political conservatism (Layman & Carmines, 1997; Malka, Lelkes, Srivastava, Cohen, & Miller, in press). Intuitive responses were also positively correlated with self-reported belief in immortal souls, $r(875) = .14$, $p < .0001$, and with reports of experiences that convinced the participant of God's existence (Figure 1A); $\chi^2(1,$

Table 1
Correlations Between CRT and Measures of Religious Belief (Study 1)

Variable	1	2	3	4	5
1. CRT–intuitive responding	—				
2. Belief in God	$.176^{***}_{882}$	—			
3. Belief in immortal souls	$.141^{***}_{875}$	$.725^{***}_{874}$	—		
4. Familial religiosity	$.048_{743}$	$.375^{***}_{738}$	$.267^{***}_{733}$	—	
5. Belief change since childhood	$.192^{***}_{736}$	$.755^{***}_{738}$	$.548^{***}_{729}$	$.162^{***}_{741}$	—
6. Convinced of God's existence[a]	$.145^{***}_{829}$	$.680^{***}_{826}$	$.572^{***}_{821}$	$.317^{***}_{685}$	$.615^{***}_{680}$

Note. CRT = Cognitive Reflection Test (Frederick, 2005). Pairwise *N*s are provided in subscript.
[a] Values are point biserial correlation coefficients (for dichotomous variable).
$^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$ (two-tailed).

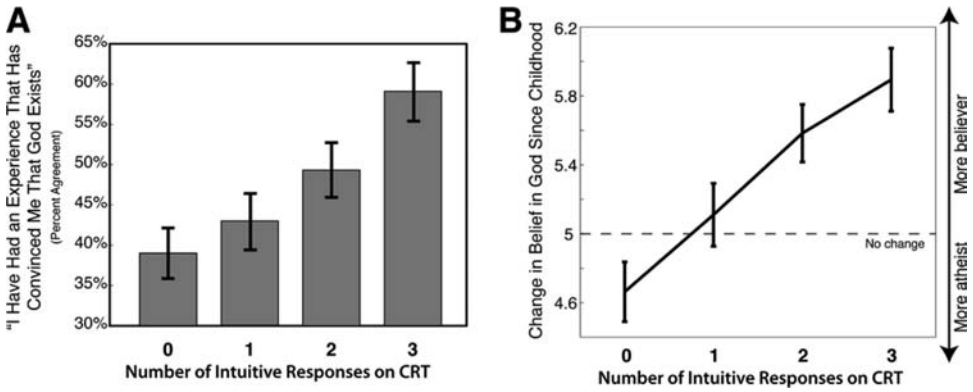

Figure 1. The frequency of intuitive/incorrect responses to Cognitive Reflection Test items was positively correlated with (A) experience-based belief in God and (B) the degree to which belief in God has increased since childhood (Study 1). Error bars reflect standard errors of the mean.

$N = 829$) = 17.6, $p < .0001$, $r_{point\text{-}biserial} = .15$. Participants who provided all intuitive responses were 1.5 times as likely (39% vs 59.1%) to report having had an experience convincing them of God's existence as those who provided none.

In addition, CRT scores were significantly positively correlated with the degree to which belief in God was reported to have changed since childhood, $r(736) = .19$, $p < .0001$, with more intuitive participants reporting becoming more confident believers and more reflective participants reporting becoming more confident atheists (Figure 1B). Post hoc comparisons to the midpoint on this scale (5, indicating *no change*) confirmed that participants who were most reflective (provided no intuitive responses on the CRT) were significantly below that midpoint (Wilcoxon signed-rank test, $p < .05$), suggesting they had on average become more confident atheists. Participants on the opposite extreme (all intuitive responses) were significantly above the midpoint (Wilcoxon signed-rank test, $p < .0001$). Notably, CRT scores were not significantly correlated with reported familial religiosity during childhood, $r(743) = .05$, $p = .19$. This suggests that the correlation between intuitive thinking and belief in God is not simply a reflection of a cultural pattern whereby childhood environments favoring religion also happen to favor intuition. Rather, these data suggest that cognitive style predicts how one's religious beliefs change over time, independent of one's childhood religious influences or lack thereof. This suggests a causal relationship between cognitive style and belief in God, a relationship for which we tested experimentally in Study 3. In Study 2, we examined the relationship between CRT and belief in God while controlling for IQ and selected personality variables.

Study 2

Method

We examined data from an independent neuroscientific and genomic study (see acknowledgments in the author note) employing a range of laboratory and online measures of cognitive ability and personality ($N = 321$, 65% female; $M_{age} = 20.3$ years; $SD = 2.7$). Participants completed an online survey including the CRT and measures of belief in God used in Study 1. Here we focus on the continuous belief in God measure.

