



# Foxhole atheism, revisited: The effects of mortality salience on explicit and implicit religious belief

Jonathan Jong<sup>\*</sup>, Jamin Halberstadt, Matthias Bluemke

Department of Psychology, University of Otago, New Zealand

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## ABSTRACT

Although fear of death features prominently in many historical and contemporary theories as a major motivational factor in religious belief, the empirical evidence available is ambivalent, and limited, we argue, by imprecise measures of belief and insufficient attention to the distinction between implicit and explicit aspects of cognition. The present research used both explicit (questionnaire) and implicit (single-target implicit association test; property verification) measurement techniques to examine how thoughts of death influence, specifically, belief in religious supernatural agents. When primed with death, participants explicitly defended their own religious worldview, such that self-described Christians were more confident that supernatural religious entities exist, while non-religious participants were more confident that they do not. However, when belief was measured implicitly, death priming increased all participants' beliefs in religious supernatural entities, regardless of their prior religious commitments. The results are interpreted in terms of a dual-process model of religious cognition, which can be used to resolve conflicting prior data, as well as to help explain the perplexing durability of religious belief.

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## Introduction

Religious belief—particularly in supernatural agents such as gods, angels, and souls—seems an indelible feature of human cognition. Indeed, while the demise of religion has been prophesied since the Enlightenment, it has proven resistant both to intellectual counterarguments (e.g., d'Holbach, 1835; Hitchens, 2007; Russell, 1957) and to political persecution (e.g., in Soviet Russia, Communist China, Socialist Albania), and it shows no signs of waning at a global level (Berger, 1999; McGrath, 2004).

What makes religion's hardiness particularly puzzling is that, even in ideal socio-political climates, it exacts substantial material and reproductive costs. From church tithes and taxes to Aztec human sacrifice, prayers five times daily to pilgrimages to holy sites halfway across the world, bans on premarital sex to celibate castes, devotion to supernatural agents is individually and societally costly. To paraphrase Barrett's (2004) titular phrase, why would anyone believe in gods, when there are such powerful motivations not to?

The answer, many researchers have argued, lies in the even more powerful fear of death (e.g., Donovan, 2003; Freud, 1961; Malinowski, 1948; Vail et al., 2010). Although particular accounts differ in their motivational details, a recurring theme in theories of religion is that humans' awareness of and concern over their own mortality create potentially crippling anxiety. Religious beliefs, and especially beliefs

in supernatural agents, can help relieve this anxiety by offering the possibility of literal immortality (Atran, 2002; Freud, 1961; Malinowski, 1948) and/or by providing means to symbolically live on after death (Landau, Greenberg, & Solomon, 2004). In the former case, religious beliefs provide a buffer against fear of death by virtue of their content: they acknowledge the existence of agents who do not die, and who can ensure that the believer might not either. In the latter case, religious beliefs provide a buffer against fear of death by virtue of their location in a cultural worldview, which allows individuals to feel like valuable parts of something larger and more enduring than themselves. On this point, previous research has shown that the affirmation of aspects of one's worldview (e.g., values) indeed reduces the cognitive accessibility of death-related thoughts. Furthermore, there is also evidence that increased salience of participants' mortality leads to worldview defense—typically manifested as increased adherence to their own or ingroups' worldviews and/or increased derogation of outgroups—in multiple domains, including ethnicity, gender, nationality, and even minimal groups (see Burke, Martens, & Faucher, 2010 for review).

While the case for death-motivated religious belief seems strong, even intuitive, there are theoretical and empirical complications. First, despite the cross-cultural ubiquity of religious and afterlife beliefs in funeral rites, anthropologists are quick to point out that religious beliefs are often far from comforting (Boyer, 2001; Guthrie, 1993). The ancient Mesopotamian belief that people are invariably cast into a terrifying netherworld populated by monsters (Bottéro, 2001; Katz, 2003); the fire and brimstone preaching, which had its heyday in the 18th century Christian revivalist movements (e.g., Edwards, 2003); and the Calvinist belief in a God who pre-determines souls to salvation or damnation

<sup>\*</sup> Corresponding author.

E-mail address: [jonathan@psy.otago.ac.nz](mailto:jonathan@psy.otago.ac.nz) (J. Jong).

(Thuesen, 2009) are all clear examples of such disquieting models of the afterlife.

