

EFFECTS OF MORTALITY SALIENCE AND UNCERTAINTY ON  
IMPLICIT ATTITUDE TOWARD RELIGION

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EFFECTS OF MORTALITY SALIENCE AND UNCERTAINTY ON  
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## Abstract

Reminders of death and personal uncertainty are so distressing that many individuals turn to religion for protection against the fears these reminders can conjure. To investigate this, the current study compared the effects of mortality salience (MS) and uncertainty salience (US) on implicit attitude toward religion. Differences in effects of MS and US on implicit positive attitude toward religion were predicted. A sample of 45 religious female undergraduates participated. After completing a demographic questionnaire, implicit measures of attitude toward religion were assessed using an affective priming task (APT) measuring reaction times (RT) to word valence classification following religious image primes. Participants then completed a written response to a prompt priming MS, US, or a control topic. A second APT tested changes in implicit attitude toward religion following this manipulation. A mixed ANOVA compared valence biases within repeated measures of APTs, between manipulation conditions, and between ethnicities. Results revealed a significant 4-way interaction between time, word valence, condition, and ethnicity. Results suggest that neither MS nor US induced significant changes in attitude toward religion that would imply greater defense of worldviews (i.e. more positive attitude toward religion) following existential distress.

## **EFFECTS OF MORTALITY SALIENCE AND UNCERTAINTY ON IMPLICIT ATTITUDE TOWARD RELIGION**

Religion is characteristic of all cultures throughout history and provides many meaningful answers to existential questions, such as the meaning of life and the characteristics of death. Despite the emotional and psychological price inherent in the laws and standards prescribed by religion, research suggests that religious people confront less distressing inner conflict than non-religious people (Neyrinck, Vansteenkiste, Lens, Duriez, & Hustebaut, 2006; Ryan, Rigby, & King, 1993). Though seemingly paradoxical, adherence to the standards prescribed by a religion can minimize distressing inner-conflict due to religion's palliative properties. For example, religion can bring emotional comfort to believers seeking answers to existential questions. The purpose of the current study was to investigate the ways in which an individual's attitude toward religion can be manipulated in response to provoked states of existential distress. It was assumed that reminding participants of anxieties that could be assuaged by religion could effectively cause them to cling more tightly to it. This assumption is supported by studies that have induced mortality salience (MS) by reminding participants of imminent death (Friedman, 2008), in addition to studies that have induced uncertainty salience (US) by reminding participants of personal uncertainty (McGregor, Nash, & Prentice, 2010; McGregor, Haji, Nash, & Teper, 2008).

In the current study, effects MS and US on implicit attitude toward religion were directly compared to determine any difference between the cognitive states and their influence on religiosity. To better understand the phenomena at hand, religion will first be briefly explained, followed by an introduction to MS and US as well as the implicit measures used to examine their effects on attitude toward religion. These issues provide the background to the current study and its objective to delineate the nature of and differences between effects of MS and US on attitudes toward religion.

Many religious followers believe in forms of literal or symbolic immortality as a response to the inevitable human state of non-existence. Symbolic immortality can be defined in a multitude of forms such as perpetuation of the ancestral line through future generations or leaving behind a legacy of fame or fortune. Castano, Yzerbyt, and Paladino (2004) consider social identification an important form of symbolic immortality in which a personal identity resists mortality by depending upon a group that outlives the individuals of which it is composed. This conceptualization of immortality is especially evocative of Émile Durkheim's (1912) interpretation of the society itself as a symbol of the infinite being that is the focus of religious worship, surviving beyond the lives of individuals. According to Durkheim, the essential characteristics of religion are symbolic interpretations of the symbiotic relationship between society and its people. The importance of social cohesion is thus the fulcrum of religious belief and practice, motivating not only the existence of religion in the first place, but also its maintenance over time. Viewed through Durkheim's interpretation, worship of a supernatural being is the symbolic worship of the society, a force greater than its individual components that

has properties typically assigned to deities, such as eternal life, creation of identity, and powers of unification.

Literal immortality is understood through belief in an afterlife promised by many religions in the form of heaven, paradise, reincarnation, or return to a state of spiritual perfection. When faced with the certain human factor of ceasing to exist at death, maintaining a belief in the continuation of existence after death can bring great comfort. Faith in the continuation of life can assuage even some of the most primal anxieties about personal survival. While literal immortality is not upheld by all religions, it is common to many worldviews and is an important principle for disengaging the believer from fear of non-existence.

Religion also provides its followers a sense of meaningfulness through an understanding of the order of the universe and society. Atran (2002) points out that in addition to upholding the existence of both malevolent and benevolent deities in some form, all religions rely on their deities to handle existential distress. Atran notes that in light of the counterintuitive nature of many religious beliefs that cannot be proven empirically or logically, justification of belief relies on its relief of existential anxieties that constitutes a reason to believe and to continue to trust the efficiency of the belief. Belief in the existence of supernatural entities that have at least knowledge of (and at most, empathy for) the human condition can allay emotional distress through interpretation of human problems as part of a grand plan or divine action. Considering life's struggles as dependent upon the powers of a supernatural entity can bring peace to the believer that finds the world to be unjust and full of seemingly unfair circumstances.

### ***Terror Management Theory***

The rise of experimental existential psychology opened many doors for researchers addressing deeply rooted and commonly experienced states of existential distress. Terror Management Theory (TMT) incorporates a variety of social science disciplines to investigate how individuals evade existential distress by clinging to identity-shaping beliefs and ideologies, referred to as worldviews (Solomon, Greenberg, & Pyszczynski, 2004). TMT research typically involves manipulating some form of existential distress to determine its effects on behavior and attitude toward worldviews, such as ardent defense of personal beliefs, rejection of out-groups (i.e. individuals that do not support one's worldviews), risk-taking, self-esteem, and willingness to self-sacrifice.

Existential anxieties, as defined by Atran (2002), develop from the interaction of evolutionarily necessary emotions (e.g. fear, survival instincts) and evolutionarily necessary cognitive processes (e.g. episodic memory, awareness of the self and others through spans of time and space). For example, humans are often faced with situations that cause them to question life's meaning, such as reminders of mortality or states of uncertainty. These cognitive existential states might be enough to overwhelm humans completely, constantly remaining fearful of death and the unknown at the expense of leading a comfortable life. However, maintaining a cultural worldview that provides a sense of meaningfulness softens the impact of these anxiety-provoking reminders, allowing individuals to find comfort by identifying with a cultural group that provides social support, a collective understanding of the world, and prescribed standards for how to interact within it (Solomon et al., 2004).

