How is analytical thinking related to religious belief? A test of three theoretical models

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Abstract

The replicability and importance of the correlation between cognitive style and religious belief has been debated. Moreover, the literature has not examined distinct psychological accounts of this relationship. We tested the replicability of the correlation ($N = 5284$; students and broader samples of Canadians, Americans and Indians); while testing three accounts of how cognitive style comes to be related to belief in God, karma, witchcraft, and to the belief that religion is necessary for morality. The first, *the dual process model*, posits that analytical thinking is recruited in overriding intuitions related to supernatural beliefs. The second, *the expressive rationality model*, posits that analytical thinking is recruited in supporting already-held beliefs in an identity-protective manner. And the third, *the counter-normativity rationality model*, posits that analytical thinking is recruited to question beliefs supported by prevailing cultural norms. In Study 2, we tested the replicability of our results in a re-analysis of published data. The association between analytic thinking style and beliefs was replicated. We conclude that whereas the counter-normativity rationality model was contradicted by the data, both the dual process and expressive rationality models received varying degrees of empirical support, but neither model fully accounted for all the patterns in the data.

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Introduction

What accounts for the emergence of religious beliefs in human minds? This question has long motivated research, and in recent years, a growing literature of interdisciplinary research offers explanations for the ubiquity of religious beliefs in terms of underlying motivational, cultural, and cognitive processes (e.g., Järnefelt, Canfield, & Kelemen, 2015; Kay, Gaucher, McGregor, & Nash, 2010; Norenzayan, 2016; Norenzayan et al., 2016). One of the key insights regarding the cognitive foundations of religious belief is the hypothesis that religious beliefs are partly rooted in interrelated intuitive cognitive biases, such as, mind-body dualism, teleology, and anthropomorphism (e.g., Atran & Norenzayan, 2004; Barrett, 2007; Boyer, 2001). In support of this view, evidence is accumulating that these cognitive biases, working together with cultural learning processes, contribute to the proclivity for religious and supernatural beliefs (e.g., Banerjee & Bloom, 2013; Järnefelt et al., 2015; Lindeman et al., 2015; Purzycki, 2013; Willard et al., 2020; Willard & Cingl, 2017; Willard & Norenzayan, 2013; for a recent review, see White et al., 2021).

If religious beliefs are rooted in intuitively supported cognitive faculties, and analytical thinking can suppress or override intuitions relevant to supernatural thinking (e.g., Kelemen, Rottman, & Seston, 2013), it follows that the strength of religious belief should be negatively related to analytical thinking. Extensive correlational research supports this inference and demonstrates that tendencies for overcoming the pull of one's intuitions is associated with lower religious belief (e.g., Study 1, Gervais & Norenzayan, 2012; Pennycook, Cheyne, Seli, Koehler, & Fugelsang, 2012; Shenhav et al., 2012). The most common of these findings are centered around a single measure of analytical thinking - the 'Cognitive Reflections Test' (CRT; Frederick, 2005). In the CRT, participants are presented with a series of math puzzles (e.g., "If it takes 5 machines

64   5 minutes to make 5 widgets, how many minutes would it take 100 machines to make 100

65   widgets?") to which there is an intuitively compelling but wrong answer (i.e., 100 minutes), and a

66   correct answer (i.e., 5 minutes). Although simple in its design, this measure is reported to reliably

67   differentiate between those who tend to go with their 'gut' response and those who are willing to

68   reflect and override their 'gut' response (i.e., reason analytically) about the questions - even over

69   time and repeated tests, and controlling for cognitive ability (Stagnaro, Pennycook, & Rand, 2018).

70   And in support of the hypothesis that religious belief is related to intuitive thinking styles, a meta-

71   analysis of 31 studies consisting of mostly North American participants ($N = 15078$), found that

72   CRT scores were inversely related to religious beliefs ($r = -.18$, $.95CI = [-.21, -.16]$; Pennycook,

73   Ross, Koehler, & Fugelsang, 2016).

74   *The dual-process model of religious belief*

75   This correlational evidence forms the core of what can be called the *dual process model of*

76   *religious belief* (e.g., Norenzayan & Gervais, 2013; Pennycook, Ross, et al., 2016; Shenhav et al.,

77   2012). In this perspective, the human tendency for religious thinking emerges from the everyday

78   functioning of intuitive cognitive systems, whose output is constrained by careful, effortful

79   reasoning (for this distinction, see Evans & Stanovich, 2013). In its strong version, this model

80   proposes that deliberation and questioning of human intuitions should consistently lead to the

81   rejection of belief. Thus, a core prediction of this model is that, all else being equal, it should be

82   more common that individuals reason their way out of their religious beliefs than it is for

83   individuals to reason their way into them.

84   However, one need not look deeply into the theological and philosophical record of treatises

85   on religious belief to realize that many a religious scholar have deeply reasoned their way into

86   (and/or in maintaining) their religious beliefs. Dating back to the 4th and 5th century, the careful and

87   deeply analytical works of St. Augustine of Hippo, for example, remain a cornerstone of Christian

88   philosophically-reasoned arguments *for* believing in God (e.g., see De Cruz & De Smedt, 2017[1]).

89   This raises an important question as to whether there are reliably detectable circumstances under

90   which analytical thinking can promote religious belief rather than dampen it.

91   *The expressive rationality model of religious belief*

92   Much like Augustine – who spent a great deal of time coming up with reasoned arguments

93   defending his conversion to Christianity (Jacoby, 2017) – individuals can be deeply motivated to

94   justify their previously-held commitments and beliefs and sometimes go to incredible lengths to

95   confirm their preconceptions (Nickerson, 1998). Although overriding one's intuitions might be a

96   good way to reason through all the available evidence, an alternative account suggests that

97   analytical thinkers might be even better than intuitive thinkers at finding ways to confirm their

98   biases *regardless* of the evidence. Indeed, the *expressive rationality model* holds that individuals

99   deploy their analytical thinking to justify previously-held beliefs and that they do so most

100   dramatically when these beliefs are strong indicators of their social affiliations (Kahan, 2017).

101   That is, rationality can be deployed to confirm already held beliefs as an identity-protective

102   strategy. For example, Kahan & Stanovich (2016) demonstrated that belief in evolution in religious

103   and non-religious Americans is most different (i.e., polarized) amongst analytical thinkers from

104   either camp. In this view, while analytical thinking might lead nonreligious individuals to question

105   their core intuitions that the design of nature implies supernatural agency (Kelemen, 2004;

106   Kelemen et al., 2013; Rottman et al., 2016), the same analytical tendency leads religious

107   individuals to endorse supernatural agency with even greater conviction. Indeed, already-devoted

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[1] Moreover, the entire philosophical tradition of natural theology has aimed at providing demonstrative arguments to prove God's existence and thus license great religious belief in the face of skepticism (Chignell & Pereboom, 2020).

108   analytical thinkers – like Augustine – might prove to be the deepest believers, or at the very least

109   no more or less believing than their intuitive and devoted counterparts. No work – yet – has directly

110   tested whether and how this model applies to belief in God.

111   *The counter-normative rationality model*

112   Moreover, an important limitation of the bulk of the research on the relationship between

113   analytical thinking and religious belief is that it has been conducted with mostly North American

114   and specifically majority Christian samples (with some important exceptions; e.g., studies of

115   Turkish Muslims found results of similar size and magnitude to those reported from American

116   samples; Yilmaz & Saribay, 2016). To test the dual process model of religious belief cross-

117   culturally, Gervais et al. (2017) deployed the CRT and a measure of belief in God in a religiously-

118   diverse sample from 13 populations (e.g., Buddhists in Singapore, Hindus in Mauritius, Muslims

119   in the United Arab Emirates, and in secularized nations such as the Czech Republic). In aggregate,

120   Gervais et al. (2017) observed a relationship between analytical thinking and belief in God in the

121   direction predicted by the dual process model of belief; however, the average magnitude of the

122   effect was very small (i.e., an estimated average 2-point decrease on a 100-point scale of belief in

123   God with each additional correct answer on the CRT). While providing some cross-cultural

124   support for the dual process model of religious belief, the observed relationship between CRT and

125   belief was also found to be more strongly negative in more religious countries, and in a few places

126   – such as the UK, the observed relationship was reversed.

127   From this, Gervais et al. (2017) proposed a third possible account, which can be called the

128   *counter-normative rationality model*. This model says that the *contents* of our intuitions are not

129   just the output of evolved cognitive systems but also (at least in part) the output of culturally-

130   learned norms (Henrich, 2015). And thus, it may be that the observed effect of analytical thinking

131   on religious beliefs is an expression of questioning the prevailing norm of religiosity in majority-

132   religiously affiliated cultures (i.e., where most of this research is conducted). In highly secularized

133   cultural contexts – questioning the norms might predict higher religious belief. In line with this,

134   Gervais et al. (2017) found that analytical thinking was weakly but *positively* related to belief in

135   God in a sample of students in the United Kingdom. However, Stagnaro, Ross, Pennycook, &

136   Rand (2019), failed to replicate Gervais et al.'s positive association – in fact, they found the

137   typically sized negative correlation between CRT and belief in God in the United Kingdom in a

138   larger and broader sample of British adults. This additional data, however, does not necessarily

139   rule out the counter-normative rationality's account of the fluctuating magnitude of the

140   relationship as a function of varying levels of normative religiosity.

141   *Testing the three models*

142   The growing record of a robust negative correlation between analytical thinking and

143   religious belief has so far not adequately investigated the cognitive processes that account for this

144   relationship. Moreover, given recent failures to replicate the *causal* (i.e., experimental) effect of

145   induced analytical thinking on disbelief in God in high powered samples and preregistered designs

146   (Sanchez et al., 2017 and Camerer et al., 2018 failing to replicate Gervais & Norenzayan, 2012,

147   Study 2; and Saribay et al., 2020 failing to replicate Shenhav et al., 2012) there is all the more

148   reason to aim for a better theoretical understanding of the underlying psychological processes and

149   moderators of the association between cognitive style and religious beliefs. Based on these

150   considerations, Study 1 had several goals.

151   First, we tested the dual process model of religious belief by assessing the replicability and

152   magnitude of the correlation between belief in God and cognitive style (measured in two

153   complementary ways – tendencies to think analytically and one's self-reported faith in intuition).

154   In addition, and going beyond existing research, we examined whether the effect of cognitive style

155   extends to other types of religious and supernatural beliefs (i.e., the belief that religion is necessary

156   for morality, belief in karma, and belief in witchcraft). This is important, because the dual process

157   model predicts that all types of supernatural beliefs will be negatively correlated with analytic

158   cognitive style, whereas the expressive rationality and counter-normative rationality models do

159   not.

160   Second, we tested predictions from the expressive rationality model by examining the

161   interaction between cognitive style and political orientation in predicting varied beliefs.

162   Specifically, this model predicts that the relationship between analytical thinking and *identity-*

163   *relevant beliefs* such as belief in God and the belief that religion is necessary for morality will be

164   moderated by political orientation. These beliefs are both considered a hallmark of political

165   conservatism in North America (e.g., Haidt, 2012) and are more strongly endorsed by the

166   ideological right in many countries (Pew Research Center, 2020). The expressive rationality model

167   predicts that analytical thinking will be *positively* associated with these beliefs amongst politically

168   conservative individuals, but *negatively* associated with these beliefs among politically liberal

169   individuals – as analytical thinking is employed to strengthen existing commitments to identity-

170   relevant beliefs. This interaction thus resulting in widening differences in belief between liberals

171   and conservatives with increasing tendencies for analytical thinking. Otherwise, the expressive

172   rationality model really makes no clear predictions as to whether the relationship between

173   analytical thinking and *non-identity-relevant* supernatural beliefs (e.g., karma/witchcraft beliefs

174   among North Americans) will be similarly moderated by political orientation. Indeed, if the

175   relationship between analytical thinking and supernatural beliefs results *entirely* from the

176   dynamics of identity-protective motivated reasoning as would be proposed by a strong version of

177 the expressive rationality model, then analytical thinking would be unrelated to non-identity-

178 relevant supernatural beliefs. We test for all these possibilities in Study 1.

