

Disgust Sensitivity Predicts Defensive Responding to Mortality Salience

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Disgust protects the physical self. The present authors suggest that disgust also contributes to the protection of the psychological self by fostering stronger defensive reactions to existential concerns. To test this idea, 3 studies examined the link between disgust sensitivity and defensive responses to mortality salience or “terror management” processes (Greenberg, Solomon, & Pyszczynski, 1997). Each study included an individual difference measure of disgust sensitivity, a manipulation of mortality salience, and a dependent measure of defensive responding. In Study 1, disgust sensitivity predicted increases in worldview defense in the mortality salience condition but not in the control condition. In Study 2, disgust sensitivity predicted increases in optimistic perceptions of the future in the mortality salience condition but not in the control condition. In Study 3, disgust sensitivity predicted reductions in delay discounting for those in the mortality salience condition such that those higher in disgust sensitivity discounted the future less. This pattern did not occur in the control condition. These findings highlight disgust sensitivity as a key to understanding reactions to mortality salience, and they support the view that disgust-related responses protect against both physical (e.g., noxious substances) and psychological threats.

Keywords: terror management theory, disgust, disgust sensitivity, self-threat, optimism

The emotion of disgust is thought to have evolved as an oral rejection response to discourage the ingestion of noxious substances (e.g., Rozin, Haidt, McCauley, & Imada, 1997). Related to this idea, theorists have proposed that disgust helps to solve multiple adaptive problems, including avoidance of substances associated with disease-causing microorganisms, foods, and fluids (e.g., Curtis, Aunger, & Rabie, 2004); sexual partners and behaviors that may reduce an organism’s long-term reproductive success (e.g., Fessler & Navarrete, 2003); and individuals who may cause harm to oneself or members of one’s social network (e.g., potentially disease-causing out-group members; Faulkner, Schaller, Park, & Duncan, 2004). The common thread woven through each of these ideas is that disgust protects the physical body of organisms from sickness and death and thereby promotes survival (see Tybur, Lieberman, & Griskevicius, 2009).

To parallel the physical defense against death associated with the disgust response, the current investigation examined the possibility that psychological defenses against death are influenced by disgust sensitivity. Much like individuals differ in their disgust responses, which are presumed to have evolved to protect the

physical self, we propose that individual differences in sensitivity to disgust also influence protection of the psychological self. Evolutionary theorists have proposed that newer physical and psychological processes may emerge from or coopt older, existing mechanisms for their own use; this process is known as exaptation (e.g., Gould, 1991). The feathers on a bird offer an example of exaptation insofar as feathers were originally selected for via natural selection to keep birds warm and later were coopted for flight (see Buss, Haselton, Shackelford, Bleske, & Wakefield, 1998). Likewise, disgust may have evolved as a mechanism to protect the body from physical harm and later became useful for protecting the psychological self.

The notion that disgust protects the psychological self in a similar manner to its evolved function of protecting the physical self also accords well with scaffolding theories of the mind (e.g., Williams, Huang, & Bargh, 2009). Scaffolding theories posit that humans automatically integrate new information into existing knowledge structures. This integration gives the new information additional meaning and significance in human experience. As mentioned previously, disgust may have evolved as an oral rejection response to prevent the ingestion of noxious stimuli. From a scaffolding perspective, disgust responses function as a foundational knowledge structure. The ability to contemplate mortality may have built upon evolutionarily more primitive disgust responses to give death meaning—death was something to be avoided. Thus, much like the idea of exaptation, scaffolding theories can also be invoked to predict that disgust may have evolved as a mechanism to protect the body from physical harm and later became useful for protecting against psychological threats. The

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psychological threat of interest in the current investigation was awareness of death.

Terror Management Theory (TMT)

All organisms have a fundamental drive toward self-preservation. Compared with other organisms, however, humans have more advanced capabilities for conscious awareness and abstract thought, which enable humans to contemplate mortality and realize the grim inevitability of death. According to TMT, this uniquely human awareness of death, combined with the drive for self-preservation, elicits a potentially paralyzing existential anxiety that influences much of human psychological experience and interpersonal behavior (Greenberg et al., 1990; Rosenblatt, Greenberg, Solomon, Pyszczynski, & Lyon, 1989).

Numerous experiments have supported TMT by finding that manipulations to increase the salience of death trigger defensive responses aimed at preventing or reducing potential anxiety. The two major defenses against potential death anxiety include bolstering symbolic conceptions of reality that give order, meaning, and stability to life (i.e., worldview defense; Greenberg et al., 1990), and increased striving to live up to cultural standards of value and thereby attain literal or symbolic immortality. Consistent with the hypothesized role of potential anxiety in TMT, individual differences in anxiety-related traits such as neuroticism and self-esteem have been found to influence the use of these defenses when mortality is salient (Goldenberg, Pyszczynski, McCoy, Greenberg, & Solomon, 1999; Harmon-Jones et al., 1997; Schmeichel et al., 2009).

Death and Disgust

We propose that the propensity to experience disgust may also shape how people respond to mortality salience (MS). The sight and smell of dead and decaying bodies elicits disgust (e.g., Croy, Olgun, & Joraschky, 2011), and previous research inspired by TMT has yielded additional empirical support for a link between death and disgust. One experiment, for example, found that participants who had recently thought and written about their own death reported greater disgust reactions to body products (e.g., "It bothers me to hear someone clear a throat full of mucous"; Haidt, McCauley, & Rozin, 1994), relative to participants who had recently thought and written about watching TV (Goldenberg et al., 2001). As Haidt and colleagues (1994) put it, disgust can be considered "a defensive emotion that guards us against the recognition of our animality and, perhaps ultimately, of our own mortality" (p. 712).

Another pair of studies found that disgusting stimuli can increase the accessibility of death-related cognitions (Cox, Goldenberg, Pyszczynski, & Weise, 2007). In the first study, participants who viewed disgusting images (e.g., feces on a toilet) exhibited greater death-thought accessibility relative to those who viewed neutral images (e.g., furniture). In the second study, participants read an essay highlighting either human-animal similarities (e.g., ". . . we're all made up of the same basic biological products. . . . We're all driven by needs for food, water, sex, and comfort") or uniquely human attributes (e.g., ". . . We are . . . complex individuals with a will of our own, capable of making choices, and creating our own destinies"). Next, participants were randomly

assigned to view a series of disgusting images or neutral images. Those who viewed disgusting images exhibited greater death-thought accessibility relative to those who viewed neutral images, and those who first pondered the creaturely similarities between humans and other animals exhibited the greatest death thought accessibility.

These previous findings support the idea that death and disgust-related variables are associated. Specifically, they suggest that MS can increase disgust reactions (Goldenberg et al., 2001), and that disgusting stimuli can make mortality more salient (Cox et al., 2007). But what role do individual differences in disgust play in influencing responses to reminders of death? And is that role limited to the propensity to experience disgust toward the body, as suggested by the findings reviewed earlier, or is it the propensity to experience disgust more generally that matters? The current investigation advances research on TMT by testing the hypothesis that individual differences in disgust sensitivity predict the use of defenses under MS, such that the most highly disgust-sensitive individuals show the most extreme psychological responses to death.