The inability to prove the validity of any worldview in particular makes the existence of competing worldviews threatening and thus requires rigorous defense of one's personal worldview at the expense of all others. (Solomon et al., 2004). Because they are often fragile and falsifiable, worldviews require strong social consensus to survive. This relationship entails that worldviews provide individuals with the sense of meaningfulness necessary to survive existential distress, while individuals provide their worldview with the social consensus necessary for it to survive opposing ideologies that can threaten its validity. Clinging to religion's prescribed beliefs and behaviors when faced with existential distress can affirm the worldview's validity if it successfully ameliorates anxiety and can subsequently legitimize the believer's faith by stabilizing a sense of certainty.

A particularly important form of existential distress in the current study is MS, a state of awareness of death as an imminent fact of human life or of personal death relative to oneself or others. MS effects include a variety of worldview defenses, such as zealously supporting one's worldview (e.g. religion) and the in-group associated with it, rejecting out-groups in opposition to the worldview, and denying vulnerability to death (Greenberg, Pyszynski, & Solomon, 1986). MS was one of the first aspects of TMT analyzed in an experimental setting and can be induced in a variety of ways, including open-ended prompts requiring participants to write about their feelings of death, gruesome images and narrative passages evoking death, priming participants with death related words (e.g. coffin, cancer) and many more (Greenberg et al., 1986). MS effects are not contingent upon self-reported mood or anxiety (Solomon et al., 2004) and are very specific to reminders of death, as shown in studies comparing MS effects and

similarly negative but non-death related issues that did not produce MS effects, such as failure, public speaking, social isolation, physical pain, and anxiety in general (Pyszczynski, Greenberg, Solomon, & Maxfield, 2006).

An alternative explanation for the worldview bolstering effects of existential anxiety is US. Some researchers insist that death is uncertain and this uncertainty is what truly provokes MS effects. Therefore, inducing uncertainty in forms unrelated to death should still produce MS effects. Many different methods have been employed to induce uncertainty salience (US), which can be defined as an awareness of a lack of certainty in a specific area of one's life, including activities, goals, future, and identity. Van den Bos (2009) makes an important distinction between personal uncertainty, as is relevant to the current study, and informational uncertainty. Personal uncertainty is characterized by an emotional state specific to self-reflection (e.g. identity confusion, self-esteem deficits), whereas informational uncertainty is characterized by cognitive processes and is not necessarily relevant to the subject's self-assessment (e.g. being unable to fix a broken mechanism, not understanding directions).

A question that is central to the hypothesis of the current study concerns the root of TMT effects and the differentiation between MS and US. TMT research has shown worldview-bolstering effects resulting from the initiation of both MS and US, but this does not necessarily indicate that they activate existential anxiety in the same way. It is intuitive that two conditions with common undertones (e.g. the nature of human existence, maintaining an understanding of personal survival) should produce similar behavioral effects, and some theorists (van den Bos, Poortvliet, Maas, Miedema, & van den Ham, 2005) suggest that reminders of death and reminders of uncertainty are two

sides of the same cognitive coin. However, some TMT theorists argue strongly against equating the two (Pyszczynski et al., 2006). Pyszczynski et al. (2006) vigorously defend the primacy of MS, suggesting that, if it were the case that US produced effects similar to MS effects, it could only be due to some form of association with death thought awareness.

A study conducted by McGregor, Zanna, Homes, and Spencer (2001) found worldview-defensive effects typically associated with MS after priming US by asking participants to imagine a scene in the future. To explain the arousal of MS-typical effects following US, Pyszczynski et al. (2006) suggest that US actually aroused MS, reminding participants of life's transience and the imminent passing into old age and death. Pyszczynski et al. (2006) further conclude that many other proposed forms of existential anxiety producing effects typical of MS (e.g. subliminal priming of snakes or disease) are similarly associated with concepts that invoke thoughts of death, or that effects are due to a worldview threat that produces death-thought accessibility as a result.

In defense of the primacy of US as the true source of worldview defense effects, McGregor et al. (2001) suggests that MS effects are not due to any threat unique to death but to the uncertainty that the idea of death brings about, such as when and how it will occur and what can be expected after death. In support of this argument, Inzlicht, McGregor, Hirsh, and Nash (2009) found that the anterior cingulate cortex (ACC) was activated following US and, furthermore, showed a trend of decreased reactivity when worldview defenses were engaged. This would suggest that clinging to a worldview serves an anxiolytic role for participants confronted with US. However, ACC activation is not specific to uncertainty and is often observed in response to other events unrelated

to uncertainty, such as self-control, pain, and negative affect (Inzlicht, Tullett, & Good, 2011; Dechesne & Kruglanski, 2004).

Research remains ambiguous regarding the difference (if any) between the effects of MS and US regarding the intensity and type of threat they pose (e.g. death is uncertain so uncertainty effects are actually produced). Some studies show parallel effects and others show very clear distinctions (Greenberg, Pyszczynski, & Solomon, 1986). The current study compared these worldview-bolstering effects to determine if there is evidence of equivalence (or lack thereof) in the effects of MS and US on religiosity.

### ***Implicit measures of attitudes***

The internalized nature of religious belief can potentially hinder the objective measurement of religiosity, as there is often a difference between explicitly reported belief and internally contained belief (Wilson, 2002). Explicit measures of attitudes (e.g. surveys, interviews) have raised concerns of validity, as responses are highly vulnerable to bias (Wenger, 2003; Wittenbrink & Schwarz, 2007). For example, asking a subject sensitive questions about highly personal religious beliefs could potentially trigger participant hesitations regarding the interviewer's perception of them or how they feel they *should* respond in light of social pressures. Even anonymous questionnaires pose the problem of responder bias regarding insincere responses provided to reflect an idealized or more socially acceptable self. Ferguson and Bargh (2007) explain that explicit measures of attitudes provide varying responses depending on the context in which they are collected. Responder effects are thus a threat to the validity and accuracy of explicit measures, so research in the realms of beliefs and ideologies begs for more accurate attitude measures (Ferguson & Bargh 2007). Implicit measures, on the other hand, assess

attitudes at their core, before responders have the chance to control their responses (De Houwer & Moors, 2007; Hill, 1994). Because they access attitudes in a way that should not require awareness of the attitudes, they minimize the risk of responder bias (Ferguson & Bargh, 2007; Wenger, 2003).