179   Third, we tested the counter-normative rationality model in a novel way, by examining the

180 direction of the correlation between cognitive style and belief in *counter-normative* supernatural

181 beliefs - in karma and in witchcraft in samples where these beliefs have markedly different

182 normative status. Specifically, we tested the predictions of counter-normative rationality model

183 that: (1) among majority Hindu Indians (where karmic belief is more normative[2]) analytical

184 thinking should be *negatively* related to karma beliefs; but, (2) among North Americans (where

185 karmic belief is less normative), analytical thinking should be *positively* related to karma beliefs.

186 Witchcraft beliefs, however, being less normative in both samples, are predicted by this model to

187 be *positively* (or less strongly negatively) related to analytical thinking. In sharp contrast, the dual

188 process model predicts that these associations will be consistently *negative.*

189   Finally, in Study 2, we tested the replicability of the some of the focal results obtained in

190 Study 1 in data that was not collected by our team, through a re-analysis of two previously

191 published and openly-accessible datasets (Gervais et al., 2017; Stagnaro et al., 2019).

192   In both studies, the hypotheses are compared and contrasted in a Bayesian framework that

193 enabled us to determine the relative probabilities with which the data provide evidence in support

194 (or against) the specific predictions of these three models. In doing so, we (1) provide further tests

195 of the replicability of the association between analytical thinking and religious beliefs, in terms of

196 its magnitude and association in previously studied and understudied cultural contexts, and (2)

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[2] The Indian participants in Study 1 were roughly 75% Hindu (the rest of participants were mostly Christian or Muslim); and although karmic beliefs are more strongly endorsed by Indian Hindus than other Indian subpopulations, they are still commonly endorsed by Indian Christians and Muslims (White, Norenzayan &Schaller, 2019).

197   also move beyond documenting the association, to test three distinct psychological accounts of the

198   association between cognitive style and religious beliefs.

<p style="text-align:center">Study 1</p>

200   In Study 1, we tested the predictions of three psychological accounts of the relationship

201   between analytical thinking and religious beliefs in four samples (undergraduate students at a

202   Canadian university, and broader non-student samples of Canadians, Americans, and Indians).

203   The dual process model of belief predicts that analytical thinking (i.e., greater cognitive

204   reflection and less faith in intuition) will be negatively related to all forms of supernatural beliefs

205   across all samples. The expressive rationality model of belief predicts that (1) the relationship

206   between analytical thinking and identity-relevant supernatural beliefs (e.g., belief in God, and

207   belief that religion is necessary for morality) will be moderated by political orientation (i.e., such

208   that the association is negative for liberals and positive for conservatives), (2) that political

209   orientation will not moderate these associations in the case of non-identity relevant supernatural

210   beliefs and/or that analytical cognitive style will be unrelated to endorsement of non-identity

211   relevant beliefs. The counter-normative rationality model, on the other hand, predicts that

212   analytical thinking will be *positively* related to endorsement of counter-normative supernatural

213   beliefs.

<p style="text-align:center">Methods</p>

215   **Sample**

216   To test these predictions, we identified datasets that we had previously collected which

217   included the relevant variables to examine the association between cognitive style and varied

218   religious/supernatural beliefs. A total of 9 datasets were identified ($N = 5284$; see Table S1 for

219   sample details of each dataset). Participants were: undergraduate students sampled from the

220   University of British Columbia Psychology Department's Human Subject Pool; a national sample

221   of Canadians; two samples of majority Hindu Indians (one sample recruited from Amazon's

222   Mechanical Turk and a broader national sample recruited by an online market research company),

223   and a broad sample of majority Christian Americans (recruited from Amazon's Mechanical Turk).

224   All measures, data analytic choices, and data exclusions are fully disclosed in this article; and

225   materials, data and analysis scripts are available at https://osf.io/hpw38/.

226   **Materials**

227   The presence/absence of the focal measures in each data set are presented in Table S2.

228   Summary statistics of all focal measures are presented in Table S3 and correlations by sample in

229   Table S4, and distributions of responses plotted in Figure S1.

230   *Measures of belief*

231   Across the datasets in Study 1, belief in God was measured on different response scales (5-

232   and 7-point scales). To allow for comparison across response scales, belief in God was linearly

233   recoded to a 0 (minimum belief) to 100 (maximum belief) scale. This type of rescaling was

234   beneficial for two reasons. First, it had the benefit of making all effect size estimates across Study

235   1 and Study 2 directly comparable (as all examined datasets now employed a 0 to 100 response

236   scale to measure belief endorsement). Second, alternative rescaling strategies like standardizing

237   responses within datasets would cancel out between dataset mean differences, effectively

238   eliminating the benefits of partial pooling that result from generating estimates and predictions

239   using mixed-effect regression models as we do in our analyses.

240   In four of the datasets, the belief that religion is necessary for morality was assessed. This

241   5-item scale asked participants to rate the extent to which they agree with items such as, "Generally

242   speaking, people need religion to be morally good", and "An individual who does not believe in

243 God cannot lead a moral life" (α= .96; full scale included in supplemental, Table S5). Across

244 datasets, responses were coded on varying response scales (6- and 7- point scales). As above,

245 responses were recoded on to a 100-point scale. The belief that religion is necessary for morality

246 is prevalent across cultures (Pew Resarch Center, 2020) and known to be particularly polarizing

247 between North American conservatives and liberals (Pew Research Center, 2014).

248 Belief in karma was assessed using either the 16-item or 4-item version of a karmic belief

249 scale (White, Norenzayan, & Schaller, 2019). This scale assesses belief in karma with items such

250 as, "Karma is a force that influences the events that happen in my life", and "When people

251 experience good fortune, they have brought it upon themselves by behaviour in a past life". This

252 scale showed good internal consistency across samples (αs = .90-.93).

253 Belief in witchcraft was assessed using a 7-item scale (αs= .84-.91 across samples; e.g.,

254 "People can harm others with supernatural power, e.g., by cursing or casting spells on people",

255 and "If other people have had bad thoughts towards you, it can make you sick"). These items have

256 some overlap with (but are not identical to) previously examined measures of paranormal beliefs

257 that have been reported to be negatively correlated with analytical thinking (Pennycook et al.,

258 2012).

259 *Measures of cognitive style*

260 The Cognitive Reflection Test (Frederick, 2005) is a three-item measure (α = .75 across

261 samples) designed to assess capacities and general tendencies for inhibiting intuitive responses

262 and thinking more analytically. The test's three questions have an intuitively compelling (but

263 wrong) answer (e.g., "If a bat and a ball cost \$1.10, and the bat costs \$1.00 more than the ball, how

264 much does the ball cost?"). Individuals who tend *not* to reflect often give the answer "10 cents"

265 (the modal response). Individuals who do make the effort to reflect are more likely to arrive at the

266 correct answer, "5 cents". Correct responses are summed, and the total score serves as an index of

267 analytical thinking. This test is commonly used in assessing the association between analytical

268 thinking and religious belief (e.g., Pennycook, Ross, Koehler, & Fugelsang, 2016).

269   The Faith in Intuition subscale of the Rational Experiential Inventory (Pacini & Epstein,

270 1999) was included in these datasets as a measure of intuitive cognitive style. This 20-item self-

271 report measure (α = .96) asks participants to indicate their agreement with a series of statements

272 reflecting an explicit preference for *not* overthinking and trusting in one's intuitions (e.g., "I like

273 to rely on my intuitive impressions", and "I believe in trusting my hunches"). The inclusion of this

274 measure of intuitive thinking style allowed us to test the robustness of the hypothesized association

275 between cognitive style and religious belief. Responses were on varied response scales (5- and 7-

276 point scales) and were first rescaled on to a 0 to 1 scale for comparison and then *reverse* scored

277 such that higher scores indicated *less* faith in intuition to ease comparisons between this measure

278 and the CRT.

279 *Political Orientation*

280   Political orientation was measured across all datasets with a single item that asked

281 participants to indicate whether they were very liberal (1) to very conservative (7) on a Likert-

282 scale.

283   **Results**

284 *Analytical Strategy and Predictions*

285   Our analytical strategy was not pre-registered. As such, our focal regressions include only

286 variables that are directly relevant to testing the predictions of the dual process, expressive

287 rationality and counter-normative rationality models of religious beliefs (i.e., measures of belief,

288 political orientation, and identifiers for sample and dataset). The publicly available datasets include

289   additional demographic variables (age and sex); and we note that the pattern of results reported

290   here remain unchanged when demographic controls are added to the models. We actively

291   encourage those interested in considering the relationship between these additional variables and

292   our focal predictors to make use of our compiled data.

293   All analyses were conducted in *R* (R Core Team, 2017). Bayesian mixed-effect linear

294   regression models were executed using the *brms* (Bürkner, 2017) compiler for *RStan* (Stan

295   Development Team, 2017). Model summary tables were generated with *sjPlot* (Lüdecke, 2018).

296   Beliefs were modelled with a random-intercept for dataset (unless data was only available from a

297   single source, in which case no random-intercept was included). Priors were set as weakly-

298   regularizing: fixed effects ~ Normal(0,1); and for variance components for varying effects ~

299   Exponential(1); which help to minimize overfitting the model to the data in the estimation process

300   (McElreath, 2015, p. 393; Purzycki, Pisor, et al., 2018).

301   All predictions were tested in models that took one of two forms. The first examined the

302   main effect of analytical thinking on beliefs within each sample by including an interaction term

303   between sample and the measure of analytical thinking (CRT or reverse coded faith in intuition).

304   The second tested for the moderating effect of political orientation (1 = very liberal, 7 = very

305   conservative; standardized) on the relationship between analytical thinking on belief in each

306   sample. The four belief outcomes (belief in God, belief that religion is necessary for morality,

307   belief in karma and belief in witchcraft), two measures of cognitive style (CRT and faith in

308   intuition), and two model forms resulted in 14 model specifications all of which were run for 2000

309   iterations (1000 warmup) across four sampling chains that converged across all specifications ($\hat{R}s$

310   < 1.01). For interested readers, the summaries of all 14 regressions are presented in the

311   supplemental materials: belief in God (CRT - Table S6; Intuition - Table S7), belief that religion

312   is necessary for morality (Table S8), belief in karma (CRT - Table S9; Intuition - Table S10) and

313   belief in witchcraft (CRT - Table S11; Intuition - Table S12). In the main text, we summarize the

314   results of these models by extrapolating and making predictions from the posterior distributions of

315   the estimated contributions of analytical thinking to belief.

316   In what follows, the reported regression coefficients are the means of the posterior

317   distributions for each parameter estimated by the Bayesian models and can be interpreted as one

318   would a regression coefficient in a frequentist framework. The uncertainty around these point

319   estimates are described by the highest density intervals (95% HDIs). These intervals indicate the

320   range of values that make up the 95% most credible estimates of the parameter in the posterior

321   distribution. By more closely examining the posterior distributions of the model estimated

322   associations of analytical cognitive style and supernatural beliefs in varied contexts (between

323   samples; and within samples in more or less politically conservative individuals), we assessed

324   the extent to which these data support the predictions of the dual process, expressive rationality,

325   and counter-normativity rationality models of belief. Put simply and to summarize:

326   1. The dual process model parsimoniously predicts that all associations between analytical

327   cognitive style and supernatural beliefs will be negative.

328   2. The expressive rationality model predicts that:

329   a. The association between analytical cognitive style and identity-relevant

330   supernatural beliefs (i.e., belief in God and belief that religion is necessary for

331   morality) will be moderated by political orientation such that the association will

332   be positive in more conservative individuals and negative in more liberal

333   individuals.

334   b.   The association between analytical cognitive style and *non*-identity relevant

335   supernatural beliefs (i.e., belief in karma and belief in witchcraft among North

336   Americans) will not be moderated by political orientation - and that the main

337   effect of analytical cognitive style on these beliefs will be largely zero.

338   3.   The counter-normative rationality model predicts a positive association between

339   analytical thinking and supernatural beliefs that are counter-normative (e.g., belief in

340   karma/witchcraft in the North American samples).