Cognitive ability—specifically verbal and nonverbal reasoning abilities—was assessed with two measures: the Shipley Vocabulary Test (Shipley, 1986) and the Wechsler Adult Intelligence Scale Matrix Reasoning test (3rd ed., Wechsler, 1997). These scales provide well-validated estimates of IQ in their respective domains and are close analogs to ones used previously in dissociating cognitive ability from cognitive style (Macpherson & Stanovich, 2007; Toplak et al., in press). Participants were excluded from analysis if they failed to fully respond or reported the use of outside assistance. Personality variables were assessed using the following scales: Barratt Impulsiveness Scale (Patton, Stanford, & Barratt, 1995), NEO Personality Inventory (Costa & McRae, 1992), and the Behavioral Inhibition/Activation Scales (BIS/BAS; Carver & White, 1994). Numbers of responses vary by item due to omitted responses.

Results and Discussion

Replicating previous findings (Toplak, et al., in press; cf. Frederick, 2005), we found that the number of correct responses given on the CRT was correlated with both vocabulary IQ, $r(307) = .27$, $p < .001$, and matrix reasoning IQ, $r(302) = .34$, $p < .001$. We also replicated the results from Study 1, again finding a significant positive association between intuitive responses on the CRT and belief in God, $r(300) = .14$, one-tailed $p < .01$. Moreover, we found that this relationship held, $F(1, 270) = 5.0$, one-tailed $p = .01$, $\beta = 0.13$, while including controls for age, gender, and all measures of cognitive ability and personality described earlier in a multiple regression model with belief in God as a dependent variable (see Table 2). Thus the relationship between CRT and belief in God cannot be explained as an effect of cognitive ability per se (Stanovich, 2009; Stanovich & West, 2008). We also replicated the positive association between CRT and our binary measure of belief in God, $\chi^2(1, N = 289) = 3.64$, one-tailed $p < .05$, $r_{point\text{-}biserial} = .11$, and with change in belief in God since childhood, $r(300) = .10$, one-tailed $p < .05$, while still not finding an association with familial religiosity, $r(312) = -.01$, *ns*.

Table 2
Correlations Between CRT, Religious Belief, IQ, and Personality Variables (Study 2)

Variable	1	2	3	4	5	6
1. CRT–intuitive responding	—					
2. CRT–correct responding	−.754***	—				
3. IQ–matrix reasoning	−.272***	.337***	—			
4. IQ–vocabulary	−.213***	.266***	.293***	—		
5. Belief in God	.135* [0.138*]	−.178** [−0.166**]	−.047	−.081	—	
6. Openness to experience	−.011	.035	.033	.214***	−.322***	—
7. Extraversion	.023	−.106	.003	−.174**	.120*	.105

Note. CRT = Cognitive Reflection Test (Frederick, 2005). For brevity, we include here only personality variables that continue to predict belief in God when all other variables are included. Partial correlations given in brackets reflect first-order correlations between CRT and belief in God when controlling for IQ and personality variables shown. Pairwise *N*s vary from 299 to 314 individuals.
* $p < .05$. ** $p < .01$. *** $p < .001$ (two-tailed).

Study 3

Method

Participants were recruited online *(N* = 373; 63% female; M_{age} = 31 years; *SD* = 11.5; U.S. residents only; excluding participants based on partial task completion). As our experimental manipulation, we induced participants to favor intuition over reflection and vice versa using a writing exercise. We employed a 2 × 2 between-subjects design in which participants were randomly assigned to write about a situation in which they adopted one of two cognitive approaches (intuitive vs. reflective) and in which that approach led to an outcome that was either positive or negative. Situations involving intuitive/reflective approaches were respectively defined as ones in which the participant followed his or her "intuition/first instinct" or ones in which the participant employed a strategy of "carefully reasoning through a situation." For example, participants assigned to the intuition-positive condition responded to the following prompt (italicized portions varied by condition): "Please write a paragraph (approximately 8–10 sentences) describing a time *your intuition/first instinct* led you in the *right* direction and resulted in a *good* outcome." Participants were excluded if they failed to write at least eight sentences. Participants then completed a demographic questionnaire including the aforementioned question about experienced-based belief in God and a continuous measure of strength of belief in God. We hypothesized that inducing participants to favor intuition over reflection would increase self-reported belief in God.

Results and Discussion

As predicted, we found that participants who wrote about an experience that vindicated intuition (intuition-positive or reflection-negative) reported stronger belief in God, compared with participants who wrote about an experience that vindicated reflection (intuition-negative or reflection-positive). This was determined by a 2 × 2 between-subjects analysis of variance with self-reported belief in God as a dependent variable. Neither factor exhibited a main effect on reported belief in God—main effect of thinking style: $F(1, 369) = 0.41$, $p = .52$; main effect of outcome valence: $F(1, 369) = 0.10$, $p = .76$. However, as suggested earlier, we did observe the predicted crossover interaction between the recollected cognitive approach and the valence of the recollected outcome (Figure 2); $F(1, 369) = 4.5$, $p = .035$; Cohen's $d = 0.22$. Likewise, we observed the same crossover interaction for our binary reports of having been convinced of God's existence (Figure 2); logistic regression $\chi^2(1, N = 373) = 9.8$, $p = .002$, Cohen's $d = 0.33$; main effect χ^2s < 0.55).

