Seeking evidence and explanation signals religious and scientific commitments

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Abstract

Scientific norms value skepticism; many religious traditions value faith. We test the hypothesis that these different attitudes towards inquiry and belief result in different inferences from epistemic behavior: Whereas the pursuit of evidence or explanations is taken as a signal of commitment to science, forgoing further evidence and explanation is taken as a signal of commitment to religion. Two studies (N = 401) support these predictions. We also find that deciding to pursue inquiry is judged more moral and trustworthy, with moderating effects of participant religiosity and scientism. These findings suggest that epistemic behavior can be a social signal and shed light on the epistemic and social functions of scientific vs. religious belief.

Keywords: explanation; evidence; information search; science; religion; moral cognition

Introduction

In his influential work on the sociology of science, Robert Merton introduced the idea of "organized skepticism" as a norm that governs the scientific enterprise. "Most institutions demand unqualified faith," he wrote, "but the institution of science makes skepticism a virtue" (Merton, 1973). Whether or not this norm accurately characterizes all scientific behavior and aspirations, it nicely encapsulates a value that many uphold: the value of critical and unlimited inquiry.

Yet in some walks of life, skepticism and unfettered inquiry can compete with other values. For instance, demanding an explanation for a friend's loyalty, or hiring a private investigator to gather evidence that a spouse is indeed faithful, could damage those relationships by sending a signal about one's (uncharitable) beliefs or (weak) commitment to the relationship. In fact, in economic games, examining the available evidence can be a maladaptive strategy for promoting cooperation (Hoffman, Yoeli, Nowak, 2015). As Merton suggested, organized skepticism can interfere with "values which demand an unquestioning acquiescence."

Within some religious traditions, willingness to believe (e.g., in Jesus or in God) in the absence of evidence is itself regarded as a virtue. In the well-known story of "doubting Thomas," to take an example from the Christian tradition, Jesus tells his apostle who demanded evidence: "because thou hast seen me, thou hast believed: blessed *[are]* they that have not seen, and *[yet]* have believed" (John 20:29). Indeed, faith – whether it is faith in God or in one's partner – may be an epistemic attitude that involves a certain *abdication* from the need for further evidence (Buchak, 2012).

The diverging norms of skepticism and faith introduce an interesting possibility: that the choice to pursue (vs. forgo) inquiry could send a signal about the strength and nature of one's commitments to scientific versus religious norms, and correspondingly, to science versus religion. That is, demanding further evidence or explanation could be seen as a mark of *commitment* regarding science, but a sign of doubt or insincerity in religion, at least within those traditions that value faith. Insofar as commitment to skeptical versus faith-based norms are taken to have other social or epistemic implications, we might also expect individuals who decide to pursue or forgo further inquiry regarding scientific or religious matters to be judged differentially moral, trustworthy, or committed to truth.

Based on these ideas, the current paper asks the following two questions: (1) What kinds of social and moral inferences do people (specifically, American and predominantly Christian adults) make on the basis of another person's decision to pursue or forgo inquiry? (2) Do inferences vary across scientific and religious domains?

Prior work

Research has shown that people interpret others' decisions as signals of moral and socially relevant traits. For example, those who make harm-averse moral judgments or engage in third-party punishment are more trusted and preferred as social partners (Everett, Crockett, Pizarro, 2016; Jordan, Hoffman, Bloom, Rand, 2016). Moral values and group affiliation are also thought to influence belief formation and revision: increased analytic thinking is associated with more polarized views, potentially because analytic individuals use different evidence to support pre-determined conclusions (Kahan & Stanovich, 2016). It remains unknown, however, whether people infer moral and social traits on the basis of epistemic behaviors, namely, the decision to pursue or forgo information search. In the current work we consider two epistemic behaviors: pursuing versus forgoing an *explanation*, and pursuing versus forgoing further *evidence*.