Various methods have been constructed to access implicit attitudes, many of which include a prime stimulus (e.g. image or word) of a feature of the attitudes being measured, followed by a target not related to the prime that is evaluated by the subject. Typically, the time it takes for participants to respond to the target is used as the implicit measure of attitude, or the dependent variable. This assumes that participants would have an affective, or emotional, response to the stimulus that consequently affects the way they respond to the subsequent target. As explained by Wittenbrink (2007), the effects of priming tasks arise depending upon the compatibility of the prime and the required participant response, where trials of prime-target pairs that are similar in valence are associated with faster responses since the valence of the target is pre-activated through the valence of the prime (Storbeck & Robinson, 2004). In other words, the APT assumes that emotional responses to prime images facilitate the valence evaluation of subsequent target words that match the emotional state. For example, if a prime image is shown that evokes positive affect, the subject will more quickly correctly classify a positive target word than a negative word (Storbeck & Robinson, 2004). Consequently, incongruent prime-target pairs demonstrate an inhibitory effect, such that if a negative word follows the prime's arousal of a positive affect, the response time will be longer, reflecting the amount of time necessary for the participant to adjust his or her affective state to correspond to the valence of the word.

Implicit measures of attitudes were assessed in the current study through a computer-based affective priming task (APT), which measured reaction times to word valence classification tasks following prime images. APTs are often classified as evaluative priming measures, as they compare reaction times between two target categories to be evaluated by the participant, namely *positive* or *negative* words (Wittenbrink, 2007). Furthermore, the APT often includes two types of stimuli, an attitude prime and a control prime. Attitude prime images (e.g. image of hands praying) in the current study were incorporated to prime participants with an immediate affective response to religion. Control primes (e.g. hands holding keys) were used to gain a baseline measurement of response times. Control primes matched the arousal level of religious prime stimuli but were unrelated to the attitudes toward religion that were measured (for examples, see Fig. 1).

The current study examined differences in the effects of MS and US on implicit attitudes toward religion, measured by response latencies following religious prime images. The three manipulation conditions (MS, US, Control) were compared to investigate the possible primacy of one salience condition (MS or US) in affecting attitudes toward religion. Participants included in the current study were limited to those self-reporting a religious affiliation. Non-religious participants were not included due to the theoretically intuitive expectation that measures of religiosity should only reflect significant effects of MS and US on religious participants, since non-religious participants could not be expected to reflect increased religiosity after an existentially distressing manipulation if they did not reflect religiosity at all in the first place.

(Norenzayan, Dar-Nimrod, Hansen, & Proulx, 2007; Jonas & Fischer, 2006). Only female participants were included in analysis due to the gender effect widely studied in the psychology of religion. The gender effect refers to the increased frequency with which females report religious belief and behavior relative to men. (Francis, 1997). In addition to more reports of religious belief and behavior in females, the gender effect is especially relevant to the current study insofar as females report significantly higher levels of death anxiety relative to men. (Russac, Gatliff, Reece, & Spottswood, 2007).

For comparisons of ethnicities, only White and Hispanic participants were included in analysis, excluding African Americans on the basis that they are less likely than Whites and Hispanics to participate in solitary prayer (Gillum & Griffith, 2010). Furthermore, evidence shows that Hispanic-Americans value religion and religious institutions more than European-Americans (Milevsky & Levitt, 2004), but that documentation of comparisons between religiosity of White and Hispanic individuals is lacking (Gillum & Griffith, 2010). For these reasons, analysis was restricted to religious White and Hispanic females. The use of the APT as an implicit measure of attitudes toward religion was also assessed for its ability to accurately depict MS and US effects on religiosity.

## METHODS

### *Participants*

Subjects included 45 religious female Texas State University-San Marcos undergraduate students (average age  $M = 22.41$ ,  $SD = 3.52$ ) recruited through incentives of either extra credit for a psychology course of their choice or \$10 cash payment. Of the total 45 participants, 47% identified their ethnicity as Caucasian, 36% Hispanic, 13% African-American, and 4% Other. For religious affiliation, 92% identified as Christian, 2% identified as Buddhist, and 6% identified as a follower of some other religion. The International Review Board at Texas State University approved the procedures for human subjects in the current study prior to recruitment and data collection (IRB# 2012X4380).

### *Questionnaires*

Participants completed an online questionnaire via SurveyMonkey<sup>TM</sup>. The questionnaire included basic demographic questions (e.g. religious affiliation, ethnicity) and 14 Likert-scaled items addressing worldviews (e.g. religious and political ideologies). A 20-item online filler questionnaire concerning views of Texas State University was administered after salience manipulations as a delay task.

### ***Stimuli***

Prime images consisted of 80 color-photo images equated for size (4" x 5"), contrast, and luminance using Photoshop<sup>TM</sup>. Of the 80 total images, 40 included religious content (e.g. hands praying, prayer beads, meditating monks) and 40 included non-religious content (e.g. hands holding grains, a bicyclist, landscape). Both image types were split into two sets corresponding to the two administrations of the APT. Religious images served as religion primes, while non-religious images were chosen as neutral control primes.