341 *Bayesian regression model evaluations*

342   As a first step to assessing which of these models better accounts for the data - we

343 evaluated our regressions with the *loo* package to estimate out-of-sample prediction accuracy

344 using 'leave-one-out' (loo) cross-validation (Vehtari et al., 2017). The results (see Table 1)

345 suggest that by and large the regressions that included the analytical thinking by political

346 conservativism interaction (in line with the expressive rationality model) had greater predictive

347 performance than regressions that predicted belief only from cognitive style in each sample (i.e.,

348 those in line with the dual process model). This indicates that when predicting religious and

349 supernatural beliefs, cognitive style alone is a relatively poorer input than knowing one's

350 political orientation *and* tendencies for analytical thinking. Importantly, these evaluations adjust

351 for differences in the number of parameters between models suggesting that the better predictive

352 performance of the regressions in line with the expressive rationality model is not owed to there

353 being more predictors in the regressions testing the interaction. However, these evaluations do

354 *not* test for the predicted differences regarding the directionality of the estimated association

355 between cognitive style and belief. Given the relatively greater performance of the regressions

356 that included the expressive rationality model's predicted interaction, we next employed the

357   parameter estimates from these regressions to specifically test the directional predictions of the

358   three focal models.

Analysis 1: Dual Process Model

360   Figure 1 presents the estimated posterior distributions of the association between

361   analytical thinking (CRT and reverse-scored faith in intuition) and beliefs in all samples at (1)

362   average political orientation, (2) in more liberal (-1 SD) and (3) in more conservative individuals

363   (+1 SD). For the most part, the estimated association is robustly negative for both measures of

364   analytical thinking, varied kinds of belief, in different samples, and at different levels of political

365   orientation. This provides consistent and clear support for the dual process model. Indeed, the

366   posterior probability that at average liberalism-conservatism (i.e., 'controlling for political

367   orientation') analytical thinking is negatively associated with belief drops below .98 (i.e., highly

368   probable) only in a single case (the association between witchcraft beliefs and intuition in

369   Indians where the posterior probability = .87, which still mostly supports the dual process model;

370   see Table 2).

Analysis 2: Expressive-rationality model

372   Returning to Figure 1, the magnitude of the association between analytical thinking and

373   belief is observably moderated by political orientation, but not in the way that the expressive

374   rationality model necessarily predicts (for precise estimates and intervals see Table 2). When

375   comparing more liberal individuals (-1 SD) to more conservative individuals (+1 SD) we do not

376   find that the estimated associations reverse directions for identity-relevant beliefs (belief in

377   God/belief that religion is necessary for morality). Moreover, as already noted, we do not find

378   that analytical thinking is *unrelated* to *non*-identity relevant belief sets (belief in karma and

379   witchcraft). In stark contrast to the model's predictions, it is a non-identity relevant belief that

380   shows the greatest probability of being positively associated with analytical thinking (belief in

381   witchcraft in Americans, and also Indians; with most of the more conservative distribution

382   crossing the dashed zero line). However, what we do find is that the magnitude of the

383   associations are more often than not reduced in more conservative as compared to more liberal

384   individuals. Indeed, in all but two cases[3], the posterior probabilities that the association is

385   stronger in more liberal-leaning individuals than it is in more conservative-leaning individuals

386   are greater than .94 (see Table 2).

387   To follow this up and further unpack the analytical thinking by political orientation

388   interaction, we generated and plotted the predictions made by our regressions at each level of

389   political orientation (Figure 2). In so doing, we find that although we see little support for the

390   prediction of the expressive rationality model that there will be a *positive* association with belief

391   among conservatives (as summarized in Figure 1 and Table 2), we do find that the patterns of

392   belief are at least somewhat in line with the expressive rationality model. Indeed, the predicted

393   *spreading interaction* resulting from a positive association of belief and analytical thinking in

394   more conservative individuals and a negative association in more liberal individuals is evident in

395   a few instances (e.g., belief in God in Students) but a spreading interaction also appeared in what

396   we had considered non-identity relevant supernatural beliefs (e.g., belief in witchcraft among

397   Americans). And although this spreading interaction was not consistent across beliefs or

398   samples, it was reliably the case that variance in predicted belief is greater at *high* analytical

399   thinking than at *low* analytical thinking (i.e., the regression lines are more tightly clustered

400   together at low analytical thinking than at high analytical thinking). What this suggests is that

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[3] These are the same two cases in which LOO model evaluation indicated no evidence for difference in predictive performance between regressions with and without the conservatism by analytical cognitive style interactions.

401   without knowing one's political orientation, the extent of one's analytical thinking tendencies is

402   a relatively poor predictor of supernatural beliefs. This provides some further indication as to

403   why the regression models that included the analytical thinking by political orientation

404   interaction made more accurate predictions than models of just the main effect of analytical

405   thinking in each sample (Table 1). Moreover, Figure 2 clearly demonstrates that the negative

406   association between analytical thinking and varied beliefs is strongest in the most liberal

407   participants (with the steepest slopes), and the weakest (but only rarely positive) in the most

408   conservative participants. While these results do not exactly match the predictions of the

409   expressive rationality model, they nonetheless suggest that identity-protective processes are a

410   factor; thus it is important for future research to avoid simply averaging across political

411   orientations.

412   *Analysis 3: Counter-normative rationality model*

413   The identified clear support for the dual process model effectively demonstrates that the

414   predictions of the counter-normative rationality model are *not* supported in this data. We did not

415   find that endorsement of counter-normative supernatural beliefs were positively related to

416   analytical thinking (i.e., belief in karma and witchcraft were negatively associated with analytical

417   thinking in both the North American and the Indian samples, despite cultural differences in

418   karma's normativity).

419   **Discussion**

420   The results of Study 1 replicate previously reported findings that analytical thinking is

421   negatively correlated with religious and supernatural beliefs in a large and diverse sample. Our

422   results provide further evidence that this association, despite its small magnitude, extends to

423   several types of religious and supernatural beliefs. Moreover, tendencies for analytical thinking

424   (as measured by the Cognitive Reflection Test) and placing faith in one's intuition (as measured

425   in a self-report scale) converged in predicting religious and supernatural beliefs. Taken together,

426   this provides evidence that the association between cognitive style and religious belief is robust to

427   two different cognitive measures. Indeed, while the CRT reliably measures tendencies for

428   overriding one's intuitions, it has somewhat surprisingly been demonstrated to be a relatively poor

429   indicator of individual differences in reliance on intuitions (Pennycook, Cheyne, et al., 2016). And

430   thus, the growing body of work that employs the CRT in examining the relationship between

431   analytical thinking that and belief in God is better understood as documenting the *negative*

432   association of analytical thinking and belief, and not necessarily the complementary *positive*

433   association of intuition. Here, the consistently observed negative relationships of (reverse scored)

434   self-reported faith in intuition speaks to this inverse relationship – that a reliance on one's intuitions

435   is likewise related to belief.

436   In addition to this complementary relationship between intuition and analytical thinking in

437   predicting belief in God, our results provide evidence that these relationships extend to other types

438   of religious and supernatural beliefs. Analytical thinking was found to be *negatively* related to

439   belief in karma and witchcraft across samples that varied considerably on whether these beliefs

440   are culturally normative, and even to cross-culturally prevalent beliefs that religion is necessary

441   for morality. These consistently negative associations disconfirm the predictions of the counter-

442   normative rationality model that analytical thinking might be employed to question culturally

443   normative beliefs – and provide additional clear support for the dual process model of belief.

444   While the dual process model of belief was tested in various ways and received support,

445   the results revealed an important limitation of this model in explaining belief. Across diverse belief

446   types and samples, the negative association between analytical thinking and belief was found to

447   be weaker in more conservative individuals. The dual-process model is silent about this pattern,

448   and it is particularly striking and non-obvious, given that more politically conservative individuals

449   are reported to rely more heavily on their intuitions, and are generally more religious (Deppe et

450   al., 2015; Haidt, 2012; Nail et al., 2009; Pew Research Center, 2017). Given that the relationship

451   between analytical thinking and belief in God, for example, is reported to be greater in more

452   religious nations (Gervais et al., 2017), it might be expected that the association *within*-samples

453   would be greater amongst more religious sub-samples (i.e., more conservative-leaning individuals)

454   than less religious sub-samples (i.e., liberal-leaning individuals). And thus, if anything, the dual

455   process model, with some extra tweaking, would make the prediction that, *if* there was going to be

456   a difference in the association amongst conservative and liberal individuals, it would be larger (not

457   smaller or reversed) amongst conservatives – a pattern that was not found in our data.

458   Some, but not all, of our results can instead be accounted for by the expressive rationality

459   model, which argues that analytical thinking is employed not to override intuitions but rather to

460   engage in identity-confirming motivated reasoning (Kahan & Stanovich, 2016). While some of the

461   predictions made from our regression models do generate the spreading interaction predicted by

462   the expressive rationality model for identity-relevant beliefs (e.g., belief in God predicted by the

463   CRT in an undergraduate student sample), we also see some evidence of this spreading interaction

464   in predictions of *non*-identity relevant beliefs (e.g., belief in witchcraft as predicted by faith in

465   intuition in Americans and Indians). This latter result not being directly predicted by the expressive

466   rationality model as formulated here. That being said, our data cannot directly address whether

467   witchcraft beliefs are identity-relevant to conservatives and liberals in India or the USA. Even

468   though we see evidence of the spreading interaction in both samples in Figure 2, witchcraft beliefs

469   are more strongly correlated with political conservatism in Indians ($r = .34$) than in Americans (r

470   = .06); suggesting that different processes may be at play here in these two samples, or even that

471   these results have little to do with identity-protective cognitions. And yet more consistently, what

472   we find is not a spreading interaction resulting from a positive association between analytical

473   thinking and belief in more conservative individuals and a negative association in more liberal

474   individuals but rather a reduction in the magnitude of the association in more conservative as

475   compared to more liberal individuals.

476   If there is one thing that is abundantly clear in our data, it is that we find no support for the

477   predictions of the counter-normative rationality model. Otherwise, our data support the dual

478   process model, but with the important caveat that the magnitude of the association between

479   analytical thinking and diverse supernatural beliefs are consistently reduced (and in some instances

480   reversed in direction) amongst more conservative individuals than amongst more liberal

481   individuals. Before considering whether this provides evidence for the expressive rationality

482   model, we turn first, in Study 2, to testing the expressive rationality model in two additional

483   datasets in which only the main effect of analytical thinking has been previously reported. The

484   results of Study 1 provide sufficient impetus for researchers to look more closely at the association

485   between cognitive style and belief at different levels of political orientation, rather than merely

486   controlling for it.

487   **Study 2**

488   In Study 2, we tested the predictions of the *expressive rationality model* of religious belief

489   in two additional openly-accessible datasets from recently published papers testing the dual

490   process model of belief in diverse samples. The first dataset (Gervais et al., 2017) examined the

491   relationship between belief in God and scores on the Cognitive Reflection Test in 13 samples.

492   Their results demonstrated that the relationship between belief in God and CRT scores is (1) *small*;

493   (2) *variable* across cultures; and (3) that the magnitude of the effect is reduced in less religious

494   nations. Interestingly, these authors reported a surprising reversal: a small *positive* correlation

495   between belief in God and analytical thinking in the United Kingdom. The second dataset

496   (Stagnaro, Ross, Pennycook, & Rand, 2019) examined the relationship between belief in God,

497   supernatural beliefs (measured more broadly) and the Cognitive Reflection Test in India and the

498   United Kingdom, controlling for political orientation (as a direct attempt to replicate the surprising

499   reversal reported by Gervais et al., 2017). In India and the United Kingdom (speaking to the non-

500   replicability of the reported reversal from Gervais et al. 2017), Stagnaro et al. (2019) reported a

501   negative correlation between belief in God and analytical thinking that was comparable in size to

502   that expected by the meta-analytic estimates of the relationship. Neither of these papers, however,

503   considered the potential *moderating* effect of political orientation in the relationship between

504   analytical thinking and religious belief. Using their openly accessible data, we tested the

505   predictions of the expressive rationality model of belief in the samples from these datasets where

506   political orientation was assessed (Gervais et al., 2017: Australia, China, Czech Republic, India,

507   Mauritius, Netherlands, and Singapore; and Stagnaro et al., 2019: United Kingdom). Critically, we

508   treat these analyses as an entirely exploratory attempt to replicate the focal results in Study 1 in a

509   broader sample. We made no strong or specific a priori claims as to having insight into the

510   dynamics linking political orientation and religious belief in these diverse cultural settings.