Second, it turns out that the evidence for a relationship between religiosity and death anxiety is mixed (Donovan, 1994; Gartner, Larson, & Allen, 1991; Spilka, Hood, & Gorsuch, 1985). For example, Donovan (1994) reported that in only 57% of the 137 correlational studies he reviewed were religious people indeed less fearful of death than less religious people. In 9% they were more fearful of death, and in 33% they were neither more nor less fearful (or the results were inconclusive). Other researchers have reported that both religious and non-religious people are less fearful of death than those with more ambivalent religious attitudes (i.e., a curvilinear relationship; Aday, 1984–1985; Dolnick, 1987; Downey, 1984; Leming, 1979–1980; McMordie, 1981; Nelson & Cantrell, 1980; Wen, 2010; Wink & Scott, 2005).

Experimental research on death and religiosity is equally ambiguous. Some studies have found that mortality salience strengthens religious belief (e.g., Osarchuk & Tatz, 1973), but others have not (e.g., Burling, 1993). Some have found people to be highly sectarian in their beliefs, with mortality increasing religiosity for religious people but decreasing religiosity for non-religious people (Weisbuch, Seery, & Blascovich, 2005), but others have found them quite promiscuous, willing to endorse even other people's gods after thinking about their own death (Norenzayan & Hansen, 2006, Experiment 4).

Progress toward deciphering the actual relation between death and religious belief has been limited, we believe, by two methodological issues. First, as previous commentators have noted (e.g., Hood, Hill, & Spilka, 2009; Norenzayan & Hansen, 2006), assessing differences in “religiosity” has been hampered by the variety and ambiguity of instruments used to measure it. For example, Burling (1993) measured participants' religious orientation (their “way of being religious”; Batson & Ventis, 1982); Weisbuch et al. (2005) asked about participants' religious experiences; and Osarchuk and Tatz (1973) and Norenzayan and Hansen (2006) measured participants' afterlife and supernatural agent beliefs respectively. As recent cognitive anthropological and psychological research has shown, these various aspects of religiosity are related, but theoretically and empirically distinct (Boyer, 2011).

More importantly, previous research has relied exclusively on self-reports. Not only are such methods susceptible to strategic responding—demand characteristics, social desirability, and other self-presentational biases—they are also unsuitable for detecting changes in cognition that might occur beneath conscious awareness. Moreover, recent dual-process models of cognition (e.g., Bargh & Chartrand, 1999; Chen & Chaiken, 1999; Dijksterhuis & Nordgren, 2006; Nosek, 2007) propose that implicit cognitive associations and processes are empirically and functionally dissociable from explicit attitudes or conscious deliberations, such that measures of the latter (e.g., self-report questionnaires) do not measure the former in principle. The social psychological literature on prejudice, for example, suggests that explicit and implicit prejudice have independent effects on behavior and, indeed, predict different behavioral outcomes (e.g., Dovidio, Kawakami, & Gaertner, 2002; Knowles, Lowery, & Schaumburg, 2010).

Although dual-process models of religious cognition in particular have yet to be formalized, there is increasing evidence for “implicit theism” among ostensibly non-religious individuals (Uhlmann, Poehlman, & Bargh, 2008, p. 71). Bering (2002), for example, found that about a third of participants who explicitly denied belief in an afterlife nevertheless endorsed statements that implied post-mortem psychological functioning; furthermore, participants consistently took longer to deny emotional, motivational, and epistemic states (e.g., happiness, desire to live, knowledge of own death) than biological, psychobiological, and perceptual states (e.g., brain function, hunger, vision). Similarly, Haidt, Björklund, and Murphy (2000) found that avowed atheists refused to sign a contract stipulating the sale of their souls to the experimenter, even when the contract was explicitly identified as meaningless. Heywood (2010) recently found that atheists interpreted important life events in “teleo-functional”

terms: when attempting to explain personally significant occurrences, they frequently referred to some sort of purpose, meaning, or lesson—as if there were someone behind the events, intending to communicate something—rather than simply providing a naturalistic causal account.