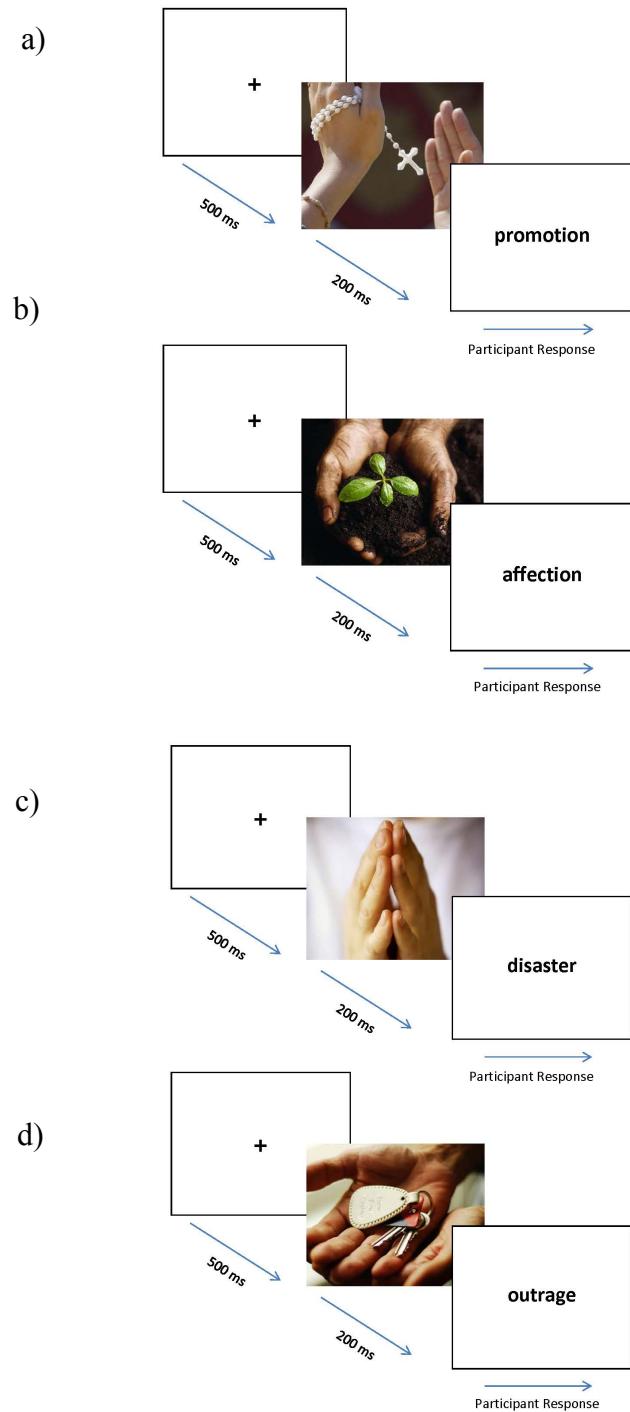
Targets consisted of 40 positive (e.g. promotion, affection) and 40 negative (e.g. disaster, outrage) words selected from the Affective Norms for English Words (ANEW) database, which includes 1034 words with their corresponding mean ratings of valence and arousal (Bradley & Lang, 1999). Words were organized into two like-valence sets of 20 positive- and 20 negative words to create the two versions of the APT. Like-valence words did not significantly differ in mean valence overall ( $p > .05$ ), or between like-valence version sets ( $p > .05$ ). Positive words significantly differed in mean valence from negative words,  $p < .001$ . All 80 words were equated for mean arousal with no significant differences in mean arousal between sets ( $p > .05$ ).

### ***Affective Priming Task***

The APT required participants to view centrally-presented prime images on a white background, immediately followed by a positive or negative valence word in black 32-point Arial font centered on a white background. SuperLab Pro v.2.0 (Cedrus, CA) was used to randomly present image-word pairs during each series. Participants were informed of their task to classify words presented on the screen as either positive or

negative using designated numbers on the computer keyboard. They were instructed to respond using one key for positive classifications and another for negative. Key press instructions were counterbalanced across participants (Version A: “Press 1 for positive, 2 for negative;” Version B: “Press 2 for positive, 1 for negative”).

After a 4-trial practice run, participants began their experimental trials. Each series of the APT phase consisted of 80 trials of image-word pairs randomly presented without replacement (20 religious image-positive word, 20 religious image-negative word, 20 control image-positive word, 20 control image-negative word). For each trial, a fixation screen was first presented for 500 ms, which consisted of a black cross, centered on a white background. Following the fixation, a prime image was presented for 200 ms immediately followed by a target word that remained visible until participant response (see Fig. 1). Participant reaction times (RTs) and classification responses were recorded, and RTs (ms) were compared across both series.



**Figure 1. Example of APT Trials.** (a) Religious image-positive word. (b) Control image-positive word. (c) Religious image-negative word. (d) Control image-negative word.

### ***Prompts and salience conditions***

Each participant was randomly assigned one of the three manipulation conditions, which were administered as writing prompts. The three manipulation variables included a mortality salience prompt, an uncertainty salience prompt, and a control prompt unrelated to death or personal uncertainty (see Appendix A). This control prompt was created to induce thoughts of non-personal distress assuaged by the apparent solution offered by participants, a condition similar in structure to the first two prompts, though not conducive to personal existential distress.

### ***Procedure***

After providing informed consent, participants were seated in front of a desktop computer in a private room. Participants then completed the intake survey over basic demographics as well as beliefs and ideologies. After finishing the intake survey, participants were instructed to complete the first of two APTs. Upon completion of the first APT, they were provided their randomly assigned writing prompt and instructed to write a response in 3-5 minutes.

Following the writing prompt, participants were instructed to complete a 3-minute filler task in the form of a questionnaire concerning views as a student of Texas State. This task was included based upon research showing the necessity of approximately three minutes of latent distraction for the thought-accessibility of salience conditions to arise (Wichman et al., 2008). Participants then completed the second APT. Finally, participants were debriefed and received their choice of incentive (i.e. extra credit assigned to a Psychology course or \$10 cash payment).

### ***Analytic Strategy***

In accordance with typical APT data analysis (Berhet, Kop, & Koudier, 2011), RTs greater than 1500 ms were considered too long to reflect immediate reactions and thus classified as time-outs. Participants with more than 20 time-outs or 20 word classification errors (25% of the 80 trials) on either task were excluded from analysis ( $n = 39$ ).

*Implicit Attitude Indices:* The current study predicted differences in implicit attitudes toward religion, determined by RTs to word classification following religious images. To operationalize the dependent variable of implicit attitudes toward religion, positive and negative implicit attitude indices were calculated prior to statistical tests by computing differences between mean RT (ms) following religious images and mean RT (ms) following control images, for positive and negative target word trials. Index values  $> 0$  (i.e. positive numerical values) indicated slower RTs to religious images relative to control images, while index values  $< 0$  (i.e. negative numerical values) indicated faster RTs to religious images relative to control images. Implicit attitudes toward religion were determined by comparing attitude indices for positive and negative word trials, creating valence bias scores reflecting how positively or negatively participants felt toward religion. In other words, positive difference scores for positive valence words would indicate relatively fewer positive attitudes toward religious images relative to control images, whereas positive difference scores for negative valence words would suggest fewer negative attitudes toward religious images relative to control images.

