Unconscious threat and judgment bias in Tibetan Buddhists

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Abstract

Individuals who have been subtly reminded of death display heightened in-group favouritism, or "worldview defense." Terror management theory argues (i) that death cues engender worldview defense via psychological mechanisms specifically evolved to suppress death anxiety, and (ii) that the core function of religiosity is to suppress death anxiety. Thus, terror management theory predicts that extremely religious individuals will not evince worldview defense. Here, two studies are presented in support of an alternative perspective. According to the unconscious vigilance hypothesis, subtly processed threats (which need not pertain to death) heighten sensitivity to affectively valenced stimuli (which need not pertain to cultural attitudes). From this perspective, religiosity mitigates the influence of mortality-salience only insofar as afterlife doctrines reduce the perceived threat posed by death. Tibetan Buddhism portrays death as a perilous gateway to rebirth rather than an end to suffering; faith in this doctrine should therefore not be expected to nullify mortality-salience effects. In Study 1, devout Tibetan Buddhists who were subtly reminded of death produced exaggerated aesthetic ratings unrelated to cultural worldviews. In Study 2, devout Tibetan Buddhists produced worldview defense following subliminal exposure to non-death cues of threat. The results demonstrate both the domain-generality of the process underlying worldview defense and the importance of religious doctrinal content in moderating mortality-salience effects.

Keywords: worldview defense, religion, threat-detection, terror management theory, Tibetan Buddhism

Introduction

Worldview defense—the polarization of ratings for laudatory and against critical attitudes toward one's cultural ingroup—is among the most widely studied effects in social psychology. Subtle reminders of death have been observed to evoke worldview defense in hundreds of experiments conducted over the last two decades (Landau, Solomon, Pyszczynski, & Greenberg, 2007). *Terror management theory* interprets these findings as evidence of a psychological adaptation specially designed to suppress the potential for debilitating anxiety aroused by ancestral humans' "burgeoning awareness of the inevitability of death" (Landau et al., 2007, p. 490). As the principal architects of the theory made plain, "support for [terror management theory] is predicated on the assumption that mortality salience effects are engendered specifically by concerns about one's own mortality rather than in response to any anxiety-provoking or self-threatening event" (Greenberg et al., 1997, p. 98). To the contrary, however, subsequent studies have documented that threat cues unrelated to death can evoke worldview defense (e.g., Holbrook, Sousa, & Hahn-Holbrook, 2011; Navarrete, 2005; van den Bos et al., 2005). In addition, mortality-salience has been observed to polarize evaluations which are either unrelated or indirectly related to worldview defense (see Table 1). This overall pattern of findings suggest that worldview defense is not the domain-specific output of a content-dedicated terror management adaptation, but rather a by-product of *unconscious vigilance*—a state of heightened reactivity to affective stimuli elicited by subtle alarm cues processed below the threshold of conscious awareness (Holbrook et al., 2011).

An extensive cognitive neuroscience literature provides convergent support for the existence of unconscious vigilance (for a review, see Williams et al., 2006). The amygdala, for example, is thought to operate as a kind of searchlight which directs attention to stimuli of

motivational significance (Barrett, 2006; Berridge, 1999; Holland & Gallagher, 1999; Wager et al., 2008). Upon exposure to unconscious alarm cues, the amygdala is theorized to excite brainstem mechanisms which innervate cortical and subcortical regions of the brain, thus facilitating the evaluation of emotionally significant stimuli (Liddell et al., 2005). Conscious awareness of threat, by contrast, activates higher cortical areas, enabling top-down control of behaviour (Williams et al., 2006) and inhibiting alarm signals (Hariri, Bookheimer, & Mazziota, 2000; Lieberman et al., 2007). Consequently, threats which bias evaluation must be encountered in a way that is alarming enough to arouse unconscious vigilance but not so alarming as to recruit conscious awareness and emotion regulation.

Inspired by cognitive neuroscience accounts of the influence of subtle alarm on evaluation, Holbrook, Sousa and Hahn-Holbrook (2011) tested the unconscious vigilance interpretation of worldview defense in a series of four experiments. The series was designed to establish the domain-specificity (or lack thereof) of the psychological system which translates death cues into increased intergroup prejudice. Whereas terror management theory contends that subtle threats of death are unique in spawning group bias—but not biases theoretically unrelated to reducing death anxiety—the unconscious vigilance account predicts the opposite: various subtle alarm cues should magnify various emotional evaluations, irrespective of death concerns. In the first two studies, mortality-salience was induced prior to ratings of pleasant and aversive affective stimuli unrelated to cultural attitudes (Study 1: abstract sounds; Study 2: aesthetic images). As predicted by the unconscious vigilance hypothesis, these worldview-neutral targets were rated as exaggeratedly positive or negative by participants in the mortality-salience condition. The next two studies tested terror management claims of the uniqueness of death cues in triggering worldview defense. Again consistent with predictions, subliminally presented

threat cues unrelated to death (Study 3: images of angry faces; Study 4: the word "pain") evoked worldview defense in both studies (also see Proulx & Heine, 2008; Proulx, Heine, & Vohs, 2010).

The primary aim of this paper is to cross-culturally replicate Holbrook et al.'s findings. By doing so within a non-Western religious context which does not portray death as a release from suffering, the present research provides an opportunity to test another core aspect of terror management theory: the claim that the primary function of religiosity is to palliate the fear of death.

