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EXSISTENTIAL MOTIVATION AND THE EXPRESSION AND REGULATION OF
RELIGIOUS FAITH AMONG BELIEVERS AND ATHEISTS

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Bachelor of Arts in Psychology

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ABSTRACT

The present study draws upon terror management theory (TMT) and cognitive science of religion (CSR) to investigate how religious believers and atheists motivational and cognitive processes might interact to affect the expression of religious intuitions and beliefs. TMT suggests the motivation to manage mortality-related concerns can lead to religious concepts, and CSR suggests religious concepts are highly intuitive but that individuals can sometimes engage in deliberate/analytical thinking to override them. The present research therefore proposes two theoretical ideas: 1) among religious believers, mortality awareness should increase the intuitive appeal of religious concepts, as well as the acceptance of those intuitions as expressed religious belief; and 2) among atheists, mortality awareness should similarly increase the intuitive appeal of religious concepts, but not expressed religious faith because (despite recognizing them as intuitively appealing) atheists may wield their available self-regulatory resources (e.g., analytic thinking) to over-ride those intuitions and thus abstain from expressing religious belief. Christians and atheists were recruited and randomly assigned to either a mortality salience condition or pain salience condition; then, each participant was asked to rate the extent to which they found religious concepts intuitively appealing and the extent to which they accept and express those concepts as religious belief. A 2 (between-subjects: Christian vs. atheist) x 2 (between-subjects: MS vs. pain) x 4 (within-subjects: want supernatural agents, believe in supernatural agents, want afterlife, believe in an afterlife)

mixed-model ANOVA found the data patterns were consistent with hypotheses;
implications are discussed.

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CHAPTER I

INTRODUCTION

In his book, *A Confession*, Leo Tolstoy (Tolstoy, 1884) attempts to understand faith through a fable about a traveler being chased by an angry beast. To evade the beast, the man climbs down into a dry well, only to find that at the bottom of the well is a dragon waiting with open jaws. To stop from sliding down toward the dragon, he clings to a twig growing on the side of the well. The twig, he soon discovers, is being eaten at the root by two mice (one black, one white, representing the passing of night and day) and will soon snap. With the beast above, the dragon below, and the twig about to snap, the traveler realizes that he will inevitably perish. While clinging to the twig, however, he notices drops of honey upon its leaves and contents himself to enjoy their sweet taste while he awaits his inevitable death. Tolstoy's allegory suggests the average person who recognizes the dragon (death) awaiting him will grasp for the twig (life) but that, upon recognizing its sour impermanence, will endure the situation by turning toward and accepting whatever might give our brief existence a sweeter character—such as the religious promises of eternal souls, spirits, and life after death.

In contrast, consider non-believer and Holocaust survivor Primo Levi's experience, recounted in *The Drowned and the Saved* (1986):

This happened in October 1944, in the one moment in which I lucidly perceived the imminence of death... naked and compressed among my naked companions with my personal index card in hand, I was waiting to file past the 'commission' that with one glance would decide whether I should go immediately into the gas chamber or was instead strong enough to go on working. For one instance I felt the need to ask for help and asylum; then, despite my anguish, equanimity prevailed: one does not change the rules of the game at the end of the match, not when you are losing. A prayer under these conditions would have been not only absurd (what rights could I claim? And from whom?) but blasphemous, obscene, laden with the greatest impiety of which a nonbeliever is capable. I rejected the temptation: I knew that otherwise were I to survive, I would have to be ashamed of it. (p. 145-146)

To borrow Tolstoy's language, Levi found himself clinging to the twig, face-to-face with the dragon, and although aware of the temptation to reach up to enjoy the twig's honey—chose not to; that is, chose to face death without indulging in expressions of religious faith.

The two examples above suggest both similarities and differences in the way that religious and non-religious people might process religious cognitions when managing existential concerns. Tolstoy's fable suggests death awareness causes religious people to recognize the intuitive appeal of religious concepts, and to then consciously accept them. But Levi's story suggests that although the awareness of mortality might cause non-believers to similarly recognize the tempting appeal of religious concepts, upon further reflection they might ultimately refrain from expressing religious faith. The present study builds upon both terror management theory (TMT; Greenberg et al., 2014) and the cognitive science of religion (e.g., Barrett, 2007) to formalize and test those ideas. Samples of Christians and atheists were recruited, and each were randomly assigned to be

reminded of either death or a control topic. Then, participants rated the intuitive appeal of religious concepts (i.e., how much they *want* gods and afterlife to be real) as well as their explicit acceptance of those religious concepts as expressed religious belief/faith.

1.1 Death Awareness at the Heart of Human Experience

Rooted in the writings of Ernest Becker, Terror Management Theory (TMT) notes that humans, like other animals, are evolutionarily oriented toward survival and reproduction. If a lion gives chase, both the gazelle and the human can recognize the existential threat and will take flight as a result, but humans have the capacity for some rather complex, sophisticated, and symbolic thought, and—as a result—they can appreciate the more abstract concept of mortality: that most if not all living things, including themselves, will eventually die. Because there is no physical threat (e.g., a hungry lion), there is no physical coping strategy (e.g., fight/flight); instead, TMT suggests humans developed psychological means of coping with the concept of mortality.

Specifically, TMT proposes that people cope with the awareness of their impermanence through the development of and participation in sociocultural systems that offer some sense of permanence. Such systems might offer opportunity to contribute to some sort of legacy, allowing people to feel that they are part of something larger and longer lasting than themselves (e.g., families, states, nations, religious/ethnic groups, and even sports teams). More directly, such systems might offer ideas suggesting death is not the end, and that one will still continue to exist even after one's physical death; examples of such beliefs include beliefs about souls, gods, heaven, etc. Historically such beliefs have manifested in various forms in religious ideas. In that context, positive or negative self-esteem is thus a reflection of whether one perceives themselves to be meeting the

standards and values of one's particular cultural worldviews, thus earning the permanence on offer.

One of the most common ways to test TMT has been the mortality salience (MS) hypothesis, which holds: if one's cultural worldviews act as a way to manage death awareness, then increasing the awareness of death (i.e., making mortality salient) should lead to increased expression of faith in one's sociocultural worldview and increased defense of such worldviews. For example, one of the earliest TMT studies testing this hypothesis recruited a sample of municipal court judges (Rosenblatt et al., 1989). The judges were randomly assigned to one of two conditions: they were either prompted to think about their own mortality (MS) or about a non-mortality-related comparison topic (e.g., pain). Then, they were presented with a case about a defendant accused of violating the criminal and moral standards of the judges worldviews—a case involving a prostitution charge. Compared to the control condition, in the MS condition the judges set a much harsher bail amount, suggesting that the increase awareness of death increased the judges vindictive defense of their cultural standards and values. In a more recent study (Vail, Arndt, Motyl, et al., 2012), stimuli that increased the awareness of death also increased both hostile worldview defense (e.g., American's support for military defense of American interests) as well as stronger faith in one's particular worldview beliefs (i.e., ideological dogmatism). Hundreds of studies, conducted in dozens of countries and in many cultures, have similarly found support for TMT via the MS hypothesis (Routledge & Vess, 2018).

1.2 TMT and Religious Beliefs

Some of the earliest evidence of modern human cultural activity features religious belief as its centerpiece. The Upper Paleolithic (40-60,000 years ago) brought with it the “cultural big bang”: the emergence of a flurry of creativity and indications of coordinated, symbolic social activity among our ancestral forebears (Mithen, 1996). Among the relics, archeological records of that period show the emergence of ritual burials suggestive of afterlife beliefs, as well as the emergence of a number of “sacred” artworks such as statues believed to depict gods/goddesses and murals believed to reflect ritualistic efforts to safeguard the souls of the deceased amid a spiritual realm (e.g., Tattersall, 1998). Such ritualistic, symbolic activity reveals, among other things, the development of a dualistic mental separation of mind and body—the apparent apprehension that our mortal body is but a temporary vessel containing an intangible essence that persists after death (e.g., Hauser, 1951). Since then, religious beliefs have similarly continued to color the human experience; today, polls show some form of supernatural belief professed by 93% of Americans and 84% globally (Pew, 2012, 2015a).

To understand why religion has been so prevalent throughout human history, some have posited, for example, that religious beliefs are byproducts of other adaptive functions (thus, epiphenomena with no primary function themselves; Boyer, 2001; Kirkpatrick, 2004); or that they primarily serve a coalitional function (Durkheim, 1912/1995; Sloan-Wilson, 2002); or that they are perhaps parasitic memes, cultural analogs to genes—self-replicating, mutating, and responding to selective pressures at the expense of their hosts (Dwakins, 2006). TMT, however, argues that an important function

of religious belief is to address the potential existential anxiety arising from the human awareness of mortality (Landau et al., 2004; Vail et al., 2012). As Bertrand Russell commented: “If we were not afraid of death, I do not believe that the idea of immortality would ever have arisen...immortality removes the terror from death.” (1957, p. 53-54). Even the earliest piece of literature we have, the *Epic of Gilgamesh* (~3000 B.C.E.) portrays the ancient Sumerian king on a quest to learn the secret of immortality after having been struck by the death of his close friend, Enkidu. In that light, religious cultural worldviews are unique in that they offer a supernatural immortality. It is difficult to imagine a more direct, more expedient solution to the problem of death than to believe that death is not the end—that he or she has a supernatural essence, a soul that will literally permanently exist beyond physical death.