511   **Methods**

512   The published datasets were retrieved from the Open Science Framework: Gervais et al.

513   (2017) - https://osf.io/v53c4/; Stagnaro et al. (2019) - https://osf.io/jb2mr/). For full sample details,

514   interested readers should refer to their published papers. In both datasets, not all samples included

515   a measure of political orientation and thus we selected only those samples that did. These

516   exclusions left us with 1192 individuals from 7 countries (Australia, China, Czech Republic, India,

517   Mauritius, Netherlands, and Singapore) from the Gervais et al. (2017) dataset; and 523 individuals

518   from the United Kingdom from Stagnaro et al. (2019) Distribution of responses to the focal

519   measures used in this re-analysis are presented in Figure S2. Our scripts for the re-analysis of these

520   datasets are available at https://osf.io/hpw38/.

521   *Measures*

522   In Gervais et al. (2017), belief in God was measured on a 0 to 100 (max belief) scale,

523   analytical thinking was assessed using the 3-item Cognitive Reflection Test (Frederick, 2005), and

524   political orientation was assessed with a single item ("Would you consider yourself more liberal

525   or conservative? [1 = very liberal; 7 = very conservative]. In Stagnaro et al. (2019), belief in God

526   was measured on a 0 to 100 (max belief) scale, analytical thinking was assessed using a 7-item

527   Cognitive Reflection Test (Thomson & Oppenheimer, 2016), and political orientation was

528   assessed with two items: "On social issues I am…" and "On economic issues I am…" [1 = strongly

529   liberal to 5 = strongly conservative]. These two items were strongly positively correlated, r (521)

530   = .73 [.69, .77], p < .001 and we took their average as an index of political conservatism. Stagnaro

531   et al. (2019) also measured supernatural belief using the 6-item revised-Supernatural Belief Scale

532   (Jong & Halberstadt, 2016). For all analyses, political orientation was centered (negative values =

533   more liberal; positive values = more conservative).

534   *Analytical Models*

535   Analyses were conducted using the same software as in Study 1. Beliefs were modelled

536   using Bayesian mixed-effect linear regressions as conducted in Study 1. For the re-analysis of the

537   Gervais et al. (2017) dataset a random intercept for sample was included (7 countries) in addition

538   to a random slope by country for the effects of CRT, political orientation and their interaction – to

539   allow all effects to vary across samples. The UK data from Stagnaro et al (2019) were modelled

540   using Bayesian linear regressions (i.e., with no random effects). Priors were set as uninformative

541   and weakly-regularizing: fixed effects ~ Normal(0,1); variance components for varying effects ~

542   Exponential(1); and for the covariance structure of varying effects ~ LKJ(4); (McElreath, 2015, p.

543   393; Purzycki, Pisor, et al., 2018).

544   **Results**

545   Reproducing the focal results and support for the dual process model reported by Gervais

546   et al. (2017) and Stagnaro et al. (2019), across all models, analytical thinking (CRT) was negatively

547   related to religious belief controlling for political orientation (model summaries presented in the

548   supplemental materials; Table S13). When holding political orientation constant at zero (i.e.,

549   amongst political centrists), these models predict varying magnitudes of belief reduction amongst

550   those who respond correctly to *all* CRT items: 3.93 points out of 100 (Gervais et al. data; belief in

551   God), 10.92 points (Stagnaro et al. data; belief in God), and 16.02 points (Stagnaro et al. data;

552   supernatural belief).

553   As observed in Study 1, however, the estimated effect of CRT on belief was moderated by

554   political orientation across models. The posterior distributions of regression coefficients at varied

555   levels of political orientation are plotted in Figure 3 (and precise estimates presented in Table 3).

556   In all three cases, we find that the association is more strongly negative in more liberal leaning

557   participants than in more conservative leaning participant. That being said, the magnitude of the

558   effect remains small, and is less clearly differentiated in Gervais et al.'s (2017) more broadly cross-

559   cultural dataset. Moreover, we again find only a slight indication of a reversal of the direction of

560   the association in the conservative leaning individuals as predicted by the expressive rationality

561   model - and rather that the posterior distributions of the estimated association are more closely

562   centered around zero. As in Study 1, this analysis provides evidence that the predictions of the

563   dual process model of belief holds more for liberals than conservatives. And as in Study 1, although

564   we find no clear support for the expressive rationality models' predicted *reversal* of the association

565   in conservatives; we do find that the already small negative association approaches 0 in more

566   conservative individuals.

567   **Discussion**

568   In Study 2, we further tested the predictions of the expressive rationality model of belief in

569   two additional cross-cultural datasets. We find that in both of these datasets – the negative

570   relationship between CRT and religious belief predicted by the dual process model of belief was

571   to some extent stronger in increasingly liberal-leaning individuals. However, contrary to the

572   prediction of the expressive rationality model, the association between analytic thinking and

573   religious belief in conservative-leaning individuals was largely flat – it was not positive. These

574   results provide further evidence that the contributions of CRT to religious belief can sometimes be

575   just as "fickle" (Gervais et al., 2017) within cultures as they may be between them. While Stagnaro

576   et al. (2019) demonstrated a negative relationship *controlling* for political orientation, our analyses

577   demonstrate that the relationship is largely reduced to zero with greater political conservatism.

578   And while this result does not provide strong evidence for the expressive rationality model of

579   belief, in the general discussion we consider this evidence, in tandem with the results of Study 1,

580   by returning to our focal question of "how" is analytical thinking related to religious and

581   supernatural beliefs.

582   **General Discussion**

583   How is analytical thinking related to religious belief? To answer this question, in two

584   studies we tested competing predictions derived from three accounts about the contributions of

585 cognitive style to religious belief (one of which, the counter-normative rationality model, went

586 completely unsupported). As predicted by the dual process model of religious belief, we found that

587 analytical thinking is robustly related to religious belief in the predicted negative direction, in large

588 culturally diverse samples, for two distinct measures of analytic thinking (cognitive reflection and

589 faith in intuition), and for several types of religious beliefs (i.e., belief in God, that religion is

590 necessary for morality, in karma, in witchcraft). Nevertheless, the dual process model's limitations

591 in accounting for religious belief were apparent in the estimated small effect size and the

592 consistently observed interaction of analytical thinking and political ideology, which is not

593 obviously predicted by this model. And thus, the pattern of our results also fit to some extent with

594 the predictions of an alternative account - the expressive rationality model of belief - that holds

595 that analytical thinking is employed to sustain one's already held commitments, particularly those

596 emblematic of social identities. However, this model had its limitations too; from the perspective

597 of the expressive rationality model, (1) the negative association between analytic thinking and

598 religious belief should reverse for political conservatives, (2) the main association should

599 disappear once the interaction with political ideology is taken into account, and (3) analytical

600 thinking should only be associated with identity-relevant supernatural beliefs. These predictions

601 received inconsistent support. The main effect often remained even after accounting for the

602 interaction with political ideology; moreover, the predicted reversal (to a positive relationship

603 between analytic thinking and religious/supernatural belief) for conservatives did not materialize

604 in most of our samples. Instead, we consistently observed that rather than reversing in direction,

605 the size of the association weakened or became zero among conservatives. And contrary to the

606 expressive rationality model, we find that this weakening of the effect in more conservative

607 participants compared to more liberal participants occurred in both identity-relevant (belief in God,

608 belief that religion is necessary for morality) and *not*-obviously identity-relevant beliefs (belief in

609 witchcraft in both Americans and Indians).

610   One way to interpret these results is to take them as evidence for a "weak" version of the

611 expressive rationality model that makes the prediction that analytical thinking will only be

612 negatively correlated with religious beliefs amongst more politically liberal individuals, while

613 being largely unrelated to belief amongst more politically conservative individuals. But it is not

614 directly obvious why identity-protective cognitions would be less involved in maintaining

615 religious and supernatural beliefs in the typically more religious sub-samples of our datasets (i.e.,

616 conservative-leaning individuals). Another way to explain these results might be to make the

617 prediction that if we had more data from the *most* liberal and *most* conservative individuals, we

618 might have observed stronger evidence for the predicted reversal and the spreading interaction.

619 Testing this prediction is one clear way forward for research of this kind. But yet, an altogether

620 different explanation arises from considering the relative contributions of 'cognition' and

621 'culture' in predicting religious and supernatural beliefs.

622   A recent review of the empirical evidence (White et al., 2021) and a pre-print of a study

623 that employs a nationally-representative sample of Americans (Gervais et al., 2019) provide

624 evidence that analytical cognitive style is a robustly weaker predictor of religious and

625 supernatural beliefs than is growing up with caregivers who consistently demonstrated their

626 religious commitment (i.e., religious credibility enhancing displays; Lanman & Buhrmester,

627 2016). What our results might suggest is that high enough cultural exposure to religion - as might

628 be more likely in more conservative individuals than in liberals - leaves little room for cognitive

629 style to have sway over the extent to which one endorses religious and supernatural beliefs. This

630 perhaps explains the fairly consistent reduction in the association between analytical thinking

631   and belief in politically conservative individuals. If this is the case, then the dynamics at play

632   might have little to do with identity-protective cognition; instead, political orientation in our

633   datasets is perhaps acting as a proxy-measure for cultural exposure to religion. In support of this

634   view, Gervais et al. (2019) found that analytical thinking only predicted supernatural beliefs in in

635   those with relatively lower cultural exposure to religion. That being said, this alternative

636   explanation does little to account for the cases, particularly at the extremes of political

637   orientation, in which some of our models do indeed predict patterns in line with the expressive

638   rationality model.

639   Taken together, it is clear that neither the dual process nor the expressive rationality model

640   can fully account for all of the observed data. And importantly, neither of them (as they are

641   currently posited) seem fully equipped to deal with how intuition and/or analytical thinking may

642   or may not be implicated in 'religious and supernatural belief' (broadly construed) in a variety of

643   different cultural contexts. Although it is the counter-normative rationality model that went

644   entirely unsupported – it is the dual process model of belief, given its broad predictive potential,

645   that requires the *most* re-calibration. The dual process model of belief as it is currently formulated

646   provides no explanation for the observed within-sample heterogeneity in how the strength of the

647   association between analytical thinking and beliefs depends on political orientation. And thus, it

648   has the *most* difficulty accounting for some observations, like those reported here, that the

649   relationship between cognitive style and belief is sometimes (though not always) moderated by

650   political orientation. The evidence suggests, in part, the operation of motivated reasoning processes

651   in justifying both believing and not believing. Importantly, the current analyses show that the dual

652   process and expressive rationality models as applied to religious belief likely have independent

653   explanatory value (despite their shortcomings) and are not necessarily incompatible theoretical

654   accounts. The pattern of results is thus consistent with the idea that at least two independent,

655   interacting psychological processes are at play, one guided by the intuitiveness of supernatural

656   beliefs consistent with a dual process account, the other guided by motivated reasoning consistent

657   with the expressive rationality account. And from what we have learned from other recent work in

658   this area (Gervais et al. 2019), it is all together possible that the extent to which either or both of

659   these processes contribute to belief may covary in meaningful ways with a third psychological

660   mechanism – cultural learning driven by social exposure to religion.

661   Given the expressive rationality's model explanatory power in other domains (e.g., climate

662   change beliefs; Kahan et al., 2012), at least where it has been tested (i.e., in nationally

663   representative samples of Americans) - it remains an open question, as to whether our results would

664   look different with access to a broader, fully representative sample. Our results demonstrate some

665   cross-culturally recurrent patterns in predicting diverse religious and supernatural beliefs. But of

666   course, a clear way forward in unpacking the contributions of cognitive style to belief is to continue

667   broadening the scope of these types of investigations, in more diverse cultures – but also more

668   broadly within cultures. On this front, future work should broaden the scope of the content of

669   examined supernatural beliefs to include those that might also be more representative of both

670   liberals and conservatives in their investigations of the cognitive mechanisms supporting

671   supernatural beliefs. For example, belief in astrology, horoscopes, and the Tarot is high amongst

672   North American youth, consistent with other secularized corners of the world (Beck, 2018; Pew

673   Resarch Center, 2009) – and are similarly endorsed by liberals and conservatives (e.g., Lindgren,

674   2014).