Disgust Sensitivity and Psychological Self-Defense

TMT started as theory of self-esteem and was sensibly centered on anxiety, and several forms of evidence have supported these core tenets of the theory. For example, individual differences in self-esteem have been shown to moderate defensiveness under MS (Harmon-Jones et al., 1997; Schmeichel et al., 2009), and experimental inductions to prevent the experience of anxiety have been found to reduce responses to MS (Greenberg et al., 2003).

As reviewed earlier, disgust is associated with death and may also be relevant to understanding responses to MS. One accepted method for elucidating processes underlying experimental effects is to examine the role of individual difference variables that influence the tendency to engage a proposed process (e.g., Gohm & Clore, 2000; see also Underwood, 1975). Examining whether such individual differences moderate an experimental effect is one way to test assumptions about processes underlying the effect. At issue in the current investigation are the effects of MS manipulations, and one process presumed to underlie these effects is disgust. As we detail next, individual differences in disgust sensitivity have been linked to variations in disgust-related responding. Therefore, evidence that individual differences in disgust sensitivity moderate the effects of MS would lend support to the idea that disgust is a potential process by which MS influences subsequent responding.

We expected individuals higher in disgust sensitivity to be more prone to defensive responses to death because these individuals are more reactive to disgusting stimuli and more motivated to avoid them. For example, brain-imaging research has observed that persons higher (vs. lower) in disgust sensitivity exhibit greater right amygdala activation when viewing disgusting images (Schienle, Schäfer, Stark, Walter, & Vaitl, 2005; see also Stark et al., 2005). Disgust sensitivity has also been found to predict another neural marker of disgust reactivity: activation of the anterior insula (Calder et al., 2007). These findings reveal that persons who report being particularly sensitive to disgust also exhibit more pronounced reactions to disgusting stimuli at the neural level.

Individual differences in disgust sensitivity also predict the motivation to avoid disgusting stimuli. For example, disgust sensitivity is positively associated with behavioral inhibition (Olatunji, Haidt, McKay, & David, 2008). Furthermore, disgust sensitivity predicts behavioral avoidance of potentially disgusting events. One study found that participants higher in core disgust were less likely to comply with a request to chew up a grape, spit it in a cup, and then drink the contents of the cup (Olatunji et al., 2008). Insofar as death is linked to disgust, individual differences in disgust sensitivity should influence how persons respond to MS.

The Current Experiments

Based on evidence linking death and disgust, evidence that individuals higher in disgust sensitivity have stronger reactions to disgust-related stimuli, and the proposed defensive psychological functions of disgust, we reasoned that persons who are particularly sensitive to disgust should react more strongly to thoughts of death and be more motivated to reduce or avoid them. In three studies, we measured disgust sensitivity, manipulated MS, and assessed defensiveness. The main difference between the studies was the dependent measure. We selected worldview defense as a starting point in Study 1 because it has been the most commonly used measure of defensive responding to MS (Burke, Martens, & Faucher, 2010). Study 2 sought to conceptually replicate Study 1 using a different outcome measure: optimistic perceptions of one's future. We chose optimistic perceptions because they are widely associated with self-enhancement and have been observed to increase following self-threats (e.g., negative feedback, physical illness; Taylor & Brown, 1988). Study 3 sought additional evidence using a different dependent measure—delay discounting. We chose delay discounting because it is conceptually similar to the optimistic perceptions measure used in Study 2 and is similarly focused on the future. The prediction for all three studies was the same: Individual differences in disgust sensitivity predict responses in the MS condition but not in the other aversive control conditions.

Study 1

Thinking and writing about death has been found to increase support for worldview-consistent information and lead to derogation of information that threatens one's cultural worldview (e.g., Greenberg, Simon, Pyszczynski, Solomon, & Chatel, 1992). Study 1 tested the hypothesis that individual differences in disgust sensitivity influence worldview defense following MS.

The literature on disgust sensitivity includes at least two major individual difference measures. One of the most frequently used measures is Haidt et al.'s (1994) disgust scale, which contains items that specifically ask respondents to indicate how they feel about death (e.g., "It would bother me tremendously to touch a dead body"). Such items are problematic when testing hypotheses derived from TMT because questionnaire items that ask explicitly about death and death anxiety may increase MS and elicit associated psychological defenses (e.g., Arndt, Greenberg, Simon, Pyszczynski, & Solomon, 1998, Experiment 2; Greenberg et al., 1995, Experiment 3; Koole & van den Berg, 2005, Experiment 2; Mandel & Heine, 1999; Rosenblatt et al., 1989, Experiment 6). Thus, we elected to not use the Haidt et al. scale in the current

studies to avoid increasing MS prior to the experimental manipulation. Instead, we used Tybur et al.'s (2009) three domain disgust scale (TDDS), which assesses pathogen disgust, sexual disgust, and moral disgust, respectively, and does not ask explicitly about death.

From a TMT perspective, it is not clear which of the three domains of disgust assessed by the TDDS should be most relevant for responses to MS. Pathogens are disease-causing microorganisms and thus are obvious potential agents of death. Likewise, sexual partners can transmit life-threatening disease or infection. Both pathogen and sexual disgust sensitivity may thus be relevant predictors of how persons respond to MS. Moral disgust is targeted at those who violate cultural norms, particularly those related to honesty (Tybur et al., 2009). Moral disgust is likely to be relevant to responses to MS insofar as thinking about death causes increased adherence to salient cultural norms (e.g., Gailliot, Stillman, Schmeichel, Maner, & Plant, 2008) and causes harsher judgments for those who violate cultural norms (e.g., moral transgressions; see Rosenblatt et al., 1989). This likely occurs because norms and moral responses to norm violations are central components of cultural worldviews (see Gangestad, 2012). On a priori bases, then, each of the three domains of disgust sensitivity could serve as a moderator of MS effects, and we did not make specific predictions regarding the individual domains. Rather, we focused our predictions on total TDDS scores (incorporating all three domains of disgust sensitivity) and considered the contributions of the individual domains in an exploratory fashion.

Finally, we statistically controlled for individual differences in behavioral inhibition sensitivity (BIS) to ascertain whether disgust sensitivity predicts responses to MS above and beyond the influence of another trait associated with negative affect. In addition, controlling for BIS allowed us to minimize the contribution of the punishment-sensitive component of disgust sensitivity that is shared with some other negative emotions (e.g., fear).

Method

Participants and procedure. One hundred ten introductory psychology students (59 women) participated in exchange for credit toward a course requirement. One participant did not report their sex. Sex of participants did not influence the main results. Participants arrived at the lab in groups of 1–4 per session. After the consent process, they were separated into individual rooms and completed the remainder of the study on computers using DmDx software (Forster & Forster, 2003).

