

The Dynamics of Death and Meaning: The Effects of Death-Relevant Cognitions and Personal Need for Structure on Perceptions of Meaning in Life

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Do reminders of mortality increase or decrease perceptions of life's meaning? The authors propose that death-relevant thought has divergent effects on meaning perceptions depending on individuals' personal need for structure (PNS) or dispositional desire for structured knowledge. In prior research, high-PNS individuals primed with mortality-related stimuli were found to employ clearly structured conceptions of reality. Consequently, these individuals were expected to show stable or even bolstered perceptions of meaning when death thought was heightened. Low-PNS individuals did not show this tendency and were therefore expected to show decreased meaning under heightened death-thought activation. The results of Studies 1a–1d supported these hypotheses. Studies 2 and 3 sought to identify how low-PNS individuals might reaffirm meaning and found that death thought increased their willingness to explore novelty. Studies 4 and 5 directly tested the meaning-conferring function of novelty seeking among low-PNS individuals, showing that the consideration of novel interpretations of the world and their experiences affirmed a sense of meaning in life following reminders of death. Discussion focuses on the relationship between meaning and death and the unique ways low-PNS individuals respond to mortality concerns.

Keywords: terror management theory, meaning in life, exploration of novelty, personal need for structure

Is there any meaning in my life that will not be annihilated by the inevitability of death which awaits me?

—Leo Tolstoy (1882/1987, p. 17)

It is perhaps easy to see why Tolstoy might ponder such a distressing question. To be aware of the inevitability of death is to know that one's life may ultimately be no more meaningful than the stone that will mark one's future grave. Yet the awareness of death's inevitability is also thought to be intricately associated with the psychological resources that people employ to imbue their lives with meaning (e.g., Becker, 1973). Indeed, empirical research derived from terror management theory (TMT; Greenberg, Pyszczynski, & Solomon, 1986) has shown that reminders of death (i.e., mortality salience [MS]) increase the accessibility and defense of structures posited to provide meaning (e.g., national identity; Arndt, Greenberg, & Cook, 2002; just world beliefs; Landau et al., 2004). Despite this volume of work, however, the relationship between death-related thought and explicit perceptions of meaning in life has received very little empirical attention. Although many

factors are likely to influence this relationship, the present research focused on the role of individual differences in the desire for clearly structured and unambiguous interpretations of reality, as assessed using the Personal Need for Structure (PNS) scale (Neuberg & Newsom, 1993; M. M. Thompson, Naccarato, Parker, & Moskowitz, 2001).

From the perspective of TMT, a structured understanding of the world and one's life provides an important source of meaning that functions to assuage mortality concerns. Because prior research has shown that mortality reminders lead high-PNS individuals to structure their understanding of the world in clear and orderly ways (e.g., Landau et al., 2004), we hypothesized that high-PNS individuals will perceive a stable or even bolstered sense of life's meaning when death thought is active. In contrast to those high in PNS, comparatively little empirical focus has been directed toward understanding how low-PNS individuals respond to mortality concerns. These individuals do not show heightened structuring tendencies following mortality reminders (e.g., Landau et al., 2004) and we thus expected them to view their lives as less meaningful under conditions of heightened death thought. Four separate studies (Studies 1a–1d) tested these hypotheses.

In addition to understanding how differences in PNS shape the relationship between death-focused thought and meaning in life, the present research sought to reveal a strategy that low-PNS individuals might use to reaffirm meaning as a defense against mortality concerns, a question that has not been adequately addressed in prior work. We reasoned that low-PNS individuals are not only more tolerant of ambiguity and novelty (e.g., Neuberg & Newsom, 1993) but may also derive terror-assuaging meaning

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from thinking about the world and their lives in novel and open ways. Studies 2 and 3 assessed this analysis by testing whether low-PNS individuals primed with mortality actively seek out novel information. Studies 4 and 5, in turn, examined whether these explorative responses to death thought lead low-PNS individuals to affirm the meaningfulness of their lives. The current research is, to our knowledge, the first to systematically examine the epistemic strategies that low-PNS individuals employ to lend meaning to life when confronted with its finitude.