675   Although the focal measures employed here are nearly ubiquitous in studies of the

676   relationship between cognitive style and religious belief, they are certainly not without fault. It is

677   important to note that some of the mismatch between the predictions and results reported here may

678   result from measurement issues. For instance, given our research design we cannot assess the

679   reliability of single item indicators of belief like those used here for belief in God (which also tend

680   to be bimodally distributed). As a consequence, we concede that the models presented here may

681   very well underestimate the magnitude of the relationship between analytical thinking and belief.

682   However, even more reliable multi-item measures such as the often used Supernatural Belief Scale

683   (Jong et al., 2013; used here in Study 2) still exhibit some degree of bimodality (see Figures S1

684   and S2). And thus, new measurement tools may provide further insight. That being said,

685   supernatural beliefs may very well be bimodally distributed in many populations, and thus there

686   may be even more to be gained in the application of novel modelling techniques to potentially

687   capture with greater precision the correlates of religious and supernatural beliefs. Moreover, single

688   item measures of belief do not adequately capture the diversity in the kinds of gods (and other

689   supernatural agents/forces) that people believe in across cultures, and the traits/qualities/capacities

690   afforded to them (Johnson et al., 2019; Lang et al., 2019; Purzycki et al., 2016; Purzycki, Henrich,

691   et al., 2018). In our data, we cannot identify, for example, which God Indian respondents (mostly

692   Hindus) were considering at the time (though we note that belief in God is strongly endorsed by

693   Hindu participants here and in previous research, e.g., White et al., 2019; Baimel, 2019). In so

694   doing, research of this kind may otherwise be missing important pieces of the puzzle of

695   understanding how belief covaries with psychological intuitions. In line with this view, recent

696   evidence from samples of American Hindus suggests that intuitions are more supportive of belief

697   in, for example, personal as opposed to abstract god concepts, even when they are more culturally

698   normative (Baimel, 2019).

699   The three-item CRT employed across most of the studies here has more recently been

700   expanded to seven items to increase reliability and relies less on participant's numerical intuitions

701   (Thomson & Oppenheimer, 2016). And while the data from Stagnaro et al. (2019) as presented in

702   Study 2 provide some evidence of consistency in results between the two versions, future work

703   might benefit from the use of more diverse measures of cognitive style. That being said, we do

704   report some consistency in effect sizes across two distinct measures of cognitive style (the CRT

705   and the self-reported faith in intuition scale). Moreover, the single item measure of political

706   orientation employed in both of our studies could be elaborated into a more reliable and valid

707   measure that also distinguishes between different types or aspects of political orientation (e.g.,

708   social vs. economic conservativism). More fine-grained measurements of political orientation may

709   be particularly valuable for future cross-cultural research on this topic that considers more deeply

710   the relationship between religious belief and political orientation (and types of conservatism) in

711   diverse cultural settings.

712   Our results contribute to the growing literature examining the relative contributions of

713   cognition and culture to the form and prevalence of religious beliefs around the world. Willard &

714   Cingl (2017), for example, provide evidence that the contributions of cultural learning are

715   substantially larger than that of cognitive processes in explaining between-country differences in

716   the prevalence and strength of religious belief. Our results suggest that the contributions of

717   cognition to belief might be greater when the cultural norms to hold certain beliefs are weak (i.e.,

718   commitment to religious beliefs in liberals as compared to conservatives). This interpretation fits

719   well with previous work that demonstrates that intuitively-supported cognitive biases are more

720   strongly related to the endorsement of paranormal beliefs than the more culturally-constrained

721   belief in God (Willard & Norenzayan, 2013). Weighing the relative contributions of cognitive

722   processes, motivational factors, and cultural learning is essential in broadening our understanding

723   of what supports the world's "theodiversity" (Norenzayan, 2016); and our results also demonstrate

724   that there may be even more to be gained from considering how cognitive processes *interact* with

725   social and cultural factors in the maintenance of religious beliefs (e.g., see Purzycki & McNamara,

726   2016). This is an important future direction for the cultural and cognitive sciences of religion.

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885

Table 1. Bayesian model evaluations

Belief	Predictor	ELPD Difference (SE)	
		Dual Process Model	Expressive Rationality Model
God	CRT	-165.2 (16.8)	0
God	Intuition	-172.6 (15.6)	0
Morality	CRT	-153.5 (18.3)	0
Karma	CRT	0	-0.5 (.3)
Karma	Intuition	-14.4 (5.6)	0
Witchcraft	CRT	0	-0.9 (.2)
Witchcraft	Intuition	-16.7 (4.5)	0

Notes: ELPD difference is the difference in expected log predictive densities estimated by the *loo* package (Vehtari, Gelman, & Gabry, 2017). Differences *smaller* than 4 (absolute value) are typically considered to be small and indicative of little to no difference in predictive accuracy. The greater the difference, and smaller the standard error, the larger the difference in predictive performance. "0"s here are indicative of the model with greater predictive performance (e.g., the expressive rationality models in all but two cases where there is no clear indication of any differences). Dual process model estimates are those of models that predicted belief from analytical thinking in each sample; expressive rationality model estimates are those of models that included the additional interaction term between analytical thinking and political orientation in each sample.

Table 2. Estimated regression coefficients and posterior probabilities

| Belief	Predictor	Sample	b_{AVG} [HDI]	$p(b < 0)$	b_{LIB} [HDI]	b_{CON} [HDI]	Δ HDI	$p(b_{LIB} < b_{CON})$
God	CRT	Students	-3.14 [-4.23, -2.12]	.99	-4.22 [-5.70, -2.76]	-2.06 [-3.12, -1.01]	[-3.65, -0.73]	.99
God	CRT	Americans	-5.37 [-6.53, -4.13]	.99	-6.03 [-7.47, -4.37]	-4.70 [-5.78, -3.77]	[-2.47, -0.23]	.98
God	Intuition	Canadians	-2.84 [-3.76, -1.91]	.99	-4.02 [-5.37, -2.75]	-1.65 [-2.93, -0.38]	[-4.25, -0.45]	.98
God	Intuition	Americans	-4.52 [-5.61, -3.48]	.99	-6.26 [-7.56, -4.91]	-2.78 [-4.29, -1.25]	[-5.42, -1.52]	.99
God	Intuition	Indians	-4.60 [-5.87, -3.28]	.99	-6.33 [-8.05, -4.64]	-2.86 [-4.64, -0.83]	[-6.10, -0.88]	.98
Karma	CRT	Americans	-1.78 [-3.23, -0.47]	.98	-1.70 [-3.45, 0.11]	-1.85 [-3.68, -0.05]	[-2.21, 2.51]	.45
Karma	Intuition	Canadians	-5.56 [-6.43, -4.63]	.99	-6.19 [-7.47, -5.00]	-4.92 [-6.08, -3.69]	[-2.91, 0.37]	.90
Karma	Intuition	Americans	-4.70 [-5.68, -3.75]	.99	-6.39 [-7.53, -5.14]	-3.01 [-4.46, -1.61]	[-5.23, -1.59]	.99
Karma	Intuition	Indians	-4.44 [-5.15, -3.62]	.99	-5.14 [-6.02, -4.07]	-3.73 [-4.81, -2.62]	[-2.89, 0.05]	.94
Witchcraft	CRT	Americans	-2.24 [-3.51, -1.02]	.99	-2.22 [-3.87, -0.64]	-2.24 [-3.96, -0.65]	[-2.18, 2.18]	.48
Witchcraft	Intuition	Americans	-2.19 [-3.24, -1.00]	.99	-4.61 [-6.01, -3.22]	0.23 [-1.46, 1.92]	[-7.01, -2.71]	.99
Witchcraft	Intuition	Indians	-0.82 [-2.00, 0.35]	.87	-2.32 [-3.81, -0.60]	0.68 [-1.04, 2.27]	[-5.39, -0.60]	.98
Morality	CRT	Students	-1.82 [-2.57, -1.04]	.99	-2.78 [-3.81, -1.70]	-0.85 [-1.97, 0.17]	[-3.48, -0.40]	.99
Morality	CRT	Americans	-2.74 [-3.43, -2.12]	.99	-3.58 [-4.54, -2.74]	-1.90 [-2.77, -1.06]	[-2.87, -0.50]	.99

Notes: Regression parameters 'b's indicate estimated difference in belief on the 100-point response scale (Min =0; Max =100) for each additional correct analytical answer on the CRT or a one standard deviation increase in analytical thinking as measured by the Faith in Intuition scale (which was reverse coded so direction of parameters are comparable to those of the CRT). Intervals around these point estimates (HDI) represent the 95% most probable parameter values. Regression parameters are presented for the effects of CRT/Intuition at mean political orientation (b_{AVG} [HDI]), in more liberal individuals (b_{LIB}) and more conservative individuals (b_{CON}), as they are plotted in Figure 1. The difference between more liberal and more conservative individuals is presented in the second to last column (Δ HDI). The posterior probability that the average effect of analytical thinking is *negative* is presented in the '$p(b < 0)$' column. The posterior probability that the effect was stronger in more liberal participants than conservatives is presented in the last column ($p(b_{LIB} < b_{CON})$). Students were recruited from the human subject pool at the University of British Columbia, Canada.

1   Table 3. Estimated contributions of analytical thinking to belief by sample and political
2   orientation
3

| Source	Outcome	Political Orientation	b [95% HDI]	$p(b_{+LIB} < b_{+CON})$
Gervais et al. (2017)	Belief in God	+ Liberal	-2.41 [-5.31, 0.97]	.79
		Liberal	-1.65 [-3.32, 0.11]	
		Conservative	-0.89 [-2.81, 1.02]	
		+Conservative	-0.13 [-3.49, 3.26]	
Stagnaro et al. (2017)	Belief in God	+ Liberal	-4.21 [-5.90, -2.50]	.99
		Liberal	-3.01 [-4.28, -1.77]	
		Conservative	-0.61 [-2.17, 0.86]	
		+Conservative	0.59 [-1.53, 2.56]	
	Supernatural belief	+ Liberal	-5.19 [-6.64, -3.61]	.99
		Liberal	-3.93 [-5.02, -2.82]	
		Conservative	-1.42 [-2.72, -0.02]	
		+Conservative	-0.16 [-1.99, 1.73]	

4   Notes. Estimates are differences in belief (0-100) for each additional correct response on the
5   CRT.The last column presents the posterior probability that the estimated association in the *most*
6   liberal ("+LIB") is more negative than in the *most* conservative ("+CON").
7