Empirical support for the terror management function of religion has been steadily growing. In correlational studies, for example, religious belief and commitment among Christians (Harding et al., 2005), Muslims (Suhail & Akram, 2002; Roshdieh et al., 1999), and Jews (Florian & Ravetz, 1983) have repeatedly been associated with lower death anxiety (see Jong et al., 2018 for meta-analytic review of similar findings). More compellingly, experimental evidence shows that people who believe in an afterlife increase their faith in it after being reminded of death (Osarchuk & Tatz, 1973; Schoenrade, 1989). Similarly, after being reminded of mortality, providing participants with (faked) scientific evidence of spiritual afterlife eliminated the subsequent MS-induced increases in worldview defense and self-esteem striving that were otherwise observed (Dechesne et al., 2003). Thus, reminders of an afterlife appears to buffer against the awareness of death. And belief in an immortal soul has been associated with less

resistance to (faked) scientific evidence predicting the end of the world and humanity, suggesting that belief in an immortal soul helps protect against the threat of more material end of world scenarios (Lifshin et al., 2016).

In addition to eternal spiritual existence, religions also step in to explain the creation of the world: identifying the supernatural creator(s), revealing how those creators have established and maintain order in the world, and prescribing the thoughts and behaviors that lead down the path to immortality. Creation stories and other religious myths affirm the eternal spiritual realm by divining “spiritual histories” of one’s way of life: from creation of the universe *ex nihilo* via a god’s telekinetic fiat, or from sex between the earth and sky, or a creator bird plunging the depths of a primordial ocean to retrieve the seeds of life and the mud of our terrestrial world (Leeming & Leeming, 1994). Such myths about creation, and gods and spirits, serve a terror management function by casting the self as a player in a supernatural drama stretching indefinitely backward and forward in time. Accordingly, research has shown that challenging creationists’ beliefs, by presenting them with evolutionary evidence contradicting creationism, increases the accessibility of death-related cognitions (Schimel et al., 2007). Similarly, MS can reduce acceptance of evolutionary theory and increase acceptance of the “theory of intelligent design” (Tracy et al., 2011), and increase faith in gods and supernatural agents (Norenzayan & Hansen, 2006; Vail, Arndt, & Abdollahi, 2012).

But maintaining faith in gods, spirits, and other ornaments of one’s religion involves believing in and valuing things that are inherently unverifiable. The apprehended validity of one’s religion, or any other cultural worldview, is instead heavily influenced by social consensus (Berger & Luckmann, 1967). Fellow believers help verify

one's religious belief as righteous and true, whereas encountering apostates, atheists, and/or followers of alternative religions can be problematic because it raises the possibility that one's own religion is not a valid or worthwhile path to immortality. As Becker noted, "One of the main reasons that cultures can be so directly undermining to one another is that, despite their many varieties, they all ask and answer the same basic questions. So that when two different ways of life come into contact they clash on the same vital points" (1962, p. 113). As a result, TMT research has demonstrated that when reminded of mortality, people not only affirm faith in their specific religious beliefs and deny faith in the alternatives (Vail, Arndt, et al., 2012) but they also express support for fellow believers (Greenberg et al., 1990 ; Kosloff et al., 2010) and express derogatory attitudes or even support violence against followers of alternative religions (Hayes et al., 2008; Pyszczynski et al., 2006).

1.3 Existential Motivation and Cognitive Processes in Belief/Unbelief

Although the vast majority of people around the world are religious, the number of people claiming to be non-religious is notable and growing (Pew, 2012, 2015a). But with a few notable exceptions, little work has directly investigated how the religious and non-religious might differ in the way they might (or might not) rely upon religious concepts to manage the awareness of mortality.

Religion and atheism. First, as has been noted above, religious worldviews offer to their adherents opportunities for *both* supernatural and secular immortality. On the one hand, religions offer opportunity for non-supernatural ("secular") routes to immortality in much the same way that any other social group—a nation or university, an orchestra or sports team—would: by offering an opportunity to become a valued member of a

seemingly permanent cultural group, with a larger and longer lasting impact than oneself. But the defining, unique quality of religious worldviews is that they also offer a supposedly supernatural immortality (i.e., continued existence in an eternal spiritual realm) that can be attained by engaging in the specific thoughts and behaviors outlined by its moral and theological code; perhaps gaining eternal life through prayer, taking communion, observing fire pooja, treating others kindly, or even just simply believing.

Atheism, however, traces a tradition of skepticism that stretches through Renaissance thought to ancient Indic and Greek doubts, often echoing Epicurian lines of thought (e.g., Lucretius, C. 50 B.C./2007), drawing upon advances in naturalism (e.g., Darwin, 1859) and other rational and scientific progress, and/or recoiling from the logical contradictions and social and moral failures of religions and their supposed supernatural agents (e.g., Hitchens, 2007; Hume, 1779/2009; Kant, 1781/2009). Although there may be different types of atheists (e.g., Norenzayan & Gervais, 2013; Coleman et al., 2015), ultimately, as Dawkins put it, an atheist "...is somebody who believes there is nothing beyond the natural, physical world; no *supernatural* creative intelligence lurking behind the observable universe; no soul that outlasts the body and no miracles – except in the sense of natural phenomena that we don't yet understand" (p. 35, 2008, italics original). That is, atheism is at least the lack of belief in religious ideas about the supernatural and at most the explicit rejection of the supernatural. Thus, atheists may represent an appropriate comparison population for studying the motivational and cognitive processes involved in engaging or not engaging in religious terror management strategies. In that light, we next consider the cognitively intuitive power of religious concepts and some critical factors in the emergence of religious belief vs. atheism.

Cognitive processes of belief. Some have argued that religious belief enjoys a natural cognitive advantage, in the sense that “much of what is typically called ‘religion’ may be understood as the natural product of aggregated *ordinary* cognitive processes” (Barrett, 2000, p. 29). That is, the religious conceptualizations of supernatural agents, immortal souls, and afterlife are buttressed by basic, evolutionarily adaptive cognitive inclinations to make intuitive causal attributions and interpret others’ intentions (theory of mind), make moral judgments, engage in social learning, and judge the utility or purposes of people and objects (teleological reasoning), among other tasks (e.g., Barrett, 2004; Bering, 2006; Bloom, 2007; Boyer, 1994). As but one example, the evolutionarily adaptive ability to detect the intentions of others ostensibly created an inclination to see agency where there is none, to see “faces in the clouds” (Guthrie, 1995; Barrett, 2000); for instance, in much the same way as observing an arrow strike one’s shoulder would lead one to wonder who shot the arrow, observing lightning strike one’s village might lead one to wonder who shot the lightning bolt. The research on such so-called religious cognition has led some to conclude that religious “...belief is a ‘cognitive default’ and that, all else being equal, in any given cultural context religious beliefs are driven into expression by a universal, evolved, core set of psychological intuitions present in all normal human brains” (Bering, 2012, p. 166).

However, although it may be true that religious *cognition* (esp. intuition) is default, it is not necessarily the case that it drives religious *belief* into expression in any given cultural context. Rather, religious *intuitions* appear to be only necessary, but not sufficient, components driving religious *belief*. As Norenzayan and Gervais (2013) argued, for a person to express religious faith, s/he must:

- a) be able to execute the cognitive processes (biases) that give rise to religious intuitions;
- b) be motivated to accept supernatural beliefs as real and relevant worldviews;
- c) receive cultural inputs that a specific set of supernatural concepts (e.g., the trimurti, karma, reincarnation, nirvana) should be believed in as real and relevant; and
- d) accept those intuitions without further analytic processing.

Such components may be ordinary, even highly probable (e.g., Barrett; Bering, 2010), but they are not inevitable. As will be illustrated below, modifications that negate any of these four can and do occur, potentially resulting in atheism (Norenzayan & Gervais, 2013).

First, it may not always be the case that individuals are able to fully engage in the otherwise ordinary cognitive processes that give rise to religious intuitions (Gervais, 2014), such as may be the case with young children (Lane et al., 2010) or individuals with clinical diagnoses of autism (Norenzayan et al., 2012). Of course, the majority of people can easily represent minds and gods, and engage in other similar cognitive tasks, but, as we will see below, the fact that fully-functioning adults can engage in such cognitively intuitive processes does not inevitably produce religious belief.

Second, individuals might not always be motivated to convert religious intuitions into religious belief. Indeed, religious activity appears to be less prevalent in regions marked by strong secular governments and social services, relative economic prosperity and equality, and health and safety (P. Zuckerman, 2008), whereas it is more prevalent in areas marked by weak or absent secular governments, violence and economic instability,

and shorter life expectancies (Gray & Wegner, 2010; Norris & Inglehart, 2004). Yet, numerous theoretical and research traditions hold that other various self-relevant threats—whether the witness of suffering (Gray & Wegner, 2010), feelings of uncertainty (Kay et al., 2010; Rutjens et al., 2010), isolation (Epley et al., 2008), or death awareness (Vail et al., 2010)—can intensify belief in religious worldviews for one reason or another. It is difficult, however, to imagine societies that can eliminate, or even reduce, the prevalence or onset of such motivational conditions as the awareness of mortality.