*Implicit Attitudes Toward Religion:* It was predicted that valence biases for participants in salience conditions (MS, US) would reveal significantly more positive

attitudes toward religion post-manipulation than pre-manipulation, exhibited through an interaction of time, valence bias, and condition. This interaction was predicted based on the hypothesis that salience conditions would have a significant effect on attitudes toward religion. It was also predicted that implicit attitudes toward religion would not be affected by differences in ethnicity and, thus, no main effect or interaction involving ethnicity would be found. To test this, valence biases were analyzed for religious females via a mixed Analysis of Variance  $2 \times 2 \times 3 \times 2$  (ANOVA), including within-subjects factors of time (pre-manipulation task, post-manipulation task) and valence bias score (positive, negative). Between-subjects factors included manipulation condition (MS, US, control) and ethnicity (White, Hispanic).

## RESULTS

### ***ANOVA of implicit attitudes toward religion***

Results of the mixed ANOVA revealed a significant main effect of condition,  $F(2, 36) = 4.071, p = .025$ , which was qualified by the predicted statistically significant interaction between time, valence bias, and condition,  $F(2, 36) = 3.84, p = .031$ . In addition, the interaction between time and ethnicity was found to be statistically significant,  $F(3, 36) = 3.071, p = .04$ . Each of these results was qualified by a significant 4-way interaction between time, valence bias, condition, and ethnicity,  $F(5, 36) = 3.381, p = .013$ . This 4-way interaction revealed that implicit attitudes toward religion differed across time due to a higher-order interaction involving condition and ethnicity.

To understand the 4-way interaction between time, valence bias, condition, and ethnicity, separate  $2 \times 2 \times 3$  ANOVAs were run for White and Hispanic participants, including within-subjects factors of time and valence bias and a between-subjects factor of condition.

### ***ANOVA for White participants***

Results of the ANOVA for White participants ( $n = 22$ ) revealed no significant differences in implicit attitudes toward religion between APTs,  $F(1, 19) = .001, p > .05$ , or between positive and negative word trials,  $F(1, 19) = .142, p > .05$  (see Figs. 2 and 3). Results also showed no significant interaction between time and condition, suggesting no significant changes in attitudes toward religion relative to condition,  $F(2, 19) = .183, p >$

.05. These results suggest that the significant interaction of time, valence bias, condition, and ethnicity in the original analysis was not particularly reflective of differences between White participants. In other words, White participants did not significantly differ in implicit attitudes toward religion after manipulation, regardless of their manipulation condition.

#### ***ANOVA for Hispanic participants***

Results of the ANOVA for Hispanic participants ( $n = 17$ ) revealed a significant main effect of time,  $F(1, 14) = 9.462, p = .008$ , suggesting that Hispanic participants significantly differed in RTs between APTs (see Figs. 4 and 5). Estimated marginal means for Hispanic participants across time showed slower RT to religious images relative to control images in the first APT ( $M = 32.2$ ) and a reversal of this trend in the second APT, reflected by accelerated RT to religious images relative to control images ( $M = -7.3$ ). Because there was no significant interaction between time and condition for Hispanic participants,  $F(2,14) = .559, p > .05$ , results suggest that they simply responded more quickly to religious images than control images in the post-manipulation APT relative to the pre-manipulation APT, regardless of condition.

As with the ANOVA for White participants, results for Hispanic participants did not reveal a significant effect or interaction of condition. These results suggest that Hispanic participants reflected a significant change in RT between the first and second APT regardless of manipulation condition. Thus, the 4-way interaction of time, valence bias, condition, and ethnicity of the original ANOVA was understood to reflect significant changes in RT over time associated with Hispanic ethnicity.

Understanding that the significance of condition could not be traced to either White or Hispanic participants in particular, three separate  $2 \times 2 \times 2$  repeated measures ANOVAs were run for each condition (within-subjects factors of time and valence bias, between-subjects factor of ethnicity) to determine how the significant higher-order interaction from the initial implicit attitudes ANOVA between time, valence bias, condition, and ethnicity was related to manipulation condition.

### ***ANOVA for conditions***

Results of the ANOVAs for each condition revealed no significant effect of time for the MS group,  $F(1,13) = .118, p > .05$ , but a significant interaction between time and valence bias for the US group,  $F(1,9) = 5.117, p = .05$ , and a significant interaction between time, valence bias, and ethnicity for the control group,  $F(2, 14) = 5.627, p = .016$ . For each condition, separate paired samples *t*-tests were conducted for positive and negative valence biases across time to investigate the significant interactions between time and valence bias shown in results for the US ANOVA and control group ANOVA. Results of the paired-samples *t*-tests for positive valence biases revealed no significant difference in positive valence bias scores between APTs for MS ( $t(16) = 1.134, p > .05$ ), US ( $t(12) = .652, p > .05$ ), or the control group ( $t(16) = .127, p > .05$ ). Results of the paired-samples *t*-tests for negative valence biases also revealed no significant difference in negative valence bias scores between APTs for MS ( $t(16) = 1.41, p > .05$ ), US ( $t(12) = 1.497, p > .05$ ), or the control group ( $t(16) = .001, p > .05$ ).

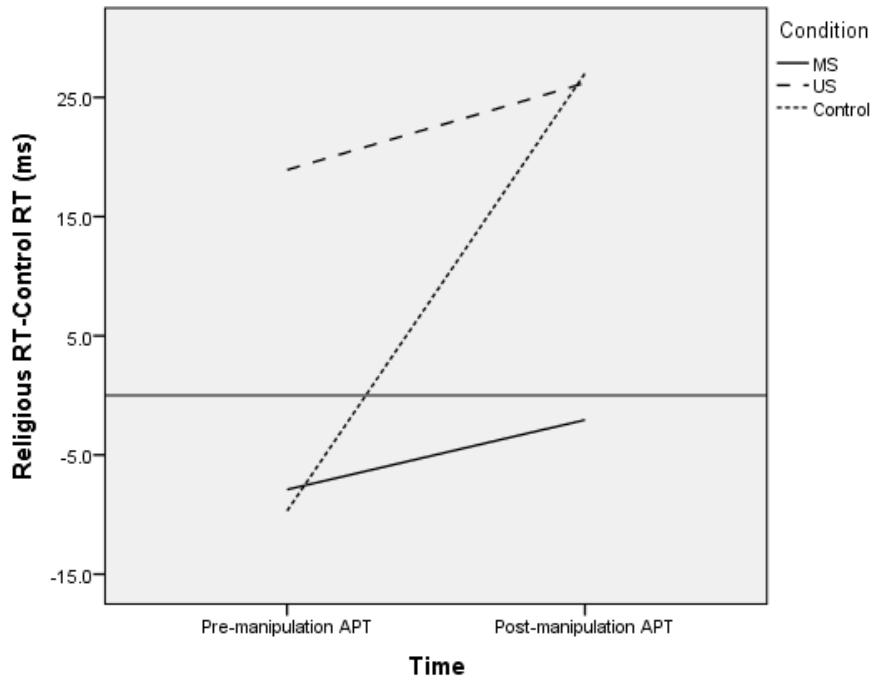
To further investigate the significant interaction between time, valence bias, and ethnicity shown in the control group ANOVA, post -hoc comparisons of valence biases were conducted between White and Hispanic participants, revealing no significant