Prior work has found that judgments about the "need for explanation" differ across the domains of science and religion (Liquin, Metz, & Lombrozo, 2018). In particular, participants judged scientific statements – such as "the center of the earth is very hot" – to demand an explanation

to a greater extent than religious statements – such as "there is a hell" – even when confidence in the truth of the two statements was matched. When participants were presented with the "explanation" that it's a mystery (e.g., "Why is the center of the earth very hot [is there a hell]? It's a mystery"), they judged the answer more acceptable for religious questions than for scientific ones. These findings suggest that explanation-seeking – or abdication from explaining – could play different roles within science vs. religion, consistent with the diverging norms of skepticism vs. faith.

There is also reason to believe that science and religion could differ when it comes to attitudes towards evidence. Van Leeuewen (2017) develops a proposal according to which science and religion tend to involve distinct epistemic attitudes – what he calls factual *belief* versus religious *credence*. A characteristic of the latter is that it is "evidentially invulnerable": religious credences are not typically extinguished by contrary evidence. If this view is right, evidence should be more relevant to the evaluation of factual versus religious propositions.

In sum, prior work suggests that various decisions can serve as social signals, and that the domains of science and religion could differ in the epistemic attitudes they typically involve. Across two studies, we investigate novel questions that build upon this work: whether epistemic behaviors (the decision to pursue vs. forgo explanation or evidence) send different social signals across domains.

Study 1

In study 1, we examine the inferences that people make from an agent's epistemic behavior. To do so, we presented a story about a character, Jen, who learns about a new issue: either near-death experiences or the shroud of Turin (scenario: NDE vs. shroud). These issues were chosen because they can be framed as scientific or religious (domain: scientific vs. religious). Jen contemplates whether the issue *demands an explanation* or whether the issue *requires more evidence* (inquiry: explanation vs. evidence). Critically, Jen ultimately decides that it does or does not (decision: pursue vs. forgo). Participants rated the morality of Jen's behavior, her trustworthiness, and her commitment to truth, science, and religion. We predicted that the decision to pursue inquiry would be taken as a signal of scientific commitment, and the decision to forgo as a signal of religious commitment. We also predicted (but failed to find) that these effects would be strongest within their corresponding types of framing.

Method

Participants Participants in Study 1 were 97 adults recruited from Mechanical Turk (63 male, 34 female, mean age 36, range 22-73). Participation was restricted to MTurk workers in the U.S. who had completed 5000 past HITs with a minimum approval rating of 99%. Nine additional participants were excluded for leaving responses blank.

Materials & Procedures Participants were randomly assigned to read one of 16 vignettes about Jen, who learns about an issue and decides whether to inquire further about it. The issue was either near-death experiences or the shroud of Turin (scenario: NDE vs. shroud), framed in a scientific or religious manner (domain: scientific vs. religious). For example, the text for the shroud of Turin with a scientific framing included the following:

> Jen learns about the shroud of Turin, a piece of cotton cloth that may have been the burial shroud that Jesus (1st century preacher and religious leader) was wrapped in after being crucified by the Roman government.
>
> Scientific findings in disciplines ranging from chemistry to biology shine light on whether the shroud of Turin is indeed the burial shroud of Jesus. Multiple radiocarbon dating and vibrational spectroscopy tests date the shroud between 300 BC and 400 AD, corresponding with the timing of Jesus's crucifixion.
>
> Though most scientific leaders believe the shroud to be the burial cloth of Jesus, the matter is still not settled. Some people believe that it is not authentic and/or was created at a later date.

The version with religious framing was similar, but instead of offering scientific evidence and appealing to scientific consensus, it included biblical references and appealed to consensus among religious leaders.

