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What Makes You So Sure? Dogmatism, Fundamentalism, Analytic Thinking, Perspective Taking and Moral Concern in the Religious and Nonreligious

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Abstract Better understanding the psychological factors related to certainty in one's beliefs (i.e., dogmatism) has important consequences for both individuals and social groups. Generally, beliefs can find support from at least two different routes of information processing: social/moral considerations or analytic/empirical reasoning. Here, we investigate how these two psychological constructs relate to dogmatism in two groups of individuals who preferentially draw on the former or latter sort of information when forming beliefs about the world—religious and nonreligious individuals. Across two studies and their pooled analysis, we provide evidence that although dogmatism is negatively related to analytic reasoning in both groups of individuals, it shares a divergent relationship with measures of moral concern depending on whether one identifies as religious or not. Study 1 showed that increasing levels of dogmatism were positively related to prosocial intentions among the religious and negatively related to empathic concern among the nonreligious. Study 2 replicated and extended these results by showing that perspective taking is negatively related to dogmatism in both groups, an effect which is particularly robust among the nonreligious. Study 2 also showed that religious

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fundamentalism was positively related to measures of moral concern among the religious. Because the current studies used a content-neutral measure to assess dogmatic certainty in one's beliefs, they have the potential to inform practices for most effectively communicating with and persuading religious and nonreligious individuals to change maladaptive behavior, even when the mode of discourse is unrelated to religious belief.

Keywords Religion · Dogmatism · Moral concern · Perspective taking · Default mode network (DMN) · Task-positive network (TPN)

Introduction

Dogmatism can be understood as an unwavering conviction in one's beliefs and is further characterized by a failure to revise beliefs when confronted by contradictory evidence (Altemeyer 1996). While dogmatic tendencies can be expressed toward any particular belief, or system of beliefs, prior work has demonstrated that religious individuals are, generally speaking, more dogmatic than nonreligious individuals (Hunsberger and Altemeyer 2006). However, research into the psychological processes related to dogmatism among religious and nonreligious individuals is scant. Hence, it remains an open question whether dogmatic tendencies bear similar relationships to psychological processes implicated in belief in/flexibility among individuals who adopt or reject religious worldviews. In this manuscript, we examine the relationship between dogmatism and two different types of cognition implicated in belief in/flexibility—aspects of analytic reasoning and aspects of moral concern[1]—among religious and nonreligious individuals.

Practical Motivations

There are both theoretical and empirical reasons to suppose, first, that aspects of analytic reasoning and moral concern are implicated in dogmatism and, second, that whether one identifies as religious or not might influence the relationship that aspects of these two broad yet distinct types of cognition may share to dogmatism. However, before reviewing the motivations behind this project, it is first worth considering the practical import of better understanding the psychology of dogmatism.

Dogmatic tendencies can have both positive and negative consequences. On the one hand, dogmatic adherence to certain beliefs can help solidify social affiliations and provide stability and clarity with which individuals organize and motivate their behavior, especially when confronted with difficulties in life (e.g., God has a plan for all of us). On the other hand, dogmatically adhering to beliefs which are inaccurate or harmful can be highly counterproductive to the individual and/or to society at large (e.g., beliefs about gender or

[1] Our rationale for investigating the relationship these two rather broad yet distinct psychological constructs share with (religious) belief was first explained in Jack et al. (2016). Empirical and theoretical support is discussed in this paper, in the section titled 'Neuroscience reveals a tension between different types of thinking related to different belief considerations.' The interested reader is directed to Friedman & Jack (accepted), where we advance a through theoretical and empirical account of the relationship between (brain areas underlying) aspects of analytic reasoning, aspects of moral concern and aspects of a more emotionally distanced sort of social cognition (e.g., theory of mind).

racial superiority). Moreover, recent work in communications neuroscience has demonstrated the benefits of affirming one's core values and beliefs prior to being confronted with threatening health information intended to promote behavioral change (Falk et al. 2011; see below). Hence, better understanding the cognitive origins of dogmatic tendencies can inform techniques for modifying maladaptive beliefs on the one hand, and appealing to certain beliefs and values as vehicles through which positive behavioral change can be instigated on the other. If certain psychological processes or modes of information integration bear different relationships to dogmatism depending on whether one identifies as religious or not, then this can be used to tailor or personalize health information for positive behavioral change (e.g., Tompson et al. 2015).

Beliefs, Analytic/Empirical Reasoning and Social/Moral Considerations

Generally speaking, important beliefs and values can find support from at least two broadly characterized, yet fundamentally different, sorts of cognition. The first includes psychological processes that aid in the ability to evaluate evidence and arguments, including, but not limited to, nonsocial-working memory (simultaneously considering alternative propositions), attention selection and inhibition (cycling between different propositions) and logical or critical reasoning (deducing or inducing relationships between propositions). These sorts of psychological processes underlie many important beliefs and attitudes, such as commitment to the theory of evolution (Gervais 2015). The second includes psychological processes that aid in generating affective value and meaningful interpersonal relationships, including, but not limited to, introspection (internally directed attention toward our thoughts and feelings), theory of mind (representing our own and others mental states), empathy (vicariously simulating another person's experience) and emotional regulation (creating new affective meaning from one's emotions). These sorts of psychological processes also relate to many important beliefs, especially those that have a clear humanistic dimension, such as the right to free speech.

However, these two different sorts of considerations—analytic/empirical versus social/moral—do not always align and may create tension within the individual. For instance, the claim that 'All men are created equal' would appear to have been contradicted by research in the medical and social sciences, even though social and moral considerations may continue to suggest it is a 'self-evident truth.' Hence, it appears that beliefs can find more (or less) support from at least two different sorts of cognition, one which emphasizes aspects of analytic reasoning and empirical facts, and another other which emphasizes aspects of social and moral considerations. It is therefore important to measure psychological capacities related to both routes of belief formation simultaneously, alongside dogmatism, in order to better understand how both types of consideration contribute to belief in/flexibility among those who identify as religious or not. Depending on whether one identifies as religious or not may reveal different relationships between dogmatism and aspects of analytic reasoning compared to aspects of social/moral considerations, including moral concern. That is the goal of this paper, which is motivated by work in both cognitive neuroscience and psychology.

Neuroscience Reveals a Tension Between Different Types of Thinking Related to Different Belief Considerations

Cognitive neuroscientists have reoriented their attention away from the 'phrenological brain mapping' approach in order to adopt a more fecund neural network approach. This approach aims to broadly characterize groups of brain regions (neural networks) based on their tendency to commonly deactivate/activate in response to different experimental demands and further understand how the interaction between different networks gives rise to more complex cognitions and behaviors (Anticevic et al. 2012; Bressler and Menon 2010). Two networks that have received considerable empirical attention are the task-positive network (TPN) and the default mode network (DMN). These two anatomically dissociable neural networks are important to the present paper because converging evidence suggests that each network shares a unique relationship with the psychological processes preferentially associated with the two different sorts of belief considerations discussed above.

Decades of experimental and meta-analytic research have demonstrated that lateralized fronto-parietal brain regions belonging to the TPN are consistently activated by tasks that engage basic executive functions, including nonsocial-working memory,[2] focused attention, conflict control, inhibition and selection, as well as more complex forms of problem solving, including logical, causal–mechanical, arithmetic, statistical and empirical reasoning (Duncan and Owen 2000; Fox et al. 2005; Goel 2007; Jack et al. 2012; Krueger et al. 2008; Shulman et al. 1997; Van Overwalle 2011). These are all psychological processes which contribute to effectively evaluating arguments and making predictions about the physical world. Combining these empirical observations with the advantages of broadly characterizing the psychological profile of neural networks (Bressler and Menon 2010) has motivated us to characterize the TPN as being associated with various sorts of analytic reasoning skills (Friedman et al. 2015; Friedman and Jack accepted, 2012, 2016; Jack et al. 2014). Others have noted how these brain regions are involved in psychological processes related to generalized intelligence, such as IQ (Anticevic et al. 2012; Duncan and Owen 2000).

Experimental and meta-analytic research has also demonstrated that brain regions belonging to the DMN, which include medial frontal and medial parietal regions, as well as the temporal–parietal junctions, are consistently activated by a variety of controlled and attention-demanding social/emotional/moral tasks. These include the use of introspection, representing one's own and others emotions and mental states, generating affective meaning and value, empathizing with others, exercising abstract moral principles that honor the humanity in others and motivating prosocial behavior (Bartra et al. 2013; Bzdok et al. 2012; Jack et al. 2014; Koenigs et al. 2007; Lindquist et al. 2012; Marstaller et al. 2016; Morelli et al. 2014; Rameson et al. 2012; Roy et al. 2012; Schilbach et al. 2008; Spreng et al. 2009). Some have referred to the DMN as the 'social brain' (Mars et al. 2012; Schilbach et al. 2008), as these are all psychological processes which aid in interpersonal

[2] The distinction between nonsocial-working memory (e.g., manipulating numbers or alphabetizing names in one's own mind) and social-working memory (e.g., manipulating mental states and personality traits in one's own mind) is supported by work in neuroscience demonstrating that the former sorts of tasks activate TPN regions, while the latter sorts of tasks activate DMN regions (Meyer et al. 2015). Moreover, DMN activation during social-working memory tasks is related to behavioral performance on social tasks, such as perspective taking, while TPN activation during either sort of working memory task is unrelated (Meyer et al. 2015). Hence, there are clear neurological and functional (e.g., behavioral) dissociations between social and nonsocial-working memory systems.

connection and deriving meaning from one's experiences, especially emotional experiences. Damage to certain areas of the DMN can lead to instrumentally manipulating people during moral judgment tasks (Koenigs et al. 2012). With these empirical observations in mind, we have referred to this network as being associated with various sorts of social–emotional skills, especially those related to moral concern (Friedman et al. 2015; Friedman and Jack accepted, 2012, 2014, 2016).

Importantly, these two brain networks are not merely anatomically independent, but they are also functionally antagonistic, or shRare an 'anti-correlated' relationship (Fox et al. 2005). As activation in one network increases, the other network tends to be deactivated (Shulman et al. 1997), something that is observed even when participants are simply laying at rest in the brain scanner (Fox et al. 2005). Importantly, the degree to which these two networks 'fight with each other' is exacerbated by engaging their associated psychological processes. In other words, the same sorts of analytic reasoning tasks that activate the TPN also simultaneously deactivate the DMN (for reviews see Anticevic et al. 2012; Shulman et al. 1997). In contrast, tasks that require empathizing with and representing other people's mental states activate the DMN and simultaneously deactivate the TPN (Jack et al. 2012). Hence, it appears the brain is organized in such a way that we are constrained from simultaneously engaging the sorts of cognitive processes associated with each network (Anticevic et al. 2012; Jack et al. 2012).

This is important to the present paper for two reasons. First, it helps explain the cognitive dissonance or 'tension'[3] that individuals might experience when reflecting on contradictory inputs related to their beliefs, discussed in 'Beliefs, Analytic/Empirical Reasoning and Social/Moral Considerations' section. Second, the TPN and DMN have been implicated in several neuroimaging studies investigating (dis)belief in general, religious (dis)belief in particular. Religious belief and prayer are associated with increased activation in regions of the DMN (Harris et al. 2009; Schjoedt et al. 2010; Schjoedt et al. 2009), whereas disbelief is associated with greater activation in TPN regions (Harris et al. 2009; Schjoedt et al. 2010). One study provides causal evidence that as activity in a region of the TPN (right inferior parietal lobe) is experimentally increased (via transcranial magnetic stimulation; TMS), belief in religious and supernatural phenomena decreases (Crescentini et al. 2015). Consistent with these findings is a recent review piece which argues that the DMN is likely involved in adopting reflective religious beliefs, whereas cognitive control and inhibitory areas, which lie within the TPN, are involved in rejecting or revising such beliefs (van Elk and Aleman 2016). Hence, it appears that psychological processes associated with the DMN might incline individuals to accept certain religious and supernatural beliefs, whereas those associated with the TPN may disincline the acceptance of such beliefs. Indeed, we have advanced an account of the cognitive origins of religious belief which is partly motivated by the tension between these two neural networks and their associated cognitive processes (see below; Jack et al. 2016).