The success of dual-process models in general, and the striking dissociations between religious attitudes and behaviors in particular, raise the intriguing possibility—to be examined in the present research—that death-related affect and cognition motivates individuals' explicit and implicit beliefs in different ways. In Study 1 we examined participants' explicit reactions to mortality salience using the Supernatural Beliefs Scale (SBS; Jong, Bluemke, & Halberstadt, 2011). In contrast to previous research that has indiscriminately measured religious attitudes, values, experiences, and behaviors, the SBS targets respondents' tendency to believe in supernatural entities and events (e.g., god, heaven, miracles). Study 2 then explores the effect of mortality salience on implicit religious belief via the single-target Implicit Association Test (ST-IAT; Wigboldus, Holland, & van Knippenberg, 2006), a version of the Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998) adapted to measure the relative strength of association between a single target and two attributes. In this case, we measured the relative strength of association between religious concepts (i.e., the items in the SBS) and the concept “real” in comparison to the concept “imaginary”, and operationalized religious belief in these terms (cf. Shariff, Cohen, & Norenzayan, 2008). Finally, Study 3 extends this examination of implicit religious belief via a property verification task, in which respondents categorize religious and non-religious entities as “real” or “imaginary” as quickly as possible; in this case, the strength of religious beliefs is inferred from response latencies (cf. Gibson, 2005).

Together, these three studies represent the first examination of the effects of death priming on both explicit and implicit religious belief. Additionally, by considering mortality salience effects in light of participants' prior religious commitments, the studies can also shed light on the mechanism(s) by which belief exerts any buffering effects. As noted above, religious beliefs might, on the one hand, mitigate existential anxiety by virtue of their unique content, which include reference to supernatural entities with the power to grant a literal reprieve from death. If so, then all individuals, regardless of whether they self-identify as “religious”, should recognize the potential of religious belief to provide some emotional salve, which should motivate them to entertain such belief; mortality salience should therefore increase religious belief (or at least decrease religious skepticism) regardless of prior religious commitments (cf. Norenzayan & Hansen, 2006, Experiment 4).

On the other hand, religious beliefs might mitigate existential anxiety by virtue of their role in an individual's enduring, socially-validated value system (Greenberg, Pyszczynski, & Solomon, 1986; Landau et al., 2004). If so, then “religious” individuals should be motivated to bolster religious beliefs, but “non-religious” individuals should be motivated to denigrate religious beliefs. Even among non-religious individuals who do not identify strongly with being non- or anti-religious, the pursuit of symbolic immortality should be manifest in much the same way as with other demographically-based outgroups; previous research has demonstrated worldview defense against various kinds of outgroups (e.g., age; Martens, Greenberg, Schimel, & Landau, 2004), even minimally-defined, arbitrarily-assigned ones (Harmon-Jones, Greenberg, Solomon, & Simon, 1996). Likewise, mortality salience should lead to increased religious belief among religious participants and increased religious disbelief among non-religious participants.

Finally, and most interestingly, these two predictions might not be mutually exclusive. It is possible that, consistent with previous demonstrations of implicit theism, and a dual-process perspective on religious cognition more generally, religious belief could simultaneously offer both literal and symbolic immortality, at different levels of representation. Such effects would be most evident for non-religious individuals, who may explicitly deny religious belief (i.e., bolster their non-religious

worldview), but nevertheless show evidence of enhanced implicit religiosity.

## Study 1

### Method

#### Participants

Ninety-three psychology undergraduates participated in this experiment in exchange for partial course credit. The study was run in conjunction with several other, unrelated procedures.

#### Materials and procedure

Each task was presented on separate sheets of paper in a questionnaire pack including several unrelated studies. Following previous research (Norenzayan, Dar-Nimrod, Hansen, & Proulx, 2009; Norenzayan & Hansen, 2006, Experiment 4; Greenberg, Solomon, & Pyszczynski, 1997; Rosenblatt, Greenberg, Solomon, Pyszczynski, & Lyon, 1989), mortality salience was manipulated via a writing task. Under the auspices of a task examining participants' ability to imagine various events, participants in the death priming condition were instructed to write down specifically "what you think will happen to you physically as you die and once you are physically dead," along with the feelings that these thoughts arouse. Participants in the control condition were instructed to write down specifically "what happens to you when you watch TV" and "about the feelings that thoughts of watching TV arouse in you" (see, e.g., Norenzayan et al., 2009 for a similar procedure).