differences in positive valence bias scores ( $t(28) = .171, p = .866$ ) or negative valence bias scores ( $t(28) = 1.912, p = .066$ ).

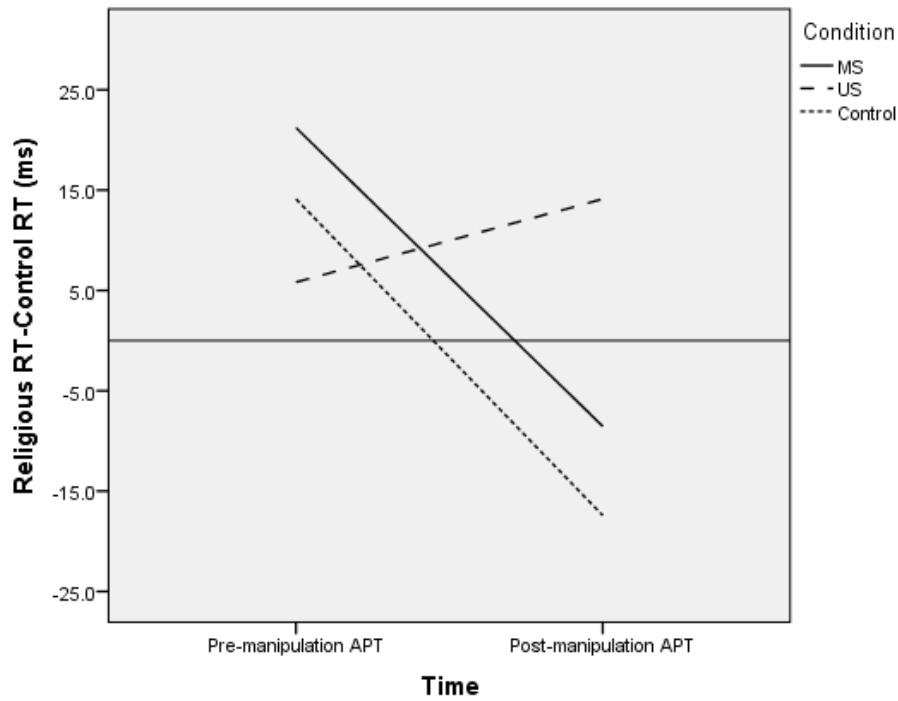
Estimated marginal means of condition groups were assessed relative to time and valence bias, revealing that for participants in the US condition, an initial positive bias for religious images was reflected by positive valence bias scores ( $M = -24.2$ ) and negative valence bias scores ( $M = 43.7$ ). This trend was reversed in the second task, with a negative bias reflected post-manipulation by positive valence bias scores ( $M = 14.6$ ) and negative valence bias scores ( $M = -13.7$ ). This trend for the US group suggests an increasingly negative attitude toward religious images following manipulation. Post-manipulation trends for both the MS group and control group suggest mixed valence biases regarding implicit attitudes toward religion, with results reflecting both less positive attitudes and less negative attitudes toward religion for both conditions. MS results for both APTs reflected less positive (T1:  $M = 31.3$ ; T2:  $M = 6.7$ ) as well as less negative (T1:  $M = 19.0$ ; T2:  $M = 29.7$ ) attitudes toward religion. The control group reflected less positive ( $M = 4.2$ ) and more negative ( $M = -50.9$ ) attitudes toward religion before manipulation, followed by more positive ( $M = -5.0$ ) and more negative ( $M = -4.3$ ) attitudes toward religion after manipulation. Results do not support the initial hypothesis that either the MS or US group valence bias scores would reflect more positive attitudes toward religion post-manipulation relative to the other groups.

Because the paired-samples  $t$ -tests of valence bias between APTs for condition revealed no significant differences in valence biases over time for any of the three condition groups, and because no significant differences in valence biases were found across time or between ethnicities for the control group, it was determined that any

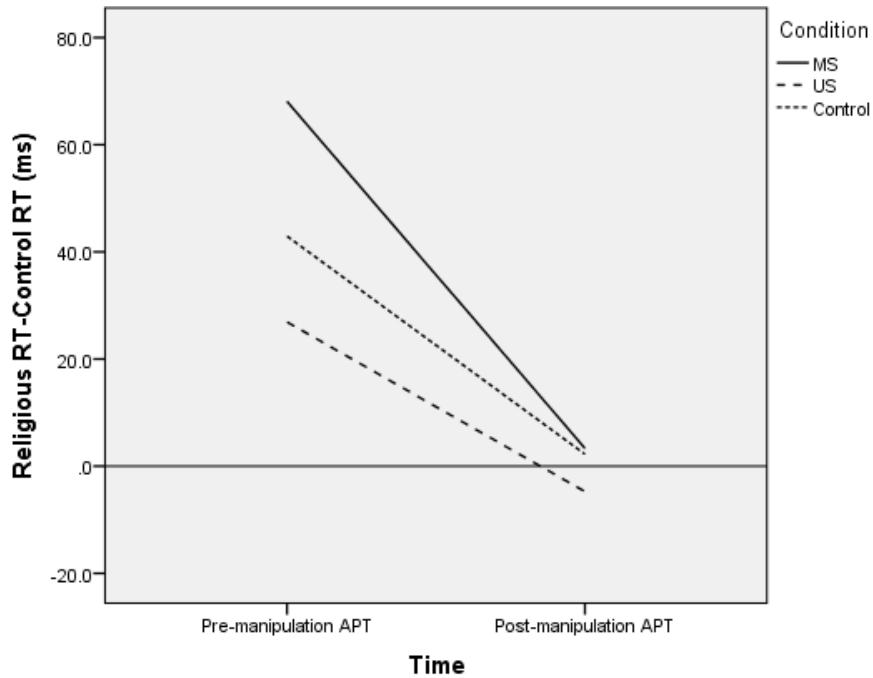
significant differences in valence biases found in the initial implicit attitudes ANOVA were the result of a combination of interacting factors, not any single identifiable source of variance. It was determined through these results that condition alone could not account for differences in valence biases.