Figure 1. Posterior distribution of the estimated associations between analytical thinking and varied beliefs by sample and political orientation.
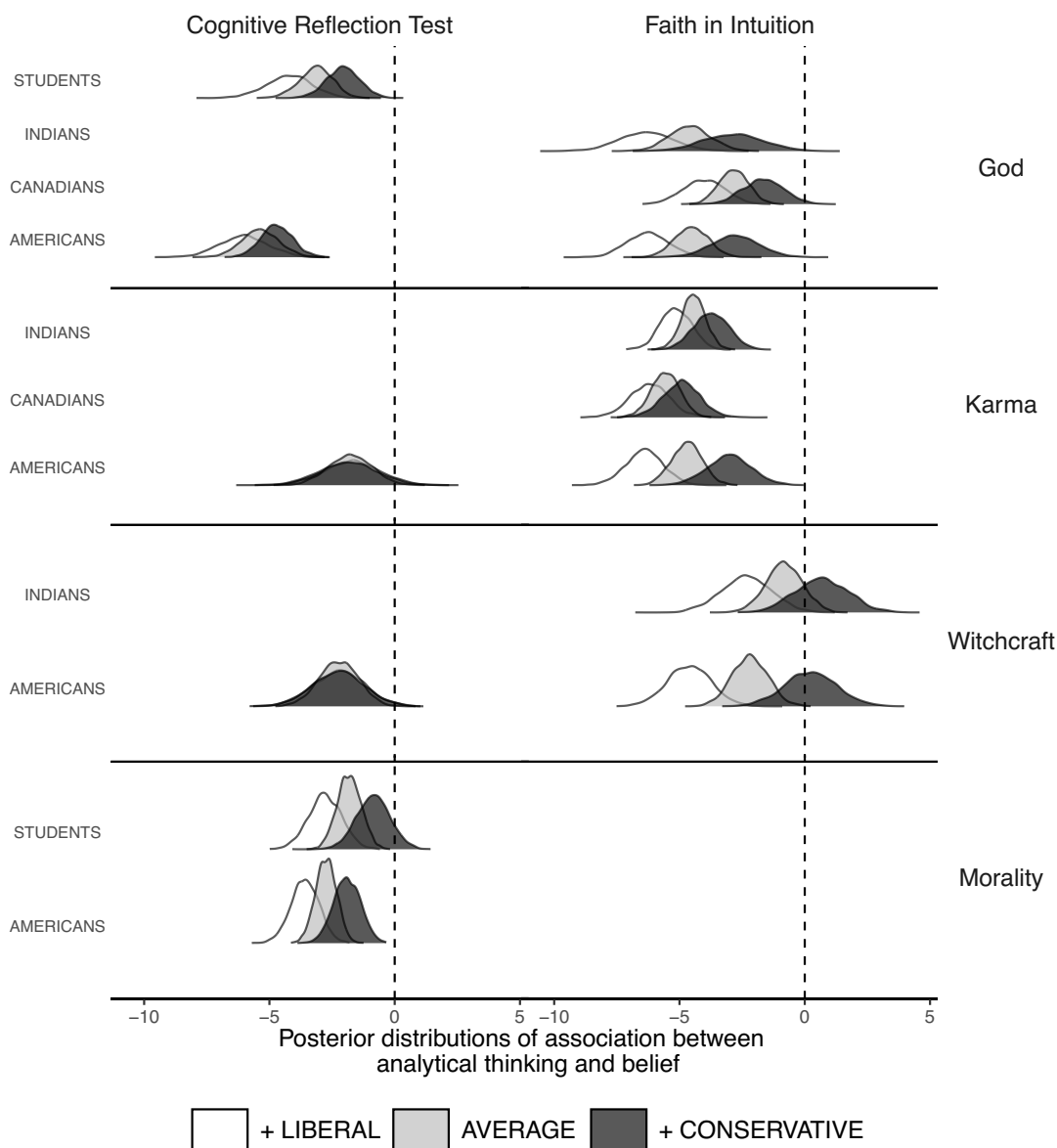

Notes: Students were recruited from the human subject pool at the University of British Columbia, Canada. X-axis values are of estimated change in belief with each additional correct answer on the CRT and one standard deviation increase in analytical thinking as measured by the faith in intuition scale which has been reverse scored so the direction of predictions is matched to those of the CRT. With the bulk of the posterior distributions in all instances being to the left of the dashed lines (i.e., below zero), these data largely support the dual process model. The expressive rationality model predicts that the posterior distributions in more conservative individuals for identity-relevant beliefs (belief in God/belief that religion is necessary for morality) would fall to the right of the dashed line (i.e., above zero) - a pattern of results that is not observed here. For more information about these estimates see Table 2.

Figure 2. Posterior predictions of belief from analytical thinking and political orientation
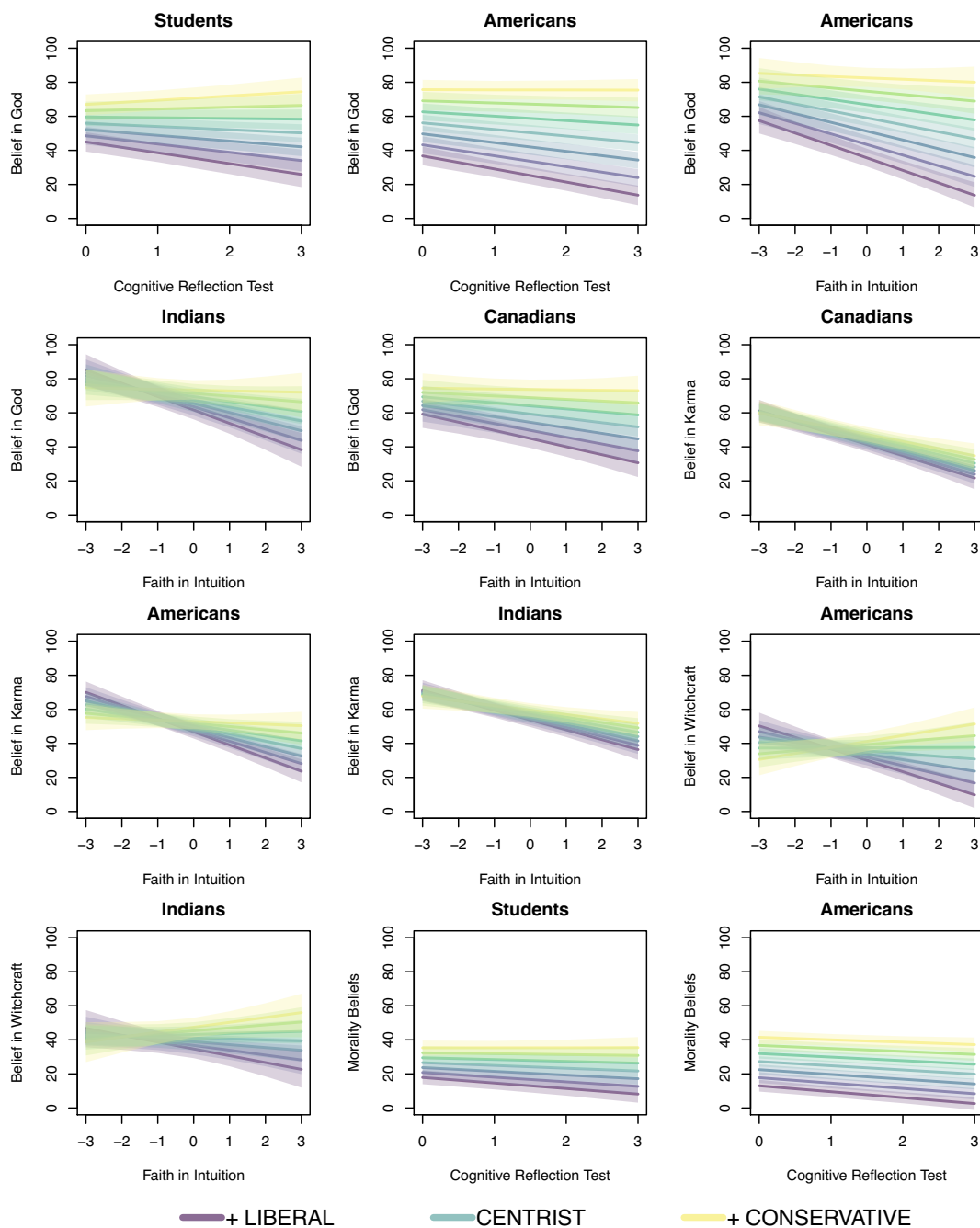
Notes: Predictions estimated from 8000 draws from the posterior distributions of each parameter. Purple lines indicating predictions for the most liberal, yellow lines indicating predictions for the most conservative. Shaded regions are 95% prediction intervals. Students were recruited from the human subject pool at the University of British Columbia, Canada.

1   Figure 3. Posterior distributions of the estimated regression coefficients of analytical thinking
2   predicting belief by political orientation
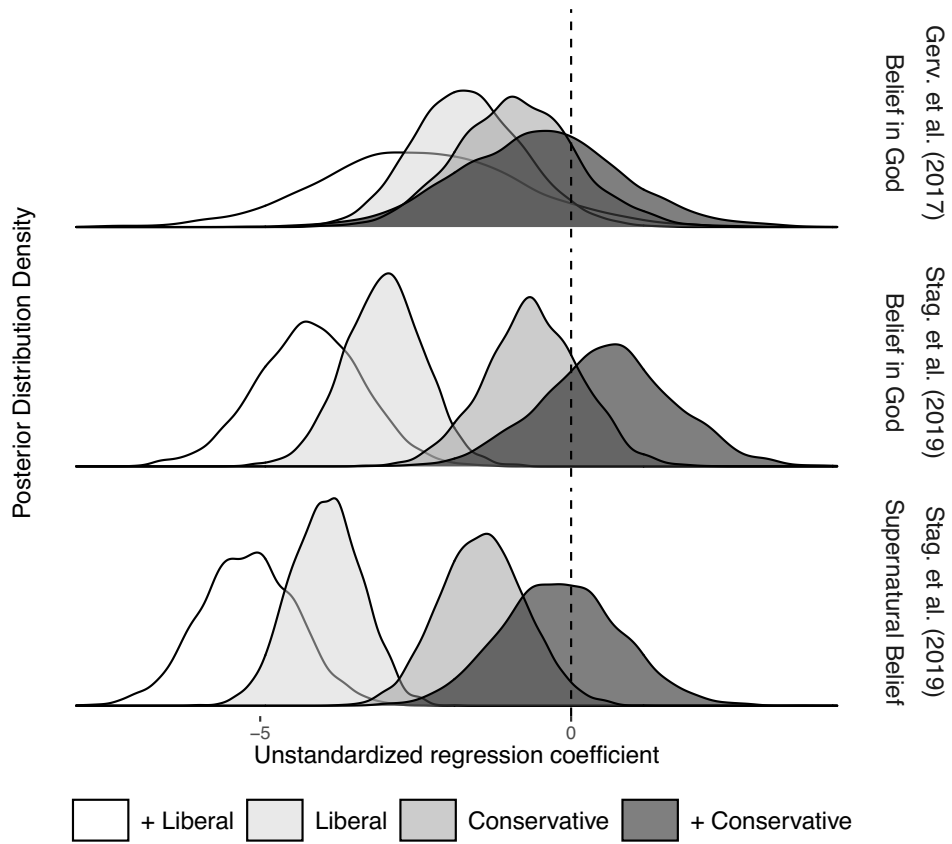
3

4

5   **How is analytical thinking related to religious belief? A test of three theoretical models**

6

7   **Supplemental Materials**

8   Table S1 Sample characteristics of the data sets

Source of Data	Code[1]	Sample	N	Male (%)	Age [M (SD)]	Political Conservatism[2] [M (SD)]
White, Norenzayan, & Schaller (2018) – Dataset 1	WN1	Canada - National	1000	49	46.7 (15.2)	3.61 (1.71)
Baimel, Li, & Norenzayan (unpublished)	BL1	Undergraduate Students	816	21.1	2.4 (3.13)	3.13 (1.23)
White, Norenzayan, & Schaller (2018) – Dataset 1	WN1	India - National	1000	49.1	38.6 (13.5)	3.57 (1.81)
White, Norenzayan, & Schaller (2018) – Dataset 2	WN2	India - MTurk	319	70.3	32.7 (9.53)	3.90 (1.64)
Baimel, Norenzayan & Sarkissian (unpublished) – Dataset 1	BN1	USA - MTurk	428	50.5	36.5 (12.2)	3.32 (1.66)
Baimel, Norenzayan & Sarkissian (unpublished) – Dataset 2	BN2	USA - MTurk	291	53.3	34.7 (11.8)	3.50 (1.75)
Baimel, Li & Norenzayan (unpublished)	BL2	USA - MTurk	792	38.3	38.3 (13.3)	3.51 (1.85)
White, Norenzayan & Schaller (2018) – Dataset 2	WN2	USA - MTurk	417	38.5	36.7 (12.2)	3.53 (1.76)
White, Norenzayan, & Schaller (2018) – Dataset 3	WN3	USA - MTurk	215	39	35.6 (1.9)	3.44 (1.80)
Total			5284	43.4	36.3 (14.5)	3.49 (1.70)

9   Notes: [1]Code is recorded in the SOURCE variable in the dataset associated with Study 1. [2]Political orientation was assessed on a 1 =

10   very liberal to 7 = very conservative response scale. Students were recruited from the human subject pool at the University of British

11   Columbia, Canada.

12   Table S2 Included measures in each dataset

Source	Sample	Belief in God	CRT	REI	KARMA	WITCH	MORAL
WN1	Canadians	1 – 7 Scale (1 item)		5 pt	✓		
BL1	Students	1 – 7 Scale (1 item)	✓				7 pt
WN1	Indians	1 – 7 Scale (1 item)		5 pt	✓		
WN2	Indians	1 – 5 Scale (3 items)		7 pt	✓	✓	
BN1	Americans	1 – 7 Scale (1 item)	✓	7 pt			6 pt
BN2	Americans	1 – 7 Scale (1 item)	✓	7 pt			6 pt
BL2	Americans	1 – 7 Scale (1 item)	✓				7 pt
WN2	Americans	1 – 5 Scale (3 items)		7 pt	✓	✓	
WN3	Americans	1 – 5 Scale (3 items)	✓	7 pt	✓	✓	

13   Notes: CRT = Cognitive Reflections Test; REI = Faith in Intuition subscale from the Rational

14   Experiential Inventory; KARMA = Belief in Karma Scale; WITCH = Belief in Witchcraft;

15   MORAL = Belief that religion is necessary for morality. Variables coded on different response

16   scales are identified in this table (5-, 6-, or 7-point scales). For comparison and analyses (to handle

17   these differences), all responses were rescaled to a 100 point response scale (0 = Minimum belief;

18   100 = maximum belief). REI-Faith in Intuition subscales were rescaled to a 0 to 1 scale, and then

19   *reverse* coded such that higher scores indicated *less* faith in intuition (greater analytical thinking;

20   to ease comparison between this scale and the Cognitive Reflection Test). Students were recruited

21   from the human subject pool at the University of British Columbia, Canada.