After reading this information, participants learned about Jen's subsequent epistemic behavior: she either decided to pursue further inquiry or not (inquiry decision: pursue vs. forgo), and her inquiry took the form of either seeking (or not seeking) further evidence or seeking (or not seeking) an explanation (inquiry: evidence vs. explanation). Following prior work (Liquin et al., 2018), explanation seeking was framed broadly: that is, the specific type of explanation available (such as mechanistic or teleological) was not specified. For the Shroud of Turin, for example, participants read one of the following sentences, depending on inquiry condition (evidence vs. explanation) and decision (indicated by text in brackets):

> Evidence: Jen decides that she does [not] need more evidence that the cloth was the burial shroud that Jesus was wrapped in.
> Explanation: Jen decides that she does [not] need an explanation for how the shroud came to have its characteristic markings.

Crossing scenario (NDE vs. shroud), domain (scientific vs. religious), decision (yes vs. no), and inquiry (evidence vs. explanation) resulted in the 16 distinct vignettes.

After reading the vignette, participants were asked to rate 14 statements designed to probe their inferences about Jen, including her morality, trustworthiness, commitment to truth, commitment to science, and commitment to religion. All items and rating anchors are indicated in Table 1. Items

about truth, science, and religion were presented in random order before items about morality and trustworthiness. Nine participants failed to answer at least one item and are therefore excluded from reported analyses. Participants then answered an open-ended question about what they thought of the fact that Jen did [not] pursue further evidence or explanation. We do not analyze these open-ended responses here.

Next, participants completed a set of individual difference measures, which are not reported here. Finally, participants reported their political orientation, age, and gender.

Table 1: Study 1 and 2 rating questions. Items with an asterisk were reverse-scored. For the composite measures, we additionally report Cronbach's α (Study1 / Study 2).

Moral and character inferences
Morality
Jen's decision that […] was…
(1 = "very immoral/bad" – 7 = "very moral/good")
Trustworthiness
Jen is probably…
(1 = "very untrustworthy" – 7 = "very trustworthy")
Commitment to truth (α = .88 / .79)
Jen values truth above all.
When it comes to what she believes, Jen cares about getting things right.
Jen is not concerned about whether she is right or wrong.*
Jen values some things more than getting things right.*
(1 = "strongly disagree" – 7 = "strongly agree")
Commitment to science (α = .94 / .94)
Jen has a strong commitment to the methods of science.
Jen is a deeply scientific person.
Jen values her identity as a scientifically-minded person.
Jen trusts scientific authorities.
(1 = "strongly disagree" – 7 = "strongly agree")
Commitment to religion (α = .93 / .94)
Jen has strong religious faith.
Jen is a deeply religious person.
Jen values her religious identity.
Jen trusts religious authorities.
(1 = "strongly disagree" – 7 = "strongly agree")

Results

Our key dependent variables were the single ratings for morality and trustworthiness, as well as our composite ratings for commitment to truth, science, and religion, which were calculated by averaging the four ratings for each scale. The reliability of these scales, as assessed by Cronbach's α, ranged from good to excellent (see Table 1). For each dependent variable, we performed an ANOVA with domain (scientific vs. religious), decision (yes vs. no), scenario (Shroud of Turin vs. NDE) and inquiry (evidence vs. explanation) as between-subjects factors (see Figure 1a). Given the large number of tests, we adopted the more conservative p-value of .01 as our threshold for significance; we report all significant effects.

The ANOVA with ratings of morality as a dependent variable revealed a main effect of decision: deciding to inquire was rated morally better than deciding not to, $F(1, 81) = 37.58$, $p < .001$. Analysis of trustworthiness as a dependent variable also revealed a main effect of decision, $f(1,81) = 22.22$, $p < .001$, such that the character was rated as more trustworthy when she decided to inquire than when she decided not to.

Analyzing composite ratings of commitment to truth also showed a main effect of decision, $f(1,81) = 70.40$, $p < .001$, with decisions to inquire associated with higher perceived commitment to truth. However, this effect was qualified by a significant interaction with domain, such that decision had a greater impact on perceived commitment when the issue was framed as religious, $f(1,81) = 8.41$, $p = .005$.