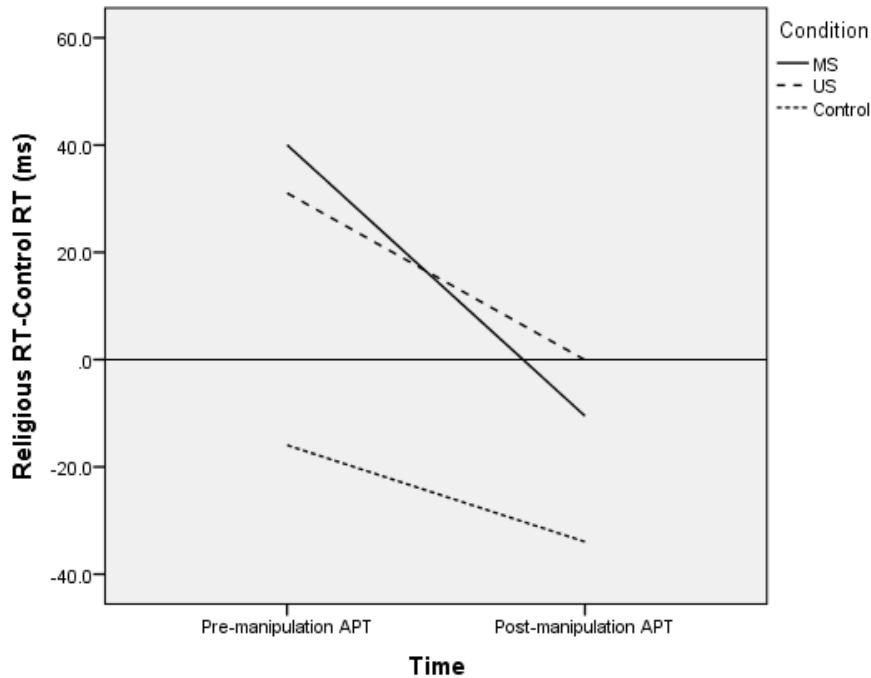
**Figure 2. Positive Valence Bias for White Subjects Between Conditions Across Time.** Each group became less positive over time. MS group had positive attitudes toward religion in first APT that became less positive, though still remaining positive, in second APT. US group had negative attitudes toward religion in first APT that became more negative in second APT. Control group had positive attitudes toward religion in first APT that reversed to negative attitudes in second APT.



**Figure 3. Negative Valence Bias for White Subjects Between Conditions Across Time.** MS group had less negative attitudes toward religious images than control images in first APT that reversed to more negative attitudes toward religious images than control images in second APT. US group had less negative attitudes toward religion in first APT that became even less negative in second APT. Control group had less negative attitudes toward religion in first APT that reversed to more negative attitudes toward religious images than control images in second APT.



**Figure 4. Positive Valence Bias for Hispanic Subjects Between Conditions Across Time.** MS group had less positive attitudes toward religious images than control images in first APT that became more positive in second APT, though still reflecting less positive attitudes toward religious images than control images. US group had less positive attitudes toward religion in first APT that reversed to more positive attitudes toward religious images than control images in second APT. Control group had less positive attitudes toward religion in first APT that became more positive in second APT, though still less positive toward religious images than control images.



**Figure 5. Negative Valence Bias for Hispanic Subjects Between Conditions Across Time.** MS group had less negative attitudes toward religious images than control images in first APT that reversed to more negative attitudes in second APT. US had less negative attitudes toward religious images than control images in first APT that became more negative in second APT, though still less negative toward religious images than control images. Control group had less negative attitudes toward religion than control images in both APTs that became even less negative in second APT relative to first APT.

## DISCUSSION

Comparing attitudes toward religion before and after salience of existentially distressing topics was the central focus of the current study. An initial question concerned the possibility of differences between MS and US and whether these differences might be reflected in acceleration of RTs following religious image trials. Though both MS and US have been studied in the context of TMT, difference in effect between the two conditions has yet to be scientifically established. For example, Loseman, Miedema, van den Bos, & Vermunt (2009) found greater worldview defense in response to US than MS, while Routledge, Arndt, & Goldenberg (2004) found just the opposite, with evidence for greater worldview defense in response to MS than US.

With attitudes toward religion as the worldview defense examined in the current study, it was hypothesized that participants in either the MS or US group would reflect more positive attitudes toward religion after salience induction. However, the results of the current study showed that neither condition induced the hypothesized changes in attitudes toward religion, thus refuting the hypothesized effect of existential distress leading to increased defense of a religious worldview.

Recently, a meta-analysis of TMT research (Burke, Martens, & Faucher, 2010) suggested that if a difference in effects were to exist between MS and US, it would necessarily be dependent upon the qualitative nature of the threat, such that they induce different effects based on the meaning of the threats they pose, not simply the degree. In

their meta-analysis of 277 studies, Burke et al. (2010) found MS effects to be relatively stable, unique, and significantly greater regardless of whether the comparison condition was US, a negative control topic (e.g. reflecting upon dental pain), or a neutral topic (e.g. feelings about watching television). This suggests that MS poses a threat that is distinctive and unique to death as opposed to negative feelings in general. Furthermore, this implies that MS differs from US in the type as well as the intensity of its threat to existential issues. Thus, there is reason to assume that the two conditions are not mere branches of a single root of existential threat but could legitimately vary in the significance of their effect due to an inherent conceptual difference between death threats and uncertainty threats (Burke et al., 2010).