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29   *Table S3 Means (standard deviations) of focal measures by sample (rescaled)*

Source	Sample	Belief (0-100)	CRT (0-3)	INT (0-1)	KARMA (0-100)	WITCH (0-100)	MORAL (0-100)
WN1	Canada	58.00 (37.80)	---	.36 (.16)	42.80 (20.50)	---	---
BL1	Students	40.20 (38.0)	1.53 (1.21)	---	---	---	15.20 (16.40)
WN1	India	85.00 (25.20)	---	.34 (.14)	67.30 (18.10)	---	---
WN2	India	74.30 (21.30)	---	.37 (.12)	65.80 (20.70)	55.60 (19.70)	---
BN1	USA	41.00 (39.70)	1.51 (1.25)	.45 (.17)	---	---	23.40 (25.60)
BN2	USA	39.70 (40.90)	1.53 (1.19)	.45 (.17)	---	---	23.70 (28.60)
BL2	USA	50.00 (42.10)	1.30 (1.23)	---	---	---	21.50 (25.20)
WN2	USA	64.60 (33.30)	---	.31 (.17)	43.40 (24.70)	33.00 (24.40)	---
WN3	USA	60.70 (35.70)	1.47 (1.20)	.34 (.20)	42.70 (28.40)	28.10 (22.50)	---

30

31   Notes: CRT = Cognitive Reflections Test; INT = Reverse coded faith in Intuition subscale from

32   the Rational Experiential Inventory. KARMA = Belief in Karma scale. WITCH = Belief in

33   witchcraft scale; MORAL = Belief that religion is necessary for morality. Students were recruited

34   from the human subject pool at the University of British Columbia, Canada.

35

36   Table S4. Correlations [95% confidence intervals] of focal variables by sample

	Country	Belief in God	CRT	Intuition (R)	Karma	Witchcraft	Morality-Religion
CRT	Canada	---					
	India	---					
	Students	-.07 [-.14, .00]					
	USA	-.19 [-.24, -.15]					
Faith in Intuition (R)	Canada	-.07 [-.13, -.00]	---				
	India	-.18 [-.24, -.13]	---				
	Students	---	---				
	USA	-.26 [-.31, -.21]	.22 [.15, .28]				
Belief in Karma	Canada	.30 [.24, .35]	---	-.27 [-.33, -.21]			
	India	.39 [.34, .43]	---	-.28 [-.33, -.23]			
	Students	---	---	---			
	USA	.33 [.25, .39]	-.27 [-.39, -.14]	-.27 [-.34, -.20]			
Belief in Witchcraft	Canada	---	---	---	---		
	India	.05 [-.07, .16]	---	-.11 [-.22, .01]	.54 [.46, .62]		
	Students	---	---	---	---		
	USA	.33 [.26, .40]	-.31 [-.43, -.19]	-.21 [-.28, -.13]	.54 [.48, .59]		
Religion is necessary for morality	Canada	---	---	---	---	---	
	India	---	---	---	---	---	
	Students	.44 [.39, .50]	-.11 [-.18, -.04]	---	---	---	
	USA	.50 [.46, .54]	-.17 [-.22, -.12]	-.05 [-.13, .02]	---	---	
Conservatism	Canada	.24 [.18, .30]	---	-.01 [-.07, .06]	.03 [-.04, .09]	---	---
	India	.12 [.06, .17]	---	.06 [.00, .12]	.15 [.10, .20]	.34 [.23, .44]	---
	Students	.20 [.13, .27]	.12 [.05, .19]	---	---	---	.28 [.21, .34]
	USA	.40 [.36, .44]	-.06 [-.11, -.01]	-.05 [-.11, .00]	.01 [-.07, .08]	.06 [-.02, .14]	.38 [.33, .42]

37   Notes: Students were recruited from the human subject pool at the University of British Columbia, Canada.

38 *Table S5. Factor loadings of items measuring the belief that religion is necessary for morality*

Items	Loading
1. An individual who does not believe in God cannot lead a moral life	.95
2. An individual who does not attend religious services cannot lead a moral life	.93
3. An individual who does not practice any religion cannot lead a moral life	.97
4. Religious texts should be understood literally	.72
5. Generally speaking, people need religion to be morally good.	.86

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40

41 Table S6. Regression summaries - Belief in God & CRT

42

Belief in God	Dual Process Model		Expressive Rationality Model	
Predictors	*Estimates*	*CI (95%)*	*Estimates*	*CI (95%)*
Intercept	52.11	46.23 – 58.29	42.79	37.03 – 48.73
CRT in Students	**-2.45**	**-3.71 – -1.18**	-3.12	-4.50 – -1.91
Difference in belief in Americans compared to Students	0.26	-1.67 – 2.24	0.16	-1.72 – 2.13
Change in the contributions of CRT in Americans compared to Students	**-2.30**	**-3.76 – -0.90**	-2.24	-3.68 – -0.79
Political conservatism in Students (standardized)			3.91	2.53 – 5.31
Change in the contributions of CRT with a 1SD increase in conservatism in Students			**1.08**	**0.21 – 1.96**
Change in the contributions of conservatism in Americans compared to Students			3.38	1.95 – 4.74
Change in the contributions of CRT with a 1SD increase in conservatism in Americans			**-0.42**	**-1.37 – 0.49**
Observations	2469		2469	

43
44 Notes: Models included a random intercept for dataset. Reference category for Sample =
45 undergraduate students at a Canadian university. Key estimates for tests of each model are
46 bolded.
47

48
49 Table S7. Regression summaries - Belief in God & Faith in Intuition (R)
50

Belief in God	Dual Process Model		Expressive Rationality Model	
Predictors	*Estimates*	*CI (95%)*	*Estimates*	*CI (95%)*
Intercept	56.32	49.25 – 63.07	56.36	49.36 – 63.02
Faith in Intuition (Reverse scored, standardized)	**-2.92**	**-4.14 – -1.76**	-2.84	-3.97 – -1.69
Difference in belief in Indians compared to Canadians	8.32	6.77 – 9.87	8.73	7.18 – 10.32
Difference in belief in Americans compared to Canadians	-0.67	-2.49 – 1.24	-0.44	-2.28 – 1.41
Change in the contributions of intuition in Indians compared to Canadians	**-1.66**	**-3.19 – -0.10**	-1.77	-3.30 – -0.21
Change in the contributions of intuition in Americans compared to Canadians	**-1.98**	**-3.42 – -0.55**	-1.68	-3.13 – -0.26
Political conservatism in Canadians (standardized)			6.18	5.05 – 7.33
Change in the contributions of intuition with a 1SD increase in conservatism in Canadians			**1.20**	**0.05 – 2.29**
Change in the contributions of conservatism in Indians compared to Canadians			-1.38	-2.83 – 0.10
Change in the contributions of conservatism in Americans compared to Canadians			4.90	3.45 – 6.31
Change in the contributions of intuition with a 1SD increase in conservatism in Indians			**0.54**	**-0.98 – 2.10**
Change in the contributions of intuition with a 1SD increase in conservatism in Americans			**0.55**	**-0.82 – 1.90**
Observations	3560		3560	

51
52 Notes: Models included a random intercept for sample. Reference group for Sample =
53 Canadians. Key estimates for tests of each model are bolded.

54

55   Table S8. Regression summaries - Belief that religion is necessary for morality & CRT

56

Religion & Morality	Dual Process Model		Expressive Rationality Model	
Predictors	*Estimates*	*CI (95%)*	*Estimates*	*CI (95%)*
Intercept	24.13	20.25 – 28.37	23.70	20.11 – 27.92
CRT in Students	**-1.73**	**-2.74 – -0.73**	-1.82	-2.75 – -0.89
Difference in belief in Americans compared to Students	0.62	-1.28 – 2.55	0.67	-1.33 – 2.62
Change in the contributions of CRT in Americans compared to Students	**-1.26**	**-2.41 – -0.05**	-0.92	-2.09 – 0.20
Political conservatism in Students (standardized)			3.89	2.57 – 5.23
Change in the contributions of CRT with a 1SD increase in conservatism in Students			**0.96**	**0.09 – 1.88**
Change in the contributions of conservatism in Americans compared to Students			2.92	1.53 – 4.41
Change in the contributions of CRT with a 1SD increase in conservatism in Americans			**-0.12**	**-1.14 – 0.85**
Observations	2263		2263	

57
58   Notes: Model included a random intercept for sample. Reference category = undergraduate
59   students at a Canadian university. Key estimates for the test of the model are bolded.
60
61

62   Table S9. Regression summaries - Belief in Karma & CRT

63

Karma	Dual Process Model		Expressive Rationality Model	
Predictors	*Estimates*	*CI (95%)*	*Estimates*	*CI (95%)*
Intercept	45.61	41.06 – 49.85	45.46	40.99 – 50.02
CRT in Americans	**-1.83**	**-3.47 – -0.06**	-1.78	-3.43 – -0.11
Political conservatism in Americans (standardized)			-0.37	-2.21 – 1.43
Change in the contributions of CRT with a 1SD increase in conservatism in Americans			**-0.08**	**-1.49 – 1.30**
Observations	208		208	

64

65   Notes: Key estimates are bolded.

66

67   Table S10. Regression summaries - Belief in karma & Faith in Intuition (R)

68

Karma	Dual Process Model		Expressive Rationality Model	
Predictors	*Estimates*	*CI (95%)*	*Estimates*	*CI (95%)*
Intercept	56.23	51.37 – 61.04	56.02	50.95 – 60.60
Faith in Intuition (Reverse scored, standardized)	**-4.45**	**-5.40 – -3.53**	-4.44	-5.40 – -3.50
Difference in belief in Canadians compared to Indians	-12.26	-13.67 – -10.84	-12.30	-13.71 – -10.91
Difference in belief in Americans compared to Indians	-6.87	-8.52 – -5.19	-6.80	-8.56 – -5.12
Change in the contributions of intuition in Canadians compared to Indians	**-1.11**	**-2.41 – 0.16**	-1.11	-2.38 – 0.14
Change in the contributions of intuition in Americans compared to Indians	**-0.44**	**-1.76 – 0.84**	-0.26	-1.57 – 1.02
Political conservatism in Indians (standardized)			2.02	1.15 – 2.90
Change in the contributions of intuition with a 1SD increase in conservatism in Indians			**0.71**	**-0.16 – 1.58**
Change in the contributions of conservatism in Canadians compared to Indians			-1.07	-2.29 – 0.23
Change in the contributions of conservatism in Canadians compared to Indians			-0.87	-2.25 – 0.53
Change in the contributions of intuition with a 1SD increase in conservatism in Canadians			**-0.07**	**-1.22 – 1.14**
Change in the contributions of intuition with a 1SD increase in conservatism in Americans			**0.99**	**-0.25 – 2.22**
Observations	2873		2873	