Finally, the neuroscience is also relevant in light of demonstrations that a core node of the DMN, the ventromedial prefrontal cortex (vmPFC), is associated with belief in general, that is, in adopting a variety of claims, from mathematical and autobiographical, to ethical

[3] The felt or experienced tension between competing inputs and beliefs (as well as methods for ameliorating such tension) is well documented by research on cognitive dissonance (Festinger 1962; Tavris and Aronson, 2008). We are not claiming that all sorts of cognitive dissonance can be traced to the relationship between these two networks. However, we refer the interested reader to other work that provides theoretical and empirical support for the notion that the tension between these two neural networks underlies many important—and experientially real—tensions pertaining to competing philosophical beliefs and their associated worldviews (Friedman and Jack accepted, 2012, Jack 2013; Robbins and Jack 2006).

and religious (Harris et al. 2008). This is important for two reasons. First, the vmPFC is critically implicated in reversal learning, the generation/modification of affective meaning (Marstaller et al. 2016; Roy et al. 2012) and ethical reasoning that honors the humanity in others (Jack et al. 2014; Koenigs et al. 2007). This provides further support for the idea that social and moral considerations are linked to belief adoption and revision. However, most work has focused on the role of analytic reasoning in adopting and revising beliefs (see below). Second, vmPFC has recently been implicated in persuading individuals to change maladaptive behavior, especially when individuals reaffirm their most important core values (e.g., religious belief, independence, politics) before being exposed to the persuasion (Falk et al. 2011). These findings have motivated efforts to personally tailor persuasive messages, especially in the context of health care (Tompson et al. 2015).

In conclusion, the neuroscience suggests there is a tension between two broad yet fundamentally different types of cognitive processes—those implicated in various sorts of analytic reasoning tasks and those implicated in various sorts of social and moral considerations. It is worth emphasizing that the division between these networks is not one of controlled and reflective processing on the one hand (task-positive network) and automatic and intuitive processing on the other (default mode network). That is, that the TPN is categorically associated with Type 2 processing, whereas the DMN is associated with categorically Type 1 processing (e.g., Evans and Stanovich 2013; Kahneman 2011). The mere observation that these two networks actively interfere with each other speaks against any conception that the DMN and social–emotional processes are automatic and intuitive. Instead, both networks are associated with Type 1 (automatic and implicit) and Type 2 (controlled and reflective) processes in distinct and opposing domains of cognition (Friedman et al. 2015). We bring this up to avoid any misconceptions that we are suggesting religious belief and social–emotional processes are automatic and intuitive, whereas religious disbelief and analytic/empirical reasoning processes are controlled and deliberate.

Using the Cognitive Sciences to Motivate a Psychological Account of Religious (Dis)belief

There is a large body of work in cognitive science which suggests religious and nonreligious individuals may place a relatively different emphasis on aspects of analytic reasoning versus aspects of social/moral concern when it comes to adopting or rejecting certain beliefs. First, nonreligious individuals score higher on measures of analytic and empirical reasoning than religious individuals (Gervais and Norenzayan 2012; Pennycook et al. 2016; Shenhav et al. 2012) and also report that their disbelief derives from a preference for analytic and logical thinking (Caldwell-Harris et al. 2011; Hunsberger and Altemeyer 2006). In contrast, religious individuals score higher than the nonreligious on a variety of measures assessing aspects of social/emotional/moral cognition, including peer reports (Liu 2010; Norenzayan et al. 2012; Rounding et al. 2012; Saroglou et al. 2005). This may incline religious and nonreligious individuals to differentially rely on these psychological capacities in certain situations, especially when confronted with stimuli or arguments that uniquely appeal to aspects of both broad types of cognition.

In this regard, we have recently provided evidence that religious worldviews represent a class of beliefs which place analytic and social/moral considerations in tension with each other (Jack et al. 2016). More specifically, we demonstrated that while religious belief is

negatively related to different aspects of analytic reasoning, it shares a stronger and more robust positive link to several measures of moral concern. Moreover, measures of theory of mind were either unrelated or negatively related to religious belief, after taking the other measures into account (Jack et al. 2016). Hence, it appears that religious belief is related to a particular suite of social–psychological processes, namely those related to aspects of moral concern, which are at least partially dissociable from psychological processes involved in theory of mind skills (Blair 2005; Jack et al. 2016; Lockwood et al. 2013).

How Aspects of Analytic Reasoning and Social/Moral Considerations Relate to Dogmatism

The relationship that aspects of analytic reasoning might share to dogmatism is relatively straightforward. Pennycook et al. (2016) have argued that higher levels of analytic intelligence, as well as manipulations that engage analytic thinking, encourage belief revision by allowing an individual to evaluate conflicting claims and consider alternatives. Further, individuals with greater fluid intelligence, which is highly correlated with working memory capacity (Stupple et al. 2013; Toplak et al. 2011), may be better able to hold alternative possibilities in mind, and thus more capable of dealing with, and hence willing to accept, uncertainty (Coutinho et al. 2015). These considerations suggest that analytic reasoning ability is likely to be associated with flexibility in one's beliefs, whether they identify as religious or nonreligious. However, analytic reasoning cannot be the only, or even the most important, psychological factor related to belief flexibility, since many important beliefs are inherently social in nature, and the literature reviewed above clearly implicates social–emotional processes into the psychology of belief.

Surprisingly, less research has examined how social cognitive factors might relate to dogmatism. On the one hand, perspective taking and theory of mind ability require the individual to hold in mind multiple perceived realities, much as they must do when dealing with uncertain beliefs. These capacities also involve active consideration of beliefs and views that differ from one's own. For these reasons, it might be natural to assume that these capacities would relate to decreased dogmatism in both the religious and the nonreligious.

On the other hand, the individual's tendency for moral concern can be at least partially distinguished from their perspective taking and theory of mind abilities (Blair 2005; Jack et al. 2016; Lockwood et al. 2013), and anecdotal evidence suggests that individuals who justify their beliefs with moral considerations often appear to possess an unreasonable degree of certainty (e.g., consider Pascal's wager). Given the relative differences in moral concern among religious and nonreligious individuals, and the positive relationship moral concern shares to religious belief, it is possible that measures of moral concern positively relate to belief certainty among the religious and negatively relate to belief certainty among the nonreligious.

Our rationale for this hypothesis is that these different worldviews appear to afford a fundamentally different role for this type of consideration, and thus religious and nonreligious individuals may 'consult' or rely upon these considerations differently, when it comes to belief evaluation in general. A caricature of the difference between these worldviews, and their associated psychological processes, may serve to illustrate this point:

The nonreligious presumably adopt some version of a materialistic and morally relativistic worldview that predominates in popular culture. In this framework, moral considerations have no clearly proscribed role in determining truths about the world. Such

considerations tend to be regarded more as matter of individual opinion or choice, or a reflection of feelings rather than a basis for establishing truth. Hence, for individuals with such a worldview, feelings of moral concern may play the role of nagging background doubts that reduce their certainty in some socially relevant propositions, without providing any clear or acceptable positive rationale for adopting a particular belief.

On the other hand, religious individuals have already adopted a worldview which, by its supernatural nature, appears to contradict analytic and empirical reason. They have already embraced and adopted a clear role for moral considerations, as prescribed by their religion, to guide their view of the world, even when such beliefs appear to be inconsistent with analytic reasoning. Hence, for individuals with this kind of worldview, strongly felt feelings of moral concern may create a sense of belief conviction, perhaps because some aspects of these beliefs resonate with their emotional intelligence (e.g., Liu 2010; Łowicki and Zajenkowski 2016).

The Present Research

Here, we investigate how individual differences in moral concern and analytic reasoning relate to individual differences in dogmatism among those self-identifying as religious and nonreligious. The measures used to index these cognitive processes broadly parallel the two domains of cognition and two routes of belief formation discussed in the introduction (i.e., analytic/empirical reason and social/moral considerations). These measures have already been shown to share opposing relationships with religious belief, measured on a continuum (Jack et al. 2016). Here we extend that work using a domain-general measure of certainty, Altemeyer's (1996) dogmatism scale, in order to examine how these different types of cognition influence domain-general certainty in individuals with religious and nonreligious worldviews. The dogmatism scale has previously been shown to have adequate reliability and validity (Crowson et al. 2008).

Since the dogmatism scale captures, in part, an individual's willingness to revise their beliefs in the face of new evidence, we hypothesized that analytic reasoning would negatively relate to dogmatism in both the religious and nonreligious (Norenzayan et al. 2012; Pennycook et al. 2012, 2016; Shenhav et al. 2012). We further hypothesized that perspective taking would negatively relate to dogmatism in both groups. However, the more novel hypothesis under investigation concerns the predicted relationships between dogmatism and measures of moral concern in the religious and nonreligious. We hypothesize that dogmatism will positively relate to measures of moral concern among the religious, but negatively relate to such measures among the nonreligious.

Study 1

Participants

Six hundred participants were recruited through Amazon's Mechanical Turk, where they were linked to a survey hosted by SurveyMonkey. Participants were required to have completed 500 HITs on Mechanical Turk with an approval rating of 95% or higher. Location of participants was limited to the USA. One hundred and ninety-five people were excluded from the final analyses for either failing to answer our catch questions correctly or having incomplete data, leaving a total of 405 participants with complete data (280

females, 69.1% females; average age 34.12, SD = 12.87). Participants self-identified as the following: 209 Christian (51.6%), 153 Nonreligious (37.8%), 24 A follower of some other religion (5.9%), 9 Jewish (2.2%), 5 Buddhist (1.2%), 4 Hindu (1.0%) and 1 Muslim (0.2%). Participants were paid $0.45 for their HIT.

Procedures and Measures

Participants first completed demographic questions (gender, age and education), followed by a 3-item measure assessing religious belief used previously (Jack et al. 2016), which had good internal consistency Cronbach's $\alpha = .92$. The three items are 'Do you believe in the existence of either God or a universal spirit?, Do you currently identify with a religion?, Are you religious?' These questions were answered on a 7-point Likert scale (1 = not at all; 7 = definitely yes). This was followed by a single-item question assessing their religious affiliation: 'Do you consider yourself Christian, Jewish, Buddhist, Muslim, Hindu, a follower of some other religion or not religious?' All participants identifying with a religion were collapsed together into the religious group, whereas those answering 'not religious' constituted the not religious group. This yielded a total of 153 participants identifying as nonreligious (or not affiliated with a religious system) and 232 identifying as religious (or those who are affiliated with a religious system).[4]

Next, participants completed Altemeyer's 20-item dogmatism scale (Altemeyer 1996). This scale had good internal consistency Cronbach's $\alpha = .94$. A sample item is 'I am so sure I am right about the important things in life; there is no evidence that could convince me otherwise.' Participants responded with a 9-point Likert scale (1 = completely disagree; 9 = completely agree).

Next, participants completed the two measures assessing aspects of moral concern and single measure assessing aspects of analytic reasoning (e.g., Jack et al. 2016). The first of these measures was the 7-item interpersonal reactivity index-empathic concern subscale (IRI-EC) (Davis 1983). A sample item from the IRI-EC is 'I often have tender, concerned feelings for people less fortunate than me.' This scale had good internal consistency Cronbach's $\alpha = .85$. This was followed by the single measure assessing analytic reasoning, the CRT, which is designed to test one's ability to override intuitively appealing but incorrect answers with deliberate reasoning (Frederick 2005). A sample item of the CRT is 'If it takes 5 machines 5 min to make 5 widgets, how long would it take 100 machines to make 100 widgets.' In Study 1 and Study 2, we summed the number of correct responses given by participants, as this is an index of their analytic reasoning skills (Gervais and Norenzayan 2012; Pennycook et al. 2012). Participants then completed the second measure of moral concern, a six-item measure of prosocial intentions (Pavey et al. 2011). This scale asks participants 'to what extent do you intend, in the next 6 weeks, to…' A representative item is 'Go out of your way to help a stranger in need.' This scale had

[4] While the three-item religiosity scale captures religious affiliation, as well as belief in certain core religious and supernatural concepts, we use the terms 'religious' and 'nonreligious' for ease of exposition and readership. This terminology is also used here because participants were divided into 'religious' or 'nonreligious' groups based on their answer to the single item asking which religious system they belong to (the average score from all three items is used in subsequent analyses). However, it is worth mentioning that this single-item measure likely addresses aspects of religiosity more broadly, beyond mere affiliation. For instance, those who identify with a religious affiliation likely adopt (some of) the relevant beliefs and practices, while the opposite would be true for those who are not affiliated (those who chose 'not religious'). We fully acknowledge the inherent limitations with this approach to studying something as complex as religious belief and discuss some of these in the general discussion.

good internal consistency Cronbach's $\alpha = .82$. Participants completed other measures which are not of interest to the current hypotheses.