Composite ratings of commitment to science exhibited a similar pattern, revealing a significant main effect of decision in the same direction, $f(1,81) = 45.208$, $p < .001$, as well as a marginal interaction with domain, trending in the same direction, $f(n) = 5.95$, $p = .02$.

Finally, composite religious commitment ratings revealed a significant main effect of decision, $f(1,81) = 45.618$, $p < .001$, but in a direction opposite to that observed for our other dependent variables: the decision to inquire was associated with a *decrease* in perceived commitment to religion. Once again, there was a suggestive trend for decisions to be more informative in the religious domain (decision x domain interaction), $f(1,81) = 2.72$, $p = .10$. There was also a significant main effect of scenario, qualified by an interaction with decision, such that perceived commitment to religion was rated higher when Jen learned about the shroud of Turin, $f(1,81) = 10.68$, $p = .001$, especially when Jen decided not to pursue more information, $f(1,81) = 9.56$, $p = .002$.

Discussion

Participants in our study viewed evidence- and explanation-seeking behaviors favorably: participants viewed the decision to pursue both evidence and explanation as morally good and a cue to trustworthy character. Critically, evidence- and explanation- seeking was also treated as a signal of commitment to truth and science, where *forgoing* further inquiry was treated as a signal of commitment to religion. These effects were remarkably consistent across modes of inquiry (evidence versus explanation), and across our manipulation of domain (science versus religion), though we found modest evidence that pursuit decisions might be regarded as more informative in the domain of religion than science.

We initially hypothesized that the effect of inquiry decisions on inferences about the inquirer would be moderated by participants' own religious and scientific commitments. Because our sample was overwhelmingly non-religious, however, we were unable to test this hypothesis. We revisit this question in Experiment 2, for which we recruited a more religious sample.

Study 2

In Study 2, we again tested the effect of epistemic behaviors (pursuing vs. forgoing evidence vs. explanation) and domain (religious vs. scientific) on inferences about morality, trustworthiness, commitment to truth, commitment to science, and commitment to religion. However, we restricted participation to MTurk workers from the nine states in the U.S. with the highest proportion of religious residents – this involved drawing from the generally protestant population of the South (Lipka & Wormald, 2016). We also aimed to strengthen the manipulation of domain (religious vs. scientific), editing scenarios to be more identifiably religious or scientific. Finally, by including a larger and more religious sample, we aimed to test two hypotheses about individual differences that could moderate the effect of inquiry decision on perceived morality and trustworthiness: religiosity and scientism. Specifically, we predicted that more religious participants might see greater value in the epistemic attitude of faith, resulting in higher ratings of morality and trustworthiness (relative to non-religious participants) after Jen decides to forgo further inquiry. On the other hand, participants who endorse a narrow commitment to science might be especially likely to value associated norms (such as organized skepticism) and therefore judge Jen more favorably (relative to less-scientistic participants) when she decides to pursue inquiry.

Method

Participants Participants in Study 2 were 304 adults recruited from Amazon Mechanical Turk (117 males, 186 females, mean age 40, range 19 to 77). Participation was restricted to MTurk workers from Alabama, Mississippi, Tennessee, Louisiana, Arkansas, South Carolina, West Virginia, Oklahoma, and Georgia. Thirty-six additional participants were excluded for failing one or more attention checks (explained below).

Materials & Procedures The materials and procedures were the same as those in Study 1, with the following modifications. First, we made slight modifications to the 16 original vignettes to further differentiate the religious and scientific framing. For example, for the religious version of the Shroud of Turin vignette, we replaced the original sentence "could it be the burial shroud of Christ," with "could it be the burial shroud of Jesus Christ, son of God?" Second, we collected fewer individual difference measures than in Study 1. Those retained included the religiosity inventory from Pennycook et al. (2012; sample items: "There is a life after death," "Religious miracles occur"), the moralized rationality and importance of rationality scales from Stahl et al. (2016), and the scientism scale from Farias et al. (2013; sample items: "Science provides us with a better understanding of the universe than does religion," "Science is the most valuable part of human culture"), presented in this order. An attention check ("select 'strongly agree'") was included in the religiosity inventory, and 31 participants were excluded for failing to answer correctly. Participants then reported their political orientation, age, and gender.