Participants then completed a demographics form and a 10-item Supernatural Belief Scale (SBS). The latter asked them to indicate, using a 9-point Likert scale, anchored at  $-4$  (Strongly Disagree) and  $4$  (Strongly Agree), their agreement with statements affirming the reality of religious supernatural agents, places, and events (e.g., "There exists an all-powerful, all-knowing, loving God", "Some people will go to Heaven when they die"). By design, responses greater than 0 indicate belief, responses less than 0 indicate disbelief, while 0 indicates agnosticism. In a pretest involving 142 participants from the same population, the SBS formed a highly reliable measure of belief (Cronbach's  $\alpha = .95$ ), which correlated significantly both with attitudinal measures (i.e., the importance of their religious identity;  $r = .54$ ,  $p < .01$ ) and behavioral measures (i.e., the number of religious services attended,  $r = .65$ ,  $p < .01$ ) of religiosity. Furthermore, participants who self-categorized as atheist scored significantly lower on the SBS ( $M = -2.49$ ,  $SD = 1.37$ ) than those who reported no religious affiliation ( $M = -.76$ ,  $SD = 1.63$ ),  $t(86) = -4.03$ ,  $p < .001$ , who in turn scored significantly lower than those who self-categorized as religious ( $M = 1.37$ ,  $SD = 1.90$ ),  $t(140) = -7.18$ ,  $p < .001$ . These data provide evidence for the convergent validity of the SBS, and show that low negative SBS scores indicate strong disbelief and that high positive scores indicate strong belief. Further data on the scale's psychometric properties and validity can be found in Jong et al. (2011).

After completing all the tasks in the questionnaire pack, participants were debriefed and thanked.

### Results and discussion

Consistent with pretesting, SBS scores were highly reliable in this sample (Cronbach's  $\alpha = .93$ ).

Prior to analysis, participants were split into two groups on the basis of their self-reported religious identity in the demographics form. Forty-six participants self-categorized as being Christian, while forty-seven participants self-categorized as being non-religious (87.23% "None", 10.64% "Atheist", 2.13% "Agnostic"). A 2 (religious identification)  $\times$  2 (death vs. control priming) ANOVA showed no main effect of priming condition ( $M_{\text{death}} = .48$ ,  $SD = 2.22$  vs.  $M_{\text{control}} = .61$ ,  $SD = 1.69$ ),  $F(1, 89) = .013$ , but did reveal a main effect of religious identification, ( $M_{\text{religious}} = 2.02$ ,  $SD = 1.16$  vs.  $M_{\text{non-religious}} =$

$-.89$ ,  $SD = 1.42$ ),  $F(1, 89) = 122.89$ ,  $p < .001$ ,  $\eta_p^2 = .58$  and an interaction,  $F(1, 89) = 5.47$ ,  $p < .05$ ,  $\eta_p^2 = .06$ . Indeed, the effects of mortality salience priming (MS) on SBS scores differed qualitatively as a function of religious identity. For religious participants, MS increased SBS scores,  $t(44) = 1.77$ ,  $p < .05$ ,  $\eta_p^2 = .07$ , whereas for non-religious participants, MS decreased SBS scores,  $t(45) = -1.59$ ,  $p < .06$ ,  $\eta_p^2 = .05$ .

The data clearly show, then, that when religious belief is measured explicitly, and using a targeted instrument, the effect of mortality salience depends critically on an individuals' prior religious identification. These results are therefore more consistent with the worldview defense account of religion (Vail et al., 2010), which predicts that religious participants should defend their religious worldviews (i.e., report strengthened religious belief), while non-religious participants should defend their non-religious worldviews (i.e., report strengthened religious disbelief). Conversely, these results are inconsistent with the proposal that religious beliefs, by virtue of their distinctive support for literal immortality, create a uniquely effective buffer against death anxiety for everyone, regardless of his or her prior religious commitment.

However, as discussed above, explicit self-report measures, no matter how well-designed, can only measure the beliefs to which individuals have conscious access and which they can express propositionally, beliefs that may be different than or even independent of their implicit associations. It is possible, therefore, that mortality salience motivates bolstering of worldview-consistent explicit beliefs, while at the same time increasing worldview-independent implicit beliefs in supernatural agents. To test this possibility, in Study 2, we employed a single-target Implicit Association Test (ST-IAT; Wigboldus et al., 2006) as a measure of implicit religious belief. In this task, participants categorize synonyms of "real" (e.g., actual) and "imaginary" (e.g., false), while responding to words that referred to supernatural entities (e.g., God). The relative speed with which participants respond to "supernatural" words using the "real" key compared to the "imaginary" key indicates strength of religious belief, defined as the strength of association between supernatural and existential concepts. Thus, if mortality salience triggers implicit belief in the service of worldview defense, then, analogous to the results of Study 1, death-priming should lead to more positive ST-IAT scores (i.e., stronger belief) among religious participants, but more negative ST-IAT scores (stronger disbelief) among non-religious participants. On the other hand, if mortality salience triggers implicit belief by virtue of its unique association with immortality, then death-priming should lead to more positive scores for all participants, regardless of their self-reported religious affiliations and beliefs.