TMT, Existential Threat, and Existential Meaning

TMT posits that human behavior is motivated in part by a need to mitigate the potential for anxiety stemming from the recognition that death is inevitable. People buffer themselves from mortality-related concerns by subscribing to culturally shared conceptions of reality (worldviews) that imbue existence with transcendent meaning, order, and permanence. Cultural worldviews provide a context for understanding the meaning and purpose of one's life, delineate standards for what is valued, and offer opportunities to transcend physical death, either literally in the form of afterlife beliefs or symbolically through enduring cultural achievements. By maintaining faith in the legitimacy of their worldview, individuals sustain a belief that their lives have meaning that transcends their physical death.

Support for the terror management function of cultural worldviews is provided by evidence that MS instigates efforts to bolster aspects of one's worldview and to defend those belief systems against threats to their validity (for reviews, see Greenberg, Solomon, & Arndt, 2008; Pyszczynski, Greenberg, Solomon, Arndt, & Schimel, 2004). For example, multiple studies have shown that MS (relative to aversive control topics such as pain, future uncertainty, and social exclusion) engenders amplified positive reactions toward people and ideas consistent with one's cultural beliefs and amplified negative reactions toward people and ideas that oppose those beliefs. Research also shows that MS increases the cognitive accessibility of personally valued aspects of the cultural worldview (e.g., national identity, relationships; Arndt et al., 2002), indicating that these belief systems are quickly brought to mind when death-focused thoughts are active. The functional significance of cultural beliefs in reducing concerns about death is further supported by studies showing that affirming the validity of one's beliefs reduces the accessibility of death-focused cognitions following MS (e.g., Arndt, Greenberg, Solomon, Pyszczynski, & Simon, 1997; Schmeichel & Martens, 2005) and that threats to the legitimacy of these beliefs increase the accessibility of death-focused cognitions even in the absence of MS (Schimel, Hayes, Williams, & Jahrig, 2007; see also Florian, Mikulincer, & Hirschberger, 2002; Friedman & Rholes, 2007).

TMT's analysis of worldviews converges with other perspectives that emphasize that stable, culturally derived conceptions of reality function in large part to shield the individual from existential threats. For example, Van den Bos and Lind's (2002) uncertainty management theory posits that certain conceptions of reality help individuals manage concerns with personal uncertainty. More recently, Heine, Proulx, and Vohs (2006) suggested that structured conceptions of reality help satisfy people's fundamental need for meaning. Although these perspectives differ in their explanations for why meaning-reaffirmation efforts take place, each emphasizes

the psychological importance of such efforts (for discussions of these perspectives relative to TMT, see McGregor, 2006; Proulx & Heine, 2006; Pyszczynski, Greenberg, Solomon, & Maxfield, 2006). Yet, despite this converging theoretical emphasis, surprisingly few studies have examined how existential threats such as MS directly influence perceptions of meaning in life. McGregor, Zanna, Holmes, and Spencer (2001, Study 4), for example, demonstrated that MS, and personal uncertainty to a lesser extent, led to higher scores (relative to controls) on an identity-seeking scale conceptually linked to the search for meaning in life. However, research has shown that the search-for-meaning construct is psychologically distinct from the presence of meaning and therefore does not simply reflect a sense of meaninglessness (e.g., Steger, Frazier, Oishi, & Kaler, 2006).