Disgust sensitivity. Disgust sensitivity was assessed via the TDDS (Tybur et al., 2009). The TDDS is a 21-item measure that assesses disgust sensitivity across three functional domains: pathogen disgust (e.g., "Accidentally touching a person's bloody cut"), sexual disgust (e.g., "Bringing someone you just met back to your room for sex"), and moral disgust (e.g., "A student cheating to get good grades"). Participants responded to each item using a 7-point scale from 0 = *not at all disgusting* to 7 = *extremely disgusting*. We used the overall sum score ($M = 92.25$, $SD = 15.20$) rather than subscale scores because our a priori prediction concerned disgust sensitivity generally; we did not make specific predictions for each of the three domains of disgust sensitivity. The overall score demonstrated good reliability ($\alpha = .85$), and the subscales

for the three domains correlated significantly with one another ($r_s > .20$, $p_s < .05$).

BIS. BIS was measured with the BIS subscale of Carver and White's (1994) BIS/BAS scales. BIS is a single-factor 7-item measure that assesses punishment sensitivity (e.g., "I worry about making mistakes"). Participants rate each item on a 4-point scale from 1 = *very true for me* to 4 = *very false for me*. The average BIS score in the current study was 20.14 ($SD = 3.52$, $\alpha = .74$). Twelve participants did not complete the BIS scale and as a result, all analyses reported below which include BIS have a lower degrees of freedom.

MS. Following previous research (Harmon-Jones et al., 1997; e.g., Rosenblatt et al., 1989), participants were randomly assigned to respond to two open-ended prompts related to either death ($N = 59$) or dental pain ($N = 51$). In the MS condition, the prompts were "Please briefly describe the emotions that the thought of your own death arouse in you" and "Jot down, as specifically as you can, what you think will happen to you as you physically die and once you are physically dead." In the control condition, participants responded to prompts about a painful dental procedure: "Please briefly describe the emotions that the thought of a painful dental procedure arouses in you" and "Jot down, as specifically as you can, what you think will happen to you as you have a painful dental procedure."

Delay. After writing about death or dental pain, participants read an affectively neutral passage from "The Growing Stone," a short story from the collection, *Exile and the Kingdom* (Camus, 1957), and answered questions about the story's content and the gender of the author. This task functioned as a delay and distraction task and was intended to remove thoughts of death from focal awareness. This story is a commonly used delay and distraction task in the TMT literature (e.g., Greenberg, Pyszczynski, Solomon, Simon, & Breus, 1994). Following this delay task, participants completed a measure of worldview defense.

Worldview defense. We assessed worldview defense by having participants read and evaluate two essays allegedly written by students in an unrelated study (Greenberg et al., 1992). Thematically, one of the essays was pro-American and stressed freedom and the American dream, whereas the other essay was anti-American and emphasized conflict and poverty in America. Participants rated each essay and author along 5 dimensions (likability, intelligence, knowledgeable, agreement, and validity) using a 9-point scale from 1 = *not at all* to 9 = *totally*. Responses to the pro-America essay were averaged as were responses to the anti-America essay. A worldview defense composite was created by taking the difference between participant's ratings of the two essays, with positive values indicating more worldview defense ($M = 10.74$, $SD = 12.82$).

Results

A multiple regression used disgust sensitivity, MS, and their interaction term as predictor variables, and worldview defense as the criterion variable. The main effect of MS was not significant, $B = 0.69$, $t(106) = 0.28$, $p = .78$, nor was the main effect of disgust sensitivity, $B = 1.61$, $t(106) = 0.75$, $p = .56$. More important, the predicted interaction between disgust sensitivity and MS was significant, $B = 7.68$, $t(106) = 2.36$, $p = .02$, $f^2 = .15$.

To probe the significant interaction and test our specific hypothesis, we examined the relationship between disgust sensitivity and worldview defense within the MS and dental pain salience conditions separately. Recall that our prediction was that disgust sensitivity should relate to responding under MS but not in the control condition. Thus, we used within-cell regressions to assess the hypothesized relationship between our dichotomous (MS condition) and continuous (disgust sensitivity) predictor variables. Please refer to Figure 1, which depicts the scatterplot and least-squares regression lines for the two conditions. Participants higher (vs. lower) in disgust sensitivity engaged in more worldview defense in the MS condition, $r(57) = .48$, $p < .001$, but not in the dental pain salience condition, $r(49) = .10$, $p = .49$. This pattern supports our prediction that disgust sensitivity influences how a person responds to thoughts of death.

We also examined the effects of MS on worldview defense at $\pm 1 SD$ from the mean disgust sensitivity score. Predicted-values t tests indicated that among participants higher in disgust sensitivity ($+1 SD$), MS increased worldview defense relative to dental pain salience, $t(106) = 1.88$, $p = .06$, although this difference fell just short of conventional levels of statistical significance. Among participants lower in disgust sensitivity ($-1 SD$), MS did not influence worldview defense relative to dental pain salience, $t(106) = 1.45$, $p = .15$.

Controlling for BIS. To test the alternative explanation that the observed results may be driven by anxiety-related traits rather than disgust sensitivity, we ran the regression model again, this time including BIS (a correlate of both anxiety-related traits and disgust sensitivity) as a predictor. BIS did not predict worldview defense, $B = 0.53$, $t(93) = 1.45$, $p = .15$. More important, the interaction between MS and disgust sensitivity remained statisti-

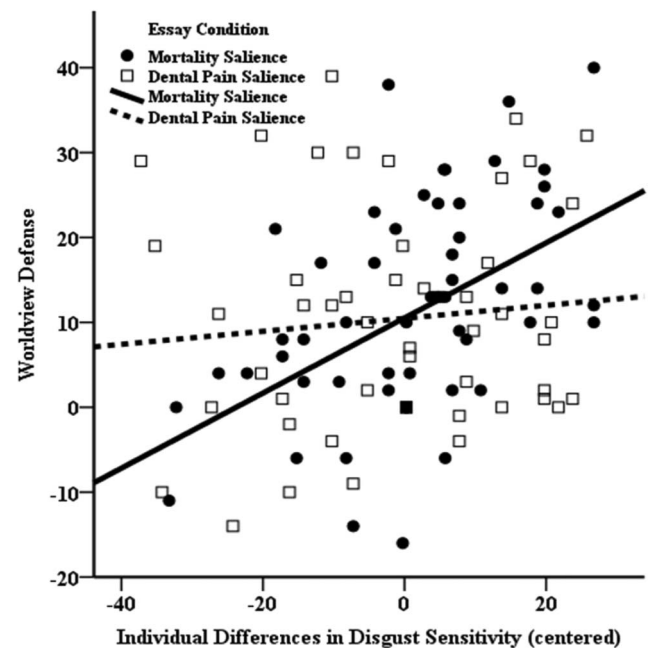


Figure 1. Individual differences in disgust sensitivity were positively associated with worldview defense in the mortality salience condition but not in the dental pain salience condition (Study 1).

cally significant with BIS included in the model, $B = 0.38$, $t(93) = 2.43$, $p < .02$.

Disgust subscale analysis. Given that disgust sensitivity is a multidimensional construct (Tybur et al., 2009), we examined the extent to which each of the three domains of disgust sensitivity assessed by the TDDS predicted worldview defense within the dental pain salience and MS conditions separately. Because our a priori prediction for the current studies concerned disgust sensitivity generally, these analyses must be considered exploratory. We did not make specific predictions for the three domains.