## Study 2

### Method

#### Participants

Seventy-six female and 25 male psychology undergraduates ( $M_{\text{age}} = 20.14$ ,  $SD = 3.73$ ) participated in this study in exchange for partial course credit.

#### Materials and procedure

The experiment consisted of two parts, separated by a five-minute break, during which participants completed an unrelated task. In Part 1, death thoughts were primed under the auspices of a study on imagination, as in Study 1. Part 2 then consisted of a computer-based ST-IAT, an adaptation of the IAT (Greenwald et al., 1998; see Bluemke & Friese, 2008 for a psychometric evaluation of ST-IAT). In a training phase, participants categorized synonyms of "real" (e.g., real, existent, actual;  $n = 7$ ) and "imaginary" (e.g., imaginary, false, illusory;  $n = 7$ ) as quickly and accurately as possible, using keyboard keys. Each item was presented three times in random order. In a first test phase, participants were presented with "real" and "imaginary"



items from the training phase, but also with words referring to the religious supernatural entities that reflected SBS item content (e.g., God, soul, Hell;  $n = 7$ ); in this phase, participants categorized the “real” and “supernatural” words using the same key, and “imaginary” words using a different key. “Imaginary” items were presented six times, whereas “supernatural” and “real” words were presented three times each, to ensure equal number of correct keystrokes per key (Wigboldus et al., 2006). A second test phase was identical to the first, except that “supernatural” and “imaginary” words were now associated with the same key; as in the first test phase, the number of correct keystrokes per key was kept balanced.

After completing the ST-IAT, participants completed a sociodemographics questionnaire, as in Study 1. Finally, participants were debriefed, thanked, and dismissed.

## Results and discussion

The self-report measure of religious identity indicated that the sample contained 42 religious (100% “Christian”) and 59 non-religious (95% “None”, 5% “Agnostic”) participants.

Following guidelines specified by Bluemke and Fries (2008), participants’ ST-IAT scores were calculated as the difference between the mean standardized response latencies in the two test phases (analogous to the IAT D-score; Greenwald, Nosek, & Banaji, 2003), such that positive values reflect stronger implicit religious belief (raw response time differences are reported here for ease of interpretation). ST-IAT scores were overall negative, ( $M = -29$  ms,  $SD = 7$  ms),  $t(100) = -3.68$ ,  $p < .001$ , reflecting a stronger association between religious concepts and “imaginary” than between religious concepts and “real,” although this is partially attributable to practice effects inherent in the standard procedure (Bluemke & Fries, 2008).

A 2 (religious identification)  $\times$  2 (death vs. control priming) ANOVA revealed two main effects on ST-IAT scores: religious participants scored higher (greater implicit belief) than nonreligious participants ( $-7$  ms versus  $-43$  ms,  $SEs = 12$  ms and  $10$  ms respectively),  $F(1, 97) = 6.10$ ,  $p = .015$ ,  $\eta_p^2 = .06$ ; and death-primed participants scored higher than control participants ( $-6$  ms versus  $-43$  ms,  $SEs = 11$  ms and  $10$  ms respectively),  $F(1, 97) = 5.62$ ,  $p = .02$ ,  $\eta_p^2 = .06$ . There was no interaction,  $F < 1$ ; self-reported religious affiliation did not moderate the effect of death priming on implicit belief.

Thus, in contrast to Study 1, when religious belief is measured implicitly the effects of mortality salience do not depend on prior religious identification: regardless of religious identification, participants were faster to associate supernatural agents with existence after thinking about their own death. The results therefore suggest that implicit religious belief serves a unique buffering function that benefits even the non-religious individual. Taken together, Studies 1 and 2 are consistent with a dual-process model of religious cognition, in which non-religious individuals in particular may pursue symbolic immortality by explicitly repudiating religious beliefs (Study 1), while simultaneously pursuing literal immortality by implicitly accepting them (Study 2).