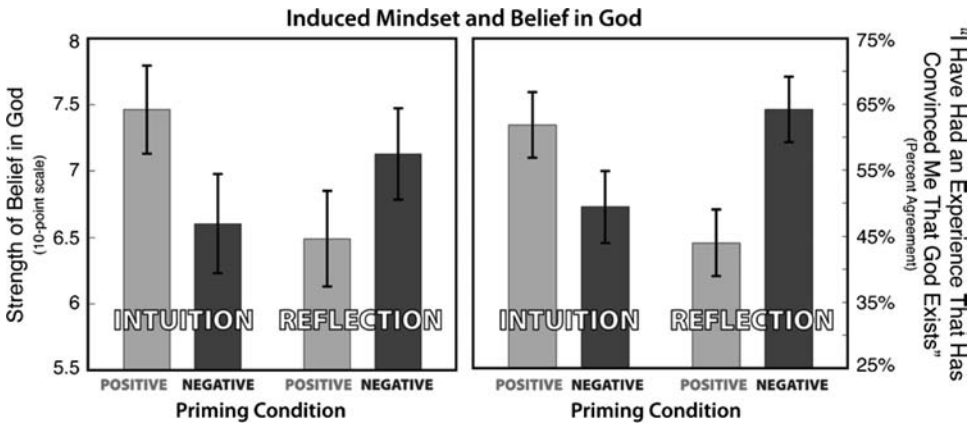

Figure 2. Recollecting the past efficacy of intuition, or inefficacy or reflection, increases reported belief in God (Study 3). Error bars reflect standard errors of the mean.

General Discussion

Three studies—two correlational, one experimental—showed that intuitive thinking predicts belief in God. Study 1 showed that people who exhibit thinking styles that are more intuitive and less reflective are more likely to believe in God and to believe in God with greater confidence. These results held while variables related to education, socioeconomic status, and political orientation were controlled. Study 2 showed that these results held while cognitive ability and personality were controlled. In both studies, we found that cognitive style predicted self-reported changes in belief since childhood but was uncorrelated with religious influences during childhood. This suggests that cognitive style is not only predictive of one's beliefs but also a critical factor in the evolution of one's beliefs over time. Consistent with this hypothesis, we demonstrated a causal relationship between (induced) cognitive style and belief in God in Study 3, showing that the induction of mindsets favoring intuition (or opposing reflection) significantly increased self-reported belief in God.

The observed relationship between reliance on intuition and belief in God may stem from multiple sources. First, as noted earlier, belief in God may be intuitive for reasons related to more general features of human cognition that give rise to tendencies toward dualism (Bering, 2006, 2011), anthropomorphism (Epley, Waytz, & Cacioppo, 2007; Waytz et al., 2010), and promiscuous teleology (Kelemen & Rosset, 2009). From a dual-process perspective, these processes are hypothesized to produce automatic judgments that can be overridden through the engagement of controlled or reflective processes, with reflective processes enabling or supporting judgments based on less intuitive explanations. Thus, if belief in God is supported by these intuitive social–cognitive tendencies, we have a straightforward explanation for why a cognitive style favoring intuition over reflection would lead to greater belief in God. It is important to note that while intuitive CRT responses are incorrect, it does not follow that reliance on intuition is always irrational or unjustified.

Second, just as the belief in God may be the outcome of intuitive belief-formation processes, it may also play a supporting role in such processes. A belief in God may enable a general class of easily accessible explanations that make sense of otherwise mysterious phenomena by appeal to God's varied and extensive causal powers (Lupfer et al., 1996), explanations that thus have a heuristic quality. Research suggests that individuals with more intuitive cognitive styles are more likely to rely on heuristics (Frederick, 2005; Stanovich & West, 1998; Toplak, et al., in press). Thus, individuals who are drawn to intuitive explanations may come to believe in God or strengthen their existing beliefs in God, because believing in God supports intuitive explanations of diverse phenomena (Inzlicht & Tullett, 2010; Preston & Epley, 2005, 2009). What's more, the belief in God may give rise to a feedback cycle whereby satisfying explanatory appeals to God reinforce the intuitive cognitive style that originally favored the belief in God.

We note that the foregoing theories are compatible with other theories that would explain variability in belief in God in cultural terms (e.g., Gervais, et al., in press; Henrich, 2009). First, cultures may vary in the extent to which they promote intuitive versus reflective cognitive styles. Second, even in the absence of cultural differences in cognitive style, cultures may vary in the extent to which the belief in God is intuitive or explanatorily useful, if only because of variation in how commonly the belief is held. A framework that incorporates individual differences in cognitive style may help illuminate the causes of cultural variability in belief in God, for example the high rates of atheism in Scandinavian countries (Zuckerman, 2007).

In sum, the present results are noteworthy because they help explain a profoundly important and elusive social phenomenon in terms of more basic cognitive tendencies, ones with observable effects across a wide range of psychological domains (Stanovich, Toplak, & West, 2008; Stanovich & West, 1998). How people think—or fail to think—about the prices of bats and balls is reflected in their thinking, and ultimately their convictions, about the metaphysical order of the universe.

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