First, we conducted a hierarchical regression analysis to test the interactive effects of each domain of disgust sensitivity with the MS manipulation. Worldview defense was the criterion variable, and the MS manipulation and the three disgust sensitivity subscales were entered in the first step. The $MS \times$ pathogen disgust, $MS \times$ sexual disgust, and the $MS \times$ moral disgust interaction terms were entered in the second step. The results are displayed in Table 1. We found a main effect of sexual disgust sensitivity, such that higher sexual disgust sensitivity predicted greater worldview defense. All other first-level predictors were nonsignificant. In the second step, none of the two-way interaction terms were significant.

Discussion

This first study found that disgust sensitivity predicts worldview defense under MS. Consistent with our hypothesis, higher disgust sensitivity was associated with more worldview defense following MS but not dental pain salience. When exploring the contributions of the three domains of disgust sensitivity separately, we did not find evidence of any one subscale predicting worldview defense. More important, the results regarding total disgust sensitivity (collapsing across the three domains) supported the hypothesis that individual differences in sensitivity to disgust help to shape psychological responses to death reminders.

Study 2

In a second study, we sought to provide a conceptual replication and extension of the results from Study 1 using a different dependent measure. Past research has identified increased optimism as a defensive response to MS. Two studies, for example, examined

optimistic perceptions of the future as they pertain to group affiliation with national and collegiate athletic teams. In a sample of Dutch participants, a first study found that MS increased optimism about the home team's upcoming soccer match against a key rival (i.e., Germany; Dechesne, Greenberg, Arndt, & Schimmel, 2000). A second study by the same authors conceptually replicated this effect in an American sample. Furthermore, MS has been found to bolster belief in moral and societal progress, which seems to reflect a hopeful and optimistic view of the future that may allay fears of death (Rutjens, van der Pligt & van Harreveld, 2009). Although we are aware of no prior research linking disgust sensitivity to personal optimism, our theoretical analysis suggests that individual differences in disgust sensitivity may help to shape how MS influences personal optimism.

We reasoned that optimistic perceptions of one's future may increase in response to MS for three reasons. First, at the broadest level, optimism relates to the use of effective coping strategies in the presence of threat or adversity, including turning to religion and seeking social support (e.g., Scheier, Carver, & Bridges, 1994). Consistent with this coping perspective, MS increases belief in deities (e.g., Jong, Halberstadt, & Bluemke, 2012). Second, an optimistic future is not likely to include one's untimely, premature demise, so optimism may help to allay fears of death. Indeed, optimistic perceptions of the future are associated with subjective well-being, better coping skills, and physical health (Carver, Scheier, & Segerstrom, 2010). Third, optimistic perceptions may promote symbolic immortality and help to defend against the psychological threat of death because an optimistic future is one in which sources of symbolic immortality (e.g., children, possessions, and culturally relevant accomplishments) have been or are being attained.

Based on the hypothesized relationship between disgust sensitivity and responses to MS, the results from Study 1, and the results of Dechesne et al. (2000) and Rutjens et al. (2009), we predicted that disgust sensitivity would influence the effect of MS on personal optimism. Specifically, we expected to find increased optimism about the future under MS among those higher in disgust sensitivity.

Method

Participants and procedure. One hundred twenty-one introductory psychology students (61 women) participated in exchange for credit toward a course requirement. Sex of participants did not influence the main results. Participants arrived at the lab in groups of 1–4 per session. After the consent process, they were separated into individual rooms and completed the remainder of the study on computers using DmDx software (Forster & Forster, 2003). Seven participants were excluded from analysis because they did not complete the personality questionnaires in the beginning of the study, leaving 114 participants (59 women) for analysis.

The procedure and materials were identical to Study 1, with one exception: Following the death ($N = 57$) versus dental pain ($N = 57$) prompts and distraction task, participants in Study 2 completed a measure of optimistic perceptions of the future. As in Study 1, we used the overall sum score on the TDDS ($M = 85.23$, $SD = 18.30$) rather than subscale scores as our measure of disgust sensitivity because our a priori prediction concerned disgust sensitivity generally. The overall score demonstrated good reliability

Table 1
Hierarchical Regression Predicting Worldview Defense From the Three Domain Disgust Scale (TDDS) Subscales and Mortality Salience Condition (Study 1)

Variable	B	SE	β	t	p
Step 1					
Mortality salience (MS)	.371	2.41	.014	.154	.878
Moral disgust	-.142	1.81	-.008	-.078	.938
Sexual disgust	2.54	1.03	.250	2.46	.016
Pathogen disgust	1.85	1.40	.132	1.32	.190
Step 2					
$MS \times$ Moral disgust	-1.55	3.65	-.057	-.424	.673
$MS \times$ Sexual disgust	3.80	2.18	.290	1.74	.085
$MS \times$ Pathogen disgust	3.77	2.86	.192	1.29	.201

Note. As reported in the text, the total score on the TDDS interacted with the MS manipulation to predict worldview defense.

($\alpha = .88$), and the subscales were significantly correlated with one another ($r_s > .27, p_s < .01$). The average BIS score in the current study was 20.67 ($SD = 3.51, \alpha = .72$).

Optimistic perception task. The optimistic perception task (borrowed from Weinstein, 1980) asked participants to consider the likelihood of 43 possible future life events happening to them relative to a peer of the same age and sex. Eighteen events were positive (e.g., statewide recognition in your profession) and 24 were negative (e.g., heart attack before age 40). Responses could range from -4 (*very much less likely to occur*) to $+4$ (*very much more likely to occur*). Events were presented in a randomized order. Responses to negative events were reverse scored, and a composite score was created with larger values indicating more optimism about the future ($M = 35.44, SD = 35.88, \alpha = .86$).

Results

A multiple regression used disgust sensitivity, MS, and their interaction term as predictor variables and optimistic perception of future life events as the criterion variable. The main effect of disgust sensitivity was not significant, $B = 0.01, t(110) = 0.03, p = .98$, nor was the main effect of the MS manipulation, $B = 5.50, t(110) = 0.84, p = .40$. The predicted interaction between disgust sensitivity and MS was significant, $B = 0.77, t(110) = 2.16, p = .03, f^2 = .09$.

To probe the significant interaction and test our specific hypothesis, we examined the relationship between disgust sensitivity and optimism within the MS and dental pain salience conditions separately using the same technique as Study 1. Figure 2 depicts the scatterplot and least-squares regression lines for the two conditions. Participants higher (vs. lower) in disgust sensitivity were

more optimistic about the future in the MS condition, $r(55) = .39, p = .002$, but not in the dental pain salience condition, $r(55) = .004, p = .98$. This pattern further supports our prediction that disgust sensitivity influences how persons respond to thoughts of death.

We also examined the effects of MS on optimism at $\pm 1 SD$ from the mean disgust sensitivity score. Predicted-values t tests indicated that among participants higher in disgust sensitivity ($+1 SD$), MS increased optimism relative to dental pain salience, $t(113) = 2.12, p = .036$. Among participants lower in disgust sensitivity ($-1 SD$), MS did not influence optimism relative to dental pain salience, $t(113) = -0.93, p = .36$.