Before discussing the implications of Study 2 further, however, there are several limitations to be addressed. First, conclusions regarding literal immortality are based on the fact that mortality salience had the same impact on participants’ implicit beliefs regardless of their self-proclaimed religious identity (i.e., religious versus non-religious). Although there is no reason to suspect the study is underpowered, particularly given that religious identity did moderate the effects of mortality salience in Study 1, it might still be argued that our independent variable was insufficiently precise: participants’ religious worldviews are an imperfect proxy for their religious beliefs. Many “Christians” likely hold irreligious or areligious beliefs and, more importantly, many “non-religious” participants may be theists nonetheless. If so, it might be unreasonable to expect non-religious participants in Study 2 to repudiate supernatural religious beliefs in the face of death.

Second, Study 2 differed from Study 1 in that it included a delay between the mortality salience manipulation and the measure of religious belief, which, according to Pyszczynski, Greenberg, and Solomon’s (1999), should alter the nature of participants’ defensive strategies. In particular, the researchers argue that when faced with existential anxiety, people initially pursue literal solutions to immortality (termed proximal defenses) but later pursue symbolic solutions (distal defenses) once mortality-related cognitions have faded from consciousness. Of course, the current data reveal the opposite pattern: participants exhibited worldview defense (a distal defense) in Study 1, directly after death-priming, but indicated increased religious belief (a proximal defense) in Study 2, after a distracter task. Nevertheless, a conceptual replication of Study 2 that eliminates this confound is important.

To address these limitations, Study 3 examined the speed with which participants categorize religious supernatural concepts (e.g., God, heaven) as “real” versus “imaginary” as a function of mortality salience (without delay) and prior religious belief, measured as scores on the SBS rather than religious identification. In this case, the speed with which participants categorize stimuli is indicative of the strength of their beliefs, and the literal and symbolic defense hypotheses predict competing interaction patterns. In the control condition, participants who strongly endorse, and who strongly reject, the existence of religious supernatural agents should be fastest to report their beliefs (replicating Cohen, Shariff, & Hill, 2008). Mortality salience, however, should change this relationship in one of two ways, depending on the function that those beliefs serve in this context.

Specifically, if mortality salience affects participants’ beliefs via worldview defense, then participants with the strongest beliefs (i.e., those scoring either high or low on the SBS) should more readily affirm them, compared to those in a control-priming condition, a more strongly quadratic relation between SBS and judgment latencies relative to the control group. If, however, all people are inclined toward religious belief under mortality salience conditions, then towards the high (religious) end of the SBS scale, participants should be increasingly confident of their beliefs, but toward the low (non-religious) end they should be increasingly uncertain. This result would be evidenced by a cubic SBS-response time function in the mortality-salience group relative to the control group, as the SBS-response time function changes direction. We did not expect differences between control and death-primed participants in their likelihood of classifying religious concepts as “real”, or in their processing of real or imaginary concepts that are unrelated to religion.

## Study 3

### Method

#### Participants

Thirty-eight male and 33 female non-psychology students at the University of Otago volunteered for the study in exchange for NZ \$12 to cover their travel expenses. The study was run in conjunction with several other, unrelated procedures.

#### Materials and procedure

Participants first completed, on a computer, a demographics form and the Supernatural Belief Scale (SBS). Then, as in Studies 1 and 2, mortality salience was manipulated via a writing task; participants were randomly assigned into the death priming or control condition.

After the priming phase, participants were told that the next task was about the “cognitive processing of beliefs”. Participants were presented with a series of 20 nouns, which they were instructed to categorize as “real” or “imaginary” as quickly and accurately as possible, by pressing one of two labeled keys on their keyboard. Of the 20 nouns, 10 were associated with Christian religious concepts (e.g., God, Angel, Heaven, Miracles), 5 were real items (e.g., Turtle, Helicopter) and 5

were imaginary items (e.g., Genie, Narnia). All stimuli were presented via SuperLab™ software running on Macintosh iMac desktop computers in individual light and sound attenuated experimental cubicles. After categorizing all stimuli, participants were debriefed, thanked, and paid.