Finally, participants answered two additional attention check questions about the content of their vignette and Jen's decision; these were simple multiple-choice questions based on what they had read (e.g., "What did Jen decide?"). Four participants were excluded for failing to answer at least one question correctly.

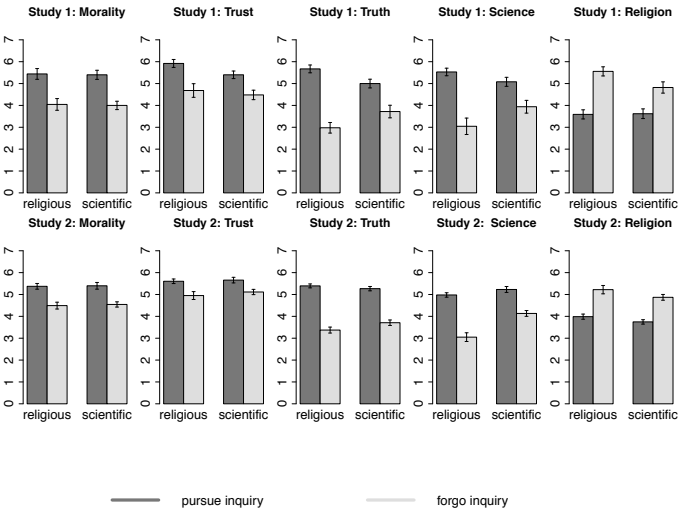

Figure 1: Mean ratings in Study 1 and 2 for the inferred characteristics of the vignette's character as a function of domain and her decision to pursue or forgo further inquiry. Error bars correspond to SEM.

Results

As with Study 1, our key dependent variables were the single ratings for morality and trustworthiness, as well as our composite ratings for commitment to science, religion, and truth, calculated by averaging the four ratings for each scale. The reliability of these scales, as assessed by Cronbach's α, ranged from good to excellent (see Table 1). For each dependent variable, we performed an ANOVA with domain (scientific vs. religious), inquiry decision (pursue vs. forgo), inquiry type (evidence vs. explanation), and scenario (shroud vs. NDE) as between-subjects factors (see Figure 1b). Given the large number of tests, we adopted the more conservative *p*-value of .01 as our threshold for significance, and we report all significant effects.

The ANOVA with ratings of morality as a dependent variable again revealed a main effect of decision, $f(1, 288) = 39.50$, $p < .001$, as well as a marginal interaction between domain, decision, and inquiry type, $f(1, 288) = 6.51$, $p = .01$. Both kinds of inquiry were associated with higher moral goodness judgments, but explanation-seeking behaviors were more informative for morality in a scientific context than a religious one, and conversely, evidence-seeking behaviors were more informative in a religious context than a scientific one. There was also an interaction between

decision and scenario, such that the main effect of decision was more pronounced in the NDE scenario, $f(1,288) = 6.95$, $p = .008$.

Analysis of trustworthiness judgments also revealed a main effect of decision, $f(1,288) = 20.25$, $p < .001$, with the decision to pursue inquiry associated with greater trustworthiness.

Analyzing composite ratings of commitment to truth revealed a main effect of decision, $f(1,288) = 266.52$, $p < .001$, with greater perceived commitment when inquiry was pursued, and a main effect of inquiry type, $f(1,288) = 16.78$, $p < .001$, with greater perceived commitment in the evidence condition than in the explanation condition. There was also a marginal interaction between decision and domain, $f(1,288) = 4.52$, $p = .03$, with decision having a greater impact in the religious condition.