Results and Discussion

Our hypotheses concerning the group differences were supported. Independent samples t test revealed that religious participants reported higher levels of dogmatism $t(396.595) = 5.88$ ($p < .001$), empathic concern $t(263.370) = 3.43$ ($p < .001$) and prosocial intentions $t(286.674) = 2.71$ ($p < .01$), while nonreligious participants performed better on the CRT $t(289.102) = 4.78$ ($p < .001$). Unsurprisingly, religious belief as assessed by the 3-item measure was significantly higher in those identifying as religious $t(402.962) = 33.027$ ($p < .001$).

We next conducted separate bivariate correlations for religious and nonreligious groups, the results of which are displayed in Tables 1 and 2. Among the religious, dogmatism was positively related to the 3-item measure of religious belief and prosocial intentions but did not reach significance with either empathic concern or correct responses to the CRT (see Table 1). Among the nonreligious, dogmatism was negatively correlated with the 3-item measure of religious belief and empathic concern but did not reach significance with either prosocial intentions or correct responses to the CRT (see Table 2).

We conducted Fisher r-to-z transforms in order to test for significant differences between correlation coefficients among the religious and nonreligious. This revealed that the correlation between dogmatism and empathy was significantly different between the religious and the nonreligious ($z = 3.92$, $p < .0001$), and similarly the correlation between dogmatism and prosocial intentions was significantly different between religious and nonreligious ($z = 2.1$, $p < .05$). There was no significant difference between dogmatism and correct responses to the CRT among the two groups ($z = 0.29$, $p = .77$).

Finally, we conducted separate 3-step hierarchical regression analyses for both groups, with the dogmatism scale as the dependent variable. All predictor variables were entered in the same order for both groups, as can been seen in Tables 3 and 4. We use Cohen's f^2 to report the effect size of each additional step in the regression model (Cohen's f^2; small = .02, medium = 0.15, large = 0.35).

Table 1 Means (M), standard deviations (SD) and intercorrelations among study variables for participants identifying as religious ($N = 252$)

Variable	M	SD	1	2	3	4	5	6	7
1. Gender	1.69	0.46							
2. Age	35.72	12.91	0.07						
3. Education	3.89	1.54	0.03	−0.02					
4. Dogmatism	4.03	1.68	−0.05	0.02	−0.02				
5. Religiosity	5.49	1.45	−0.01	0.08	−0.04	0.36***			
6. Prosocial	4.2	1.34	0.08	0.01	0.01	0.16*	0.19***		
7. Empathy	4.12	0.62	0.2***	0.14*	−0.12	0.08	0.18**	0.26***	
8. CRT	0.91	1.11	−0.10	0.11	0.10	−0.10	−0.08	−0.18**	0.00

Gender, 1 = *male*, 2 = *female*

Coefficients are significant at $p < .05$ (2-tailed)*; $p < .01$ (2-tailed)**; $p < .005$ (2-tailed)***

Table 2 Means (*M*), standard deviations (SD) and intercorrelations among study variables for participants identifying as nonreligious ($N = 153$)

Variable	*M*	SD	1	2	3	4	5	6	7
1. Gender	1.69	0.46							
2. Age	31.47	12.40	−0.09						
3. Education	3.98	1.16	−0.07	0.24***					
4. Dogmatism	3.19	1.16	−0.05	0.03	−0.03				
5. Religiosity	1.70	.87	0.13	0.08	−0.04	−0.16*			
6. Prosocial	3.78	1.54	0.29***	−0.02	0.09	−0.06	0.19*		
7. Empathy	3.86	0.79	0.23***	−0.08	−0.05	−0.32***	0.13	0.41***	
8. CRT	1.50	1.36	−0.25***	0.07	0.27***	−0.13	−0.03	−0.15	−0.14

Gender, 1 = *male*, 2 = *female*

Coefficients are significant at $p < .05$ (2-tailed)*; $p < .01$ (2-tailed)**; $p < .005$ (2-tailed)***

Table 3 Three-step hierarchical multiple regression analysis predicting dogmatism among participants identifying as religious ($N = 252$)

Model		B	SE	β	t	p	$R^2\Delta$	$F\Delta$	F sig
1	Intercept	4.29	0.55		7.77	0.000			
	Gender	−0.18	0.23	−0.05	−0.78	0.438			
	Age	0.00	0.01	0.03	0.41	0.680			
	Edu	−0.02	0.07	−0.02	−0.30	0.766			
							0.003	0.281	0.839
2	Intercept	3.09	0.86		3.59	0.000			
	Gender	−0.26	0.23	−0.07	−1.10	0.274			
	Age	0.00	0.01	0.02	0.32	0.749			
	Edu	−0.02	0.07	−0.01	−0.23	0.820			
	IRI-EC	0.13	0.18	0.05	0.71	0.477			
	Prosocial	0.19	0.08	0.15	2.34	0.020			
							0.029	3.657	0.027
3	Intercept	3.19	0.86		3.70	0.000			
	Gender	−0.29	0.23	−0.08	−1.23	0.218			
	Age	0.00	0.01	0.03	0.46	0.645			
	Edu	−0.01	0.07	−0.01	−0.07	0.944			
	IRI-EC	0.15	0.18	0.05	0.80	0.423			
	Prosocial	0.17	0.08	0.14	2.06	0.041			
	CRT	−0.38	0.30	−0.08	−1.30	0.196			
							0.007	1.677	0.196

Demographics were entered into the first model, followed by the two measures of moral concern (IRI-EC = empathic concern, Prosocial = prosocial intentions) in the second model, followed by the measure of analytic reasoning (CRT) in the third model

For the religious, entering demographics into the first step failed to produce a statistically significant model, $\Delta R^2 = .003$, $\Delta F(3, 248) = .281$, $p = .839$, and failed to produce a small effect size (Cohen's $f^2 = .003$). Adding the two measures of moral concern (IRI-EC and prosocial intentions) in the second step produced a statistically significant model, $\Delta R^2 = .029$, $\Delta F(2, 246) = 3.657$, $p < .05$, and a small effect size (Cohen's $f^2 = .027$). Prosocial intentions were the only significant predictor in this step ($\beta = 0.15$, $p < .05$). Adding the measure of analytic reasoning (CRT) in the final step failed to produce a better model than the previous, $\Delta R^2 = .007$, $\Delta F(1, 245) = 1.651$, $p = .196$, but did produce a small effect size (Cohen's $f^2 = -.025$). The measure of prosocial intentions was the only significant predictor in the final step ($\beta = 0.14$, $p < .05$).

For the nonreligious, entering demographics into the first step failed to produce a statistically significant model, $\Delta R^2 = .005$, $\Delta F(3, 149) = .226$, $p = .878$, and failed to produce a small effect size (Cohen's $f^2 = .005$). Adding the two measures of moral concern in the second step produced a statistically significant model, $\Delta R^2 = .11$, $\Delta F(2, 147) = 9.144$, $p < .001$, and a small effect size (Cohen's $f^2 = .124$). The measure of empathic concern was the only significant predictor in this step ($\beta = -0.37$, $p < .001$). Adding the measure of analytic reasoning (CRT) produced a better model than the previous, $\Delta R^2 = .025$, $\Delta F(1, 146) = 4.181$, $p < .05$, and produced a small effect size

Table 4 Three-step hierarchical multiple regression analysis predicting dogmatism among participants identifying as nonreligious ($N = 153$)

Model		*B*	SE	*β*	*t*	*p*	$R^2\Delta$	$F\Delta$	*F* sig
1	Intercept	3.40	0.50		6.82	0.000			
	Gender	−0.11	0.21	−0.05	−0.54	0.587			
	Age	0.00	0.01	0.04	0.45	0.654			
	Edu	−0.03	0.06	−0.04	−0.51	0.610			
							0.005	0.226	0.878
2	Intercept	5.07	0.62		8.22	0.000			
	Gender	0.02	0.21	0.01	0.12	0.909			
	Age	0.00	0.01	0.02	0.27	0.789			
	Edu	−0.05	0.06	−0.06	−0.78	0.439			
	IRI-EC	−0.53	0.13	−0.37	−4.24	0.000			
	Prosocial	0.07	0.07	0.10	1.08	0.281			
							0.110	9.144	0.000
3	Intercept	5.41	0.63		8.56	0.000			
	Gender	−0.06	0.21	−0.02	−0.28	0.777			
	Age	0.00	0.01	0.02	0.23	0.818			
	Edu	−0.01	0.06	−0.02	−0.20	0.840			
	IRI-EC	−0.54	0.13	−0.37	−4.36	0.000			
	Prosocial	0.06	0.07	0.08	0.89	0.374			
	CRT	−0.47	0.23	−0.17	−2.05	0.043			
							0.025	4.181	0.043

Demographics were entered into the first model, followed by the two measures of moral concern (IRI-EC = empathic concern, Prosocial = prosocial intentions) in the second model, followed by the measure of analytic reasoning (CRT) in the third model

(Cohen's $f^2 = .028$). Both empathic concern ($\beta = -0.37$, $p < .001$) and correct responses to the CRT ($\beta = -0.17$, $p < .05$) were independent and significant predictors of dogmatism in this final model.

These results provide initial support for the hypothesis that dogmatism shares different relationships to different aspects of moral concern, depending on whether one identifies as religious or not. Both measures of moral concern—empathic concern and prosocial intentions—differed significantly in their correlations with dogmatism for the two groups. For the religious, there was a significant positive relationship between dogmatism and prosocial intentions and a positive trend for empathic concern. For the nonreligious, there was a significant negative correlation between dogmatism and empathic concern and a negative trend for prosocial intentions. The final step of the regression analyses suggests that, after accounting for other variables in this study, prosocial intentions were the strongest statistical predictor of dogmatism among the religious, while empathic concern and correct responses to the CRT each independently predicted dogmatism among the nonreligious. Importantly, prosocial intentions positively predicted the measure of dogmatism among the religious, while empathic concern negatively predicted dogmatism among the nonreligious.

Study 2

Study 2 aimed to extend the results of Study 1 by including measures of perspective taking and religious fundamentalism. In addition to replicating the hypotheses tested above, we predicted that perspective taking would negatively relate to dogmatism among both the religious and nonreligious, establishing a distinct role for this aspect of social cognition, compared to measures of moral concern, in relation to dogmatism. That is, we did not hypothesize that dogmatism would share a divergent relationship with perspective taking among those identifying as religious or nonreligious, as we did for the measures of moral concern (i.e., empathic concern and prosocial intentions). Following prior findings by Jack et al. (2016), we did not predict any group differences in perspective taking skills.

We included the measure of religious fundamentalism in order to validate our assumption that dogmatism can be differentiated from fundamentalism, such that dogmatism is a domain-general measure of certainty in belief, whereas fundamentalism is a domain-specific measure of certainty in religious belief. We predicted that dogmatism would be highly positively correlated with fundamentalism in the religious, and uncorrelated with fundamentalism in the nonreligious. If supported, this will establish a clear distinction between the scales and support our assumption that the dogmatism scale can be validly used to assess certainty in belief, regardless of whether such beliefs pertain to religion or not.