The third component, cultural learning processes—e.g., modeling, imitation, instruction—enable people to translate their religious intuitions, when so motivated, into specific, socially validated sets of supernatural beliefs (Berger & Luckmann, 1967; Harris, 2012; Rendell et al., 2011). Not only do people tend to learn culturally endorsed beliefs and behaviors (Tomasello et al., 1993), but preferentially learn beliefs perceived to be socially normative (Joe Henrich & Boyd, 1998), prestigious (Henrich & Gil-White, 2001), and important enough to be ostensibly worth various demonstrable costs (Henrich, 2009). In contrast, people in regions with relatively fewer sincere public expressions of religious belief (e.g., Scandinavia) might not be guided to translate their cognitive inclinations into any particular expression of religious faith (Gervais et al., 2011; Zuckerman, 2008). Such people might instead learn to live according to secular beliefs and institutions, building cognitive conceptual networks that can potentially direct existential motivation toward the intuitive expression of more secular, non-religious ways of life. However, the present thesis takes place within the American context, which is saturated with religious concepts and modeling of religious behavior and belief.

Therefore, the present thesis accepts that most people who have participated in the present thesis study: a) will be *able* to engage in the otherwise ordinary cognitive processes that give rise to religious intuitions; b) live in a world in which they regularly encounter stimuli that might *motivate* them to convert those intuitions into belief—such as the awareness of death; and c) live within a social context (America) *in which religious faith is socially normative*. The fourth component is more interesting, however, because it suggests ways that analytic thinking might influence individuals' religious (vs. not-religious) terror management processes.

Specifically, the fourth and most common form (Silver et al., 2014) of atheism appears to occur when individuals consciously revise, or over-ride, their cognitive intuitions—when they do not *allow* intuition to result in religious belief. The research on this topic is consistent with dual-process models of cognitive processing (Chaiken & Trope, 1999; Evans, 2008, 2010; also Baumard & Boyer, 2013) which hold that intuitive processing (System 1) is quick, automatic, and implicit, whereas reflective processing (System 2) is typically slower, more deliberate, and explicit. For example, in contrast to reliance on intuitive cognitive processes, which is indeed associated with stronger religious belief, weaker and less prevalent religious belief occurs among those who engage in more analytic thinking, such as scientists (Larson & Witham, 1998; Mccauley, 2013; Pew, 2009), those with greater intelligence (M. Zuckerman et al., 2013 for recent meta-analysis), and those with a more chronically analytic cognitive style (Pennycook et al., 2012; Shenhav et al., 2012). While analytic cognitive style helps over-ride cognitive intuitions that lead, for example, to endorsement of creationism rather than evolution (Will M. Gervais, 2015), experimental conditions that *prevent* analytic thinking (e.g.,

high-speed response trials) have been found to prevent people from over-riding those intuitions—leading Finnish and American atheists to make cognitively intuitive errors consistent with religious creationist views (Järnefelt et al., 2015). Further experimental evidence shows that activating analytic thinking (e.g., via perceptual disfluency, or image-based or lexical primes of analytic thinking concepts), presumably over-riding intuition, decreases religious belief (Gervais & Norenzayan, 2012).

Similarities and differences in religious and atheist terror management

processes. By interfacing TMT (Routledge & Vess, 2019) with dual process models of religious cognition (e.g., Norenzayan & Gervais, 2013), the present thesis predicts a systematic set of similarities and differences between religious believers and atheists managing the awareness of mortality. First, I anticipate that when made aware of the concept of mortality, both religious believers and atheists alike should similarly prepare intuitive cognitive solutions, which may naturally lead to the (System 1) implicit activation of supernatural concepts. The individual may explicitly experience the intuitive appeal of such cognitions. Second, however, there may be differences in the (System 2) expression of those intuitions. Religious believers may accept those intuitively appealing cognitions, shape them into one's culturally-relevant set of religious ideas (e.g., Christianity, Hinduism), and thus express those intuitions as explicitly accepted belief. In contrast, atheists may not accept such religious concepts, despite recognizing them as intuitively appealing, and thus may wield their available self-regulatory resources (e.g., analytic thinking) to over-ride and reject those intuitions and abstain from expressing religious belief. Although no prior work has directly tested this set of ideas, a small but growing body of research is consistent with them.

On that first point, for example, if atheists are unable or unmotivated to reflect on their worldviews and employ their cognitive resources to over-ride active religious intuitions, then such intuitions will be expressed. When non-religious people reminded of death are asked to make implicit associations between supernatural concepts and “real” (Jong et al., 2012, Study 2 & 3)—such as on an IAT, a speeded method which likely prevents them from employing their cognitive resources to over-ride intuition—they fail to explicitly over-ride those intuitions and instead those existentially-activated intuitions emerge in the form of stronger implicit association between religious concepts and the category “real”. Thus, atheists might express religious concepts when they lack the ability or motivation to regulate their expressions of intuition.

On that second point, in contrast, Vail et al., (2019 Study 1) found that whereas MS caused Christian participants to increase their reliance on intuition (reduced analytic thinking style), it led atheists to instead more strongly adopt an analytic cognitive style. This finding may suggest that MS leads religious believers to rely on their intuitions, whereas atheists may over-ride the natural cognitive intuitions that might have otherwise led to expression of atheism-violating religious concepts. In other work, when atheists were given the opportunity to self-report about religion—which presumably allows them the opportunity to marshal such resources—they did indeed abstain from and reject religious belief (e.g., Jong et al., 2012; (Vail, Arndt, & Abdollahi, 2012; Vail et al., 2016).

Thus, although prior research has not directly addressed the idea, it is nevertheless consistent with the possibility that: a) heightened awareness of mortality may motivate the activation of intuitive terror-managing cognitions, such as religious supernatural

concepts; but then, b) once a person has the opportunity to draw upon their beliefs, s/he can revise the impulse according to their worldview. If the person is Hindu, he might shape the religious intuition into faith in the Trimurti, rendering a prayer to Vishnu or Shiva begging for protection or asylum; or if Catholic, she might shape the impulse into faith in the Trinity and render a prayer to God to intervene; but, if one is atheist, one might shape that impulse into non-belief (over-ride the intuition) based on one's belief that supernatural concepts are false and/or that gods do not exist.

1.4 The Present Study

The present thesis proposes two theoretical ideas: 1) among religious believers, mortality awareness should increase the intuitive appeal of religious concepts, as well as the acceptance of those intuitions as expressed religious belief; and 2) among atheists, mortality awareness should similarly increase the intuitive appeal of religious concepts, but not expressed religious faith because (despite recognizing them as intuitively appealing) atheists may wield their available self-regulatory resources (e.g., analytic thinking) to over-ride and reject those intuitions and thus abstain from expressing religious belief.

Therefore, the present study recruited religious believers (Christians) and non-believers (atheists). Participants were randomly assigned to one of two experimental conditions: either an MS condition or a non-death-related prime (pain) condition. Each participant was then asked to rate the intuitive appeal of two religious concepts (“to what extent do you *want* heaven to exist?” and a parallel question about God) and their acceptance of those intuitions as expressed religious belief (e.g., “to what extent do you

believe heaven exists?” and a parallel question about God). Based on my theoretical analysis, this study tested two key hypotheses:

1. Among Christians, MS (vs. pain) should increase the extent to which they *want* God and heaven/afterlife to exist (reflecting increased intuitive appeal), as well as explicitly accepted *belief* that God and heaven/afterlife to exist;
2. Among atheists, MS (vs. pain) should similarly increase the extent to which they *want* God and heaven/afterlife to exist (reflecting increased intuitive appeal), but will *not* lead increase explicitly accepted *belief* that God and heaven/afterlife to exist (reflecting self-regulatory over-ride/rejection of those religious intuitions).

CHAPTER II

METHODS

2.1 Estimation of Minimum Sample Size

To make sure the present study was well-powered enough to detect MS effects if such effects are present, I consulted a prior meta-analysis of MS effects (Burke et al., 2010), in which 164 articles with 277 experiments were analyzed; that work found an overall MS effect size of $r = .35$ ($d = .75$) across various studies using a variety of outcome variables (e.g., national identity, aggression, attitudes towards women, attitudes towards animals, sports team affiliations, test scores etc.). Hence, assuming $r = .35$ ($d = .75$), an *a priori* power analysis (G*Power; Faul, Erdfelder, Buchner, & Lang, 2009) was conducted which prescribed a minimum of 29 participants per each of the four between-subjects conditions, for a minimum total sample size of 116 participants.

2.2 Participant Selection Procedure

Due to the difficulty of locating and recruiting sufficient numbers of local atheists to attend lab sessions, a research panel company was used to reach participants throughout the USA. For a two-week period, the company first administered a religious category selection item to a panel of 5,000 possible participants. Then, the following day, the critical study materials were administered to eligible panel members.

Religious category selection item. The current study investigated the existential motivations behind people either holding or rejecting supernatural beliefs. To do this, the existing theoretical perspective suggests that an acceptable population for religious believers would be “Christians” and the critical category for those who reject supernatural beliefs should be the category of “atheist”. Therefore, the research panel company recruited participants based on a single selection-criteria item, “What religion or philosophy are you affiliated with if any?” Response options were: “Christian”; “Muslim”; “Jewish”; “Buddhist”; “Hindu”; “Atheist (I do not believe supernatural beings exist)”; “Spiritual (I believe supernatural beings do exist, but I do not follow a specific religion)”; “Agnostic (I’m not sure whether, or it is impossible to know whether, supernatural beings do or do not exist)”; and “other”.