Controlling for BIS. As in Study 1, we attempted to address the alternative explanation that the observed results may be driven by anxiety-related traits rather than disgust sensitivity. To this end, the regression model above was rerun controlling for BIS. BIS was positively correlated with disgust sensitivity, $r(112) = .21, p = .02$, but was unrelated to optimistic perception scores, $r(112) = -.08, p = .39$. With BIS included in the model, the interaction between MS and disgust sensitivity remained statistically significant, $B = 0.74, t(109) = 2.09, p = .039, f^2 = .11$.

Disgust subscale analysis. We again conducted exploratory analyses to examine the contributions of each of the three domains of disgust sensitivity. A hierarchical regression analysis tested the interactive effects of each domain of disgust sensitivity with the MS manipulation. Optimistic perception of the future was the criterion variable, and the MS manipulation and the three disgust subscales were entered in the first step. The $MS \times$ pathogen disgust, $MS \times$ sexual disgust, and the $MS \times$ moral disgust interaction terms were entered in the second step. The results are displayed in Table 2. All single-level predictors were nonsignificant, as were all three interaction terms in the second step.

Discussion

Study 2 found that disgust sensitivity influences personal optimism as a response to MS such that higher disgust sensitivity predicts more optimism under MS but not under dental pain salience. These results match precisely the patterns of worldview defense observed in Study 1. Further, the results of Study 2 suggested that the influence of disgust sensitivity was robust when controlling for individual differences in BIS—another individual difference variable associated with negative emotionality. Exploratory analyses indicated that none of the specific domains of disgust sensitivity significantly moderated the effect of MS (vs. dental pain salience) on optimistic perceptions of the future. Taken together, the results support the hypothesis that overall disgust sensitivity shapes responses to MS.

Study 3

Study 3 was designed to be a conceptual replication of Study 2 that looked at the joint impact of MS and disgust sensitivity on perceptions of the future in a slightly different manner. Whereas Study 2 investigated optimistic perceptions of the future, Study 3 investigated subjective valuations of the future. Given that MS made persons higher (vs. lower) in disgust sensitivity become more optimistic in Study 2, we reasoned that MS should also cause them to value the future more. Thus, in Study 3 we measured

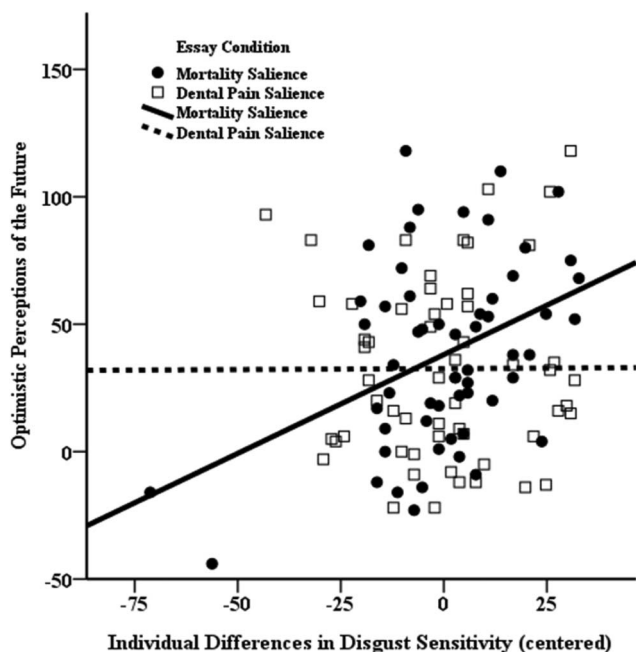


Figure 2. Individual differences in disgust sensitivity were positively associated with optimistic perceptions of the future in the mortality salience condition but not in the dental pain salience condition (Study 2).

Table 2
Hierarchical Regression Analysis Predicting Optimistic Perceptions From the Three Domain Disgust Scale (TDDS) Subscales and Mortality Salience Condition (Study 2)

Variable	B	SE	β	<i>t</i>	<i>p</i>
Step 1					
Mortality salience (MS)	5.82	6.72	.082	.866	.388
Moral disgust	.625	.547	.115	1.14	.256
Sexual disgust	.353	.342	.106	1.03	.304
Pathogen disgust	.271	.505	.055	.536	.593
Step 2					
MS \times Moral disgust	.164	1.10	.023	.150	.881
MS \times Sexual disgust	.636	.679	.133	.938	.350
MS \times Pathogen disgust	1.48	1.00	.207	1.47	.144

Note. As reported in the text, the total score on the TDDS interacted with the MS manipulation to predict optimistic perceptions of the future.

disgust sensitivity, experimentally manipulated MS, and assessed subjective valuations of the future using a delay-discounting task.

Delay discounting refers to a present-biased valuation of rewards in which individuals discount the value of future rewards in favor of smaller, more immediately available rewards. Delay discounting rates have been implicated in a wide range of behaviors that pit short-term gains against long-term investments, including dieting (Weller, Cook, Avsar, & Cox, 2008) and financial planning (Chapman & Elstein, 1995). Given that MS can induce more abstract, high-level construals associated with good self-control (e.g., Landau, Kosloff, & Schmeichel, 2011), Kelley and Schmeichel (2014) predicted and found that MS decreases delay discounting immediately after participants have pondered their own mortality. This evidence suggests that reductions in delay discounting can be considered a proximal defensive response to MS (as opposed to the more distal defensive responses observed in Studies 1 and 2; see Greenberg, Arndt, Simon, Pyszczynski, & Solomon, 2000; Pyszczynski, Greenberg, & Solomon, 1999).

Study 3 further examined decreases in delay discounting as a proximal response to MS, this time taking individual differences in disgust sensitivity into account. Compared with the distal defenses examined in Studies 1 and 2, more proximal defenses are more rational and more likely to be activated when thoughts of death are in focal attention (e.g., immediately after a MS induction; see Pyszczynski et al., 1999). The rational response on a delay-discounting task is to prefer larger, greater rewards over smaller, sooner ones (i.e., to discount the future less). If disgust sensitivity predicts proximal defenses to MS, then we would anticipate those higher in disgust sensitivity to be especially likely to forego immediate rewards relative to those lower in disgust sensitivity.

Whereas TMT theorists have proposed that death is a unique form of psychological threat (e.g., Greenberg, Kosloff, Solomon, Cohen, & Landau, 2010; Landau et al., 2006), other theorists have suggested that death may best be understood as a type of uncertainty (e.g., van den Bos, Poortvliet, Maas, Miedema, & van den Ham, 2005) and have proposed that defensive responses under mortality salience do not differ from defensive responses under uncertainty salience. To test the extent to which the moderating role of disgust sensitivity is exclusive to MS effects, we included uncertainty salience as the comparison condition. Insofar as feelings of disgust are more relevant to death than to uncertainty, we

expected that disgust sensitivity would predict responding under MS more than responding to uncertainty salience.

In addition, building on evidence from the previous studies that individual differences in disgust sensitivity predict responses to MS above and beyond the contributions of BIS, Study 3 included additional personality measures that have been found to be relevant predictors of responses to MS, namely neuroticism and self-esteem.