We note that the dataset used for study 2 has been analyzed elsewhere (Study 4, Jack et al. 2016). Although the present analyses are based on the same dataset, the results reported do not overlap with those previously reported by Jack et al. (2016). Our prior work investigated the relationship that analytic/empirical reasoning and social/moral considerations share with religious/supernatural belief measured as a continuum, in the entire sample. We did not separate participants into distinct categories depending on whether they identified as religious or not, and we did not report any findings related to dogmatism. Hence, the analyses reported below are novel insofar as they test hypotheses related to psychological factors associated with dogmatism (and religious fundamentalism) in religious and nonreligious participants.

Participants

Seven hundred and five participants were recruited through Amazon's Mechanical Turk, where they were linked to a survey hosted by SurveyMonkey. Participants were required to have completed 500 HITs on Mechanical Turk with an approval rating of 95% or higher. There was no geographical restriction for participation. One hundred and seventy-eight people were excluded from the final analyses for either failing to answer our catch questions correctly or having incomplete data, leaving a total of 527 participants with complete data (275 females, 52.2% females; average age 30.29, SD = 10.17). Participants self-identified as the following: 210 Christian (39.8%), 202 Nonreligious (38.3%), 63 Hindu (12.0%), 19 Other (3.6%), 12 Buddhist (2.3%), 11 Jewish (2.1%) and 10 Muslim (1.9%). Participants were paid $0.44 for their HIT.

Procedures and Measures

Participants were first asked demographic questions (age, gender, education) followed by the same three-item measure of belief, which had good internal consistency (Cronbach's

$\alpha = .92$), and the single-item religious affiliation question. This yielded a total of 202 participants identifying as nonreligious and 325 identifying as religious. Participants then completed the Cognitive Reflection Test, followed by the Revised Religious Fundamentalism 12-item measure (Altemeyer and Hunsberger 2004), which had good internal consistency Cronbach's $\alpha = .96$. Responses were anchored to a 9-point Likert system (1 = completely disagree; 9 = completely agree). A sample item is 'To lead the best, most meaningful life, one must belong to the one, fundamentally true religion.' Participants then completed the empathic concern measure from Study 1 (IRI-EC), which had good internal consistency: Cronbach's $\alpha = 0.88$. Participants next completed the interpersonal reactivity index-perspective taking scale (IRI-PT) (Davis 1983). A representative item is: 'I try to look at everybody's side of a disagreement before I make a decision.' This scale had good internal consistency: Cronbach's $\alpha = 0.81$. Participants then completed the same six-item measure assessing prosocial intentions from Study 1, followed by the dogmatism scale, each of which had good internal consistency: Cronbach's $\alpha = 0.88$, Cronbach's $\alpha = .94$, respectively. Participants completed other measures which are not of interest to the current hypotheses.

Results and Discussion

The group differences from Study 1 were replicated. Participants identifying as religious reported higher levels of dogmatism $t(513.73) = 8.825$ ($p < .001$), religious fundamentalism $t(462.238) = 22.550$ ($p < .001$), empathic concern $t(525) = 2.377$ ($p < .05$), prosocial intentions $t(525) = 4.513$ ($p < .001$) and religious belief $t(524.073) = 36.267$ ($p < .001$). Those identifying as nonreligious scored higher on the CRT $t(525) = 3.619$ ($p < .001$). There were no significant group differences on the measure of perspective taking $t(525) = .795$ ($p = .427$).

Bivariate correlations were again conducted separately for each groups, the results of which are reported in Tables 5 and 6. Among the religious, dogmatism was positively correlated with religious belief, prosocial intentions and religious fundamentalism and negatively correlated with correct responses to the CRT. Dogmatism was marginally significant with empathy ($r = .10$, $p = .06$), but did not approach significance with perspective taking ($r = -.075$, $p = .176$). Religious fundamentalism was positively related to the 3-item measure of religious belief, empathy and prosocial intentions and negatively related to correct responses on the CRT.

Among the nonreligious, dogmatism positively correlated with religious fundamentalism and negatively correlated with empathic concern and perspective taking. Individual differences in dogmatism did not reach significance with religious belief ($r = -.16$, $p = .09$), correct responses to the CRT ($r = -.10$, $p = .154$) or prosocial intentions ($r = -.06$, $p = .437$). Religious fundamentalism was positively related to the 3-item measure of religious belief and negatively related to CRT and perspective taking.

Fisher r-to-z transform revealed that the correlation coefficient between dogmatism and empathy ($z = -2.89$, $p < .005$), dogmatism and perspective taking ($z = -2.18$, $p < .05$), dogmatism and prosocial intentions ($z = 2.79$, $p < .01$) and dogmatism and religious fundamentalism ($z = 7.35$, $p < .001$) all differed between the religious and nonreligious. There was no significant difference between dogmatism and correct responses to the CRT among the religious and nonreligious ($z = 0.21$, $p = .84$).

Next, we conducted separate 4-step hierarchical regression analyses for both groups, with dogmatism as the dependent variable in each. Again, all predictor variables were entered in the same order for both groups, as can be seen in Tables 7 and 8. Because the

Table 5 Means (*M*), standard deviations (SD) and intercorrelations among study variables for participants identifying as religious ($N = 325$)

Variable	*M*	SD	1	2	3	4	5	6	7	8
1. Gender	1.54	0.50								
2. Age	31.34	11.29	0.08							
3. Education	4.61	1.67	0.02	0.16***						
4. Dogmatism	4.42	1.51	−0.03	−0.01	−0.00					
5. Fundamentalism	4.74	2.17	0.00	0.06	−0.12*	0.73**				
6. Empathy	3.88	0.75	0.38***	0.23***	−0.02	0.10	0.17***			
7. Prosocial	4.53	1.43	0.16***	0.07	0.19***	0.19***	0.19***	0.38***		
8. CRT	0.47	0.40	−0.21***	−0.02	0.15**	−0.12*	−0.22***	−0.08	−0.03	
9. Perspective taking	3.67	0.60	0.17***	0.12*	0.02	−0.08	0.04	0.46***	0.27***	−0.04

Gender, 1 = *male*, 2 = *female*

Coefficients are significant at $p < .05$ (2-tailed)*; $p < .01$ (2-tailed)**; $p < .005$ (2-tailed)***

Table 6 Means (*M*), standard deviations (SD) and intercorrelations among study variables, for those identifying as nonreligious ($N = 202$)

Variable	*M*	SD	1	2	3	4	5	6	7	8
1. Gender	1.50	0.50								
2. Age	28.60	9.50	−0.01							
3. Education	4.16	1.56	−0.10	0.26***						
4. Dogmatism	3.42	1.09	−0.11	0.19**	0.05					
5. Fundamentalism	1.69	0.87	0.02	0.14*	−0.05	0.26***				
6. Empathy	3.72	0.81	0.25***	0.07	−0.07	−0.16*	−0.01			
7. Prosocial	3.96	1.40	0.19**	0.00	0.03	−0.06	0.00	0.40***		
8. CRT	0.60	0.40	−0.32***	0.10	0.19**	−0.10	−0.20**	−0.08	−0.17*	
9. Perspective taking	3.71	0.73	0.11	−0.08	−0.07	−0.27***	−0.16*	0.54***	0.36***	−0.09

Gender, 1 = *male*, 2 = *female*

Coefficients are significant at $p < .05$ (2-tailed)*; $p < .01$ (2-tailed)**; $p < .005$***

Table 7 Four-step hierarchical multiple regression analysis predicting dogmatism among participants identifying as religious ($N = 325$)

Model		B	SE	β	t	p	$R^2\Delta$	$F\Delta$	F sig
1	Intercept	4.59	0.40		11.51	0.000			
	Gender	−0.09	0.17	−0.03	−0.53	0.596			
	Age	0.00	0.01	0.00	−0.06	0.950			
	Edu	0.00	0.05	0.00	−0.05	0.962			
							0.001	0.099	0.960
2	Intercept	3.60	0.52		6.96	0.000			
	Gender	−0.26	0.18	−0.08	−1.43	0.154			
	Age	0.00	0.01	−0.02	−0.40	0.693			
	Edu	−0.03	0.05	−0.03	−0.60	0.547			
	IRI-EC	0.14	0.13	0.07	1.07	0.285			
	Prosocial	0.20	0.06	0.19	3.14	0.002			
							0.046	7.705	0.001
3	Intercept	3.89	0.53		7.35	0.000			
	Gender	−0.34	0.18	−0.11	−1.86	0.063			
	Age	0.00	0.01	−0.03	−0.47	0.637			
	Edu	−0.01	0.05	−0.01	−0.22	0.825			
	IRI-EC	0.14	0.13	0.07	1.11	0.268			
	Prosocial	0.20	0.06	0.19	3.09	0.002			
	CRT	−0.49	0.21	−0.13	−2.31	0.021			
							0.016	5.342	0.021
4	Intercept	4.86	0.62		7.89	0.000			
	Gender	−0.34	0.18	−0.11	−1.91	0.057			
	Age	0.00	0.01	−0.02	−0.40	0.687			
	Edu	−0.01	0.05	−0.01	−0.21	0.836			
	IRI-EC	0.29	0.14	0.15	2.14	0.034			
	Prosocial	0.22	0.06	0.21	3.45	0.001			
	CRT	−0.49	0.21	−0.13	−2.37	0.019			
	IRI-PT	−0.46	0.15	−0.18	−2.98	0.003			
							0.026	8.906	0.003

Demographics were entered into the first model, followed by the two measures of moral concern (IRI-EC = empathic concern, Prosocial = prosocial intentions) in the second model, followed by the measure of analytic reasoning (CRT) in the third model, and the measure of perspective taking (IRI-PT) in the fourth model

measure of religious fundamentalism was included primarily to provide evidence of discriminant validity of the dogmatism scale, it was omitted from the regression analyses.

For the religious, entering demographics into the first step failed to produce both a statistically significant model, $\Delta R^2 = .001$, $\Delta F(3, 321) = .099$, $p = .960$, and a small effect size (Cohen's $f^2 = .001$). Entering the two measures of moral concern into the second step produced a statistically significant model $\Delta R^2 = .046$, $\Delta F(2, 319) = 7.705$, $p = .001$ and a small effect size (Cohen's $f^2 = .048$). Adding the measure of analytic reasoning into third step produced a statistically better model $\Delta R^2 = .016$, $\Delta F(1,$

Table 8 Four-step hierarchical multiple regression analysis predicting dogmatism among participants identifying as nonreligious ($N = 202$)

Model		*B*	SE	*β*	*t*	*p*	R2Δ	*F*Δ	*F* sig
1	Intercept	3.18	0.37		8.53	0.000			
	Gender	−0.24	0.15	−0.11	−1.60	0.111			
	Age	0.02	0.01	0.19	2.67	0.008			
	Edu	−0.01	0.05	−0.01	−0.11	0.913			
							0.049	3.389	0.019
2	Intercept	3.79	0.48		7.93	0.000			
	Gender	−0.17	0.16	−0.08	−1.07	0.286			
	Age	0.02	0.01	0.21	2.87	0.005			
	Edu	−0.01	0.05	−0.02	−0.28	0.782			
	IRI-EC	−0.22	0.10	−0.16	−2.07	0.039			
	Prosocial	0.02	0.06	0.02	0.30	0.766			
							0.022	2.280	0.105
3	Intercept	4.17	0.50		8.38	0.000			
	Gender	−0.28	0.16	−0.13	−1.73	0.086			
	Age	0.03	0.01	0.22	3.03	0.003			
	Edu	0.01	0.05	0.01	0.11	0.916			
	IRI-EC	−0.20	0.10	−0.15	−1.97	0.050			
	Prosocial	0.00	0.06	0.00	−0.04	0.972			
	CRT	−0.49	0.20	−0.18	−2.41	0.017			
							0.027	5.790	0.017
4	Intercept	4.96	0.55		9.01	0.000			
	Gender	−0.31	0.16	−0.14	−1.96	0.052			
	Age	0.02	0.01	0.19	2.69	0.008			
	Edu	0.00	0.05	0.00	0.06	0.952			
	IRI-EC	−0.04	0.11	−0.03	−0.31	0.755			
	Prosocial	0.03	0.06	0.04	0.53	0.601			
	CRT	−0.51	0.20	−0.19	−2.56	0.011			
	IRI-PT	−0.38	0.12	−0.25	−3.10	0.002			
							0.042	9.580	0.002

Demographics were entered into the first model, followed by the two measures of moral concern (IRI-EC = empathic concern, Prosocial = prosocial intentions) in the second model, followed by the measure of analytic reasoning (CRT) in the third model, and the measure of perspective taking (IRI-PT) in the fourth model

318) = 5.342, $p < .05$, but failed to produce a small effect size (Cohen's $f^2 = .014$). Adding the measure of perspective taking into the final step produced a statistically better model $\Delta R^2 = .026$, $\Delta F(1, 317) = 8.906$, $p < .005$ and a small effect size (Cohen's $f^2 = .03$). In the final step, dogmatism was positively predicted by empathic concern ($\beta = 0.15$, $p < .05$) and prosocial intentions ($\beta = 0.21$, $p = .001$) and negatively predicted by correct responses to the CRT ($\beta = -0.13$, $p < .05$) and perspective taking ($\beta = -0.18$, $p < .005$).