For the current study, the data were collected from only those panel members who indicated that their religious/ philosophical affiliation was either “Christian” or “atheist”. Eligible “Christian” and “atheist” panel members were contacted and invited to participate in the primary study with a US\$1.50 incentive

2.3 Materials and Procedure

For all participants in the study, the materials were distributed electronically, using a neutral title and description (e.g., “social attitudes and personality survey”) to conceal its true purpose and associated hypotheses. After obtaining informed consent, participants first completed a brief set of filler items (e.g., a personality measure) and then the target materials, in the following order:

Personal need for structure. A short six-item version of the PNS scale (Thomson et al., 2001) was presented. The PNS scale measures individual preferences for

order, certainty, and unambiguous knowledge. Example items include, “I enjoy having a clear and structured mode of life” and “I become uncomfortable when the rules in a situation are not clear.” Each item used a 6-point Likert-type scale (1 = strongly disagree, 6 = strongly agree).

Mortality salience manipulation. Following previous research (Rosenblatt et al., 1989), participants were randomly assigned to respond to either MS or a negative event topic prompt. In the MS condition, two prompts asked participants to, “Please briefly describe the emotions that the thought of your own death arouses in you,” and “Jot down, as specifically as you can, what you think happens to you as you physically die.” For the control condition, a negative event topic prompt asked participants to, “Please briefly describe the emotions that the thought of dental pain arouses in you,” and “Jot down, as specifically as you can, what you think happens to you as you physically experience dental pain.” This comparison topic was chosen because the dental pain prompt evokes a negative/anxiety-provoking event, and thus allowed to determine whether MS causes effects beyond simply being reminded of a negative event.

Delay and distraction. Next, the 20-item positive and negative affect schedule (PANAS, Watson & Clark, 1992) and a brief 3-5 minute reading task (an excerpt taken from Albert Camus’ *The Growing Stone*) was used to act as a delay and task-switching distraction needed to observe the effects of non-conscious awareness of mortality (see Pyszczynski et al., 1999). This was considered to be necessary because when thoughts related to death are in conscious awareness, individuals will deal with death-related thoughts in a relatively rational manner such as by attempting to become healthier (e.g., reducing smoking) or use safety precautions to avoid death (e.g., put on a seatbelt).

However, when thoughts related to death are still accessible but no longer in conscious attention, individuals will employ defenses that are more symbolic, such as by bolstering one's self-esteem or defending one's cultural beliefs and ideologies.

Dependent measures. Participants then completed a series of four Likert-type (1 = Not at all, 6 = Very strongly) items: "To what extent do you want supernatural beings to exist?"; "To what extent do you believe that supernatural beings actually do exist?"; "To what extent do you want afterlife (e.g., heaven, eternal life) to exist?"; and "To what extent do you believe that afterlife (e.g., heaven) actually does exist?". Zero order correlations between the dependent measures are reported in Table 3. As can be seen from Table 3 the four dependent measures were significantly positively correlated with each other. Although these measures were significantly positively correlated with each other it is possible that desire for and belief in supernatural agents and afterlife are four different measures measuring four different facets. E.g. it is conceivable one might desire for and believe in an afterlife without having any desire for or belief in supernatural agents. Hence, each of these items were treated as four separate measures measuring four different constructs.

Demographics. At the end of the survey, participants completed a demographic questionnaire about age, sex, ethnicity, race, and education levels.

CHAPTER III

RESULTS

3.1 Primary Analyses

A 2 (category: Christian vs. atheist) x 2 (MS vs. pain) x 4 (dependent measure: want supernatural, believe supernatural, want afterlife, believe afterlife) mixed model ANOVA was tested. Mauchly's test indicated the assumption of sphericity had been violated ($\chi^2 [5] = 127.31, p < .01$), so the degrees of freedom of the omnibus interaction tests were corrected using the Lower-bound (the most conservative) estimate of sphericity ($\epsilon = .33$). Levene's test also indicated the assumption of equality of variances between groups had been violated for each dependent measure ($F[3, 309]_s > 5.75, ps < .01$), so main effects and pairwise comparisons were evaluated using Welch's unequal variances t-tests.¹

There was an unqualified main effect of category ($t[244.25]_{\text{Welch}} = 23.68, d = 3.16, 95\% \text{ CI} = [2.52, 2.98], p < .001$), such that scores on the dependent measures were collectively higher among Christians ($M = 4.38, SD = 1.29$) than among atheists ($M = 1.62, SD = .69$). There was also a main effect of MS ($t[286.51]_{\text{Welch}} = 3.60, d = .66, 95\%$

¹ Welch's unequal variances test procedure is a parametric (thus, allowing analysis in the original metric) alternative to the non-parametric Mann-Whitney U test, and is more reliable than student's t-test when using unequal variances and unequal sample sizes (Ruxton, 2006).

CI = [-1.07, -.32], $p < .001$), such that scores on the dependent measures were collectively higher in the MS condition ($M = 3.38$, $SD = 1.88$) than in the pain condition ($M = 2.69$, $SD = 1.50$). However, the latter was qualified by the expected 3-way interaction, $F(1, 309)_{\text{Lower-bound}} = 8.27$, $\eta_p^2 = .03$, $p = .004$ (see *Table 1, Figure 1*). Pairwise comparisons were conducted to further explore the hypothesized effects within the interaction.

Among Christians. *Desire for supernatural agents* was higher in the MS condition than in the pain condition ($t[155.26]_{\text{Welch}} = 3.91$, $d = .63$, $CI = [-1.40, -.46]$, $p < .001$); *belief in supernatural agents* was higher in the MS condition than in the pain condition ($t[156.12]_{\text{Welch}} = 5.57$, $d = .89$, $CI = [-1.90, -.90]$, $p < .001$); *desire for afterlife* was higher in the MS condition than in the pain condition ($t[149.06]_{\text{Welch}} = 3.89$, $d = .64$, $CI = [-1.18, -.38]$, $p < .001$); *belief in afterlife* was higher in the MS condition than in the pain condition ($t[151.20]_{\text{Welch}} = 5.22$, $d = .85$, $CI = [-1.16, -.75]$, $p < .001$).

Among atheists. *Desire for supernatural agents* was higher in the MS condition than in the pain condition ($t[129.76]_{\text{Welch}} = 2.16$, $d = .40$, $CI = [-.888, -.03]$, $p = .03$); however, *belief in supernatural agents* was marginally lower in the MS condition than in the pain condition ($t[139.05]_{\text{Welch}} = -1.84$, $d = -.31$, $CI = [-.01, .33]$, $p = .07$); *desire for afterlife* was higher in the MS condition than in the pain condition ($t[139.90]_{\text{Welch}} = 2.17$, $d = .37$, $CI = [-1.14, -.05]$, $p = .03$); however, *belief in afterlife* was marginally lower in the MS condition than in the pain condition ($t[105.02]_{\text{Welch}} = -1.87$, $d = -.36$, $CI = [-.006, .19]$, $p = .07$).

3.2 Ancillary Analyses: Demographics, PNS, Affect

As is reported in the supplementary analysis, the Christian and atheist samples did not differ on race, ethnicity, or education level. However, the atheist sample was younger than the Christian sample, and the Christian sample had more females than males whereas the atheist sample had more males than females. The atheist sample also had lower PNS scores than the Christian sample. Therefore, we examined whether differences in age, sex, and PNS could have explained (mediated) the moderating effect of being atheist vs. Christian in the observed 2 (category: atheist vs Christian) x 2 (MS vs. control) interactions on the dependent measures. However, whereas religious category moderated the MS effect on belief in supernatural agents and belief in afterlife, neither age nor sex nor PNS similarly moderated the MS effect, and were therefore not viable mediators.

Positive and negative affect were also analyzed using 2 (category: Christian vs. atheist) x 2 (MS vs. pain) ANOVAs, and there was an interaction on each. The negative affect interaction pattern did not mimic the supernatural belief or afterlife belief interaction patterns, and thus was not a viable mediator. The positive affect interaction pattern did mimic the supernatural belief and afterlife belief interaction patterns, and was therefore a viable mediator, but a PROCESS model test for conditional indirect effects (mediation) suggested that positive affect did not mediate the effects on supernatural belief or afterlife belief. See the supplementary analysis for details.

CHAPTER IV

DISCUSSION

First, it was hypothesized that among Christians MS (vs. pain) should lead to increased desire for supernatural beings and afterlife concepts, reflecting the intuitive appeal for such concepts along with an increased explicit belief that supernatural beings and the afterlife do exist. The data supported this hypothesis. Following the main effects for both category (Christians vs. Atheists) and MS (vs. pain), pairwise comparisons revealed that for Christians desire for and belief in supernatural and afterlife concepts were higher in the MS condition as compared to the control condition.

Second, for atheists, it was hypothesized that MS (vs. pain) should lead to an increased desire for supernatural beings and afterlife concepts thus revealing a similar intuitive pull of such concepts, but that it would not increase explicit belief in such concepts reflecting an override/rejection of the religious intuitions. In line with the hypothesis, results from pairwise comparisons showed that for atheists MS (vs. pain) led to increased desire for supernatural agents and afterlife but did not lead to increased belief in such concepts. In fact, belief in supernatural agents and the afterlife were

marginally lower in the MS condition as compared to the control condition. The implications of these results are discussed below.

4.1 Implications

The present study contributes to our understanding of the psychology of religion in some unique ways. By assimilating ideas from TMT and dual-process model of religious cognition, the present study tests how the intuitive desire for supernatural and afterlife concepts systematically differs from the explicitly held beliefs about such concepts. The results from the present study also help us understand how these processes manifest differently among Christians and atheists; although the intuitive appeal of supernatural and afterlife concepts are similarly recognized across the board despite one's religious (or non-religious) beliefs, especially under conditions where mortality is made salient, such desire does not directly transfer to explicitly held beliefs. Instead, the results from the study suggest that, when mortality is made salient, these intuitions are regulated in a manner that is consistent with one's prior worldviews, leading Christians to accept these intuitions as expressly held beliefs and leading atheists to override those intuitions and reject such beliefs. These results further add support to: a) the dual-process model of religious cognition (Norenzayan & Gervais, 2013), in terms of showing that religious concepts are largely reliant on System 1 processing and do indeed hold an intuitive pull; and also b) the worldview defense account of religion (Vail et al., 2010), by showing that these intuitions will be expressed as beliefs only if they are consistent with one's worldviews.