69

70   Notes: Reference group for sample = Indians. Key estimates are bolded.

71   Table S11. Regression summaries - Belief in witchcraft & Faith in Intuition (R)

72

Witchcraft	Dual Process Model		Expressive Rationality Model	
Predictors	*Estimates*	*CI (95%)*	*Estimates*	*CI (95%)*
Intercept	31.45	27.84 – 35.07	31.58	27.84 – 35.24
CRT in Americans	**-2.23**	**-3.81 – -0.69**	-2.24	-3.79 – -0.73
Political conservatism in Americans (standardized)			0.15	-1.63 – 1.85
Change in the contributions of CRT with a 1SD increase in conservatism in Americans			**-0.03**	**-1.28 – 1.27**
Observations	208		208	

73

74   Table S12. Regression summaries - Belief in witchcraft & Faith in Intuition (R)
75

Witchcraft	Dual Process Model		Expressive Rationality Model	
Predictors	*Estimates*	*CI (95%)*	*Estimates*	*CI (95%)*
Intercept	40.13	33.87 – 46.33	40.40	33.84 – 46.26
Faith in Intuition (Reverse scored, standardized)	**-0.94**	**-2.36 – 0.52**	-0.83	-2.26 – 0.58
Difference in belief in Americans compared to Indians	-5.51	-7.19 – -3.65	-5.45	-7.20 – -3.76
Change in the contributions of intuition in Americans compared to Indians	**-1.58**	**-3.07 – -0.07**	-1.37	-2.85 – 0.12
Political conservatism in Indians (standardized)			2.66	1.29 – 4.19
Change in the contributions of intuition with a 1SD increase in conservatism in Indians			**1.49**	**0.09 – 2.90**
Change in the contributions of conservatism in Americans compared to Indians			-0.37	-1.90 – 1.21
Change in the contributions of intuition with a 1SD increase in conservatism in Americans			**0.92**	**-0.54 – 2.38**
Observations	899		899	

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78   Table S13. Model summaries from Study 2

Predictors	Model 1: Belief in God		Model 2: Belief in God		Model 3: Supernatural Belief	
	Gervais et al (2017)		*Stagnaro et al (2019)*			
Predictors	*Estimates*	*HDI (95%)*	*Estimates*	*HDI (95%)*	*Estimates*	*HDI (95%)*
Intercept	62.39	51.56 – 72.05	41.54	36.71 – 47.40	57.81	53.36 – 62.84
CRT[1]	-1.31	-2.81 – 0.24	-1.82	-2.93 – -0.54	-2.67	-3.68 – -1.60
Conservatism[2]	0.34	-1.04 – 1.75	0.25	-1.56 – 2.04	-.14	-1.99 – 1.68
CRT * Conservatism	0.38	-0.64 – 1.29	1.20	0.49 – 1.92	1.26	0.61 – 1.94
Observations	1192		523		523	
Samples	7 Countries		United Kingdom		United Kingdom	

79   Notes: [1] CRT = 3 items in Gervais et al (2017); CRT = 7 items in Stagnaro et al (2019). [2]Political

80   orientation = -3 (very liberal) to 3 (very conservative) in Gervais et al (2017); Political

81   orientation = -2 (strongly liberal) to 2 (strongly conservative). Belief in God and Supernatural

82   Belief were measured on 100-point scales.
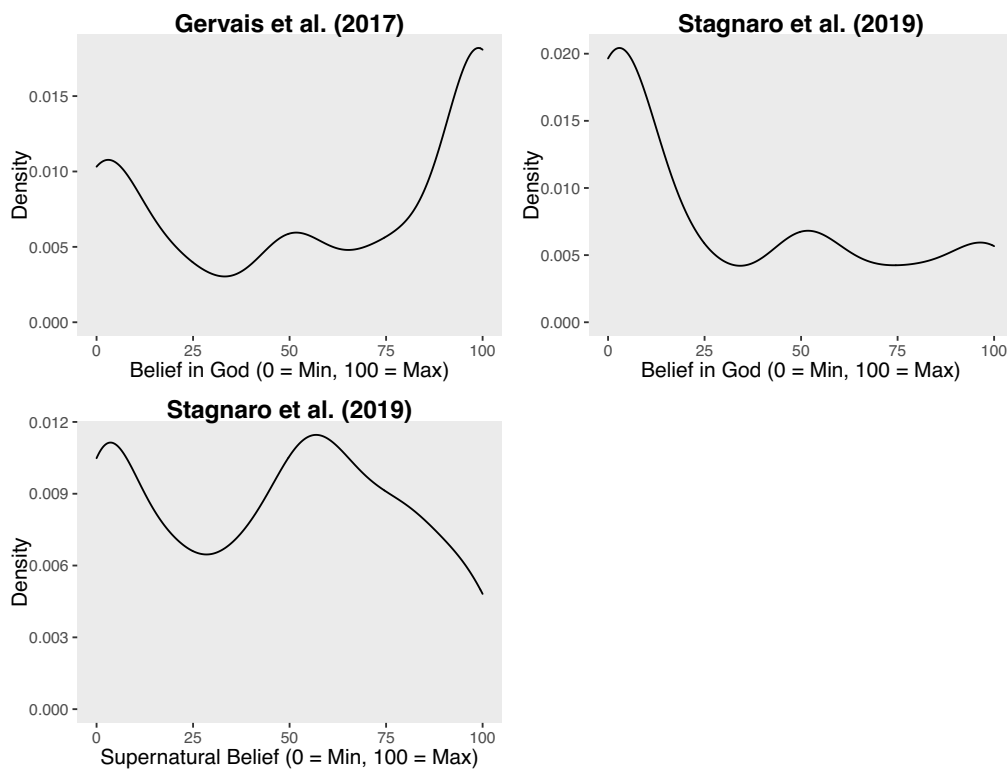
83

84

85   Figure S1. Density plots of belief by sample from Study 1
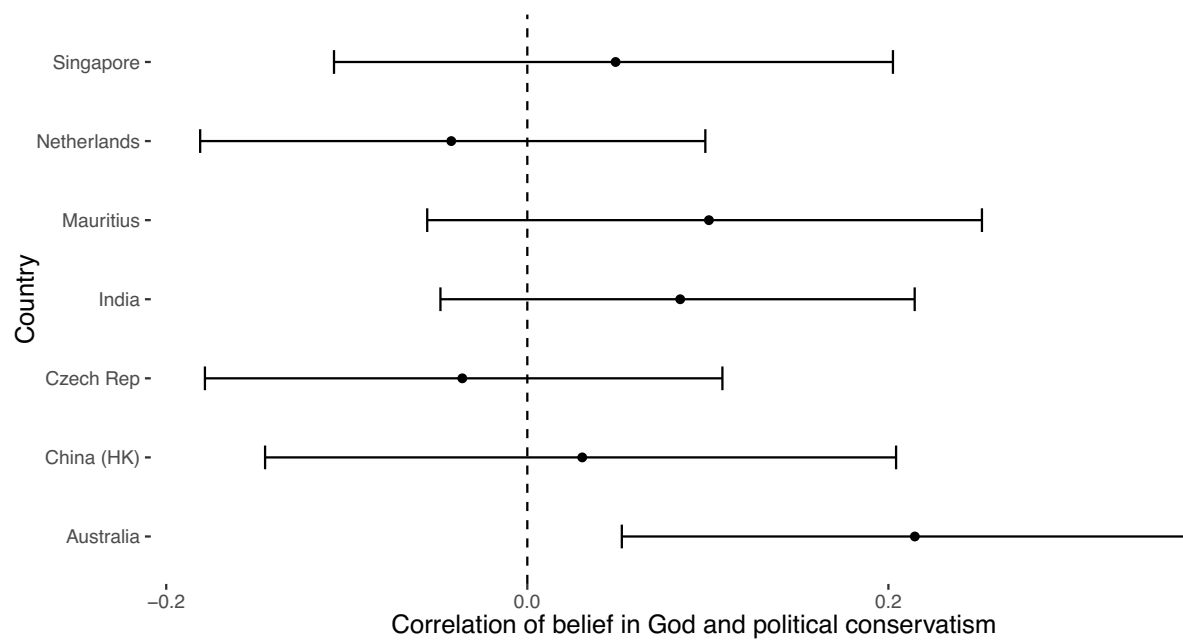86
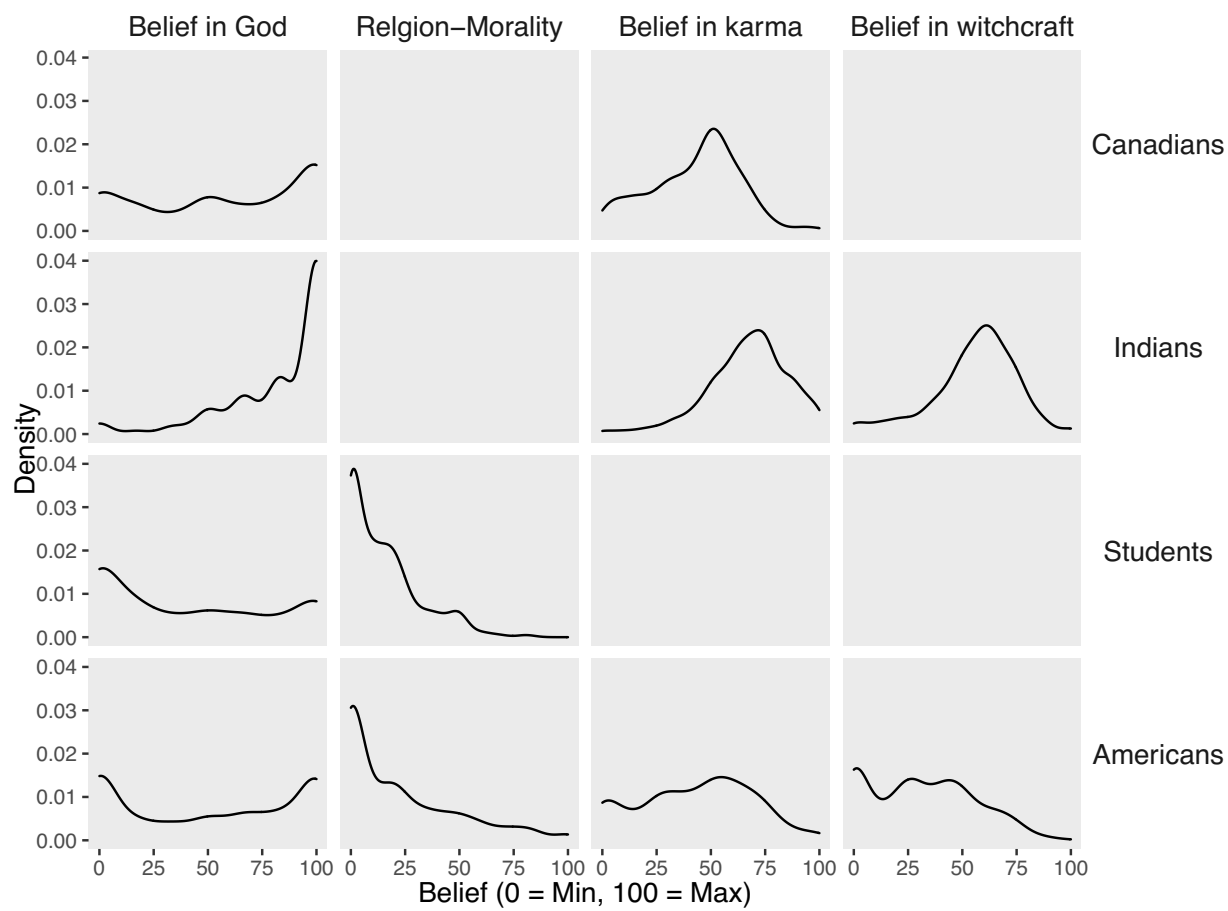
87
88

89   Figure S2. Density plots of belief by sample from Study 2
90

91

92 Figure S3. Correlation of belief in God and political conservatism in Gervais et al.'s (2017)
93 cross-cultural dataset
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96
97
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