For the nonreligious, entering demographics into the first step failed to produce both a statistically significant model, $\Delta R^2 = .049$, $\Delta F(3, 198) = 3.389$, $p < .05$, and a small effect size (Cohen's $f^2 = .04$). Entering the two measures of moral concern into the second step did not produce a better statistical model $\Delta R^2 = .022$, $\Delta F(2, 196) = 2.28$, $p = .105$ but did produce a small effect size (Cohen's $f^2 = .023$). Entering the measure of analytic reasoning produced both a better statistical model $\Delta R^2 = .027$, $\Delta F(1, 195) = 5.79$, $p < .05$ and a small effect size (Cohen's $f^2 = .03$). Adding the measure of perspective taking in the final step produced both a better statistical model $\Delta R^2 = .042$, $\Delta F(1, 194) = 9.58$, $p < .005$ and a small effect size (Cohen's $f^2 = .05$). In the final step, dogmatism was positively predicted by age ($\beta = 0.19$, $p < .01$) and negatively predicted by correct responses to the CRT ($\beta = -0.19$, $p < .05$) and perspective taking ($\beta = -0.25$, $p < .005$).

The results from this study again support the hypothesis that aspects of moral concern have distinct associations with dogmatism, depending on whether one identifies as religious or nonreligious. Both measures of moral concern (empathic concern and prosocial intentions) shared significantly different relationships with dogmatism, depending on whether one identified as religious or not, as revealed by Fisher *r*-to-*z* transform tests.

As in Study 1, for the religious, there was a significant positive relationship between dogmatism and prosocial intentions, and a positive trend for empathic concern, which in this study was marginally significant. Perspective taking was negatively correlated with dogmatism in the nonreligious, but only showed a negative trend for the religious. Further, the correlations between dogmatism and perspective taking were significantly different in the two groups. One potential explanation for this is that perspective taking is positively correlated with both empathic concern (religious $r = .46$, $p < 0.001$; nonreligious $r = .54$, $p < .001$) and with prosocial intentions (religious $r = .27$, $p < .001$; nonreligious $r = .36$, $p < .001$). Hence, the tendency for perspective taking to be negatively related to dogmatism in the religious may have been masked by the positive association dogmatism shares with the measures of moral concern in that group. This is supported by findings from the hierarchical regression, which show that perspective taking was negatively related to dogmatism in both groups once the two measures of moral concern were taken into account.

With regard to the fundamentalism scale, we did find an unexpected significant positive relationship between dogmatism and fundamentalism in the nonreligious. This may be because a number of our participants who reported no religious affiliation nonetheless retained a degree of religious belief. Nonetheless, the correlation was much weaker in the nonreligious than in the religious, and the correlations differed significantly between groups. This establishes the discriminant validity of the dogmatism scale as distinct from the fundamentalism scale.

It is notable that when perspective taking was added to the third step of the hierarchical regression, the effect of empathic concern was knocked out for the nonreligious (see Table 8). One possibility is that the negative relationship between empathic concern and dogmatism in the nonreligious can be better accounted for by perspective taking, which is positively correlated with empathic concern. Alternatively, this may be a peculiarity of the covariance matrix for this particular sample. In favor of the latter view, it is notable that perspective taking neither accounts for group differences between religious and nonreligious individuals, who do not differ on perspective taking, nor does it simply account for our main findings.

First, the strength of the correlations between perspective taking and dogmatism, and perspective taking and measures of moral concern, is not sufficient to account for the

negative relationship between dogmatism and empathy in the nonreligious observed in two distinct studies. Second, we conducted a second set of Fisher *r*-to-*z* transform significance tests to compare partial correlations for religious and nonreligious between the two moral concern measures and dogmatism in the second study, controlling for perspective taking and other variables in the regression. These revealed that the correlations were still distinct (empathy and dogmatism controlling for all but prosocial $z = 2.12$, $p < .05$, 2 tailed; prosocial and dogmatism controlling for all but empathy $z = 2.21$, $p < .05$, 2 tailed). Hence, since perspective taking is not a variable that accounts well for the observed differences between the measures of moral concern and dogmatism among the religious and nonreligious, we believe the most parsimonious explanation is that the observed differences between these groups are explained by differences in aspects of moral concern. However, we acknowledge the possibility that deficits in perspective taking better account for dogmatism in the nonreligious than deficits in empathic concern. This possibility wants to be explored in future studies.

Pooled Analysis

We pooled the data from the two studies in order to better evaluate the main hypothesis that measures of moral concern positively relate to dogmatism among the religious and negatively relate to dogmatism among the nonreligious. Hence, here we look at the key measures used across both studies—dogmatism, the three-item measure assessing religious belief, empathic concern, prosocial intentions and correct responses to the CRT.

The results of bivariate correlations for the religious and nonreligious are presented in Tables 9 and 10, respectively. Among the religious ($N = 577$), dogmatism was positively correlated with the 3-item measure assessing belief and prosocial intentions and negatively correlated with correct responses to the CRT. The relationship between dogmatism and empathy was trending in the positive direction ($r = .07$, $p = .094$). Among the nonreligious ($N = 355$), dogmatism was negatively correlated with the 3-item measure assessing belief and empathic concern. The relationship between dogmatism and prosocial intentions failed to reach significance ($r = -.05$, $p = .349$), while the negative relationship with CRT was marginally significant ($r = -.10$, $p = .060$).

Fisher *r*-to-*z* transform revealed that the correlations between dogmatism and empathy differed significantly between the religious and the nonreligious ($z = 4.65$, $p < .001$). Similarly, the correlations between dogmatism and prosocial intentions were also significantly different among the religious and nonreligious ($z = 3.58$, $p < .001$). These findings strongly support the hypothesis that aspects of moral concern play a different role in dogmatism for the religious and nonreligious. In contrast, there was no significant difference between dogmatism and correct responses to the CRT among the religious and nonreligious ($z = 0.3$, $p = .761$).

We again conducted separate 3-step hierarchical regressions for participants identifying as religious and nonreligious, the results of which are presented in Tables 11 and 12, respectively. For the religious, entering demographics into the first step failed to produce a statistically significant model $\Delta R^2 = .004$, $\Delta F(3, 573) = 3.389$, $p = .568$ and did not produce a small effect size (Cohen's $f^2 = .004$). Entering the two measures of moral concern into the second step produced a significantly better model $\Delta R^2 = .04$, $\Delta F(2, 571) = 12.087$, $p < .001$ and small effect size (Cohen's $f^2 = .042$). Adding the measure of analytic reasoning into the final step produced a significantly better model $\Delta R^2 = .007$, $\Delta F(1, 570) = 4.335$, $p < .05$, but did not produce a small effect size (Cohen's $f^2 = .007$). In the final step, dogmatism was positively predicted by prosocial intentions ($\beta = 0.18$,

Table 9 Means (*M*), standard deviations (SD) and intercorrelations among study variables for participants identifying as religious ($N = 577$)

Variable	*M*	SD	1	2	3	4	5	6	7
1. Gender	1.60	0.49							
2. Age	33.26	12.21	0.10*						
3. Education	4.30	1.65	−0.01	0.04					
4. Dogmatism	4.25	1.60	−0.06	−0.01	−0.02				
5. Religiosity	5.46	1.48	0.04	0.05	−0.04	0.40***			
6. Prosocial	4.38	1.40	0.11*	0.02	0.14***	0.19***	0.24***		
7. Empathy	3.99	0.71	0.33***	0.21***	−0.09*	0.07	0.22***	0.31***	
8. CRT	1.18	1.19	−0.19***	0.00	0.17***	−0.08*	−0.16***	−0.06	−0.09*

Gender, 1 = *male*, 2 = *female*

Coefficients are significant at $p < .05$ (2-tailed)*; $p < .01$ (2-tailed)**; $p < .005$ (2-tailed)***

Table 10 Means (*M*), standard deviations (SD) and intercorrelations among study variables for participants identifying as religious ($N = 355$)

Variable	*M*	SD	1	2	3	4	5	6	7
1. Gender	1.58	0.49							
2. Age	29.84	10.92	−0.02						
3. Education	4.08	1.55	−0.10	0.24***					
4. Dogmatism	3.32	1.12	−0.10	0.09	0.02				
5. Religiosity	1.66	0.88	0.18***	0.13*	−0.05	−0.14			
6. Prosocial	3.88	1.46	0.22***	−0.02	0.06	−0.05	0.14*		
7. Empathy	3.78	.80	0.26***	0.01	−0.07	−0.24	0.17***	0.39***	
8. CRT	1.67	1.22	−0.30***	0.07	0.23***	−0.10	−0.11	−0.15***	−0.12*

Gender, 1 = *male*, 2 = *female*

Coefficients are significant at $p < .05$ (2-tailed)*; $p < .01$ (2-tailed)**; $< .005$ (2-tailed)***

Table 11 Three-step hierarchical multiple regression analysis predicting dogmatism among all participants identifying as religious, pooled across the two studies ($N = 577$)

Model		B	SE	β	t	p	R2Δ	FΔ	F sig
1	Intercept	4.52	0.33		13.82	0.000			
	Gender	−0.18	0.14	−0.06	−1.33	0.185			
	Age	0.00	0.01	−0.01	−0.21	0.831			
	Edu	0.02	0.04	0.02	0.38	0.708			
							0.004	0.675	0.568
2	Intercept	3.48	0.45		7.71	0.000			
	Gender	−0.29	0.14	−0.09	−2.07	0.039			
	Age	0.00	0.01	−0.02	−0.41	0.682			
	Edu	−0.01	0.04	−0.01	−0.18	0.861			
	IRI-EC	0.10	0.11	0.05	0.96	0.336			
	Prosocial	0.21	0.05	0.19	4.28	0.000			
							0.040	12.087	0.000
3	Intercept	3.65	0.46		7.98	0.000			
	Gender	−0.35	0.14	−0.11	−2.40	0.017			
	Age	0.00	0.01	−0.02	−0.38	0.703			
	Edu	0.01	0.04	0.01	0.21	0.838			
	IRI-EC	0.10	0.11	0.05	0.99	0.325			
	Prosocial	0.21	0.05	0.18	4.14	0.000			
	CRT	−0.12	0.06	−0.09	−2.08	0.038			
							0.007	4.335	0.038

Demographics were entered into the first model, followed by the two measures of moral concern (IRI-EC = empathic concern, Prosocial = prosocial intentions) in the second model, followed by the measure of analytic reasoning (CRT) in the third model

$p < .001$) and negatively predicted by gender ($\beta = -0.11$, $p < .05$) and correct responses to the CRT ($\beta = -0.09$, $p < .05$).