Furthermore, the results of the present study converge with previous findings that show that atheism sometimes appears to be a result of conscious effort involving override

of the intuitions that are the product of default cognitive inclinations and is associated more engagement with analytical (System 2), self-regulatory thinking styles (Silver et al., 2014; Pennycook et al., 2012). This is especially true under conditions of mortality salience where research has shown that mortality salience leads Christians to increase reliance on their intuitions, and leads atheists to adopt a more analytical thinking style when they are able to draw upon their cognitive resources i.e. engage in System 2 processing (Vail et al., 2019, Study 1).

Additionally, the present study adds further clarity to some of the results found in previous research on the intuitive appeal of religious beliefs under conditions where mortality is made salient. E.g. in their study Jong et al. (2012 Study 2 & 3) using IAT found that mortality salience led to a stronger implicit association between supernatural concepts (e.g. God, soul, Hell) and the category “real” among both religious and non-religious participants. However, from their study, it was not very clear whether these implicit associations indicated a belief in such concepts or whether they simply reflect an intuitive pull towards such concepts. By separately measuring the desire for supernatural and afterlife concepts and belief in supernatural and afterlife concepts the results from the current study potentially suggests that these implicit associations are more likely to reflect an intuitive appeal of these religious concepts rather than belief in those concepts.

4.2 Limitations and Future Directions

One possible limitation of the present study is that the study used a single-item to measure desire and belief in the supernatural and afterlife concepts. However, multi-item measures are primarily desirable when the latent construct is poorly understood, poorly defined, or difficult to measure exactly, such as diffuse latent constructs with various

definitions, aspects, or facets (e.g., neuroticism, extroversion). In such cases, multiple items are used to triangulate on the latent variable of interest, with internal consistency estimates being a measure of reliably overlapping measurement of that construct. However, as measurement improves, or when hypotheses are articulated with sufficient specificity, single-item measures are often both more efficient and appropriate. On that note, it should be pointed out that single-item measures have been successfully used to measure constructs like self-esteem (Robins et al., 2001), the Big Five personality traits (Gosling, Rentfrow, & Swann, 2003), attention at work (Gardner et al., 1998) and social identification (Postmes, Haslam & Jans, 2013) among others. In the present research, although there are a variety of definitions, aspects, and facets of religiosity, the only two facets that were relevant to the presently articulated hypotheses were the aspects of intuitive appeal (desire) and expressed/accepted belief, so face-valid single-item measures were sufficient to investigate the present research question as it pertained to the intuitive appeal and expressed belief in the religious concepts of supernatural agents and afterlife—two of the conceptually defining features of religion, as articulated in the Introduction section above.

Another potential limitation of the present study is that the present study asked respondents to rate their desire for and belief in Supernatural agents. It is conceivable that one could interpret the term Supernatural agents in a manner that is not religious e.g. in terms of various fictional superhero characters found in movies. Although the floor effects found among atheists in the MS condition suggest that the term supernatural agents were interpreted within the religious contexts, future research should employ

measures that look at the desire for and belief in supernatural agents within the religious context.

4.3 Conclusion

The appeal of religious beliefs especially in face of existential concerns has been a topic of much research and discussion within psychological literature and the broader philosophical and theological literature in general. For Tolstoy, leaning on his Christian faith allowed him to deal with the anxiety that resulted from the realization of the inevitability of death. Consistent with this, the present research shows that awareness of mortality leads Christians to find the supernatural and afterlife concepts more desirable and increase their expressed faith in those same concepts. In contrast to this and consistent with Primo Levi's account of unwavering atheism, even in face of death, the results from the present study also show that among atheists although mortality salience increases the desire for supernatural and afterlife concepts it does not increase their belief in them. The results of the present study further contribute to a growing literature showing that the intuitive appeal of religious beliefs is felt similarly across the board independent of one's prior religious convictions (Jarnfelt et al, 2015), that mortality awareness leads to maintenance of or even increase in one's prior beliefs be it religious or atheistic (Jong et al 2012, Vail et al, 2012), and that atheists tend to reject religious beliefs by engaging in analytical (System 2) thinking styles and overriding their default cognitive intuitions (Silver et al., 2014; Shenhav et al., 2012).

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Table 1
Participant descriptive and frequency statistics.

Demographic	Christian	atheist	Total sample
Age	37.03 (12.27)	34.00 (11.33)	35.54 (11.90)
Sex			
Male	69	93	162
Female	89	60	149
Did not report	1	1	2
Ethnicity			
Hispanic or Latino	17	12	29
Non-Hispanic or Latino	141	142	283
Did not report	1	0	1
Race			
Caucasian	138	133	271
African American	10	5	15
Native American/Native Alaskan	1	2	3
Asian/Pacific Islander	5	11	16
Other	5	3	8
Years of education	15.25 (2.17)	15.57 (2.41)	15.41 (2.29)

Note. Sums and means are presented, with standard deviations following means in parentheses.

Table 2. Descriptive statistics of each of the four dependent measures, in the MS and dental pain conditions, among Christians and among atheists.

	Want supernatural to exist		Believe supernatural exists		Want afterlife to exist		Believe afterlife exists		<i>n</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Christians									
Mortality salience	4.47	1.55	4.55	1.62	5.50	1.09	5.19	1.29	78
Pain salience	3.54	1.45	3.15	1.56	4.72	1.43	3.98	1.64	81
Atheists									
Mortality salience	2.07	1.51	1.14 ^a	.42	2.67	1.85	1.03 ^a	.16	73
Pain salience	1.60	1.09	1.30 ^a	.64	2.07	1.52	1.12 ^a	.43	81

Note: Means with the same superscript were not significantly different; all other MS vs. Pain salience pairwise comparisons were significantly different, see text for effect sizes.

Table 3. Zero order correlations for each of the four dependent measures, PNS, PANAS.

		To what extent do you want supernatural beings to exist?	To what extent do you believe that supernatural beings actually do exist?	To what extent do you want afterlife (e.g., heaven, eternal life) to exist?	To what extent do you believe that afterlife (e.g., heaven) actually does exist?	PNS_Mean	Positive_affect	Negative_affect
To what extent do you want supernatural beings to exist?	Pearson Correlation	1	.781**	.665**	.647**	.173**	.137*	.053
	Sig. (2-tailed)		.000	.000	.000	.002	.015	.349
	N	315	314	315	314	315	315	315
To what extent do you believe that supernatural beings actually do exist?	Pearson Correlation	.781**	1	.621**	.806**	.183**	.205**	-.036
	Sig. (2-tailed)	.000		.000	.000	.001	.000	.527
	N	314	314	314	313	314	314	314
To what extent do you want afterlife (e.g., heaven, eternal life) to exist?	Pearson Correlation	.665**	.621**	1	.752**	.192**	.111*	.012
	Sig. (2-tailed)	.000	.000		.000	.001	.048	.828
	N	315	314	315	314	315	315	315
To what extent do you believe that afterlife (e.g., heaven) actually does exist?	Pearson Correlation	.647**	.806**	.752**	1	.234**	.208**	-.066
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.241
	N	314	313	314	314	314	314	314
PNS_Mean	Pearson Correlation	.173**	.183**	.192**	.234**	1	.034	-.021
	Sig. (2-tailed)	.002	.001	.001	.000		.543	.705
	N	315	314	315	314	315	315	315
Positive_affect	Pearson Correlation	.137*	.205**	.111*	.208**	.034	1	-.368**
	Sig. (2-tailed)	.015	.000	.048	.000	.543		.000
	N	315	314	315	314	315	315	315
Negative_affect	Pearson Correlation	.053	-.036	.012	-.066	-.021	-.368**	1
	Sig. (2-tailed)	.349	.527	.828	.241	.705	.000	
	N	315	314	315	314	315	315	315