Analysis of commitment to science revealed a main effect of decision, $f(1,288) = 111.10$, $p < .001$, as well as an interaction between decision and domain, $f(1,288) = 9.3$, $p = .003$. As in Study 1, Jen was regarded as having a higher commitment to science when she sought out evidence or explanation, with a greater effect of decision with religious framing. There were also main effects of domain and scenario, such that Jen was perceived as having a higher commitment to science both when the issue was framed as scientific, $f(1,288) = 21.23$, $p < .001$, and when the issue was near-death experiences rather than the shroud of Turin, $f(1,288) = 9.48$, $p = .002$.

The ANOVA with composite commitment to religion revealed a main effect of decision in the opposite direction of truth, morality, truth commitment, and science commitment, as in Study 1. Forgoing inquiry was associated with *greater* commitment to religion, $f(1,288) = 86.626$, $p < .001$. There was also a main effect of scenario, $f(1,288) = 38.349$, $p < .001$, as well as an interaction between decision and scenario, $f(1,288) = 15.75$, $p < .001$: for the Shroud of Turin scenario, perceived commitment to religion was higher overall, and decision was more influential.

We additionally explored whether two of our individual difference measures, religiosity and scientism, moderated the effect of inquiry decision on perceived morality and trustworthiness (see Figure 2). To test for a moderating effect of religiosity, we constructed two pairs of linear mixed effects models (predicting morality or trustworthinesss), treating participant religiosity (centered) and decision as fixed factors, and treating scenario as a random factor with respect to intercept. We fit a full model with the main effects of both fixed factors as well as their interaction and a partial model that included the same factors without an interaction. An ANOVA comparison of the two models revealed that the full model better predicted moral judgments, $X^2(1) = 7.28$, $p = .006$, and trustworthiness judgments, $X^2(1) = 14.56$, $p < .001$. As participant religiosity increased, epistemic decision mattered less for judgments of morality and trustworthiness. Equivalent analyses for participant scientism also revealed that a model with the scientism-decision interaction term better predicted morality, $X^2(1) = 15.19$, $p < .001$, and trustworthiness, $X^2(1) = 27.776$, $p < .001$. However, the pattern was opposite to that observed for religiosity: participants rejecting scientism were likely to see forgoing inquiry as more moral and trustworthy, whereas participants endorsing scientism saw the pursuit of inquiry as more moral and trustworthy.

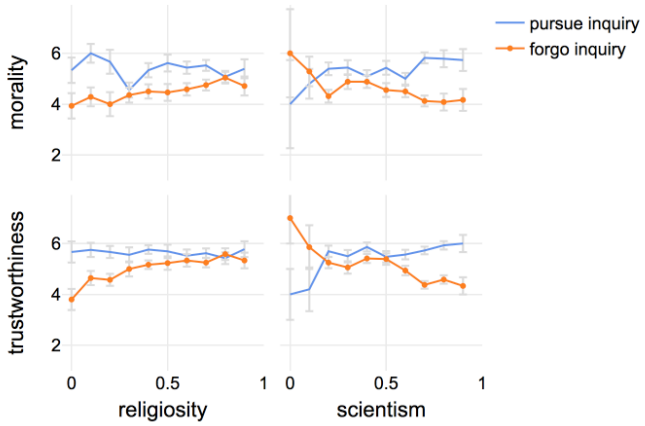

Figure 2: Moral and trustworthiness judgments by participant scientism and religiosity.

Discussion

In Study 2, we replicated our main findings from Study 1 with a larger and more religious sample drawn predominantly from the American South. Jen was regarded as more moral and trustworthy for seeking evidence and explanations. Inquiry behaviors were associated with an increase in commitment to truth and science, but a decrease in commitment to religion. We also found additional evidence of a trend observed in Study 1: inquiry decisions in the domain of religion (vs. science) were generally more informative in the sense that they had a larger impact on inferences about Jen's commitments, especially to science.