Results from the two studies inspired by TMT that directly examined the effect of MS on perceptions of meaning in life suggest that the relationship is not a straightforward one. Simon, Arndt, Greenberg, Solomon, and Pyszczynski (1998) demonstrated that mildly depressed individuals who engaged in worldview defense following MS (relative to those who did not) reported higher levels of meaning in life but that MS had no direct impact on reported meaning. More recently, Routledge, Arndt, Sedikides, and Wildschut (2008) argued that proneness for nostalgic reflection, because it affirms a sense of meaning, may protect individuals from the perceptions of meaninglessness potentially aroused by MS. Accordingly, they found that MS led to lower levels of meaning in life only among those not prone to engage in nostalgia. In sum, TMT converges with other perspectives (e.g., Heine et al., 2006; Van den Bos & Lind, 2002) in highlighting people's motivation to assuage existential threats by employing structured conceptions of reality posited to lend meaning to life, but a conclusive understanding of how heightened death-thought activation influences explicit perceptions of life's meaning has yet to be fully established.

TMT, PNS, and Meaning

The research just reviewed suggests that the relationship between heightened death awareness and perceptions of meaning in life is complex. Specifically, it appears that being reminded of one's mortality may undermine perceptions of meaning unless the individual is oriented toward preexisting knowledge about the world and him- or herself (e.g., through nostalgic revelry; Routledge et al., 2008). This possibility led us to examine whether PNS is an important factor to consider in this context, as it represents a dispositional tendency to rely on preexisting knowledge structures and form clear and simple interpretations of social information.

The PNS construct is rooted in lay epistemology theory's (Kruglanski, 1989) analysis of how individuals come to acquire knowledge. The theory posits that situational and dispositional factors influence one's desire to interpret information in ways that minimize ambiguity and confusion. Within this framework, individuals vary along a continuum in the need for closure (NFC). High NFC reflects a strong desire for clear and stable knowledge, while low NFC reflects a strong motivation to entertain novel or unfamiliar possibilities and thus avoid prematurely closing on a conclusion. PNS is very much akin to NFC, representing individual differences in the preference for clear and stable knowledge (Neuberg & Newsom, 1993). Research on the psychometric prop-

erties of both NFC (Webster & Kruglanski, 1994) and PNS (M. M. Thompson et al., 2001) has revealed that these constructs show expected associations with conceptually similar (yet distinct) constructs such as dogmatism, openness to experience, intolerance of ambiguity, and authoritarianism. NFC and PNS have also been shown to have strong predictive validity. For example, they are positively related to stereotyping (Kruglanski & Freund, 1983; Neuberg & Newsom, 1993), the formation of spontaneous inferences based on traits (Moskowitz, 1993), and the assimilation of social judgments to accessible constructs (Ford & Kruglanski, 1995; E. P. Thompson, Roman, Moskowitz, Chaiken, & Bargh, 1994). In general, then, high-PNS individuals possess a relatively inflexible orientation toward information processing and rely on preexisting schemas, scripts, and heuristics to simplify the complexities of the social world. Low-PNS individuals, in contrast, appear to be less averse to, and even motivated to seek, ambiguity, change, and novelty.

A recent integration of TMT with lay epistemology theory has focused on the ways in which variations in PNS moderate the effect of MS on interpretations of other people and social events. This research builds from the TMT postulate that stable, consistent, and unambiguous conceptions of reality provide psychological protection against mortality awareness and tests whether MS increases diverse tendencies to assimilate information into existing knowledge structures rather than entertain novel or ambiguous interpretations. Accordingly, high-PNS individuals respond to MS (relative to aversive controls) with a stronger disliking for counterstereotypic (Schimmel et al., 1999) and behaviorally inconsistent targets (Landau et al., 2004) and show increased preferences for information consistent with the preexisting belief that the world is a just place (Landau et al., 2004). In addition, Landau, Greenberg, Solomon, Pyszczynski, and Martens (2006) showed that MS led high-PNS individuals to dislike artwork devoid of clear and easily interpreted meaning (modern abstract art), but this effect was attenuated when the same artworks were given an unambiguously meaningful title or frame of reference. In short, multiple studies have shown that high-PNS, but not low-PNS, individuals seek and defend clear knowledge structures in response to mortality reminders. Because TMT posits that clear knowledge structures help to confer terror-assuaging meaning, we expected that high-PNS individuals will show stable or perhaps bolstered perceptions of life's meaning when death-focused cognitions are active. Low-PNS individuals, in contrast, do not respond to mortality reminders by employing structured interpretations of social information and were thus expected to experience deficits in meaning when death thought is active.