Unconscious Vigilance, Religiosity and Worldview Defense

The terror management premise that a deep-seated fear of death motivates worldview defense suggests that belief in life after death should reduce or eliminate the potency of mortality-salience to foster worldview defense (Greenberg, Landau, Solomon, & Pyszczynski, in press; Landau et al, 2007). In support of this prediction, Dechesne and colleagues (2003) reported that reading a bogus scientific account of near-death experiences as evidence of post-mortem consciousness eliminated the effects of mortality-salience on worldview defense. In a later study, intrinsic trait religiosity diminished both worldview defense and the accessibility of death thoughts following mortality-salience induction (Jonas & Fischer, 2006). This result was partially replicated by Norenzayan, Dar-Nimrod, Hansen and Proulx (2009), who found that high self-reported religiosity eliminated worldview defense, but not death-thought accessibility. Proponents of terror management theory have concluded on the basis of these findings that supernatural beliefs are ubiquitous and "sticky" because they function to allay the fear of death (Solomon, Greenberg, Pyszczynski, Cohen, & Ogilvie, 2010).

The unconscious vigilance hypothesis also indicates that religiosity should reduce or negate mortality-salience effects, provided that the pertinent beliefs reduce the alarm associated with death (Holbrook et al., 2011). Terror management studies of the moderating influence of religiosity on worldview defense have been conducted with overwhelmingly Judaeo-Christian samples, embedded within traditionally Judaeo-Christian cultural contexts. Most subscribers to traditional Western faiths take comfort in their religious beliefs (Panati, 1996), but psychological claims about "religion" cannot be sufficiently tested using only Judaeo-Christian samples (Shreve-Neiger & Edelstein, 2004). Many of the world's cultures depict the supernatural as strikingly threatening (Boyer, 2001; 2003). With regard to the afterlife, Tibetan Buddhists envisage the experiences following death as, at times, terrifying.

Tibetan Buddhism is principally comprised of the Nyingma, Kagyu, Sakya and Gelug traditions. These orders differ in origins, styles of practice, philosophical commitments, and supernatural and historical figures of primary focus (Samuel, 1993). The theological distinctions demarcating the disparate lineages are often blurry from the syncretic perspective of the laity, however, whose identification with one sect need not preclude reverence for the teachings of others. Thus, Tibetan Buddhists of differing traditions similarly conceive of death as a critical transition period bridging incarnations (Fremantle & Trungpa, 1975). For the exceedingly virtuous, the next life may boast accommodations in a reasonably healthy human body. For most, however, the dire likelihood exists of rebirth into poverty, disease, a hell realm, an animal form, or existence as a hungry ghost (Goss & Klass, 1997). As the Tibetan adage makes plain, "the number of beings born in the unfortunate realms of animals, ghosts and the hells is like the number of stars visible on a clear night, while the number of beings born as gods, demigods, and humans is like the number of stars seen on a clear day" (Lopez, 1994, p. 75).[1]

The Nyingma funerary text titled "The Great Liberation through Hearing in the Bardo" (Bardo Thötröl), commonly referred to as "The Tibetan Book of the Dead" or as "The Tibetan Book of Living and Dying," provides a detailed description of the events which follow physical death (Fremantle & Trungpa, 1975; Rinpoche, 1992; Thurman, 1994). Rebirth occurs after a period of 49 days in an intermediate state, or *bardo* (Fremantle & Trungpa, 1975). During the first bardo phase, the decedent encounters a dazzling, all-encompassing luminosity during which one may gain liberation from the cycle of reincarnation by recognizing an ego-transcendent state of consciousness (Lopez, 1994). The second bardo affords the decedent another chance to attain freedom from rebirth during a long succession of encounters with wrathful and peaceful deities (Goss & Klass, 1997). Finally, if the decedent fails to achieve liberation, rebirth into a new womb is transacted during the third bardo:

> "...even though you wish not to go, you have no power of your own, you are helplessly compelled to go. From behind the avengers of karma pursue you, and in front avengers and murderers drag you along; darkness, hurricanes, violent storms, noises, snow and rain, fierce hailstorms and snowstorms will whirl around you, and you will escape from them… Hidden there, you will be afraid to come out, and you will think, 'I cannot go out of here now,' and through fear of leaving you will become very attached to that place. You are afraid of meeting those terrors of the bardo if you go outside, you feel extreme fear of them; and so you hide inside and take a body, however bad it may be, and will experience all kinds of suffering." (Fremantle & Trungpa, 1975, p. 138)

Western commentators frequently psychologise these alarming descriptions into spiritual allegories, but ordinary Tibetans relate to them as essentially literal (Lopez, 1994; Samuel, 1993).

Whereas Christians, Muslims and Jews place their afterlife hopes in a benevolent, all-powerful deity, Tibetan Buddhists rely on multiple contributing factors which may go awry (Sangay, 1984). The circumstances of the next life are contingent on the decedent's experiences

and decisions during the bardo, which in turn depend upon her accrued karma, the supportive ritual practices of the living, and the spiritual insight with which the discorporate mind meets the phenomena encountered along "the dangerous pathway of the bardo" (Fremantle & Trungpa, 1975, p. 64; Sangay, 1984; Thurman, 1994). In contrast to this rather unsettling prospect, terror management theory gestures to an "ethereal existence promised in perpetuity to Hindus and Buddhists in the form of Nirvana" (Solomon et al., 2004, p. 17). Tibetan Buddhists do describe nirvana as awaiting all sentient beings, but typically as an eventual outcome attained only after eons of suffering, reincarnation and unflagging spiritual discipline. In sum, faith in Tibetan Buddhist afterlife doctrine appears unlikely to palliate the threat of death and thereby negate mortality-salience effects.