Method

Participants and procedure. Ninety-one undergraduates earned an extra credit point in a psychology course by participating. Five participants did not complete the MS manipulation, leaving 86 undergraduate students (64 women) for analysis. Participants completed the study in a classroom and were randomly assigned to either a MS ($N = 46$) or uncertainty salience condition ($N = 40$). The procedure and materials were identical to Studies 1 and 2, with four exceptions. First, in addition to the TDDS and the BIS scale, participants completed measures of neuroticism and self-esteem before the MS manipulation. As in the first two studies, we used the overall sum score from the TDDS ($M = 83.07$, $SD = 17.72$) rather than subscale scores because our a priori hypothesis concerned disgust sensitivity generally. The overall score demonstrated good reliability ($\alpha = .86$), and the subscales correlated with one another ($r_s > .25$, $p_s < .02$). The average score on the BIS scale in the current study was 21.49 ($SD = 3.31$, $\alpha = .75$).

Second, the aversive comparison condition in Study 3 was uncertainty salience rather than dental pain salience. Third, participants completed the dependent measure immediately following the MS manipulation; hence, the delay and distraction period used in the previous studies was not used in Study 3. The delay period was dropped for Study 3 so that we could examine the extent to which disgust sensitivity moderates proximal responses to MS, rather than the more distal responses assessed in the prior two studies. And fourth, the dependent measure in Study 3 was a delay-discounting task.

Neuroticism. Neuroticism was measured with the emotional stability subscale of the 10-item personality inventory (TIPI; Gosling, Rentfrow, & Swann, 2003). TIPI scores correlate significantly with scores on other established measures of big five traits such as the Big-Five Inventory (John & Srivastava, 1999) and the Revised NEO Personality Inventory (NEO-PI-R; Costa & McCrae, 1992). Neuroticism/emotional stability was assessed with two items: "I see myself as anxious, easily upset" (reverse-coded) and "I see myself as calm, emotionally stable." Participants rated each item on a 7-point scale from 1 = *disagree strongly* to 7 = *agree strongly* ($M = 8.96$, $SD = 2.72$, $r = .53$, $p < .001$).

Self-esteem. Self-esteem was measured with Rosenberg's (1965) self-esteem scale, a single-factor, 10-item measure that assesses individual differences in self-esteem (e.g., "I feel that I am a person of worth, at least on an equal plane with others"). Participants rated each item on a 4-point scale from 1 = *strongly disagree* to 4 = *strongly agree* ($M = 25.56$, $SD = 1.89$, $\alpha = .92$).

Delay discounting. Participants made hypothetical choices pitting an immediate reward against a delayed but more valuable reward. Specifically, participants made a series of choices between receiving \$50 now versus receiving other dollar values three

months later, starting with \$50 and increasing in \$5 increments up to \$100 (e.g., Weber et al., 2007). The indifference point was the dollar value at which participants switched from preferring the fixed immediate amount (\$50) to preferring the delayed amount. If the participant never switched, the indifference point was coded as \$105. Thus, \$50 now was pitted against increasing possible future rewards whereby smaller values indicated greater valuation of future rewards. The mean indifference point in the present study was \$67.84 ($SD = 13.15$).

Results

A multiple regression used disgust sensitivity (centered), MS, and their interaction term as predictor variables and delay discounting as the criterion variable. The main effect of disgust sensitivity was not significant, $B = 0.04$, $t(82) = 0.40$, $p = .69$, nor was the main effect of the MS manipulation, $B = 2.18$, $t(82) = 0.81$, $p = .42$. As in the previous studies, the interaction between disgust sensitivity and MS was significant, $B = -0.41$, $t(82) = 2.52$, $p = .01$, $f^2 = .12$.

To probe the significant interaction and test our specific hypothesis, we examined the relationship between disgust sensitivity and delay discounting within the MS and uncertainty salience conditions separately using the same technique as Studies 1 and 2. Figure 3 depicts the scatterplot and least-squares regression lines for the two conditions. Participants higher in disgust sensitivity discounted the future less in the MS condition, $r(44) = -.40$, $p = .007$, but not in the uncertainty salience condition, $r(38) = .07$, $p = .67$. This pattern supports our prediction that disgust sensitivity influences responses to thoughts of death.

We also examined the effects of MS on delay discounting at ± 1 SD from the mean disgust sensitivity score. Predicted-values t tests

indicated that among participants higher in disgust sensitivity ($+1$ SD), MS did not influence delay discounting relative to uncertainty salience, $t(82) = 1.24$, $p = .22$. Among participants lower in disgust sensitivity (-1 SD), however, MS increased delay discounting relative to uncertainty salience, $t(82) = 2.34$, $p = .02$. In monetary terms, under MS participants high in disgust sensitivity traded the opportunity for \$50 now for \$62.71 in 3 months, whereas those low in disgust sensitivity required \$75.03 in 3 months.

Controlling for BIS, neuroticism, and self-esteem. As in Studies 1 and 2, we attempted to address the alternative explanation that the observed results may be driven by anxiety-related traits rather than disgust sensitivity. To this end, the regression model above was rerun controlling for BIS, neuroticism (emotional stability), and self-esteem. With these traits included in the model, the interaction between MS and disgust sensitivity remained statistically significant (Table 3). None of the other individual difference measures interacted with MS to influence delay discounting.

Subscale analysis. We also conducted a hierarchical regression analysis to test the interactive effects of each domain of disgust sensitivity with the MS manipulation. The results are reported in Table 4. Delay discounting was the criterion variable and the MS manipulation, and the three disgust subscales were entered in the first step. The MS \times pathogen disgust, MS \times sexual disgust, and the MS \times moral disgust interaction terms were entered in the second step. All single level predictors were non-significant, and in the second step, only the MS \times moral disgust interaction was significant.

Discussion

Study 3 found that disgust sensitivity moderates the effect of MS on delay discounting, such that higher disgust sensitivity predicts less delay discounting under MS but not under uncertainty salience. This pattern is conceptually consistent with the finding of increased optimism in Study 2, and together the two studies suggest that persons higher in disgust sensitivity embrace the future under MS. Furthermore, the comparison condition in this study was uncertainty salience rather than dental pain salience. Some theorists have proposed that MS effects represent reactions to uncertainty (e.g., van den Bos et al., 2005) and thus would predict that uncertainty and MS should have similar effects. By finding that disgust sensitivity predicts responses under MS but not under uncertainty salience, the current results suggest something unique about MS versus uncertainty. One plausible interpretation of this pattern is that disgust may differentiate the effects of MS from the effects of uncertainty. Further, Study 3 found that the relationship between disgust sensitivity and delay discounting held even when anxiety-related traits (e.g., BIS, neuroticism) and self-esteem were statistically controlled. The fact that disgust sensitivity predicted responding to MS above and beyond the contribution of other relevant individual difference variables supports the hypothesis that disgust sensitivity is a distinct contributor to the shaping of responses to MS.

