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Supplementary Materials

www.sciencemag.org/cgi/content/full/science.1219328/DC1
Materials and Methods
Figs. S1 to S20
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Analytic Thinking Promotes Religious Disbelief

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Scientific interest in the cognitive underpinnings of religious belief has grown in recent years. However, to date, little experimental research has focused on the cognitive processes that may promote religious disbelief. The present studies apply a dual-process model of cognitive processing to this problem, testing the hypothesis that analytic processing promotes religious disbelief. Individual differences in the tendency to analytically override initially flawed intuitions in reasoning were associated with increased religious disbelief. Four additional experiments provided evidence of causation, as subtle manipulations known to trigger analytic processing also encouraged religious disbelief. Combined, these studies indicate that analytic processing is one factor (presumably among several) that promotes religious disbelief. Although these findings do not speak directly to conversations about the inherent rationality, value, or truth of religious beliefs, they illuminate one cognitive factor that may influence such discussions.

Although most people fervently believe in God or gods, there are nonetheless hundreds of millions of nonbelievers worldwide (*1*), and belief and disbelief fluctuate across situations and over time (*2*). Religious belief and disbelief are likely complex, multidetermined, psychologically and culturally shaped phenomena, yet to date little experimental research has explored the specific cognitive underpinnings of religious disbelief (*3*, *4*). Here we begin to address this important gap in the literature by applying a dual-process cognitive framework, which predicts that analytic thinking strategies might be one potent source of religious disbelief.

According to dual-process theories of human thinking (*5*, *6*), there are two distinct but interacting systems for information processing. One (System 1) relies upon frugal heuristics yielding intuitive responses, while the other (System 2) relies upon deliberative analytic processing. Although both systems can at times run in parallel (*7*), System 2 often overrides the input of system 1 when analytic tendencies are activated and cognitive resources are available. Dual-process theories have been successfully applied to diverse domains and phenomena across a wide range of fields (*5*, *6*, *8*, *9*).

Available evidence and theory suggest that a converging suite of intuitive cognitive processes facilitate and support belief in supernatural agents, which is a central aspect of religious beliefs worldwide (*10*–*13*). These processes include intuitions about teleology (*14*), mind-body dualism (*13*), psychological immortality (*15*), and mind perception (*16*, *17*). Religious belief therefore bears many hallmarks of System 1 processing.

If religious belief emerges through a converging set of intuitive processes, and analytic processing can inhibit or override intuitive processing, then analytic thinking may undermine intuitive support for religious belief. Thus, a dual-process account predicts that analytic thinking may be one source of religious disbelief. Recent evidence is consistent with this hypothesis (*4*), finding that individual differences in reliance on intuitive thinking predict greater belief in God, even after controlling for relevant socio-demographic variables. However, evidence for causality remains rare (*4*). Here we report five studies that present empirical tests of this hypothesis.

We adopted three complementary strategies to test for robustness and generality. First, study 1 tested whether individual differences in the tendency to engage analytic thinking are associated with reduced religious belief. Second, studies 2 to 5 established causation by testing whether various experimental manipulations of analytic processing, induced subtly and implicitly, encourage religious disbelief. These manipulations of analytic processing included visual priming, implicit priming, and cognitive disfluency (*18*, *19*). Third, across studies, we assessed religious belief using diverse measures that focused primarily on belief in and commitment to religiously endorsed supernatural agents. Samples consisted of participants from diverse cultural and religious backgrounds (*20*).

Study 1 was a correlational study with Canadian undergraduates (N = 179). We correlated performance on an analytic thinking task with three related, but distinct, measures of religious belief. The analytic thinking task (*6*) contains three problems that require participants to analytically override an initial intuition. This task was designed to specifically measure analytic processing because an intuitive reading of each problem invites a quick and easy, yet incorrect, response that must be analytically overridden (Table 1). Furthermore, experimental manipulations known to induce analytic processing

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