For the nonreligious, entering demographics into the first step failed to produce a significant model $\Delta R^2 = .019$, $\Delta F(3, 351) = 2.249$, $p = .082$ and did not produce a small effect size (Cohen's $f^2 = .002$). Entering the two measures of moral concern into the second step produced a significantly better model $\Delta R^2 = .051$, $\Delta F(2, 349) = 9.638$, $p < .001$ and a small effect size (Cohen's $f^2 = .054$). Adding the measure of analytic reasoning into the final step produced both a better model $\Delta R^2 = .022$, $\Delta F(1, 348) = 8.238$, $p < .005$ and a small effect size (Cohen's $f^2 = .024$). In the final step, dogmatism was positively predicted by age ($\beta = 0.1$, $p < .05$) and negatively predicted by both empathic concern ($\beta = -0.25$, $p < .001$) and correct responses to the CRT ($\beta = -0.16$, $p < .005$).

The clearest relationship observed in our studies was the negative correlation between dogmatism and empathic concern in the nonreligious. The strength of this result is considerably stronger than the observed relationship between dogmatism and the CRT, something which may seem surprising since prior work has focused on the role of the analytic thinking in belief revision (Pennycook et al. 2012). In order to more closely examine the roles of empathic concern and analytic thinking in dogmatism, we generated a

Table 12 Three-step hierarchical multiple regression analysis predicting dogmatism among all participants identifying as nonreligious, pooled across the two studies ($N = 355$)

Model		B	SE	β	t	p	R2Δ	FΔ	F sig
1	Intercept	3.42	0.30		11.58	0.000			
	Gender	−0.23	0.12	−0.10	−1.89	0.060			
	Age	0.01	0.01	0.10	1.74	0.083			
	Edu	−0.01	0.04	−0.01	−0.19	0.853			
							0.019	2.249	0.082
2	Intercept	4.41	0.38		11.77	0.000			
	Gender	−0.12	0.12	−0.05	−0.95	0.342			
	Age	0.01	0.01	0.10	1.93	0.054			
	Edu	−0.02	0.04	−0.03	−0.52	0.604			
	IRI-EC	−0.35	0.08	−0.25	−4.36	0.000			
	Prosocial	0.05	0.04	0.06	1.11	0.268			
							0.051	9.638	0.000
3	Intercept	4.75	0.39		12.20	0.000			
	Gender	−0.21	0.13	−0.09	−1.68	0.095			
	Age	0.01	0.01	0.10	1.98	0.049			
	Edu	0.00	0.04	0.01	0.10	0.918			
	IRI-EC	−0.35	0.08	−0.25	−4.38	0.000			
	Prosocial	0.04	0.04	0.05	0.80	0.424			
	CRT	−0.15	0.05	−0.16	−2.87	0.004			
							0.022	8.238	0.004

Demographics were entered into the first model, followed by the two measures of moral concern (IRI-EC = empathic concern, Prosocial = prosocial intentions) in the second model, followed by the measure of analytic reasoning (CRT) in the third model

post hoc graph to investigate their interaction in the nonreligious. We divided all nonreligious participants according to their raw score on the CRT (0, 1, 2, 3) and their quartile score on the measure of empathic concern. As Fig. 1 shows, individual differences in dogmatism vary as a function of empathic concern, at every level of analytic reasoning. These results suggest that, among nonbelievers, higher levels of dogmatism share a stronger relationship to deficits in empathic concern than they do with analytic reasoning skills.

Discussion

Recent work has established that religiosity, broadly construed, is positively associated with various measures of moral concern on the one hand (Jack et al. 2016; Liu 2010; Saroglou et al. 2005) and negatively associated with various measures analytic reasoning on the other (Gervais and Norenzayan 2012; Jack et al. 2016; Pennycook et al. 2012; Shenhav et al. 2012). The current set of studies investigated how these two psychological constructs—analytic/empirical reasoning and social/moral concern—relate to individual differences in dogmatic certainty among two groups of individuals holding different worldviews, those identifying as religious and nonreligious. To our knowledge, this is the

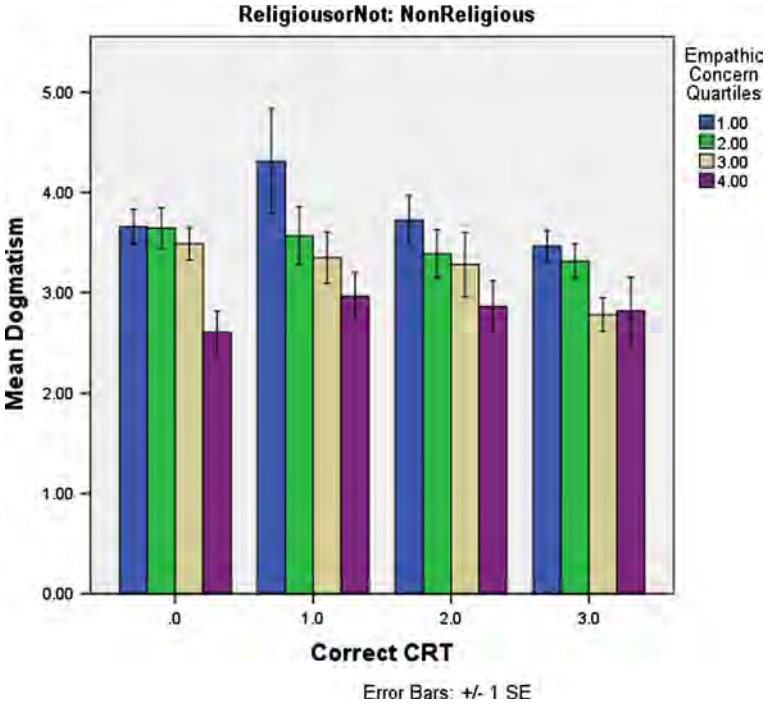

Fig. 1 Bar graph plotting dogmatism scores for nonreligious participants pooled across Studies 1 and 2 ($N = 355$) as a function of their raw scores for correct responses on the Cognitive Reflection Test (CRT) and quartile rankings for empathic concern. The *graph* shows that dogmatism varies as function of empathic concern, at every level of analytic reasoning. *Error bars* represent ± 1 standard error of the mean

first set of studies investigating how these psychological factors relate to dogmatic belief in these two populations.

In both groups, we found that analytic reasoning, as assessed by correct responses to the CRT, was negatively related to dogmatism. The two measures we used to measure aspects of moral concern demonstrated divergence between the groups. Among the religious, higher levels of dogmatism related to higher levels of prosocial intentions. Among the nonreligious, higher levels of dogmatism related to *lower* levels of empathic concern. Similar to the CRT, perspective taking was also negatively related to dogmatism in both groups. However, among the religious, this effect was initially masked by the positive correlation between perspective taking and the two measures of moral concern (empathic concern and prosocial intentions), which is present in both groups. A summary of the correlational and regression analyses across the two studies and their pooled analysis is displayed in Tables 13 and 14.

Two aspects of our findings may appear initially surprising. The first is that increasing levels of dogmatism among the nonreligious were associated with lower levels of empathic concern. Moreover, this association was found to be considerably stronger than the negative association between analytic thinking (as measured by the CRT) and dogmatism, even though analytic thinking has been a primary focus of prior work (Pennycook et al. 2012). Since most core beliefs (i.e., beliefs 'about the most important things in life') tend to be at least partly social in nature, they may be influenced by both analytic/empirical facts

Table 13 Summary table displaying significant correlations between self-reported dogmatism and variables of interest

	Religious	Nonreligious
Study 1	Prosocial intentions (+)	Empathic concern (−)
Study 2	Prosocial intentions (+) Correct CRT responses (−)	Empathic concern (−) Perspective taking (−)
Pooled	Prosocial intentions (+)	Empathic concern (−)

Results are split across the two studies, their pooled analysis and by whether participants identified as religious or nonreligious. Parentheses indicate whether the correlation was positive (+) or negative (−)

Table 14 Summary of variables that independently predicted self-reported dogmatism in the final step of regression analysis

	Religious	Nonreligious
Study 1	Prosocial intentions (+)	Empathic concern (−) Correct CRT responses (−)
Study 2	Empathic concern (+) Prosocial intentions (+) Correct CRT responses (−) Perspective taking (−)	Correct CRT responses (−) Perspective taking (−)[a]
Pooled	Prosocial intentions (+) Correct CRT responses (−)	Empathic concern (−) Correct CRT responses (−)

Results are split across the two studies, their pooled analysis and by whether participants identified as religious or nonreligious. Parentheses indicate whether the effect was positive (+) or negative (−)

[a] Empathic concern was a negative predictor of dogmatism until adding the measure of perspective taking in the final step

and by social/moral considerations. The relative differences in these two broad sorts of cognition among individuals identifying as religious or not might influence how willing they are to 'consult' each type when adopting or revising beliefs. Higher levels of empathy may incline individuals to be more sensitive to the social and moral considerations of certain beliefs and concepts, especially when they seem to clash with analytic considerations. For the nonreligious, this may manifest itself as openness to incorporating spiritual or immaterial beliefs into their worldview, despite their incompatibility with analytic modes of thinking. In other words, we suggest that dogmatic certainty in core beliefs espoused by the nonreligious may be driven in part by a 'blindness,' or attenuated ability, to appreciate the sorts of social/moral considerations which are highly present in those with strong religious convictions (see the 'caricature' we discuss in 'How Aspects of Analytic Reasoning and Social/Moral Considerations Relate to Dogmatism' section of the introduction).

But what are 'the most important things in life' for religious and nonreligious individuals. A full treatment of this question is beyond the scope of this discussion. Nevertheless, prior work investigating sources of (dis)belief among religious and nonreligious individuals is at least suggestive of divergence when it comes to what they regard as 'the most important things in life.' Nonbelievers and atheists may find science and the desire for knowledge one of the most meaningful pursuits in life, something which is built into

the so-called New Atheist and Brights movements (http://www.the-brights.net/). In line with this, at least two studies have found that atheists place much more importance on science, logic and rational thinking than believers, especially when it comes to their personal decision to adopt religious and supernatural beliefs (Caldwell-Harris et al. 2011; Hunsberger and Altemeyer 2006).

There is a clear sense in which an emphasis on this analytic and materialistic way of thinking clashes with 'spiritual and supernatural' beliefs. Unsurprisingly, atheists report reduced belief in a 'connection between all things that I cannot see but can sense,' and similar items related to spiritual self-discovery, compared to Christians and Buddhists (Caldwell-Harris et al. 2011). This is not to say that nonbelievers cannot have 'spiritual' experiences or do not engage in meaningful introspection (e.g., Harris 2014). Instead, it suggests that, on average, they may place more importance on objective and perceptible 'facts,' especially those which are empirically tractable, at least compared to more 'fuzzy and vague' concepts linked to emotional awareness and moral considerations (e.g., all beings are interconnected in some sense or another). This may even come at the expense of socializing with others and potentially give rise to more self-oriented endeavors, especially those with clear intellectual demands.

It is an interesting question whether an overemphasis on this sort of analytic understanding might unintentionally compromise certain social, emotional and moral sentiments, thereby obfuscating the importance of beliefs and ideas which are linked to them. This is at least suggested by the tension between the two neural networks discussed in the introduction, the task-positive network (TPN) and the default mode network (DMN) (Friedman and Jack accepted; Jack et al. 2012). It is further supported by correlational data demonstrating a negative relationship between analytic reasoning skills increase and aspects of moral concern (Jack et al. 2016). Interestingly, some research suggests that atheists are perceived as being more narcissistic and less empathic than individuals who are described as religiously involved, as well as those in a 'control' condition without any mention of religiosity (Dubendorff and Luchner 2015). Moreover, experimental manipulations have demonstrated that inducing analytic and calculative mindsets decreases prosocial behavior and increases self-interested behavior (Wang et al. 2014; Zhong 2011). Future work may investigate whether these and similar inductions might also change the extent to which individuals value certain core beliefs, especially depending on whether one identifies as religious or not.