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

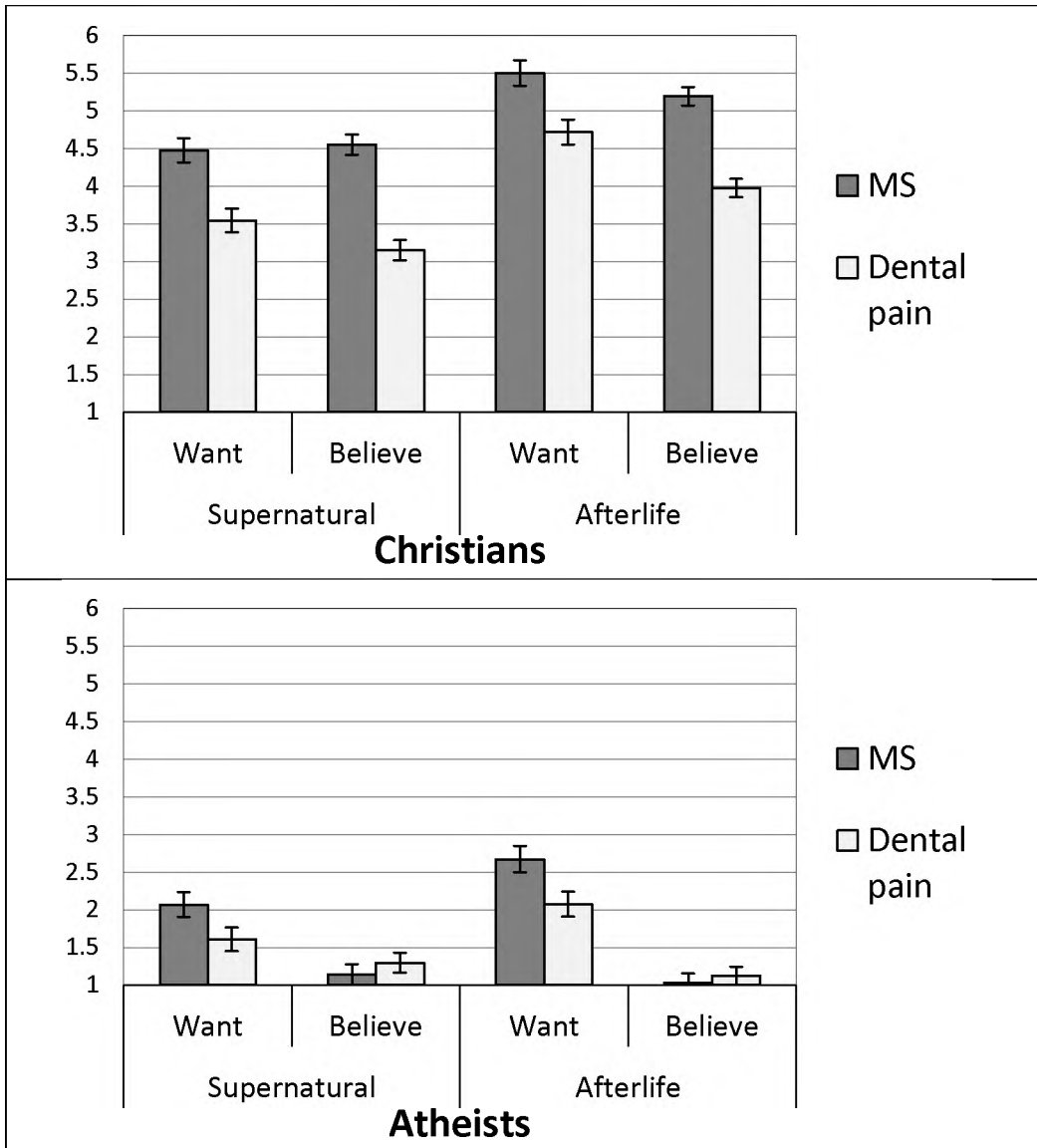


Figure 1. The effects of MS (vs. pain) on each of the four dependent measures, among Christians and among atheists.

APPENDIX A: Supplementary Materials

[Personality/filler items]

PERSONALITY ASSESSMENT

Please read each item and then mark the appropriate answer in the space next to that word. Use the following scale for your answers.

	1	2	3	4	5	6	7	8	9
10									
<i>Strongly Disagree</i>			<i>Disagree</i>		<i>Neutral</i>			<i>Agree</i>	
<i>Strongly Agree</i>									

1. _____ It upsets me to go into a situation without knowing what I can expect from it.
2. _____ I'm not bothered by things that interrupt my daily routine.
3. _____ I enjoy having a clear and structured mode of life.
4. _____ I like to have a place for everything and everything in its place.
5. _____ I enjoy being spontaneous.
6. _____ I find that a well-ordered life with regular hours makes my life tedious.

[Manipulation #1: Mortality salience]

The Projective Life Attitudes Assessment

This assessment is a recently developed, innovative personality assessment. Recent research suggests that feelings and attitudes about significant aspects of life tell us a considerable amount about the individual's personality. Your responses to this survey will be content-analyzed in order to assess certain dimensions of your personality. Your honest responses to the following questions will be appreciated.

1. PLEASE BRIEFLY DESCRIBE THE EMOTIONS THAT THE THOUGHT OF YOUR OWN DEATH AROUSES IN YOU.

2. JOT DOWN, AS SPECIFICALLY AS YOU CAN, WHAT YOU THINK HAPPENS TO YOU AS YOU PHYSICALLY DIE.

[Manipulation #2: Control Condition]

The Projective Life Attitudes Assessment

This assessment is a recently developed, innovative personality assessment. Recent research suggests that feelings and attitudes about significant aspects of life tell us a considerable amount about the individual's personality. Your responses to this survey will be content-analyzed in order to assess certain dimensions of your personality. Your honest responses to the following questions will be appreciated.

1. PLEASE BRIEFLY DESCRIBE THE EMOTIONS THAT THE THOUGHT OF DENTAL PAIN AROUSES IN YOU.

2. JOT DOWN, AS SPECIFICALLY AS YOU CAN, WHAT YOU THINK HAPPENS TO YOU AS YOU PHYSICALLY EXPERIENCE DENTAL PAIN.

[Distractor task: PANAS, Watson & Clark, 1992]

For each item below, indicate to what extent you feel this way right now. Use the following scale.

1	2	3	4	5
Very slightly or not at all	a little	moderately	quite a bit	extremely
___ Interested	___ Guilty	___ Irritable	___ Determined	
___ Disinterested	___ Scared	___ Alert	___ Attentive	
___ Excited	___ Hostile	___ Ashamed	___ Jittery	
___ Upset	___ Enthusiastic	___ Inspired	___ Active	
___ Strong	___ Proud	___ Nervous	___ Afraid	

Verbal Cues Questionnaire: Literature

Please read the following short passage and answer the questions below it.

The automobile swung clumsily around the curve in the red sandstone trail, now a mass of mud. The headlights suddenly picked out in the night—first on one side of the road, then on the other—two wooden huts with sheet metal roofs. On the right near the second one, a tower of course beams could be made out in the light fog. From the top of the tower a metal cable, invisible at its starting-point, shone as it sloped down into the light from the car before disappearing behind the embankment that blocked the road. The car slowed down and stopped a few yards from the huts.

The man who emerged from the seat to the right of the driver labored to extricate himself from the car. As he stood up, his huge, broad frame lurched a little. In the shadow beside the car, solidly planted on the ground and weighed down by fatigue, he seemed to be listening to the idling motor. Then he walked in the direction of the embankment and entered the cone of light from the headlights. He stopped at the top of the slope, his broad back outlined against the darkness. After a moment he turned around. In the light from the dashboard he could see the chauffeur's face, smiling. The man signaled and the chauffeur turned off the motor. At once a vast cool silence fell over the trail and the forest. Then the sound of the water could be heard.

The man looked at the river below him, visible solely as a broad dark motion flecked with occasional shimmers. A denser motionless darkness, far beyond, must be the other bank. By looking fixedly, however, one could see on that still bank a yellowish light like an oil lamp in the distance. The big man turned back toward the car and nodded. The chauffeur switched off the lights, turned them on again, then blinked them regularly. On the embankment the man appeared and disappeared, taller and more massive each time he came back to life. Suddenly, on the other bank of the river, a lantern held up by an invisible arm back and forth several times. At a final signal from the lookout, the man disappeared into the night. With the lights out, the river was shining intermittently. On each side of the road, the dark masses of forest foliage stood out against the sky and seemed very near. The fine rain that had soaked the trail an hour earlier was still hovering in the warm air, intensifying the silence and immobility of this broad clearing in the virgin forest. In the black sky misty stars flickered.

1. Do you think the author of this story is male or female?

_____ male _____ female

2. Do you think the narrator is “part” of the story (a character), or simply a third person voice?

_____ The narrator *is* a story character _____ The narrator *is not* a story character

3. What age might the author have been at the time this passage was written?

_____ 15-20 years old	_____ 41-50 years old
_____ 21-30 years old	_____ 51-60 years old
_____ 31-40 years old	_____ 61-70 years old

4. How do you feel about the overall descriptive qualities of the story?

1	2	3	4	5	6	7	8	9
not at all				somewhat				very
descriptive				descriptive				descriptive

[Dependent measure: Desire and Belief in Supernatural Agents]

1. To what extent do you want supernatural beings to exist? _____

1 2 3 4 5 6

Not at all

Very strongly

2. To what extent do you believe supernatural beings to exist? _____

1 2 3 4 5 6

Not at all

Very strongly

3. To what extent do you want afterlife (e.g., heaven, eternal life) to exist? _____

1 2 3 4 5 6

Not at all

Very strongly

4. To what extent do you believe afterlife (e.g., heaven) actually does exist? _____

1 2 3 4 5 6

Not at all

Very strongly

Demographic

1.) What is your age? _____ 2.) What is your sex? _____ Male _____ Female

3.) Is English your native language?

4.) What is your ethnicity? _____ Hispanic or Latino _____ Not Hispanic or Latino

5.) What is your race? (check only one)

- | | |
|---|---|
| _____ 1. Caucasian | _____ 4. Asian/Pacific Islander |
| _____ 2. African American | _____ 5. Native Hawaiian/Pacific Islander |
| _____ 3. American Indian/Native Alaskan | _____ 6. Other (specify): _____ |

6.) How many years of education have you completed? _____
(e.g., if completed through sophomore year of high school, enter 10; if graduated from high school, enter 12; if four years of college, enter 16; and so on)

7.) Please rate your political orientation:

- | | | | | | |
|-------------|---|----------|---|---|--------------|
| 1 | 2 | 3 | 4 | 5 | 6 |
| Progressive | | Moderate | | | Conservative |

8.) How strongly do you identify with your political orientation, indicated in #5 above?