Study 1

Terror management theory predicts that intense religiosity of any sort will strongly diminish or negate mortality-salience effects (Solomon et al., 2010), and that mortality-salience biases should be constrained to culturally meaningful judgments or behaviours such as worldview defense (Rosenblatt et al., 1989). In contrast, the unconscious vigilance account predicts that adherents of alarming afterlife beliefs will exhibit mortality-salience effects, and that mortality-salience will influence incidental judgments of affective stimuli whether or not they relate to cultural meaning (Holbrook et al., 2011). To test these divergent predictions, Study 1 induced mortality-salience with devout Tibetan Buddhists prior to evaluations of worldview-neutral, affectively valenced sounds.

Participants

47 adult Tibetan Buddhist students from Qinghai Normal University were recruited to participate in exchange for 15 RMB (approximately U.S. $2.20 at the time of the study) in

compensation. Three outliers of approximately three standard deviations from the mean of the main dependent variable were excluded from the analyses (Kirk, 1995), leaving a sample of 44 participants, 13 women, ranging in age from 18 to 25 years (M = 20.77, SD = 1.33).

Materials and Procedure

All informed consent, questions, procedural instructions and debriefings were conducted in Tibetan with a hypothesis-blind research assistant. Participants were told they would be helping to pilot test several unrelated measures for use in future research. Participants were tested individually. All materials were presented in a field laboratory (a simply furnished apartment) via computer using SurveyMonkey© (Finley, 2008).

All participants were pre-screened as Buddhists. A religiosity probe was included in the demographic questions: "How important for you is your Tibetan Buddhist faith?" Participants answered using a 9-point Likert scale (1 = *not important*, 5 = *medium*, 9 = *extremely important*). The demographic questions were followed by a randomly assigned mortality-salience manipulation or television-salience control.

Participants in the mortality-salience condition were asked to respond to prompts commonly used in terror management studies (e.g. Rosenblatt et al., 1989): (a) "Please briefly describe the emotions that the thought of your own death arouses in you" and (b) "Please jot down, as specifically as you can, what you think will happen to your body as you physically die and once you are physically dead." Control participants were asked parallel questions about watching television (Harmon-Jones et al., 1997).

Following the manipulation, participants completed a Tibetan translation of the Positive and Negative Affect Scales—Expanded Form (PANAS-X; Watson, & Clark, 1991). The PANAS-X measures consciously accessible affect by asking participants to rate the extent to

which they feel 60 affective states, with subscales assessing general negative and positive affect as well as specific negative emotions (fear, hostility, guilt, sadness), positive emotions (joviality, self-assurance, attentiveness) and other affective states (shyness, fatigue, serenity and surprise). This measure also provides a period of distraction and delay to decrease conscious awareness of the influence of the mortality-salience manipulation (Greenberg et al., 1994).

Participants were next asked to rate two six-second sounds developed in previous unconscious vigilance research (Holbrook et al., 2011). Analogously to the positive and negative essays used in worldview defense research, one sound was intended to be considered pleasant and one to be aversive. The aversive sound was an abrupt burst of pink noise. The pleasant sound was generated electronically using harmonious synthesized tones and reverb. Sounds were presented in counterbalanced order at a loud but comfortable volume using headphones. Following each sound, participants were asked to respond to two questions: "How much do you like this sound?" and "How much would you like to hear this sound again?" Participants answered using a 9-point Likert scale (1 = *not at all*, 9 = *extremely*).

After the experiment, each participant was questioned for suspicion about the purpose of the study, thanked, paid, and debriefed. No participant evinced suspicion that the manipulation and the sound evaluations were related.

Results

Unless otherwise specified, all parametric tests reported in this paper were two-tailed, $\alpha = .05$.

Self-reported Religiosity

Self-reported religiosity approached ceiling levels in both conditions: (television-salience control, $M = 8.88$, $SD = .61$; mortality-salience, $M = 8.8$, $SD = .89$).

Self-reported Affect

The PANAS-X has never been translated into Tibetan or administered in a Tibetan cultural context. Therefore, reliability tests of the translated subscales were initially conducted before investigating effects of manipulation. The following subscales were found to be acceptably reliable: Fear (α = .83), Hostility (α = .74), Guilt (α = .74), Sadness (α = .79), Joviality (α = .86), Self-Assurance (α = .64), Shyness (α = .74), Serenity (α = .73), Surprise (α = .78), Global Negative (α = .86), and Global Positive (α = .71). Two unreliable subscales were dropped from further analysis: Fatigue (α = .514) and Attentiveness (α = .023).

A one-way MANOVA performed on the reliable subscales of the PANAS-X revealed no significant effects of condition, with the exception of the Surprise subscale. Participants in the control condition self-reported greater surprise, (television-salience, $M = 2.76$, mortality-salience, $M = 2.10$, $F(1,42) = 4.92$, $p < .04$). The amount of self-reported surprise was not significantly correlated with ratings of either sound. A one-way ANOVA on the difference between positive and negative affect also revealed no effect of condition.

Sound Evaluations

The two ratings were internally reliable for both the pleasant sounds (α = .96) and the aversive sounds (α = .86). To compute participants' overall rating of each sound, the two ratings were averaged. As predicted, a one-way ANOVA revealed that the mean rating of the aversive sound was significantly lower in the mortality-salience condition, $F(1,42) = 6.06$, $p < .02$ (see Table 2).[2] However, ratings of the pleasant sound were not significantly different in the mortality-salience condition, $p > .2$. There were no significant effects of age, sex, or order of sound presentation.