Given the diversity of religious belief systems, there are certainly many things that such individuals regard among 'the most important in life.' Nevertheless, religious scholars have argued that universal compassion and interpersonal connection are at the foundation of all religious systems (Smith and Marranca 2009), even if they are not practiced by all individual followers. Hence, beliefs, attitudes and behaviors related to these sentiments may be of special importance to religious individuals. Consider the golden rule, which in one way or another relates to treating others as you would like to be treated. This may be illustrated by strong familial bonds, which one hopes are reciprocated, or the tendency to help others. Prior work has demonstrated that highly religious individuals are more likely to engage in familial activities than nonbelievers (Cooperman et al. 2014), and the current results suggest that prosocial behavior may be linked to a conviction to something like the golden rule. An interest in spiritual self-development and the desire to help and connect with others—including concepts related to these tendencies—may also be some of the most important things in life for religious individuals. Future work might investigate whether empathy and social-connection inductions increase the importance of religious/spiritual

values and ideas, such as the golden rule or a universal sense of interconnection to all beings.

The second surprising finding is that there is a positive association between aspects of moral concern and both dogmatism and religious fundamentalism. This relationship was most clear with religious fundamentalism, which was significantly positively associated with both prosocial intentions and empathic concern in the religious (Study 2). This may appear surprising since, in the popular press, religious fundamentalism is most often associated with violent and antisocial behavior. It lies outside the scope of this investigation to assess whether such violent and/or antisocial behaviors are representative of religious fundamentalists in general or are the actions of a nonrepresentative minority. However, it is worth noting that there is no logical contradiction inherent in the existence of a mismatch between the psychological motivations of individuals who adopt fundamentalist beliefs and their actual behavior. It has previously been shown that empathic concern is linked to hostility, particularly in individuals who are focused on potential threats (Keller and Pfattheicher 2013). More generally, it is not an implausible view of the world to claim that a great deal of violence and conflict arises not so much from selfish motivations as from the selfless desire of individuals to protect what they regard as precious from perceived threats.

Prior work examining the potential antisocial consequences of religious belief/affiliation has tended to focus on the attitudes of religious individuals toward ingroup and outgroup members, with some findings interpreted as suggesting religious fundamentalism facilitates hostility toward outgroups (e.g., Blogowska and Saroglou 2011; Galen et al. 2011). However, meta-analytic data suggest two interesting findings. First, the previously observed relationship between religious fundamentalism and antisocial behavior has decreased over the years and, second, that once individual differences in authoritarianism are accounted for, the relationship between fundamentalism and antisocial tendencies disappears (Hall et al. 2010).

Building off of these observations, it is notable that both measures of moral concern used here include items that measure prosocial attitudes toward outgroup members, and the scales have excellent internal consistency. Further, we have previously found a positive association between religious belief and a measure specifically designed to assess empathy toward outgroup members (Study 3, Jack et al. 2016). A great deal of work in social psychology shows that, regardless of whether people are religious or nonreligious, they tend to show less empathy to outgroup than to ingroup members (Leyens et al. 2007; Saroglou et al. 2005; Tarrant et al. 2009). Since religious individuals evince greater empathy in general (Jack et al. 2016; Saroglou et al. 2005; Saslow et al. 2013), it is to be expected that such ingroup/outgroup differences will sometimes be found to be more pronounced in that population. However, it does not follow from this that religious individuals have less empathic feelings toward outgroup members than nonreligious individuals, and indeed this view is clearly contradicted by the current evidence as well as prior work (Johnson et al. 2013). It is our suggestion that future research which seeks to examine the potential antisocial consequences of religious belief is likely to yield more telling results when it focuses on the issue of perceived threat rather than ingroup/outgroup membership.

Implications for Public Discourse and Health

We believe these findings shed light on the underlying causes of long-standing difficulties in creative effective dialogue between religious and nonreligious perspectives, in particular

the perception of tension between science and religion. Research on persuasive messaging frequently highlights the importance of emotional appeal and social tailoring to create effective messages in order to motivate behavioral change (for reviews see Tompson et al. 2015; Vezich et al. 2015). However, the current findings suggest important differences in how moral considerations in particular are taken into account by individuals with different worldviews. This may pose difficulties in creating constructive dialogues between religious and nonreligious groups or individuals, especially when disagreements might relate to beliefs that bear different relationships to moral sentiments. In particular, nonreligious individuals may be inclined to produce messages which emphasize analytic/empirical arguments; however, such messages may fail to touch an important motivation for belief in the religious, namely moral sentiments. A more effective strategy may be to appeal to religious individual's sense of moral concern. In contrast, the current findings also suggest that messages which primarily emphasize moral concerns may fail to persuade the nonreligious. It seems that nonreligious individuals may be more susceptible to arguments that appeal to emotionally detached forms of social considerations, such as cognitive perspective taking (e.g., Rawls 2009 'veil of ignorance' seems to be a type of argument that fits this schema).

These findings also provide initial but intriguing evidence that may be relevant to the tailoring of persuasive messages in health care. Falk et al. (2011) provide evidence that affirming core beliefs and values before receiving information that contradicts one's own maladaptive behaviors corresponds with increased vmPFC activation during the reception phase of such messages. Moreover, greater vmPFC activation predicted effective modification of maladaptive behavior weeks after the brain scan. Given the role of this brain region in generating affective meaning and value (Bartra et al. 2013; Roy et al. 2012), as well as extinguishing fear (Marstaller et al. 2016; Phelps et al. 2004), it is likely that providing health information in relationship to one's core values can be especially effective. Hence, there is a sense in which better understanding the psychological processes related to conviction in core beliefs can also be used to motivate behavioral change, rather than change the beliefs themselves.

Interestingly, the values affirmed in Falk et al (2011) study were both religious and nonreligious; however, the authors do not report information pertaining to the participant's religiosity. In light of the recent findings, it is possible that the relationship between vmPFC activation and subsequent behavior change would vary depending on whether one was religious or not, and the values an individual might be instructed to affirm. At a more practical level, this suggests that health practitioners might want to know whether an individual is religious or not, and use this information to guide their attempts to modify maladaptive behavior, and ultimately personalize or tailor their approach toward their patients (e.g., Tompson et al. 2015).

The current investigation is not without limitations. With regard to the last point mentioned above, participants were not given the opportunity to identify as agnostic or atheist, but simply 'nonreligious.' We structured the response items this way in order to straightforwardly address whether measures of moral concern would share different relationships to dogmatism among individuals who do or not adopt religious worldviews. Because agnostics are, by definition, less dogmatic than atheists, it is possible that future work will find meaningful differences between these two groups of nonreligious individuals. Nevertheless, we regard the current findings as a stepping stone for motivating future hypotheses. Moreover, the current studies are purely correlational in nature and hence cannot provide information about causal effects. Further studies are needed to assess the persuasive power of messages crafted with different contents to different groups.

Nonetheless, the current studies provide clear support for a hypothesis which, on careful consideration, may not seem very surprising: The manner in which people weigh different types of thinking when forming beliefs about the 'things that matter most in life' differs as a function of which of two fundamentally different worldviews they adopt—religious versus nonreligious. We look forward to further research which builds upon these findings.

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Compliance with Ethical Standards

Conflict of interest Both the authors declare no conflict of interest.

Human and Animal Participants All studies were approved by Case Western Reserve University's Institutional Review Board. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

References

Altemeyer, B. (1996). *The authoritarian specter*. Massachusetts: Cambridge University Press.

Altemeyer, B., & Hunsberger, B. (2004). Research: A revised religious fundamentalism scale: The short and sweet of it. *The International Journal for the Psychology of Religion, 14*(1), 47–54.

Anticevic, A., Cole, M. W., Murray, J. D., Corlett, P. R., Wang, X. J., & Krystal, J. H. (2012). The role of default network deactivation in cognition and disease. *Trends in Cognitive Science, 16*(12), 584–592. doi:10.1016/j.tics.2012. **pii**.

Bartra, O., McGuire, J. T., & Kable, J. W. (2013). The valuation system: a coordinate-based meta-analysis of BOLD fMRI experiments examining neural correlates of subjective value. *Neuroimage, 76,* 412–427.

Blair, R. J. R. (2005). Responding to the emotions of others: dissociating forms of empathy through the study of typical and psychiatric populations. *Consciousness and Cognition, 14*(4), 698–718.

Blogowska, J., & Saroglou, V. (2011). Religious fundamentalism and limited prosociality as a function of the target. *Journal for the Scientific Study of Religion, 50*(1), 44–60.

Bressler, S. L., & Menon, V. (2010). Large-scale brain networks in cognition: Emerging methods and principles. *Trends in Cognitive Sciences, 14*(6), 277–290. doi:10.1016/j.tics.2010.04.004.

Bzdok, D., Schilbach, L., Vogeley, K., Schneider, K., Laird, A. R., Langner, R., et al. (2012). Parsing the neural correlates of moral cognition: ALE meta-analysis on morality, theory of mind, and empathy. *Brain Structure and Function, 217*(4), 783–796. doi:10.1007/s00429-012-0380-y.

Caldwell-Harris, C. L., Wilson, A. L., LoTempio, E., & Beit-Hallahmi, B. (2011). Exploring the atheist personality: Well-being, awe, and magical thinking in atheists, Buddhists, and Christians. *Mental Health Religion and Culture, 14*(7), 659–672.

Cooperman, A., Smith, G., A., Mohamed, B., & Schiller, A. (2014). *Religion in everyday life: Highly religious Americans are happier and more involved with family but are no more likely to exercise, recycle or make socially conscious consumer choices*. Retrieved from http://www.pewforum.org/2016/04/12/religion-in-everyday-life/.

Coutinho, M. V., Redford, J. S., Church, B. A., Zakrzewski, A. C., Couchman, J. J., & Smith, J. D. (2015). The interplay between uncertainty monitoring and working memory: Can metacognition become automatic? *Memory and Cognition, 43*(7), 990–1006.

Crescentini, C., Di Bucchianico, M., Fabbro, F., & Urgesi, C. (2015). Excitatory stimulation of the right inferior parietal cortex lessens implicit religiousness/spirituality. *Neuropsychologia, 70,* 71–79.

Crowson, H. M., DeBacker, T. K., & Davis, K. A. (2008). The DOG SCale: A valid measure of dogmatism? *Journal of Individual Differences, 29*(1), 17–24.

Davis, M. H. (1983). Measuring individual differences in empathy: Evidence for a multidimensional approach. *Journal of Personality and Social Psychology, 44*(1), 113.

Dubendorff, S. J., & Luchner, A. F. (2015). The Perception of atheists as narcissistic. Rollins College Student-Faculty Collaborative Research Program, 2015 Annual Report, 106.

Duncan, J., & Owen, A. M. (2000). Common regions of the human frontal lobe recruited by diverse cognitive demands. *Trends in Neuroscience, 23*(10), 475–483. doi:10.1016/S0166-2236(00)01633-7.

Evans, J. S. B., & Stanovich, K. E. (2013). Dual-process theories of higher cognition advancing the debate. *Perspectives on Psychological Science, 8*(3), 223–241.

Falk, E. B., Berkman, E. T., Whalen, D., & Lieberman, M. D. (2011). Neural activity during health messaging predicts reductions in smoking above and beyond self-report. *Health Psychology, 30*(2), 177.

Festinger, L. (1962). *A theory of cognitive dissonance* (Vol. 2). California: Stanford University Press.

Fox, M. D., Snyder, A. Z., Vincent, J. L., Corbetta, M., Van Essen, D. C., & Raichle, M. E. (2005). The human brain is intrinsically organized into dynamic, anticorrelated functional networks. *Proceedings of the National Academy of Sciences of the United States of America, 102*(27), 9673–9678. doi:10.1073/pnas.0504136102.

Frederick, S. (2005). Cognitive reflection and decision making. *Journal of Economic perspectives, 19*(4), 25–42.

Friedman, J. P., & Jack, A. I. (accepted). Mapping cognitive structure onto the landscape of philosophical debate: An empirical framework with relevance to problems of consciousness, free will and ethics. *Review of Philosophy and Psychology*.

Friedman, J., Jack, A. I., Rochford, K., & Boyatzis, R. (2015). Antagonistic neural networks underlying organizational behavior. In D. A. Waldman & P. A. Balthazard (Eds.), *Organizational neuroscience (monographs in leadership and management)* (Vol 7, pp. 115–141). Emerald Group Publishing Limited.