- | | | | | | |
|----------------|---|----------|---|---|----------------------|
| 1 | 2 | 3 | 4 | 5 | 6 |
| Very Important | | Moderate | | | Not at all important |

9.) With which political party do you most strongly identify? (circle one)

- | | | |
|------------------|-------------------|--------------------|
| Democratic party | Green party | Constitution party |
| Republican party | Libertarian party | Other: _____ |

10.) How strongly do you identify with the political party indicated in #7 above? (circle one)

- | | | | | | |
|----------------|---|----------|---|---|----------------------|
| 1 | 2 | 3 | 4 | 5 | 6 |
| Very Important | | Moderate | | | Not at all important |

11.) Please indicate your religious affiliation, if any (please circle one):

- | | |
|--------------|---|
| 1. Christian | 6. Atheist (I do not believe supernatural beings exist) |
| 2. Muslim | 7. Spiritual (I believe supernatural beings exist, but I do not follow a specific religion) |
| 3. Jewish | 8. Agnostic (I'm not sure whether, or it is not possible to know whether, supernatural beings do or do not exist) |
| 4. Buddhist | 9. Other: _____ |
| 5. Hindu | |

12.) Please indicate the strength of your religious/philosophical belief:

- | | | | | |
|-------------|--------|----------|------|-----------|
| 1 | 2 | 3 | 4 | 5 |
| Very strong | strong | moderate | weak | very weak |

APPENDIX B: Supplemental Analyses

Supplemental analyses: Demographics

Descriptive statistics and frequencies of basic demographics (age, sex, race, ethnicity, education) are shown in Table 1 of the main text. The atheist sample was younger than the Christian sample ($t[311] = 2.26, p = .02$). Cross-tabulation showed ($\chi^2 [1] = 9.12, p = .003$) the samples differed in that the Christian sample had more females (56%) than males (44%), whereas the atheist sample had more males (61%) than females (39%), reflecting the broader atheist population (Pew Research Center, 2015). Cross-tabulation did not find that the samples differed in race ($\chi^2 [1] = 4.76, p = .31$) nor ethnicity ($\chi^2 [1] = .81, p = .37$). The samples of atheists and Christians also did not differ in their years of education ($t[311] = 1.26, p = .21$). Because the atheist sample was younger and had a higher proportion of males, I examined whether age and sex differences could have explained (mediated) the moderating effect of being atheist vs. Christian in the observed 2 (category: atheist vs Christian) x 2 (MS vs. control) interactions on the dependent measures.

To analyze age as the potential alternative moderator, standard methods for analyzing continuous x categorical interactions were followed, as prescribed by Aiken & West (1991). Years of age was centered about the mean, MS was dummy coded, and the interaction term was computed. Main effects showed that MS tended to increase scores on all four dependent measures (described above) and age tended to be positively associated with desire for supernatural agents ($\beta = .09, t[312] = 1.59, p = .11$), belief in supernatural agents ($\beta = .11, t[312] = 1.88, p = .06$), desire for afterlife ($\beta = .12, t[312] = 2.08, p = .04$), and belief in afterlife ($\beta = .14, t[312] = 2.46, p = .01$). The MS x age interaction was not significant for desire for supernatural agents ($F[1, 309] = 1.01, R^2\Delta = .003, p = .32$), belief in supernatural agents ($F[1, 309] = .04, R^2\Delta < .01, p = .84$), for desire for afterlife ($F[1, 309] = 2.77, R^2\Delta = .01, p = .10$), nor belief in afterlife ($F[1, 309] = 1.46, R^2\Delta = .005, p = .29$).

To analyze sex as the potential alternative moderator, 2 (category: female vs. male) x 2 (MS vs. pain) x 4 (dependent measure: want supernatural, believe supernatural, want afterlife, believe afterlife) mixed model ANOVA was tested. Mauchly's test indicated the assumption of sphericity had been violated ($\chi^2 [5] = 132.88, p < .01$), so the degrees of freedom of the omnibus test were corrected using the Lower-bound (the most conservative) estimate of sphericity ($\epsilon = .33$). Levene's test also indicated the assumption of equality of variances between groups had been violated for each dependent measure ($F[3, 307]s > 2.56, ps < .055$), so main effects were evaluated using Welch's unequal variances t-tests. There were main effects of MS (as described above) and of sex ($t[303.68]_{\text{Welch}} = 3.63, d = .42, p < .001$), such that scores on the dependent measures were collectively higher among females ($M = 3.38, SD = 1.74$) than among males ($M = 2.68, SD = 1.65$). However, there was no Sex x MS 2-way ($F[1, 307] = .13, \eta_p^2 < .01, p = .72$) nor 3-way interaction ($F[1, 307]_{\text{Lower-bound}} = 1.76, \eta_p^2 < .01, p = .19$).

Whereas religious category moderated the MS effect on belief in supernatural agents and belief in afterlife, neither age nor sex exerted a similar moderating effect. Thus, neither age nor sex were viable mediators, so neither were considered further.

Supplemental analyses: Personal need for structure.

An independent samples t-test showed that, compared to Christians ($M = 4.47$, $SD = .90$), atheists ($M = 4.01$, $SD = .99$) reported lower PNS ($t[311] = -4.25$, $p < .01$). As an initial probe for whether this difference in PNS could have explained (mediated) the effect of being atheist vs Christian, I first checked to see whether there were similar PNS x MS effects on each of the four dependent measures. Continuous x categorical interactions were analyzed following standard methods prescribed by Aiken & West (1991). PNS was centered about the mean, MS was dummy coded, and the interaction term was computed.

Main effects showed that MS tended to increase scores on all four dependent measures (described above) and PNS tended to be positively associated with desire for supernatural agents ($\beta = .16$, $t[312] = 2.94$, $p = .004$), belief in supernatural agents ($\beta = .17$, $t[312] = 3.12$, $p = .002$), desire for afterlife ($\beta = .19$, $t[312] = 3.35$, $p = .001$), and belief in afterlife ($\beta = .23$, $t[312] = 4.21$, $p < .001$). However, there were no MS x PNS interactions on desire for supernatural agents ($F[1, 309] = .004$, $R^2\Delta < .001$, $p = .95$), belief in supernatural agents ($F[1, 309] = 1.84$, $R^2\Delta = .01$, $p = .18$), desire for afterlife ($F[1, 309] = .001$, $R^2\Delta < .001$, $p = .97$), nor belief in afterlife ($F[1, 309] = .10$, $R^2\Delta < .001$, $p = .76$).

Whereas religious category moderated the MS effect on belief in supernatural agents and belief in afterlife, PNS did not exert a similar moderating effect. Thus, PNS was not a viable mediator and is not considered further.

Supplemental analyses: Affect.

Positive and negative affect were analyzed using 2 (category: Christian vs. atheist) x 2 (MS vs. pain) ANOVAs. When analyzing positive affect, there was no main effect of MS ($F[1, 309] = .10$, $\eta_p^2 < .01$, $p = .75$); there emerged an unqualified main effect of category ($F[1, 309] = 13.55$, $\eta_p^2 = .04$, $p < .01$), such that positive affect was higher among Christians ($M = 4.03$, $SD = .87$) than among atheists ($M = 3.68$, $SD = .88$). However, the interaction also emerged, $F(1, 309) = 8.24$, $\eta_p^2 = .03$, $p = .004$ (see *Figure S1*). Pairwise comparisons were conducted to further explore the interaction on positive affect. Among Christians, positive affect was higher in the MS condition ($M = 4.19$, $SD = .93$) condition than in the pain condition ($M = 3.87$, $SD = .78$) ($t[157] = 2.27$, $d = .36$, $p = .02$). Among atheists, however, positive affect was lower in the MS condition ($M = 3.54$, $SD = .92$) condition than in the pain condition ($M = 3.79$, $SD = .83$) ($t[152] = -1.79$, $d = -.29$, $p = .08$).

This interaction pattern suggests that MS increased positive affect among Christians but decreased it among atheists, matching the patterns observed on belief in

supernatural agents and belief in afterlife. It is possible that changes in positive affect mediated the changes in belief in supernatural agents and afterlife, or vice versa. Thus, we conducted a formal test of the conditional indirect effect of positive affect within the Category x MS interactions on belief using model 8 (*Figure S2*, Panel A) of the PROCESS statistical macro for SPSS (Hayes, 2013). This model used a bootstrapping method (5000 bootstrapped resamples) to estimate the various path coefficients specified in *Figure S2* (Panel B). The models indicated (*Table S1*) that positive affect did not statistically mediate the effect of the Category x MS interactions on belief in supernatural agents or afterlife. There were no higher order indirect effects ($b = .04$, 95%CI = [-.04, .18]) nor conditional indirect effects of MS on belief in supernatural agents among neither atheists ($b = -.02$, 95%CI = [-.10, .01]) nor Christians ($b = .02$, 95%CI = [-.02, .11]). There were also no higher order indirect effects ($b = .03$, 95%CI = [-.05, .14]) nor conditional indirect effects of MS on belief in afterlife among neither atheists ($b = -.01$, 95%CI = [-.08, .02]) nor Christians ($b = .01$, 95%CI = [-.03, .09]). Thus, positive affect did not mediate the effect of MS on belief in supernatural agents nor belief in afterlife.