Discussion

Previous studies of highly religious individuals have consistently reported that religiosity negates or strongly vitiates the potency of mortality-salience effects. However, these studies have predominantly focused on Christians living in Western cultural settings, who, despite the theological possibility of Hell, overwhelmingly anticipate spending their afterlives in Heaven (Panati, 1996). The present study explored whether religiosity would negate mortality-salience effects among Tibetan Buddhists, a population for whom afterlife prospects are relatively alarming (Fremantle & Trungpa, 1975; Lopez, 1998). As predicted, highly religious Tibetan participants rated an aversive burst of pink noise to be less appealing following mortality-salience induction. This finding challenges previous terror management claims that the primary psychological function of religion is to diminish the threat associated with death (Solomon et al., 2004). Further, the finding that mortality-salience biases judgments of an aversive stimulus unrelated to cultural attitudes illustrates the generality of the psychological mechanisms underlying worldview defense, replicating a prior experiment conducted in Northern Ireland (Holbrook et al., 2011, Study 1).

Against predictions, however, the pleasant sound was not rated more positively, possibly because the pleasant sound was not considered as appealing by the Tibetan sample as by the previous participants in Northern Ireland (the limited size of the available Tibetan sample precluded pretesting of the target stimuli). Despite this limitation of the current results, worldview defense has previously been measured using only one aversive target essay (e.g., Arndt et al., 2001). Arguably, therefore, the significant decrease in ratings of the aversive sound following mortality-salience therefore qualifies as a parallel bias to worldview defense.

As expected, self-reported adherence to Tibetan Buddhism did not diminish the potency of cues of death to bias the incidental evaluation. It was not possible to test whether religiosity

correlated with evaluation bias as religiosity was at extreme ceiling levels in both conditions. These extraordinarily high levels of self-reported religiosity are not surprising given the centrality of spirituality in Tibetan culture (Samuel, 1993; Thurman, 1994).

Study 2

Study 1 demonstrated that high levels of Tibetan Buddhist religiosity did not suppress the influence of mortality-salience on an aesthetic judgment, but did not measure worldview defense, the foremost measure of prior research on the mitigating effects of religiosity on unconscious alarm. Accordingly, in Study 2, highly religious Tibetan Buddhist participants were exposed to subliminal threat cues prior to evaluating attitudes toward Tibetan culture. This design tested whether, as terror management theory claims, intense religiosity obviates the need for worldview defense (Greenberg et al., in press). In addition, by employing a non-death alarm cue (angry faces), this study also replicates prior tests of whether subliminal cues which do not pertain to death may prompt worldview defense (see Holbrook et al., 2011, Studies 3 and 4).

Participants

47 adult Tibetan students from Qinghai Normal University were recruited to participate in exchange for 15 RMB (approximately U.S. $2.20 at the time of the study) in compensation. Two outliers of approximately three standard deviations from the mean of the primary dependent variable were removed (Kirk, 1995). This left a sample of 45 participants (12 women) ranging in age from 18 to 25 years (M = 20.89, SD = 1.34).

Materials and Procedure

After consent was obtained, participants were told that they would be helping with two unrelated studies: one involving gender classification, and another involving author evaluation.

Participants were tested individually. All materials were presented in Tibetan using the software platform Inquisit (Inquisit 3.0.1.0, 2008).

After obtaining demographic information, including the self-report religiosity item used in Study 1, participants were asked to classify a series of faces according to gender. This task actually provided an opportunity to subliminally prime participants. The induction modified a gender classification procedure used by Winkielman, Berridge and Wilbarger (2005a), in which subliminal face images were embedded between the plainly visible neutral faces of men and women. The subliminal and supraliminal face stimuli were taken from the Japanese and Caucasian Facial Expressions of Emotion set (JACFEE; Matsumoto & Ekman, 1988) and converted to greyscale. In a between-subjects design, angry faces were used as an alarm cue associated with threat but not particularly related to death in the experimental condition, and subliminal neutral faces were used in the control condition.

The gender classification task consisted of a practice block and an experimental block of eight trials each. During the practice block, subliminal neutral faces were interpolated between the visible neutral faces. Each trial began with a forward mask (a cross shape) presented for 50-ms, followed by a 32-ms subliminal image, followed by a plainly visible male or female face as the backward mask (see Figure 1). The visible male or female face remained on the screen until the participant entered a gender classification response, at which point the next trial immediately commenced. The visible faces never repeated—16 different male and female neutral faces were presented in random order, divided evenly by gender and ethnicity. The subliminal experimental sequences included four different randomly selected angry or neutral faces.

After the gender identification task was completed, participants were asked to read two essays ostensibly written by Western visitors to Tibet. One essay was intended to be pleasantly complimentary toward Tibetan culture:

> "The first thing that I realized when I came to Tibet was the incredible kindness of the people. Everyone I met was glad to help me out when I needed it. Not only are the people nice, but Tibetans also love making jokes and having a great time. When a Tibetan promises you something, you can be totally sure that they will do it. And of course, the culture and tradition that I experienced when visiting monasteries and historical sites was simply amazing. Where I am from, most people have forgotten that life can have honesty, compassion and joy. In this country, people still remember these things. While there are problems anywhere, Tibet truly is a great place and I don't regret visiting there at all."

The other essay was intended to be aversively critical of Tibetan culture:

> "When I first came to Tibet I believed it was the "land of compassion" but I soon realized this was not true at all. The people here talk about compassion, but they are basically selfish. They say they are caring, but they kill and eat animals without even thinking about it. If you make a plan with a Tibetan they are always late, I guess because they think it is OK to waste your time. They say they want equality but nobody cares about the women. The men only let women cook and clean and work themselves to death because no Tibetan man would do it. And Tibetan women are cowards who don't even think about making life better for themselves. Tibet thinks it's a great place but it's not."