Although low-PNS individuals may not chronically cling to familiar knowledge structures, we know of no evidence that they are more likely than high-PNS individuals to experience existential meaninglessness. It is possible, then, that low-PNS individuals may affirm meaning in ways that do not rely on neatly structured conceptions of the social world. Extending TMT's theoretical integration with lay epistemology theory, we propose that low-PNS individuals seek openness and novelty as a means of imbuing their lives with meaning and, ultimately, protecting themselves from mortality concerns. That is, although low-PNS individuals may experience initial deficits in meaning in life when death thought is active, the foregoing analysis led us to hypothesize that these individuals might reaffirm meaning through the exploration

and consideration of novel ideas and experience. Although some prior evidence (discussed in the introduction to Study 2) supports this hypothesis, the present research is the first to directly examine this possibility.

The Present Research

The present research was conducted with two specific aims in mind. First, four separate studies were designed to test how death-focused cognitions differentially influence perceptions of meaning in life as a function of individual differences in PNS. On the basis of prior evidence that high-PNS individuals structure reality in easily interpreted ways, particularly when primed with mortality (e.g., Landau et al., 2004), we hypothesized that these individuals would exhibit stable or even bolstered perceptions of meaning when death thought is active. In contrast, low-PNS individuals do not respond to MS with increased reliance on structured interpretations of reality and were therefore hypothesized to perceive less meaning in life when death thought is active. Studies 1a–1d provided converging tests of these hypotheses using different control inductions for comparison with MS and different measures of perceived meaning in life.

The second aim of this research focused on the psychological resources used by low-PNS individuals to affirm meaning when death thought is active. Building on the theoretical synthesis between TMT and lay epistemology theory, we propose that low-PNS individuals derive terror-assuaging meaning from the consideration and active exploration of novelty. A series of programmatic studies was conducted to examine this process (cf. Spencer, Zanna, & Fong, 2005). Studies 2 and 3 tested whether low-PNS individuals would show an increased interest in the exploration of novelty when death thought was active. Studies 4 and 5 then tested whether low-PNS individuals who were primed with mortality and subsequently led to consider novel interpretations of the world and themselves would experience an affirmed sense of meaning in life.

Studies 1a–1d: Interactive Effect of MS and PNS on Perceptions of Meaning in Life

The initial series of studies explored how heightened death-focused ideation influences perceptions of meaning in life differently among individuals high and low in PNS. Participants contemplated their own death or an aversive control topic (Studies 1a–1c) or completed a measure of death-thought accessibility (Study 1d) and then reported perceived meaning in life. We predicted that, when death thought was active, high-PNS individuals would show stable or even bolstered perceptions of meaning in life. Low-PNS individuals, in contrast, were expected to exhibit lower levels of perceived meaning in life in response to heightened death-thought.

Study 1a Method

Participants and Procedure

Forty (30 female) introductory psychology students participated in exchange for course credit. Participants arrived at the lab in groups of 1–6 per session and were seated at private cubicles. In this and the subsequent variants of Study 1, an experimenter described the study as investigating how personality characteristics

relate to attitudes, judgments, or decision making and then distributed randomly assigned questionnaire packets (except in Study 1b, which was completed on computers). The content and order of these packets are described below.

Materials

Personal need for structure. Participants completed M. M. Thompson et al.'s (2001) 12-item PNS scale, which was embedded within filler personality measures. The PNS scale assesses the extent to which individuals prefer order, certainty, and unambiguous knowledge. Example items include "I enjoy having a clear and structured mode of life" and "I don't like situations that are uncertain." Participants indicated their level of agreement with each of the 12 items on a scale of 1 (*strongly disagree*) to 6 (*strongly agree*). PNS scores were calculated by averaging these responses ($M = 3.05$, $SD = 0.57$, $\alpha = .71$).