When analyzing negative affect, there was no main effect of category ($F[1, 309] = .21$, $\eta_p^2 < .01$, $p = .65$), MS ($F[1, 309] = 1.41$, $\eta_p^2 < .01$, $p = .24$), but there was a 2 (category: Christian vs. atheist) x 2 (MS vs. pain) interaction ($F[1, 309] = 4.28$, $\eta_p^2 = .01$, $p = .04$). Levene's test indicated the assumption of equality of variances between groups had been violated ($F[3, 309] = 2.89$, $p = .04$), so pairwise comparisons were evaluated using Welch's unequal variances t-tests. Among Christians, negative affect was lower in the MS condition ($M = 1.93$, $SD = .93$) condition than in the pain condition ($M = 2.26$, $SD = .97$) ($t[157.00]_{\text{Welch}} = -2.19$, $d = 0.35$, $p = .03$). Among atheists, negative affect was not significantly different in the MS condition ($M = 2.10$, $SD = .77$) condition than in the pain condition ($M = 2.01$, $SD = .89$) ($t[151.71]_{\text{Welch}} = -.67$, $d = .011$, $p = .50$). This effect of religious category and MS on negative affect did not mimic the effect on belief in supernatural agents nor belief in afterlife, so negative affect was not a viable mediator and is not considered further.

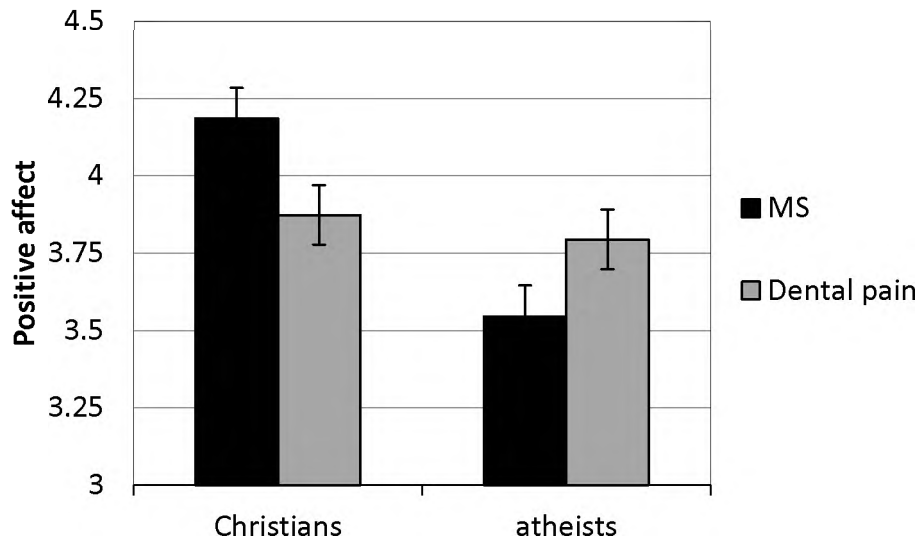


Figure 2. The effects of MS (vs. pain) on positive affect among Christians and among atheists.

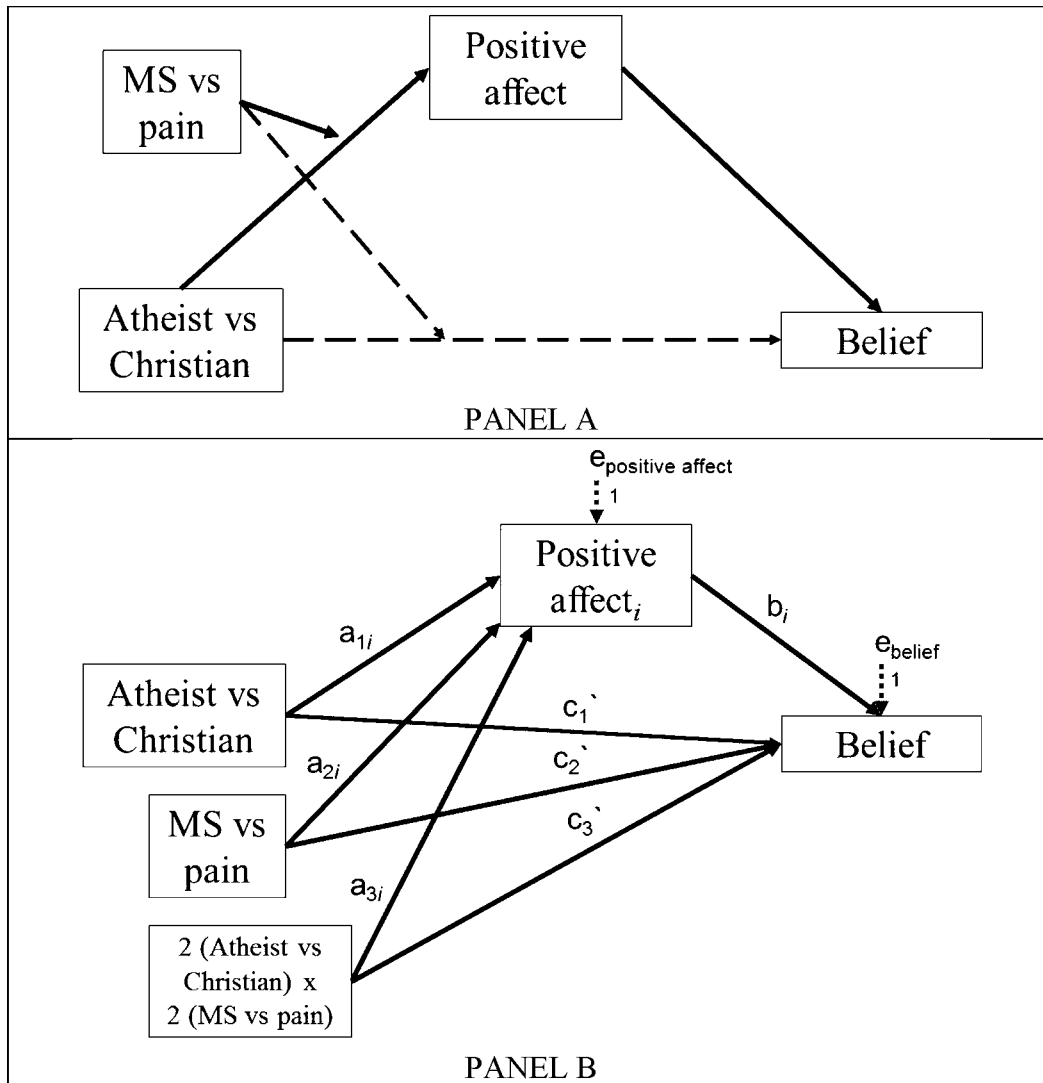


Figure 3. An illustration of the moderated mediation model, which tested whether positive affect mediates the moderated effect of MS (vs pain) among each category (atheist vs religion) on belief in supernatural agents (Model 1) and belief in afterlife (Model 2). Panel A depicts the conceptual model, Panel B depicts the statistical model. The models found that there were no higher order or conditional indirect effects through positive affect.

Table S1
Mediated moderation process model statistics.

Outcome: Positive affect		Coefficient (b)	SE	<i>t</i>	<i>P</i>
	constant	3.80	.10	39.39	< .001
a ₁	Category	.08	.14	.58	.56
a ₂	MS	-.25	.14	-1.79	.08
a ₃	Category x MS interaction	.56	.20	2.87	.004
MODEL 1: Belief in supernatural agents					
Outcome: Belief in supernatural agents		Coefficient (b)	SE	<i>t</i>	<i>P</i>
	constant	1.02	.33	3.14	.002
b ₁	Positive affect	.07	.08	.92	.36
c ₁	Category	1.85	.19	9.83	< .001
c ₂	MS	-.14	.19	-.73	.47
c ₃	Category x MS interaction	1.52	.27	5.55	< .001
Conditional direct effects on belief in supernatural agents		Coefficient	SE	LLCI	ULCI
	Atheists: MS	-.14	.19	-.52	.24
	Christians: MS	1.38	.19	1.00	1.76
Conditional indirect effects on belief in supernatural agents		Coefficient	SE	LLCI	ULCI
	Atheists: MS via positive affect	-.02	.03	-.10	.01
	Christians: MS via positive affect	.02	.03	-.02	.11
Higher order indirect effect on belief in supernatural agents		Index	SE	LLCI	ULCI
	Category x MS via positive affect	.04	.05	-.04	.18
MODEL 2: Belief in afterlife					
Outcome: Belief in afterlife		Coefficient (b)	SE	<i>t</i>	<i>P</i>
	constant	.94	.29	3.22	.001
b ₁	Positive affect	.05	.07	.66	.51
c ₁	Category	2.85	.17	16.80	< .001
c ₂	MS	-.08	.18	-.48	.63
c ₃	Category x MS interaction	1.28	.25	5.20	< .001
Conditional direct effects on belief in afterlife		Coefficient	SE	LLCI	ULCI
	Atheists: MS	-.08	.18	-.43	.26
	Christians: MS	1.20	.17	.86	1.54
Conditional indirect effects on belief in afterlife		Coefficient	SE	LLCI	ULCI
	Atheists: MS via positive affect	-.01	.02	-.08	.02
	Christians: MS via positive affect	.01	.03	-.03	.09
Higher order indirect effect on belief in afterlife		Index	SE	LLCI	ULCI
	Category x MS via positive affect	.03	.05	-.05	.14

Note. Category was coded, 0 = atheist, 1 = Christian; MS was coded, 0 = pain, 1 = MS; LLCI = Lower limit 95% confidence interval; ULCI = Upper limit 95% confidence interval. Model 1 and 2 are separate PROCESS models with same a-paths, thus presented together for brevity.