The essays were presented in counterbalanced order. After reading each essay, participants were asked to rate the author according to Tibetan translations of items modified from the Interpersonal Judgment Scale (IJS; Byrne, 1971), which has been adopted for use in previous worldview defense research (e.g., Greenberg, Arndt, Schimel, Pyszczynski, & Solomon, 2001; Navarrete & Fessler, 2006; Navarrete et al., 2004). Participants clicked one of nine horizontally displayed buttons with their mouse to rate their agreement with the following seven statements about each author on a 9-point Likert scale (1 = *not at all*, 9 = *extremely*): (a) "This person is likable," (b) "This person is intelligent," (c) "This person is well-informed," (d) "This person is

moral," (e) "This is the kind of person I would like to work with," (f) "This person is honest," and (g) "This person is well-adjusted."

Following the author ratings task, suspicion was checked by asking participants to volunteer any ideas they had about the intent of the experiment. As a manipulation check, participants were also asked whether they noticed any hidden or subtle images during the gender identification task. If so, they were asked to describe what they may have observed. No participant evinced suspicion that covert images were embedded within the gender identification task. Finally, participants were thanked, compensated, and debriefed.

Results

Self-reported religiosity

Self-reported religiosity was at ceiling levels in both conditions (television-salience, M = 8.67, SD = 1.07; mortality-salience, M = 9, SD = .00).

Worldview defense

The seven IJS ratings items were internally reliable (α = .86 for both authors). Consequently, the seven items were averaged to create one composite rating of each author.

A one-way ANOVA revealed that exposure to subliminal angry faces led to a statistically significant increase in ratings of the pro-Tibet author, $F(1, 43) = 10.1$, $p < .01$, (see Table 3 for means), but not a decrease in ratings of the anti-Tibet author. To the contrary, there was a nonsignificant trend for angry-face exposure to improve ratings of the anti-Tibet author, $F(1, 43) = 3.1$, $p < .09$. There were no significant effects of age, gender, or order of essay presentation.

Discussion

The unconscious vigilance model predicted that the non-death threat manipulation would evoke worldview defense in Tibet, replicating the findings of prior research conducted in the

United States (Holbrook et al., 2011, Study 3). The present participants' strong commitment to Tibetan Buddhist afterlife beliefs also provided an opportunity to test terror management theory's functional view of religion, according to which powerful afterlife convictions of any sort should negate the need to defend one's cultural worldview. The findings provide partial support for the unconscious vigilance framework: the complimentary author was evaluated more positively following implicit threat primes despite extremely high self-reported religiosity, and the cue which evoked this expression of worldview defense was not of death.

In a nonsignificant trend, however, the Tibetans in the experimental condition also rated the author of the "anti-Tibet" essay more positively. This unanticipated failure of the subtle alarm induction to intensify negative ratings of the critical author was explored in follow-up interviews with participants about the opinions expressed in the critical essay. These discussions revealed that the ostensibly aversive essay was often received as a somewhat laudable, if cantankerous, critique of inequity in Tibetan culture. Many of these relatively progressive college undergraduates stated that they were inclined to agree with statements such as "[Tibetans] say they want equality but nobody cares about the women." From the point of view of these participants, it seems that they were presented with two basically worldview-congruent essays—one of which possessed an overtly caustic tone. In light of the participants' feedback, and the previous findings of worldview defense following subliminal angry face cues (Holbrook et al., 2011), the Tibetan participants' tendency to favour the critical author may be plausibly reframed as a non-significant trend in the direction of worldview defense. It should be stressed, however, that follow-up work using an unambiguously aversive essay is required to confirm this interpretation.

The notably high degree of collectivism in Tibetan culture (Samuel, 1993) raises a final potential limitation of Study 2. Trait collectivism has correlated with evaluation bias in prior studies of worldview defense (Navarrete et al., 2004, Study 4; Navarrete, 2005, Study 2). This raises the possibility that high religiosity and collectivism were in a "tug of war" wherein collectivism trumped the tendency of religiosity to reduce or negate worldview defense. A follow-up study measuring collectivism with Tibetan Buddhists would be unlikely to clarify the matter, however, as collectivism and religiosity are both liable to reach ceiling levels. To disentangle the contributions of religiosity and collectivism, future studies might be conducted with individualist participants who subscribe to alarming afterlife beliefs. Despite this unresolved question, the present data are sufficient to show that extremely high levels of Tibetan Buddhist religiosity were, at minimum, insufficient to override worldview defense.

General Discussion

Terror management theory postulates a psychological adaptation evolved to suppress death anxiety via the endorsement of cultural worldviews. With respect to the outputs of the process underlying worldview defense, mortality-salience induction led the Tibetan participants in Study 1 to rate a burst of static significantly more aversive. Conversely, on the input side of the equation, a subliminal threat unrelated to death led to worldview defense in Study 2. The present data thus cross-culturally replicate previous research (Holbrook et al., 2011), and indicate that worldview defense does not owe to a psychological adaptation designed specifically to intensify commitment to group values or reduce the fear of death. The unconscious vigilance account offers a simple alternative: worldview defense tokens heightened sensitivity to affective stimuli following subtle alarm.