Salience manipulation. Following previous research (e.g., Rosenblatt, Greenberg, Solomon, Pyszczynski, & Lyon, 1989), MS was manipulated by having participants respond to two questions concerning death: "Please briefly describe the emotions that the thought of your own death arouses in you," and "Jot down, as specifically as you can, what you think will happen to you once you are physically dead." Control participants responded to parallel questions regarding the experience of dental pain, a generally aversive topic used frequently in TMT research (e.g., Landau et al., 2006).

Word-search delay. Prior research has established that symbolic, meaning-related terror management defenses (e.g., worldview defense) occur most prominently when thoughts of death are highly accessible but outside conscious awareness (see, e.g., Pyszczynski, Greenberg, & Solomon, 1999). Thus, participants completed an innocuous word-search task that served as a delay exercise between the salience manipulations and the dependent measure.

Meaning in life. Perceptions of meaning in life were assessed by Kunzendorf and Maguire's (1995) No Meaning Scale. This instrument asks participants to indicate their level of agreement with statements such as "Life has no meaning or purpose" and "All strivings in life are futile and absurd" on a scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). Following previous TMT research (Routledge et al., 2008), 6 of the full scale's 18 items were excluded because they make direct reference to death (e.g., "It does not matter whether I live or die"). To facilitate interpretation, responses were reverse scored and averaged together to form a composite meaning in life index, where higher values reflect stronger perceptions of meaning in life ($M = 3.54$, $SD = 0.54$, $\alpha = .92$).

Study 1a Results

Preliminary analyses revealed an outlier with a studentized deleted residual value of 7.38. This outlier was excluded from analyses. Following the guidelines of Aiken and West (1991), meaning in life scores for the remaining participants were regressed onto MS (dummy-coded), PNS (centered), and their interaction. The results returned a significant main effect of PNS ($\beta = .38$, $SE = .10$), $t(36) = 2.47$, $p < .05$, but no main effect of MS ($\beta = -.09$, $p = .58$). These were qualified by the predicted MS \times

PNS interaction ($\beta = .58$, $SE = .19$), $t(35) = 2.87$, $p < .01$, presented in Figure 1. The effects of MS were examined at $\pm 1 SD$ from the PNS mean to reveal the nature of this interaction. At low levels of PNS, MS led to lower meaning in life scores relative to the salience of dental pain ($\beta = -.49$, $SE = .14$), $t(35) = 2.47$, $p < .05$. At high levels of PNS, MS led to marginally higher meaning in life scores relative to the salience of dental pain ($\beta = .37$, $SE = .15$), $t(35) = 1.73$, $p = .09$.¹

Study 1b Method

Participants and Procedure

Fifty-four (45 female) introductory psychology students participated in exchange for course credit. Five participants (all female) were excluded from analyses because they indicated that they had recently participated in a study involving TMT hypotheses and reflections on personal mortality. Participants arrived at the lab in groups of 1–4 per session. They were ushered into private cubicles where the study was conducted entirely on computers using Medialab v2004 software (Empirisoft, New York, NY).

Materials

Personal need for structure. As in Study 1a, PNS was measured using M. M. Thompson et al.'s (2001) PNS scale ($M = 3.60$, $SD = 0.79$, $\alpha = .84$).

Salience manipulation. MS was manipulated via the same two open-ended questions about death utilized in Study 1a. In the present study, control participants responded to questions regarding the experience of general physical pain, rather than the more specific experience of dental pain used in Study 1a.

Affect. Following the salience manipulations, all participants completed Watson, Clark, and Tellegen's (1988) 20-item Positive and Negative Affect Schedule (PANAS), which assesses both positive and negative affect. Participants indicated the extent to which they were currently feeling a variety of positive ($M = 3.38$, $SD = 0.92$, $\alpha = .91$) and negative ($M = 1.86$, $SD = 0.72$, $\alpha = .87$) emotions (e.g., "excited," "scared") on a scale of 1 (*very slightly or not at all*) to 5 (*extremely*). Assessing immediate affective responses to the MS manipulation allowed us to test the possible alternative interpretation that the effect found in Study 1a was due to variations in self-reported affect rather than the salience of death per se.