### Results and discussion

One response faster than 200 ms, one qualitative outlying data point, and all data from one participant who classified all stimuli as “real” were eliminated from analysis. The remaining response times were log transformed to reduce the positive skew typical of such data. Preliminary analyses revealed that real and imaginary stimuli were almost always classified correctly (96% and 90% respectively), while religious stimuli were classified as real 46% of the time. SBS scores were highly reliable (Cronbach's  $\alpha = .97$ ), and highly correlated with the proportion of religious stimuli classified as “real”  $r(76) = .86$ ,  $p < .001$ . The reliabilities of response times to real, imaginary, and religious stimuli were acceptable (Cronbach's  $\alpha$ s = .63, .66, and .83), and these times were averaged for each participant to form three composite existence judgment latency scores.

As explained above, the two alternative effects of mortality salience are evidenced by the quadratic and cubic components of the relation between explicit belief (SBS score) and existence judgment latencies. Specifically, if mortality salience increases adherence to one's worldview, then individuals should more quickly report their beliefs as a function of their extremity, thereby producing a more quadratic SBS-latency function relative to the control group. Alternatively, if mortality salience increases implicit belief in supernatural agents categorically, then toward the “belief” end of the SBS scale participants should respond more quickly, but toward the “disbelief” end of the scale they should respond more slowly, as they find it increasingly difficult to report their beliefs as a function of their skepticism. This change in the relationship between SBS and existence judgments across the SBS scale would add a cubic component to the model.

To examine the linear, quadratic, and cubic components of the SBS-latency relationship, experimental condition (death vs. control priming, coded  $-1$  and  $1$ ), mean-centered SBS (the linear main effect), squared SBS (the quadratic main effect), and cubed SBS (the cubic main effect), and all three condition  $\times$  SBS interactions, were entered simultaneously into a multiple regression predicting mean log-transformed response times to “religious” items. The analysis revealed a significant quadratic main effect of SBS,  $\beta = .49$ ,  $t = -4.14$ ,  $p < .001$ , such that both believers and non-believers in religious supernatural entities reported their beliefs relatively quickly, as well as significant interactions between experimental condition and both the linear and cubic components of SBS,  $\beta = .62$ ,  $t = 2.20$ ,  $p < .05$ , and  $\beta = -.71$ ,  $t = -2.40$ ,  $p < .05$ . The same analyses conducted on real and on imaginary items revealed no significant effects on either stimulus category.

In order to examine the nature of the interactions on religious stimuli, separate regressions were run on each experimental condition, with linear, quadratic, and cubic SBS entered on separate steps. As seen in Table 1, in both conditions, the inclusion of quadratic SBS represented a significant improvement over the linear model, which was not significant on its own. However, the addition of cubic SBS improved the model further for death-primed participants,  $\Delta R^2 = .11$ ,  $p < .05$ , but not for controls,  $\Delta R^2 = .04$ , ns. Thus, a quadratic model best fit the controls' data, but a cubic model best fit the death-priming condition.

Consistent with Study 2, these results provide an interesting counterpoint to Study 1 and Terror Management Theory's worldview defense account. This account predicts that people respond to mortality salience by bolstering their own or ingroup worldviews, and therefore predicts the strengthening of both supernatural and skeptical beliefs under mortality salience conditions. However, the data show that while believers strengthened their beliefs, non-believers wavered

**Table 1**  
Regression models for control and Mortality Salience conditions.

		Control			MS		
		B	SE	$\beta$	B	SE	$\beta$
Step 1	Constant	7.06	.05		7.11	.08	
	SBS	-.014	.02	-.122	.01	.02	.04
Step 2	Constant	7.23	.07		7.25	.08	
	SBS	-.005	.02	-.04	-.008	.02	-.06
	SBS <sup>2</sup>	-.024	.01	-.43*	-.026	.01	-.40*
Step 3	Constant	7.25	.07		7.24	.07	
	SBS	-.053	.04	-.47	.113	.06	.80
	SBS <sup>2</sup>	-.029	.01	-.56*	-.027	.01	-.41*
	SBS <sup>3</sup>	.004	.004	.49	-.012	.01	-.92*

\*  $p < .05$ .

from their disbelief. This pattern is more consistent with a “distinct cognitive inclination” account of supernatural belief (Norenzayan & Hansen, 2006, p. 183), in which human beings are naturally and uniquely attracted to belief in supernatural agents. From this perspective supernatural agents and related concepts might offer a unique buffer against death-related anxiety that tempts—albeit does not fully convince—the non-believer.