Going beyond Study 1, we identified two individual difference factors that moderated the effect of inquiry decision on inferences about morality and trustworthiness: religiosity and scientism. Scientistic participants were inclined to draw inferences about Jen's morality and trustworthiness that were *more* dependent on her decision about whether to pursue or forgo inquiry, showing a more pronounced effect favoring inquiry. On the other hand, religious participants tended to draw inferences about Jen's morality and trustworthiness that were less dependent on her decision about whether to pursue or forgo inquiry.

General discussion

People infer a number of moral and social traits from another person's epistemic behavior. We found evidence that pursuing inquiry is viewed as a signal of commitment to truth and to science, but that forgoing inquiry is perceived as signaling commitment to religion. A person who pursues evidence or explanation is regarded as more moral and trustworthy, but only among certain groups: for more

religious participants, the effect of inquiry on inferences of trust and morality diminishes; for participants who very strongly reject scientism, the relationship reverses.

Keeping track of epistemic behavior is key to learning from others. The finding that adults infer moral character traits from an agent's epistemic behavior contributes to a literature showing a connection between how people track others' epistemic and moral status. Research has shown that young children use epistemic markers, such as past accuracy, to guide evaluations of source trustworthiness (Birch, Vauthier, & Bloom, 2008). However, children also use a source's moral qualities, such as niceness/meanness, in evaluating the truth-value of a claim (Landrum, Mills, & Johnston, 2013). Adults are less likely to trust a source with different political values, even when the information is non-political, e.g., about geometric shapes (Marks, Copland, Loh, Sunstein, & Sharot, 2018). Future research should investigate why we use moral information in epistemic judgments and epistemic information in moral judgments. When does trusting a source mean trusting a person?

The social consequences of information search might carry implications for real epistemic decisions. People often face the choice between accepting a proposition at face value and searching for more information. Our research suggests the possibility that epistemic considerations (e.g., strength of prior evidence, uncertainty) may not fully account for behavior. Social context may play a role in the decision-making process. For instance, a person who wants to signal commitment to religion may be more likely to forgo inquiry, risking false beliefs for potential social rewards (a "display of faith"). A person could also choose to pursue costly inquiry (high search cost, low information value) to be perceived as moral and trustworthy (a "display of skepticism").

The current studies are limited in a number of respects, including the range of materials and underspecified forms of inquiry. Explanation in particular was broadly defined in our experimental materials. There are different kinds of explanations, and participants may have differed in what they took an explanation to be. Indeed, given differences in the need for explanation across domains (Liquin, Metz, & Lombrozo, 2018), and differences in the *kinds* of explanations offered across domains (e.g., Kelemen, 2004; Lupfer, Brock, & DePaola, 1992), it could be that different kinds of explanations are more or less closely tied to religious and scientific norms.

It's also important to note that our sample – while diverse in some respects – drew from an overwhelmingly Christian (and mostly Protestant) population, considerably limiting the extent to which we can make general claims about religion or religiosity. Indeed, we expect a great deal of heterogeneity in religious attitudes towards inquiry, and additionally expect that scientific propositions can be "taken on faith." Future work should explore this heterogeneity, for instance testing more diverse samples, and additionally consider how a more nuanced understanding of science (as opposed to the "scientism" measured here) might affect attitudes towards and inference from the choice to seek further explanation or evidence.

Despite these limitations, the present work contributes to a growing body of work suggesting that beliefs and processes of belief revision are sensitive to both epistemic and social goals. Researchers have proposed that religious belief serves a social coherence function (Norenzayan, 2013), and politicized "scientific" beliefs (such as the endorsement or rejection of anthropogenic climate change or human evolution) are strongly related to cultural / group identity (e.g., Kahan & Stanovich, 2016). As Van Leeuwen (2017) suggests: "If my credence that our god exists can be banished by something so trifling as mere evidence, how can you be sure that I am really committed to our group, which defines itself by allegiance to our god?" Our research shows that forgoing inquiry can send a signal of religious commitment. On the other hand, for most observers, the decision to inquire is considered the more moral action, and a stronger marker of trustworthiness, commitment to science, and commitment to truth.

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