Delay task. Following previous research (e.g., Greenberg, Pyszczynski, Solomon, Simon, & Breus, 1994), participants read a brief innocuous passage taken from "The Growing Stone" (Camus, 1957) after the PANAS and responded to two questions based on what they had read (i.e., "How do you feel about the overall descriptive qualities of the story?" and "Do you think the author of this story is male or female?"). This exercise created a delay between the MS manipulation and the dependent measure similar to the word-search task used in Study 1a.

¹ When the excluded outlier is retained in analyses, the MS \times PNS interaction ($\beta = -.76$, $p < .01$) and the effect of MS at low ($-1 SD$) levels of PNS ($\beta = -.44$, $p < .05$) remain significant. In addition, the effect of MS at high ($1 SD$) levels of PNS is also significant ($\beta = .57$, $p < .01$).

Meaning in life. Perceptions of meaning in life were assessed by the 5-item Presence of Meaning in Life subscale (MIL-P) of Steger et al.'s (2006) Meaning in Life Questionnaire. This measure asks participants to indicate how true statements like "My life has a clear sense of purpose" and "I have a good sense of what makes my life meaningful" are of them on a scale of 1 (*absolutely untrue*) to 7 (*absolutely true*). Responses were averaged to create a meaning in life score ($M = 4.43$, $SD = 1.40$, $\alpha = .88$), where higher scores reflect stronger perceptions of meaning in life.

Study 1b Results

Meaning in life scores were regressed onto MS (dummy-coded), PNS (centered), and their interaction. These analyses yielded no significant main effects of MS ($\beta = .06$, $p = .68$) or PNS ($\beta = -.08$, $p = .61$). However, the predicted MS \times PNS interaction (see Figure 2) was significant ($\beta = .66$, $SE = .46$, $t(45) = 3.60$, $p < .01$). The effects of MS (relative to physical pain) at high and low levels of PNS (± 1 SD from the PNS mean) were subsequently analyzed to unpack this interaction. MS (relative to physical pain) was associated with weaker perceptions of meaning in life ($\beta = -.53$, $SE = .52$, $t(45) = 2.87$, $p = .01$, at low levels of PNS and stronger perceptions of meaning in life at high levels of PNS ($\beta = .42$, $SE = .52$, $t(45) = 2.25$, $p < .05$).

Ancillary analyses were also conducted to determine if self-reported affect could account for any of the observed effects. Consistent with previous TMT research (e.g., Greenberg, Solomon, & Pyszczynski, 1997), the salience manipulation did not impact positive or negative affect ($ts < .102$, $ps > .32$). There was also no main effect of PNS or an MS \times PNS interaction on either positive or negative affect ($|\beta s| > .17$, $ps > .24$), and no three-way interactions involving MS, PNS, and positive or negative affect emerged ($|\beta s| > .35$, $ps > .42$) on meaning in life scores. Finally, controlling for self-reported affect did not attenuate the MS \times PNS interaction reported above ($\beta = .61$, $p < .001$).

Study 1c Method

Participants and Procedure

Eighty-four (36 female) introductory psychology students participated in exchange for course credit. Experimental sessions were conducted in a classroom setting with 15–20 participants per session.

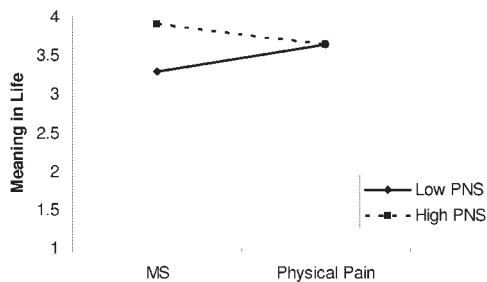


Figure 1. Mortality Saliency (MS) \times Personal Need for Structure (PNS) interaction on meaning in life scores in Study 1a. Higher meaning in life scores indicate higher perceptions of meaning. PNS values are plotted at ± 1 SD from the PNS mean.