Some might be tempted to argue that the unconscious vigilance model merely sketches the proximate mechanism by which a terror management adaptation generates worldview defense, but this would contradict core principles of evolutionary theory. Darwinian adaptations are characterized by proximal mechanisms whose design attributes precisely correspond to their functions, like keys fitting locks (Tooby & Cosmides, 2005; Williams, 1966). Given that a broad class of subtle alarms may theoretically initiate worldview defense, and that evaluations of incidental affective targets can be biased during mortality-salience whether or not they pertain to cultural attitudes, the psychological process underlying worldview defense does not qualify as an adaptation specialized for either death concerns or cultural attitudes (Buss, Haselton, Shackelford, Bleske, & Wakefield, 1998; Thornhill, 1997; for a fuller presentation of this argument, see Holbrook et al., 2011).

For the same reason, the evolutionary origins of unconscious vigilance will not be clarified until the domain-specificity of the unconscious vigilance system is empirically delineated. Unconscious vigilance might be a threat-detection adaptation specifically designed to marshal responsiveness to background hazards or resources upon detection of subtle alarm cues, or may have arisen as a by-product of more encompassing systems evolved to facilitate executive task-shifting in various contexts. To begin to adjudicate these alternatives, it will be necessary to determine whether alarming reward cues (e.g., erotic, food, or monetary stimuli) instigate unconscious vigilance and consequent judgment biases comparably to threats. Another fundamental question is whether multiple domain-specific vigilance systems mobilize strategic responses to integrally related affective targets—for example, background cues of disease may engender a heightened sensitivity to pathogenic food or conspecifics in a way that does not translate to evaluations of cultural or aesthetic targets. Work assessing the domain-specificity of

the unconscious vigilance system (or, as it may turn out, systems) is currently underway. Whatever the outcome of these investigations, the results of the current studies and the series reported in Holbrook et al. (2011) are sufficient to establish the relative domain-generality of the evaluation bias triggered by death cues.

Unconscious Vigilance, Mortality-salience and the Supernatural

Terror management theory contends that religion's core function is to convey a sense of immortality, and thus curtails mortality-salience effects, including worldview defense, by reducing the fear of death (e.g., Landau et al., 2007). Problematically for this outlook, extremely devout Tibetan Buddhists produced biased evaluations of an aversive target stimulus following mortality-salience induction (Study 1), and produced worldview defense following a non-death threat cue (Study 2). These findings are at odds with terror management theory claims that religiosity functions to dispel the threat posed by death or obviate the need to defend cultural worldviews. Beyond worldview defense studies, however, terror management researchers have assembled converging lines of support for their functional construal of human belief in the supernatural. In what follows, this literature is briefly summarized and theoretically re-interpreted from the unconscious vigilance perspective.

Mortality-salience has been shown to increase self-report ratings of belief in paranormal phenomena (Kluck, Pyszczynski, & Landau, 1999). Likewise, exposure to subtle death cues heightens religious participants' endorsements of belief in supernatural abilities such as intercessory prayer (Norenzayan & Hansen, 2006). The finding that religiously credulous participants' exaggeratedly affirm the reality of the supernatural appears analogous to patriotic participants' propensity to exaggerate their nationalistic bias: both sorts of affirmations may reflect a heightened preference for one's beliefs or values following subtle alarm. Indeed, recent

studies of the effects of mortality-salience on belief in "intelligent design theory" versus the theory of evolution directly support this interpretation (Tracy, Hart, & Martens, 2011). The authors found that mortality-salience increased subscription to intelligent design theory, but not when evolutionary theory was framed as an alternate source of existential meaning (Study 4), or when the participant sample was composed of natural-science students predisposed toward evolutionary theory (Study 5). While the authors situate their results within a terror management framework, the finding that mortality-salient natural science students intensified their endorsement of evolutionary theory over a supernatural origin myth is consistent with the unconscious vigilance premise that ideologies will be endorsed insofar as they are regarded positively.

In related terror management research, Solomon and colleagues' (2010) observed that death cues led participants to report a greater desire to possess the supernatural ability to fly. From the unconscious vigilance perspective, the "increased desire to fly" result highlights the apparent arbitrariness of the affective targets susceptible to evaluation bias following subtle alarm (see Table 1). Solomon et al. also found that flying visualizations negated worldview defense following mortality-salience induction. The authors present this result as evidence that supernatural ideation specially functions to quell death anxiety, but alternative interpretations are available. For example, Solomon et al. did not administer a control visualization condition involving a mundane mode of flight (e.g., flying through clouds with a jetpack or a hot air balloon) or any other enjoyable mode and setting of locomotion (e.g., snorkelling in warm water near a coral reef). If such control visualizations negated worldview-defense equivalently to the supernatural visualization, then there would be no reason to attach special significance to the supernatural in negating worldview defense. Absent controls, Solomon et al.'s finding that

flying visualizations negate worldview defense does not demonstrate a privileged role for the supernatural.

These scepticisms are not advanced to deny the obvious conceptual connection between notions of death and the afterlife. Rather, what is at stake is the domain-specificity of the cognitive architecture responsible for worldview defense: unconscious vigilance, or a terror management system integrally wound up with supernatural beliefs.

Implications for Other Functional Explanations of Worldview Defense

Terror management theory is not the only influential adaptationist interpretation of worldview defense. The *coalitional psychology* perspective holds that death cues trigger worldview defense because typical causes of death in the ancestral past were amenable to social support (Navarrete et al., 2004). On this account, worldview defense evolved as a special adaptation for broadcasting in-group allegiance to solicit aid and bolster social relations in times of need (Kirkpatrick & Navarrete, 2006; Navarrete & Fessler, 2005). Angry faces constitute a clear cue of the need for coalitional allies; consequently, the results of Study 2 might be rebranded as evidence that subliminal coalitional threat cues prompt worldview defense via a specialized adaptation. However, the coalitional psychology approach, like terror management theory, cannot account for the influence of mortality-salience on affective targets unrelated to cultural attitudes (Study 1; also see Holbrook et al., 2011, Studies 1 and 2). In addition, worldview defense has been previously documented to follow a subliminal threat that was not related to coalitional support in a domain-specific fashion (i.e., the word "pain"; Holbrook et al., 2011, Study 4). Thus, although the present discussion has focused on terror management claims, the unconscious vigilance hypothesis also challenges the portrait of worldview defense as an adaptation for fostering coalitional relations.