General Discussion

Three studies tested the hypothesis that psychological responses to thoughts of death are influenced by individual differences in

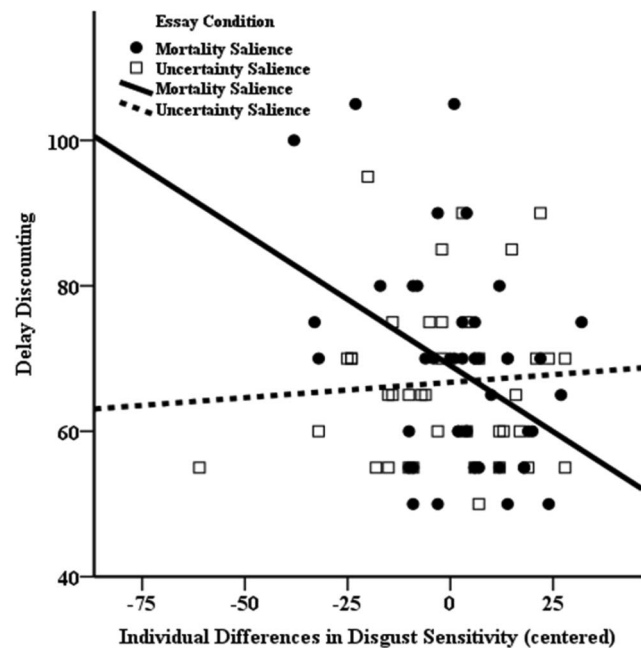


Figure 3. Individual differences in disgust sensitivity were negatively associated with delay discounting in the mortality salience condition but not in the dental pain salience condition (Study 3).

Table 3
Hierarchical Regression Analysis Predicting Delayed Discounting From Individual Difference Variables and Mortality Salience (MS) Condition (Study 3)

Variable	B	SE	β	<i>t</i>	<i>p</i>
Step 1					
MS	2.51	2.84	.099	.885	.379
Behavioral inhibition (BIS)	.535	3.835	.020	.139	.889
Neuroticism	-1.35	1.27	-.142	-1.06	.291
Self-esteem	3.90	7.74	.058	.504	.616
Disgust sensitivity	-.140	.085	-.187	-1.64	.105
Step 2					
MS × BIS	7.07	7.60	.176	.931	.355
MS × Neuroticism	-.680	2.53	-.047	-.269	.789
MS × Self-esteem	17.29	15.34	.192	1.13	.263
MS × Disgust sensitivity	-.433	.175	-.380	-2.48	.015

disgust sensitivity. All three studies found evidence in support of this hypothesis. In Study 1, disgust sensitivity predicted worldview defense under MS but not under dental pain salience. Specifically, persons higher in disgust sensitivity exhibited more worldview defense following MS. In Study 2, disgust sensitivity predicted personal optimism under MS such that those higher in disgust sensitivity demonstrated higher levels of optimism about their future. In Study 3, disgust sensitivity predicted delay-discounting rates under MS but not under uncertainty salience, such that those higher in disgust sensitivity discounted the future less.

Across the three studies, the total disgust sensitivity score predicted responses to MS. This pattern is consistent with the idea that proneness to experiencing disgust shapes how persons respond to thoughts of death. We also explored the extent to which more specific domains of disgust sensitivity influenced our dependent measures. In Studies 1 and 2, none of the three specific domains of disgust sensitivity assessed by the TDDS moderated responses to MS. In Study 3, moral disgust moderated the effect of MS on delay discounting. Given that moral disgust is correlated with religiosity (Olatunji, Tolin, Huppert, & Lohr, 2005), and religiosity predicts lower discount rates (Weatherly & Plumm, 2012), the finding in Study 3 appears consistent with evidence that religion and morality influence delay discounting rates (e.g., Carter, McCullough, Kim-Spoon, Corrales, & Blake, 2012; Kim-Spoon, McCullough, Bickel, Farley, & Longo, 2014). However, the analyses regarding the specific domains of disgust sensitivity were exploratory, and future research is needed to conduct more confirmatory investigations of the interplay between distinct domains of disgust sensitivity and defensive responding to MS.

Implications for TMT

The results of the current work have several implications for TMT. First, the current results advance understanding of the role of disgust in shaping TMT defenses. Past research linking death and disgust has mainly considered disgust through the lens of creatureliness. In this view, body products (e.g., feces, vomit) serve as reminders that the bodies of humans, like the bodies of all other animals, are certain to decay and die. This troubling awareness is thought to motivate people to seek psychological distance from their bodies as a defensive maneuver to manage potential

anxiety about death (Goldenberg, Pyszczynski, Greenberg, & Solomon, 2000). Research inspired by these ideas has found that thinking about death increases reactions to disgusting stimuli—specifically those emanating from animals. Implicit within the creatureliness perspective is the relationship between pathogen disgust and death, as bodily products such as feces and vomit may carry disease-causing microorganisms. This creatureliness perspective would suggest that pathogen disgust sensitivity should be driving the effects observed in the current studies. However, unlike research inspired by creatureliness, the current findings do not find evidence for the role of pathogen disgust specifically. Rather, the current findings suggest that proneness to experience the emotion of disgust more generally (and not only the experience of disgust toward bodily products) may be a key to understating how we manage existential concerns.

The current results also have implications for the role of affect in TMT. When the theory was originally conceived, anxiety was at its core (Rosenblatt et al., 1989). However, Rosenblatt et al. and many other studies have not found that standard MS manipulations increase anxiety. As a result, subsequent tests of the theory shifted the focus to the potential for anxiety rather than anxiety per se (e.g., Greenberg et al., 2003). More recently, researchers have challenged the notion that morality salience does not influence affect. Specifically, Lambert and colleagues (2014) found that thinking about death increases self-reported fear, even when controlling for anxiety. Lambert et al. did not consider the impact of MS on disgust. Taken together with the findings of Lambert and colleagues the current results represent a renewed interest in affective processes associated with MS.

The current findings also have implications for the dual-defense model of TMT defenses (Pyszczynski et al., 1999). Proximal defenses are thought to occur when death-related cognitions are in focal attention (e.g., before a delay), whereas distal defenses occur when death is on the fringes of awareness, not in focal attention (e.g., after a delay). Furthermore, proximal defenses appear designed to forestall death, whereas distal defenses serve to maintain self-esteem and faith in one's cultural worldview. The results of the current studies suggest that disgust sensitivity moderates both proximal and distal forms of defense. Study 1 found that disgust sensitivity predicted a classic form of distal defense, namely de-

Table 4
Hierarchical Regression Analysis Predicting Delay Discounting From the Three Domain Disgust Scale (TDDS) Subscales and Mortality Salience (MS) Condition (Study 3)

Variable	B	SE	β	<i>t</i>	<i>p</i>
Step 1					
MS	1.92	2.84	.076	.677	.500
Moral disgust	-.975	1.40	-.080	-.695	.489
Sexual disgust	-1.67	1.05	-.186	-1.59	.117
Pathogen disgust	.455	1.60	.033	.285	.777
Step 2					
MS × Moral disgust	-7.44	2.81	-.455	-2.64	.010
MS × Sexual disgust	-2.87	2.10	-.242	-1.37	.176
MS × Pathogen disgust	2.57	3.07	.126	.838	.404

Note. As reported in the text and Table 3, the total score on the TDDS interacted with the MS manipulation to predict delay discounting.

fense of one's cultural worldview. Study 2 found that disgust sensitivity predicted a novel form of distal defense, namely personal optimism about the future. Although some correlational evidence suggests that optimism relates to health and longevity (e.g., Brummett, Helms, Dahlstrom, & Siegler, 2006; Rasmussen, Scheier, & Greenhouse, 2009), we presume that personal optimism also contributes to feelings of symbolic immortality (e.g., high hopes for children, possessions, and culturally relevant accomplishments) and self-esteem. Thus, worldview defense and personal optimism both appear capable of operating as distal defense mechanisms that may assuage the potential for anxiety about death.