### General discussion

Previous theoretical and empirical research implies a causal relationship between fear of death and religious belief, but the existence and nature of this relationship are unclear due to the inconsistent operationalization of religiosity and insufficient attention to the distinction between implicit and explicit aspects of cognition. The present research used both explicit and implicit measurement techniques to examine how thoughts of death influence, specifically, belief in religious supernatural agents, a pan-cultural phenomenon often considered a definitive feature of religion (e.g., Boyer, 2001; Donovan, 2003; Guthrie, 1993; Tremblin, 2006). In Study 1, belief was measured using a self-report supernatural belief scale, an explicit measure of respondents' tendency to believe in existentially significant supernatural entities. Studies 2 and 3 measured supernatural belief implicitly, defining belief as the strength of respondents' cognitive associations between religious and existential concepts.

The results of the three studies, and particularly their differences, provide important new insight into the effects of mortality salience. When belief was measured explicitly, in Study 1, participants appeared to defend their worldviews in response to mortality salience, such that self-described Christians were more confident that supernatural religious entities exist, while non-religious participants were more confident that they do not. However, when belief was measured implicitly, in Study 2, mortality salience implicitly increased all participants' beliefs in religious supernatural entities, regardless of their self-reported religious affiliation. Study 3 conceptually replicated Study 2, measuring beliefs directly and continuously as the endorsement of religious supernatural entities on the SBS, rather than indirectly and categorically in terms of religious identification. Notably, Study 3's use of property verification times rather than classification times as a measure of belief permitted the examination of competing interactions. The results again revealed that mortality salience temporarily strengthened the association between religious and existential concepts regardless of participants' prior religious belief: following mortality salience, believers more readily judged religious concepts as real, while non-believers found it more difficult to judge religious concepts as imaginary.

Although we argue that enhanced belief in religious entities represents an effective repudiation of a non-religious worldview, it could be argued that it actually represents a bolstering of a more general acceptance of a Christian-dominated Western culture, which is therefore broadly consistent with the worldview defense hypothesis.

However, according to this view, non-religious participants in *Study 1* must be said to have repudiated these ostensible symbols of Western culture; therefore, an argument in terms of broadly-constructed cultural defense cannot account for all three of our studies simultaneously. Furthermore, the facts that the “worldviews” people defend can be quite minimal and specific (Harmon-Jones et al., 1996), and that non-religious participants need not have a well-developed secular worldview to engage in worldview defense under mortality salient conditions, favor our interpretation, but further research is necessary to rule out worldview defense entirely under these circumstances.

Tentatively, then, we interpret the combination of results in terms of a dual-process model of religious cognition, in which people hold both explicit religious beliefs, in the form of analyzable, conscious, and reportable attitudes, and implicit religious beliefs in the form of unconscious cognitive associations between religious and existential concepts (cf. Fazio, 2007). Note that although explicit and implicit belief may serve different functions, and may be more or less influential when death is salient, the distinction is theoretically distinct from that of proximal and distal defense (Pyszczynski et al., 1999): participants in our studies bolstered their worldviews only when such bolstering was measured explicitly, regardless of the proximity of the measurement to the mortality salience manipulation. Further research, however, could usefully map the time course of responses to death anxiety to develop a more comprehensive dual-process model incorporating consciousness, function, and representation of religious belief.

It is also necessary to replicate the current findings in other religious and cultural contexts. Although the SBS, which served as a dependent measure in *Study 1* and a predictor variable in *Study 3*, employs labels more familiar to Abrahamic religions (because our participant sample is drawn from a largely Christian culture), it is designed to be adaptable to other religious traditions, most of which share the same supernatural concepts captured in the scale (i.e., positive and negative supernatural agents, afterlife beliefs, etc.). Because we view these themes as reflecting universal motivational and cognitive mechanisms, we have no reason to expect the results to vary cross-culturally, but future research is necessary to bear this out.

Finally, we note that a dual-process model has the potential to explain not only apparent inconsistencies in individuals' religious beliefs and behaviors, but also the baffling durability of religious belief observed at the outset of this paper. Ironically, these inconsistencies in our view represent the flexibility of multi-level representation, which permits individuals to gain the maximal psychological benefits from both the content of their beliefs and the worldviews in which they are situated. In particular, dual processing allows “non-religious” individuals to enjoy both the comfort of distance from religious worldviews while implicitly allowing for the immortality that supernatural agents afford.

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