Uncertainty management theory provides a third functional possibility, that mortality-salience spurs worldview defense because death numbers among a range of topics about which people are profoundly unsure or perceive as conflicting with their goals. The uncertainty management take on worldview defense differs from terror management theory or coalitional psychology models in that the underlying psychological mechanism is proposed to respond to an open class of goal-conflicts (Inzlicht, McGregor, Hirsh, & Nash, 2009; McGregor, 2006; van den Bos, 2009; for a similar argument, see also Proulx, Inzlicht, & Harmon-Jones, 2012). According to McGregor and colleagues' influential articulation of uncertainty management theory, a phylogenetically ancient neural complex which evolved to enable goal-pursuit registers cues of personal uncertainty—or any other sort of poignant threat—as a goal-conflict. Upon registering a goal-conflict, this low-level system is said to sustain goal-pursuit by triggering "defensive zeal" for personal convictions and cultural ideals, which are represented in modern humans as abstract personal goals in higher cortical centers (for a detailed account, see McGregor, 2006). According to this model, defensive zeal may manifest as magnified "value convictions, communal commitment, closed-minded certainty, angry jingoism, religious fervor, or political extremism," all of which reduce the anxiety attendant to goal-conflict in order to "re-engage feelings of hope and strength" (McGregor, 2006, p. 299). Unlike uncertainty management theory, the unconscious vigilance interpretation of worldview defense does not speak to whether producing magnified ratings of ideological cultural targets assuages deep-seated anxiety, nor does it conceptualize such heightened judgments of cultural targets as more psychologically meaningful than biases of other sorts (e.g., aesthetic judgments).

In line with their functional portrayal of worldviews, uncertainty management theorists assert that "religion provides people with a meaning system that helps them navigate through and

understand an infinitely complex and uncertain world" (Inzlicht, et al., 2009, p. 2). Inzlicht and colleagues propose that religiosity minimizes the potency of threat signals and that this bluntness is reflected at the neural level by reduced reactivity in the anterior cingulate cortex, a region linked with experiences of anxiety connected to performance errors, outcome uncertainty, the simultaneous activation of competing goals, social rejection, and other problems (Hajcak & Foti, 2008). To test this prediction, Inzlicht et al. (2009) assessed trait religiosity in terms of self-reports of religious zeal (Study 1) and belief in God (Study 2) from predominantly Christian participants, then measured anterior cingulate activity during performance of the standard Stroop (color vs. color word) task. As predicted, religious zeal and belief in God both negatively correlated with anterior cingulate reactivity (Inzlicht et al., 2009). Next, Inzlicht and Tullett (2010) experimentally primed religion and once again found reduced anterior cingulate reactivity. The researchers concluded that religiosity dulls threat-detection as an anxiolytic buffer literally comparable to drugs such as Xanax (Inzlicht et al., 2009; Inzlicht & Tullet, 2010).

The present results are in tension with the uncertainty management view of religion to the extent that unconscious threat-related bias was evoked in our devoutly religious sample. However, there are major differences in design that should be taken into account. Inzlicht et al. did not measure evaluations of affectively valenced stimuli or present commensurately alarming cues (i.e., Stroop color-word incongruencies do not seem equivalent to reminders of death or subliminal angry faces). Perhaps most importantly, the lack of variance in the Tibetan sample prevented tests of the relative impact of religiosity—it is possible that less religious Tibetans would have displayed greater evaluation bias following the alarm inductions, as Inzlicht and colleagues' model predicts. Thus, though the present results do not contradict Inzlicht et al.'s work, they suggest that investigators exploring differences in threat-detection associated with

religiosity should seek out more diverse samples. You cannot draw conclusions about "religion" on the basis of data limited to Western faiths (Boyer, 2001; 2003).

Limitations

The present research is limited in several important ways. Foremost, there is no study pairing mortality-salience induction with a worldview defense measure. Although the subliminal angry-face induction design of Study 2 applies to terror management claims about religiosity insofar as group bias is supposed to reflect underlying death concerns, a Tibetan Buddhist replication of prior mortality-salience worldview defense studies is necessary to permit a direct comparison to studies conducted with Judaeo-Christian samples. In addition, the extreme ceiling levels of self-reported religiosity in both studies, although clearly attesting to the Tibetan participants' convictions, prevented correlations of religiosity and evaluation bias: a follow-up study including less devout Tibetan Buddhists should be conducted. Furthermore, the results of both studies uncovered problems with the experimental materials: in Study 1, the pleasant sound borrowed from prior research in Northern Ireland was rated as neutral in both the control and experimental conditions; in Study 2, the caustic essay intended to be objectionable was met with wide agreement. Unfortunately, subsequent to the analyses of Studies 1 and 2, relations between the Tibetan population and the Chinese government frayed following widespread Tibetan protests against the economic and social inequities of the Chinese occupation (Wong, 2009). Shortly thereafter, the Chinese government dismantled the field site, an English-language program focused on empowering young Tibetans, and the participant pool was dispersed. Follow-up studies are therefore pending the establishment of an alternate field site. Rather than delaying dissemination of novel results gathered in a previously understudied population, Studies 1 and 2 are presented here with full acknowledgment of their limitations, and in the hope of

enlivening interest in further worldview defense research among non-Judaeo-Christian religious samples.