Study 3 examined the impact of disgust sensitivity on proximal defenses to MS by assessing delay discounting immediately after the MS manipulation. Proximal defenses push the problem of death into the future by promoting health and well-being. For example, Routledge, Arndt, and Goldenberg (2004) found that when death thoughts were in focal attention participants were more motivated to use sunscreen. Presumably the use of sunscreen offers protection from harmful sun exposure and this protection pushes the threat of death further into the future. Consistent with this evidence, Study 3 of the current work found that disgust sensitivity predicted delay discounting under MS, such that those higher in disgust sensitivity valued the future more. Increased valuation put on the future suggests the possibility that at the proximal level of defense, heightened disgust sensitivity facilitates psychological efforts to forestall death. Thus the current studies thus offers evidence that disgust sensitivity predicts both proximal and distal responses to MS.

Implications for Other Theoretical Perspectives

In addition to TMT, several other theories can be brought to bear on the question of how persons respond to psychological threats. For example, research and theory pertaining to reactive approach motivation indicates that defensive responses to threats such as uncertainty and MS are driven by approach motivation. Specifically, McGregor, Prentice, and Nash (2009) conceptualized worldview defense as an approach-motivated behavior, such that focusing on ideals can provide a "goal" to move toward, which helps minimize the anxiety caused by increased activation of the behavioral inhibition system immediately after psychological uncertainty or threat (Jonas et al., 2014). The behavioral inhibition system relates to disgust sensitivity whereas the behavioral approach system does not (e.g., Olatunji et al., 2008). Thus, behavioral inhibition can be conceptualized as the motivational system underlying disgust sensitivity.

Consistent with the role of behavioral inhibition in the reactive approach motivation model, the current studies found contributions of disgust sensitivity to worldview defense, optimism, and delay discounting, arguably approach-related defensive reactions to MS. Specifically, under MS high disgust sensitivity led to increased worldview defense and increased optimism about the future, which may reflect an increase in approach motivation. In Study 3, the combination of MS and high disgust sensitivity led to less of a present focus on a delay-discounting task, that is to say, they valued the future more. Thus, the effects of disgust sensitivity appear to parallel those of behavioral inhibition—intensification of defensive responses to self-threat. In reconciling our work with that of reactive approach motivation, two ideas emerge. First,

defensive responses to MS that are modulated by individual differences in disgust sensitivity may increase approach-motivated responding. Second, it seems to be the case that both avoidance and approach motivations are crucial to understanding defensive responses to MS.

In addition to expanding upon research and theory on terror management, the current findings also accord well with amoebic self-theory (Burris & Rempel, 2004). According to amoebic self-theory, humans and single-celled organisms alike are motivated by three basic drives: engulfment, resistance, and excretion, respectively, or as Burris and Rempel (2008) aptly described it, "the need to eat, retreat and excrete" (p. 101). According to amoebic self-theory, as humans evolved and developed higher cognitive abilities (e.g., abstract thought), these basic motivations extended into domains beyond the physical body to influence also the psychological self. If disgust evolved to discourage the ingestion of noxious substances as Rozin et al. (1997) suggested, then it clearly exists to promote engulfment, resistance, and excretion motivations and is thereby a defense for the physical domain. In this light, it is not unreasonable to assume that the psychological self may have coopted the defenses of the physical domain as well. Therefore, disgust may be an underlying emotional program defending both the physical and psychological self. If indeed disgust operates in this manner, it should be a key to understanding how people respond to the ultimate self-threat: mortality. The current studies found that it was.

The current results are also consistent with other conceptually similar work on pathogen avoidance. This research has observed that pathogen avoidance mechanisms like disgust sensitivity predict harsher attitudes toward out-groups (Faulkner et al., 2004). The idea is that over time, individuals build up antibodies to potential pathogens carried by their in-group members, and the presence of out-group members signals the potential presence of pathogens that the in-group has not built up antibodies to combat. Based on this logic, those individuals who were particularly sensitive to the presence of pathogens (i.e., highly disgust-sensitive persons) would be more reactive to the presence of potentially disease-carrying out-group members. Indeed, disgust sensitivity has been shown to predict a preference for in-group members (Navarrete & Fessler, 2006) and negative explicit and implicit attitudes toward obese individuals (Park, Schaller, & Crandall, 2007) and those who are disabled (Park, Faulkner, & Schaller, 2003). Much like the current research, these prior studies reveal that individual differences in disgust sensitivity predict greater defensive responding.

Limitations and Future Directions

We did not find a main effect of MS on worldview defense in Study 1. It is not uncommon to find evidence of an MS by individual difference interaction in the absence of MS main effects. For example, Schmeichel et al. (2009; Study 1) used the same worldview defense measure as the current Study 1 and found a moderating effect of implicit self-esteem in the absence of an MS main effect. Arndt and Solomon (2003) found a moderating effect of neuroticism in the absence of MS main effects on self-reported desire for control across two studies. Vess, Routledge, Landau, and Arndt (2009) found a moderating role of personal need for structure in the absence of MS main effects across six studies using

multiple measures of meaning in life and interest in novelty. Routledge, Juhl, and Vess (2013) found a moderating effect of personal need for structure in the absence of an MS main effect on death anxiety. Thus, a lack of main effects is not an uncommon occurrence in the TMT literature (for further discussion, see Yen & Cheng, 2013). Even without a main effect of MS, the current research adds to the TMT literature in multiple ways. First, it introduces a novel individual difference characteristic that predicts MS effects—disgust sensitivity. Second, it provides initial evidence that increased personal optimism and reduced delay discount rates follow MS, at least among individuals higher in disgust sensitivity.

In the current set of studies disgust was neither manipulated nor measured. As a result, it is currently unknown how state disgust, as opposed to trait disgust, influences defensive responding under morality salience. It may be the case that the disgust sensitivity, which is conceptualized as an individual's potential to experience disgust, predicts defensive responding whereas the experience of disgust does not. Such a pattern would parallel theoretical reformulations of TMT that highlight the role of potential anxiety rather than experienced anxiety (e.g., Greenberg et al., 2003). Future studies are needed to address the role of state disgust in defensive responding to MS.

Conclusion

The current results suggest that, in addition to potential anxiety, the capacity to experience disgust may play an important role in how we think and behave in reaction to reminders of our death. Indeed, disgust may contribute to making death a unique threat in the human mind.

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