Galen, L. W., Smith, C. M., Knapp, N., & Wyngarden, N. (2011). Perceptions of religious and nonreligious targets: Exploring the effects of perceivers' religious fundamentalism. *Journal of Applied Social Psychology, 41*(9), 2123–2143.

Gervais, W. M. (2015). Override the controversy: Analytic thinking predicts endorsement of evolution. *Cognition, 142,* 312–321.

Gervais, W. M., & Norenzayan, A. (2012). Analytic thinking promotes religious disbelief. *Science, 336*(6080), 493–496. doi:10.1126/science.1215647.

Goel, V. (2007). Anatomy of deductive reasoning. *Trends in Cognitive Sciences, 11*(10), 435–441. doi:10.1016/j.tics.2007.09.003.

Hall, D. L., Matz, D. C., & Wood, W. (2010). Why don't we practice what we preach? A meta-analytic review of religious racism. *Personality and Social Psychology Review, 14*(1), 126–139.

Harris, S. (2014). *Waking up: A guide to spirituality without religion*. New York: Simon and Schuster.

Harris, S., Kaplan, J. T., Curiel, A., Bookheimer, S. Y., Iacoboni, M., & Cohen, M. S. (2009). The neural correlates of religious and nonreligious belief. *PLoS ONE, 4*(10), e0007272.

Harris, S., Sheth, S. A., & Cohen, M. S. (2008). Functional neuroimaging of belief, disbelief, and uncertainty. *Annals of Neurology, 63*(2), 141–147.

Hunsberger, B. E., & Altemeyer, B. (2006). *Atheists: A groundbreaking study of America's nonbelievers*. Amherst, NY: Prometheus Books.

Jack, A. I. (2013). A scientific case for conceptual dualism: The problem of consciousness and the opposing domains hypothesis. In J. Knobe, T. Lombrozo, & S. Nichols (Eds.), *Oxford studies in experimental philosophy* (Vol. 1). Oxford: Oxford University Press.

Jack, A. I., Dawson, A. J., Begany, K. L., Leckie, R. L., Barry, K. P., Ciccia, A. H., et al. (2012). fMRI reveals reciprocal inhibition between social and physical cognitive domains. *Neuroimage, 66C,* 385–401. doi:10.1016/j.neuroimage.2012.10.061.

Jack, A. I., Friedman, J. P., Boyatzis, R. E., & Taylor, S. N. (2016). Why do you believe in God? Relationships between religious belief, analytic thinking, mentalizing and moral concern. *PLoS ONE, 11*(3), e0149989.

Jack, A. I., Robbins, P., Friedman, J. P., & Meyers, C. D. (2014). More than a feeling: counterintuitive effects of compassion on moral judgment. *Advances in Experimental Philosophy of Mind*, *125*): Continuum.

Johnson, K. A., Li, Y. J., Cohen, A. B., & Okun, M. A. (2013). Friends in high places: The influence of authoritarian and benevolent god-concepts on social attitudes and behaviors. *Psychology of Religion and Spirituality, 5*(1), 15.

Kahneman, D. (2011). *Thinking, fast and slow*. New York: Macmillan.

Keller, J., & Pfattheicher, S. (2013). The compassion-hostility paradox the interplay of vigilant, prevention-focused self-regulation, compassion, and hostility. *Personality and Social Psychology Bulletin, 39*(11), 1518–1529.

Koenigs, M., Kruepke, M., Zeier, J., & Newman, J. P. (2012). Utilitarian moral judgment in psychopathy. *Social Cognitive and Affective Neuroscience, 7*(6), 708–714. doi:10.1093/scan/nsr048.

Koenigs, M., Young, L., Adolphs, R., Tranel, D., Cushman, F., Hauser, M., et al. (2007). Damage to the prefrontal cortex increases utilitarian moral judgements. *Nature, 446*(7138), 908–911. doi:10.1038/nature05631.

Krueger, F., Spampinato, M. V., Pardini, M., Pajevic, S., Wood, J. N., Weiss, G. H., et al. (2008). Integral calculus problem solving: an fMRI investigation. *NeuroReport, 19*(11), 1095–1099. doi:10.1097/WNR.0b013e328303fd85.

Leyens, J. P., Demoulin, S., Vaes, J., Gaunt, R., & Paladino, M. P. (2007). Infra-humanization: The wall of group differences. *Social Issues and Policy Review, 1*(1), 139–172.

Lindquist, K. A., Wager, T. D., Kober, H., Bliss-Moreau, E., & Barrett, L. F. (2012). The brain basis of emotion: A meta-analytic review. *Behavioral Brain Sciences, 35*(3), 121–143. doi:10.1017/S0140525X11000446.

Liu, C.-C. (2010). The relationship between personal religious orientation and emotional intelligence. *Social Behavior and Personality: An international Journal, 38*(4), 461–467.

Lockwood, P. L., Bird, G., Bridge, M., & Viding, E. (2013). Dissecting empathy: high levels of psychopathic and autistic traits are characterized by difficulties in different social information processing domains. *Frontiers in human neuroscience, 7,* 760.

Łowicki, P., & Zajenkowski, M. (2016). Divine emotions: On the link between emotional intelligence and religious belief. *Journal of Religion and Health*. doi:10.1007/s10943-016-0335-3.

Mars, R. B., Neubert, F. X., Noonan, M. P., Sallet, J., Toni, I., & Rushworth, M. F. (2012). On the relationship between the "default mode network" and the "social brain". *Frontiers in Human Neuroscience, 6,* 189. doi:10.3389/fnhum.2012.00189.

Marstaller, L., Burianová, H., & Reutens, D. C. (2016). Adaptive contextualization: A new role for the default mode network in affective learning. *Human Brain Mapping, 38*(2), 1082–1091.

Meyer, M. L., Taylor, S. E., & Lieberman, M. D. (2015). Social working memory and its distinctive link to social cognitive ability: An fMRI study. *Social Cognitive and Affective Neuroscience, 10*(10), 1338–1347.

Morelli, S. A., Rameson, L. T., & Lieberman, M. D. (2014). The neural components of empathy: Predicting daily prosocial behavior. *Social Cognitive and Affective Neuroscience, 9*(1), 39–47.

Norenzayan, A., Gervais, W. M., & Trzesniewski, K. H. (2012). Mentalizing deficits constrain belief in a personal God. *PLoS ONE, 7*(5), e36880. doi:10.1371/journal.pone.0036880.

Pavey, L., Greitemeyer, T., & Sparks, P. (2011). Highlighting relatedness promotes prosocial motives and behavior. *Personality and Social Psychology Bulletin, 37*(7), 905–917. doi:10.1177/0146167211405994.

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

Pennycook, G., Ross, R. M., Koehler, D. J., & Fugelsang, J. A. (2016). Atheists and agnostics are more reflective than religious believers: Four empirical studies and a meta-analysis. *PLoS ONE, 11*(4), e0153039.

Phelps, E. A., Delgado, M. R., Nearing, K. I., & LeDoux, J. E. (2004). Extinction learning in humans: Role of the amygdala and vmPFC. *Neuron, 43*(6), 897–905.

Rameson, L. T., Morelli, S. A., & Lieberman, M. D. (2012). The neural correlates of empathy: Experience, automaticity, and prosocial behavior. *Journal of Cognitive Neuroscience, 24*(1), 235–245.

Rawls, J. (2009). *A theory of justice*. Cambridge: Harvard University Press.

Robbins, P., & Jack, A. I. (2006). The phenomenal stance. *Philosophical Studies, 127*(1), 59–85.

Rounding, K., Lee, A., Jacobson, J. A., & Ji, L.-J. (2012). Religion replenishes self-control. *Psychological Science, 23*(6), 635–642.

Roy, M., Shohamy, D., & Wager, T. D. (2012). Ventromedial prefrontal-subcortical systems and the generation of affective meaning. *Trends in cognitive sciences, 16*(3), 147–156.

Saroglou, V., Pichon, I., Trompette, L., Verschueren, M., & Dernelle, R. (2005). Prosocial behavior and religion: New evidence based on projective measures and peer ratings. *Journal for the Scientific Study of Religion, 44*(3), 323–348.

Saslow, L. R., Willer, R., Feinberg, M., Piff, P. K., Clark, K., Keltner, D., et al. (2013). My brother's keeper? Compassion predicts generosity more among less religious individuals. *Social Psychological and Personality Science, 4*(1), 31–38.

Schilbach, L., Eickhoff, S., Rotarskajagiela, A., Fink, G., & Vogeley, K. (2008). Minds at rest? Social cognition as the default mode of cognizing and its putative relationship to the "default system" of the brain. *Consciousness and Cognition, 17*(2), 457–467. doi:10.1016/j.concog.2008.03.013.

Schjoedt, U., Stødkilde-Jørgensen, H., Geertz, A. W., Lund, T. E., & Roepstorff, A. (2010). The power of charisma—perceived charisma inhibits the frontal executive network of believers in intercessory prayer. *Social Cognitive and Affective Neuroscience, 6*(1), 119–127.

Schjoedt, U., Stødkilde-Jørgensen, H., Geertz, A. W., & Roepstorff, A. (2009). Highly religious participants recruit areas of social cognition in personal prayer. *Social Cognitive and Affective Neuroscience, 4*(2), 199–207.

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

Shulman, G. L., Fiez, J. A., Corbetta, M., Buckner, R. L., Miezin, F. M., Raichle, M. E., et al. (1997). Common blood flow changes across visual tasks: II. Decreases in cerebral cortex. *Journal of Cognitive Neuroscience, 9*(5), 648–663. doi:10.1162/jocn.1997.9.5.648.

Smith, H., & Marranca, R. (2009). *The world's religions*. New York: HarperOne.

Spreng, R. N., Mar, R. A., & Kim, A. S. (2009). The common neural basis of autobiographical memory, prospection, navigation, theory of mind, and the default mode: a quantitative meta-analysis. *Journal of Cognitive Neuroscience, 21*(3), 489–510. doi:10.1162/jocn.2008.21029.

Stupple, E. J., Gale, M., & Richmond, C. (2013). *Working memory, cognitive miserliness and logic as predictors of performance on the cognitive reflection test.* Paper presented at the Proceedings of the 35th annual conference of the cognitive science society.

Tarrant, M., Dazeley, S., & Cottom, T. (2009). Social categorization and empathy for outgroup members. *British Journal of Social Psychology, 48*(3), 427–446.

Tavris, C., & Aronson, E. (2008). *Mistakes were made (but not by me): Why we justify foolish beliefs, bad decisions, and hurtful acts*. New York: Houghton Mifflin Harcourt.

Tompson, S., Lieberman, M. D., & Falk, E. B. (2015). Grounding the neuroscience of behavior change in the sociocultural context. *Current Opinion in Behavioral Sciences, 5,* 58–63.

Toplak, M. E., West, R. F., & Stanovich, K. E. (2011). The cognitive reflection test as a predictor of performance on heuristics-and-biases tasks. *Memory and Cognition, 39*(7), 1275–1289.

van Elk, M., & Aleman, A. (2016). Brain mechanisms in religion and spirituality: An integrative predictive processing framework. *Neuroscience and Biobehavioral Reviews,* 73, 359–378.

Van Overwalle, F. (2011). A dissociation between social mentalizing and general reasoning. *Neuroimage, 54*(2), 1589–1599.

Vezich, S., Falk, E., & Lieberman, M. (2015). Persuasion neuroscience: New potential to test dual process theories. In E. Harmon-Jones & M. Inzlicht (Eds.), *Social Neuroscience: Biological approaches to social Psychology*. New York: Psychological Press.

Wang, L., Zhong, C.-B., & Murnighan, J. K. (2014). The social and ethical consequences of a calculative mindset. *Organizational Behavior and Human Decision Processes, 125*(1), 39–49.

Zhong, C.-B. (2011). The ethical dangers of deliberative decision making. *Administrative Science Quarterly, 56*(1), 1–25.