Conclusion

Religiosity appears to carry different psychological consequences for Tibetan Buddhists than for the adherents of Western faiths who participated in prior terror management research. In the present research, remarkably high levels of Tibetan Buddhist faith did not prevent mortality-salience bias, indicating that strong religiosity only nullifies mortality-salience effects when afterlife doctrines reduce the perceived threat posed by death. As cognitive scientists dedicated to the study of religion have long recognized, explaining religion according to any "one-liner" function (e.g., religion exists to allay anxiety) disastrously oversimplifies a complex phenomenon (Boyer, 2003).

Terror management theory depicts worldview defense as evidence of a psychological adaptation to "control death-related fear by conferring meaning and significance to the universe" via investment in cultural beliefs, particularly religion (Landau et al., 2007, p. 495). In contrast, the unconscious vigilance model is agnostic about whether, outside the laboratory, the worldview defense bias actually alleviates anxiety, reinforces meaning, or serves any intrinsic purpose. The extant data are consistent with the possibility that worldview defense meets an intrapsychic need for certainty or meaning (e.g., van den Bos, 2009; Proulx, Inzlicht, & Harmon-Jones, 2012), attracts coalitional allies during times of threat (Navarrete, 2005), or is otherwise useful. Nonetheless, the accumulating evidence that the undergirding mechanism is unconscious vigilance suggests that this experimental effect, despite having inspired elaborate intellectual edifices, may be a glorified glitch.

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Footnotes

[1] This presentation of the Tibetan Buddhist conception of the afterlife derives not only from the cited scholarship, but also from conversations with Tibetan informants conducted by the first author during two months of field study.

[2] The distribution of ratings of the aversive sound was significantly skewed toward the bottom of the scale. However, ANOVA has been found resilient to skew (Kirk, 1995). In addition, a follow-up Mann-Whitney test found the effect of condition significant, $U = 170.5$, $p = .035$, one-tailed. A one-tailed test is justifiable when, as in this case, the predictions are highly directional.

Table 1. *Types of Evaluations Influenced by Mortality-salience*

Evaluation	Studies
"worldview defense"	e.g., Greenberg et al., 1990
aesthetic sound and image ratings	Holbrook, Sousa, & Hahn-Holbrook, 2011
dislike of non-representational art	Landau, Greenberg, Solomon, Pyszczynski & Martens, 2006
dislike of public breastfeeding	Cox, Goldenberg, Arndt, & Pyszczynski, 2007
desire to be able to fly	Solomon, Greenberg, Pyszczynski, Cohen, & Ogilvie, 2010
conformity to social norms	Gailliot, Stillman, Schmeichel, Maner, & Plant, 2008
dislike of inconsistent behavior	Landau et al., 2004
religious conviction	Jonas & Fischer, 2006
dislike of sensation (for neurotics)	Goldenberg et al., 2006
desire for luxury goods	Kasser & Sheldon, 2000
desire to have children	Wisman & Goldenberg, 2005
suntanning to appear attractive	Routledge, Arndt, & Goldenberg., 2004
seeing humans as unlike animals	Goldenberg, et al., 2001

Note. This list is intended to be representative but is not exhaustive. The diversity of evaluations influenced by mortality-salience underlines the apparent arbitrariness of the affective targets susceptible to bias.

Table 2. *Influence of Mortality-salience on Evaluations of Aversive Sound*

Sound Rating	Control	Death	*F*
Mean	2.65	1.28	6.06*
SD	2.45	.44	-
N	24	20	-

* $p < .05$

Table 3. *Influence of Subliminal Angry Faces on Author Ratings (Worldview Defense)*

Praising Author	Neutral Face	Angry Face
Mean	5.59	7.05 **
SD	1.67	1.43
Caustic Author		
Mean	4.34	5.24 †
SD	1.78	1.65
N	21	24

** $p < .01$ † $p < .09$

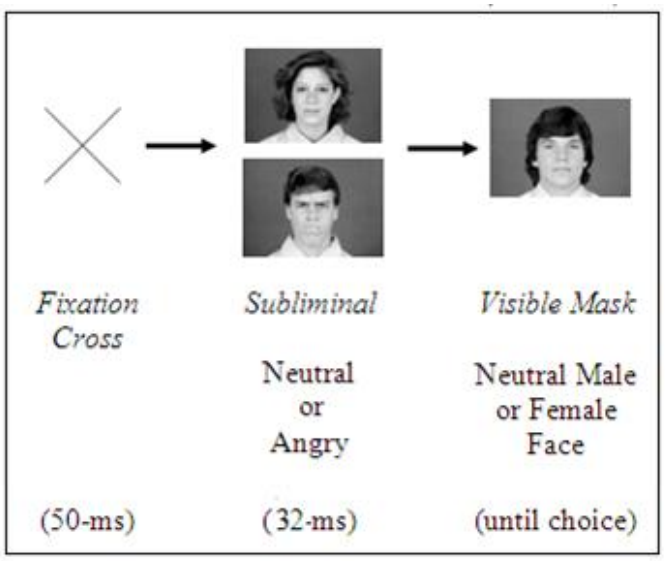

Figure 1. Gender classification task. In Study 2, participants were primed with subliminal faces embedded within a gender classification task (modified from Winkielman et al., 2005a). Immediately following this task, participants rated the authors of a pair of essays about Tibetan culture.