Estimated marginal means for positive and negative valence biases were conducted for each condition to investigate the significant interaction between time, valence, and condition found in the initial implicit attitudes ANOVA. These comparisons revealed that, for the US condition, there was a non-significant trend of a pre-manipulation positive bias for religious images that reversed to a negative bias post-manipulation. Clearly, this trend failed to support the initial hypothesis that subjects would reveal more positive attitudes toward religion post-manipulation than pre-manipulation.

As implicit attitudes indices for both APTs of the MS group revealed a non-significant trend of slower RT for religious image trials of both positive and negative valences, it is possible that religious images were simply more attention grabbing than control images. However, the valence biases for the control group reflected less positive attitudes toward religious images than control images pre-manipulation, followed by simultaneously positive and negative attitudes toward religion post-manipulation. Trends

for the control group's second APT imply faster RT following religious images regardless of valence, which counters the possibility of religious images posing inhibitory distractions. As MS and US effects tend to include an intensified appreciation for one's worldview, future research should attend to the possibility that the manipulation influenced a tendency to take more time reflecting on the worldview-supportive imagery.

The instability of object-relative attitudes is also worth considering, with some researchers suggesting that memories associated with prime images may vary in their valence (Ferguson & Bargh, 2007). This phenomenon might be manifested in alternating attitudes toward prime images depending upon the valence of the memories evoked by them. It is reasonable to assume that because religion is so emotionally and psychologically complex, it could be associated with memories of mixed valences. For example, an image depicting hands in prayer might evoke positive associations relative to memories of positive psychological effects of prayer. However, an image depicting a religious congregation could induce memories of negative feelings associated with an organized service (e.g. feeling bored during a religious service). Future research in implicit measures of attitudes toward religion will benefit from using images more extensively normed for arousal level to ensure that the implicit measures accurately reflect the attitudes under investigation.

There also remains the possibility that MS and US actually differ in their effects relative to individual differences. Given its significance in the interaction with time and in the demonstrated 4-way interaction with time, condition, and valence bias, ethnicity must be taken into account as a possible source of individual differences in attitudes toward religion. The results of the implicit attitudes ANOVA showed that the

hypothesized significance of time was revealed through interactions with ethnicity. The interaction of time and ethnicity suggests dissociations between implicit attitude indices of White and Hispanic participants. Separate ANOVAs for White and Hispanic participants only suggested significant differences in implicit attitude indices between APTs for Hispanic participants.

It is possible that individual differences between ethnicities are due to differences in susceptibility to the effects of the salience conditions on attitudes toward religion, however, literature has not been found to support any differences in MS or US effects dependent upon ethnicity. Because no significant effect or interactions of condition were found in the White and Hispanic ANOVAs of the current study, it was determined that the significance of condition in the original ANOVA was due to a combination of factors only significantly affecting RTs at a higher level of interaction with time, valence bias, and ethnicity. Furthermore, this effect of condition could not be traced to any significance for either White or Hispanic participants, suggesting that changes in RTs were not due to the effects of manipulation condition for White or Hispanic participants in particular. Regarding the implicit attitude ANOVA's demonstrated significant interaction between time and ethnicity, it is also possible that changes in RT over time between the pre- and post-manipulation APT might merely be due to practice effects as opposed to significant individual differences like ethnicity.

Another possible source of significant individual differences that was not examined in this study is religious affiliation. Van den Bos, Loseman, & Doosje (2009) found that Christian participants had stronger reactions to MS, while Muslim participants had stronger reactions US. Participants in the current study were not compared between

religious affiliations, as they were relatively homogenous, with 92% identifying as Christians. However, future research of implicit attitudes toward religion is encouraged to consider the possible significance of religious affiliation and how religious denominations might differ in responses to MS and US.

Another plausible account for individual differences in MS and US effects is a difference in individual religiosity on a categorical level, such that some participants might be more intrinsically religious than others. Intrinsically religious people view religion as an end unto itself, valuing its inherent moral properties and following its principles regardless of social or self-justifying consequences. Extrinsically religious people use religion as a means to an end, depending upon the more superficial benefits it can provide, such as social acceptance or self-justification. Jonas and Fischer (2006) found evidence suggesting that only intrinsically religious individuals reflected effective terror management following MS, insofar as they did not react with worldview defense like extrinsically religious participants. Therefore, whether or not a participant is intrinsically or extrinsically religious might affect whether existential threats have any real effect on his or her attitudes toward religion. Furthermore, type of religiosity might alter responses to religious imagery. For example, images depicting prayer might only stimulate accelerated responses post-manipulation for participants who utilize prayer for means of comfort.

In summary, the results of the current study revealed higher-order interactions between independent variables that blur the source of differences in attitudes toward religion. One plausible reflection upon results concerns the APT's ability to accurately assess attitudes toward religion. As religion is a multifaceted cultural construct that is

highly personal, it represents a complex architecture of individual differences in how it is perceived, appreciated, utilized, and practiced. Where some individuals might be relatively unstable in religious belief, others might be unchanging in their attitudes toward religion. As most TMT research examines worldview defense in the forms of in-group acceptance and out-group derogation, the use of implicit measures to determine attitudes toward religion following MS and US is relatively unique. Perhaps attitudes toward religion are simply too complex to accurately assess through the current study's implicit measures. Future research in implicit measures of religiosity should take task demands into consideration and make efforts to improve the sensitivity of implicit measures of attitudes toward religion. There is much to be investigated through experimental religious studies, such as individual factors involved in varying degrees, denominations, and psychological orientations of religiosity. The use of implicit measures of attitudes toward religion in future research will help clarify the myriad of factors that make religion a pacifying tool for individuals facing existential distress.

## APPENDIX A

### MANIPULATION CONDITION PROMPT SAMPLES

*Mortality Salience:* Please take the next 3-5 minutes to complete a short writing sample explaining your feelings about death. For example, you may wish to discuss your personal feelings, fears, and concerns about death. You may also consider what you think your own death will be like (e.g. what you suspect will happen at the moment of your own death)

*Uncertainty Salience:* Please take the next 3-5 minutes to complete a short writing sample describing a current personal problem or situation which does not have a clear solution. You may wish to include your feelings concerning the problem, how the problem initially arose, or how the problem is especially distressing to you.

*Control:* Please take the next 3-5 minutes to complete a short writing sample about a problem of a friend or family member to which you have provided or could provide a successful solution. For example, perhaps you have recently provided a solution to a friend facing a relationship problem.

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