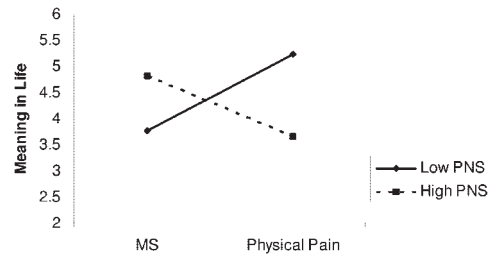


Figure 2. Mortality Saliency (MS) \times Personal Need for Structure (PNS) interaction on meaning in life scores in Study 1b. Higher meaning in life scores indicate greater perceptions of meaning. PNS values are plotted at ± 1 SD from the PNS mean.

Materials

Personal need for structure. PNS was again assessed via M. M. Thompson et al.'s (2001) PNS scale ($M = 3.32$, $SD = 0.67$, $\alpha = .78$).

Salience manipulation. Participants in the MS condition completed the same two open-ended questions about death featured in the previous studies. Control participants responded to parallel questions regarding the feelings associated with an event turning out differently than expected. This topic was selected as an alternative to general and specific pain and focused on a more epistemologically threatening experience, an expectancy violation.

Affect. Positive ($M = 2.88$, $SD = 0.85$, $\alpha = .90$) and negative ($M = 1.76$, $SD = 0.65$, $\alpha = .85$) affect was again assessed by the PANAS (Watson et al., 1988).

Word-search delay. The word-search task used in Study 1a was included as the delay.

Meaning in life. Meaning in life was measured via the MIL-P scale (Steger et al., 2006) used in the previous study and an 8-item meaning in life measure taken from Krause (2007). This measure taps into four factors posited to give rise to meaning: values, purpose, goals, and reconciling the past. Example items include "I have a system of values and beliefs that guide my daily activities" and "I have a sense of direction and purpose in life." All responses were made on a scale of 1 (*absolutely untrue*) to 7 (*absolutely true*) and were averaged into a single 13-item meaning in life composite ($M = 4.48$, $SD = 0.95$, $\alpha = .90$), where higher scores reflect stronger perceptions of meaning in life.

Study 1c Results

Meaning in life scores were regressed onto MS (dummy-coded), PNS (centered), and their interaction. No significant main effects of MS ($\beta = -.04$, $p = .75$) or PNS ($\beta = .15$, $p = .19$) emerged. However, the MS \times PNS interaction was once again significant ($\beta = .43$, $SE = .30$, $t(80) = 3.00$, $p < .01$ (see Figure 3)).² At low levels (-1 SD) of PNS, participants in the MS condition reported lower levels of meaning in life relative to those in the unexpected

² Although the two meaning in life measures formed a reliable composite and the scales were correlated ($r = .57$), regression analyses were also conducted on each scale separately. As would be expected, significant MS \times PNS interactions were returned for each measure separately ($|\beta s| > .37$, $ps < .05$) with patterns mirroring those for the composite index.

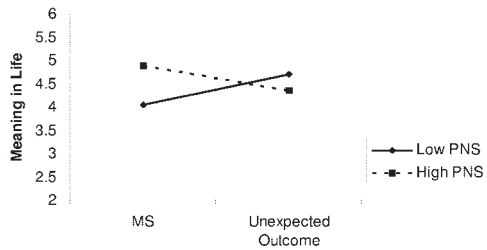


Figure 3. Mortality Saliency (MS) × Personal Need for Structure (PNS) interaction on meaning in life scores in Study 1c. Higher meaning in life scores indicate greater perceptions of meaning. PNS values are plotted at ± 1 SD from the PNS mean.

outcome condition ($\beta = -.35$, $SE = .28$), $t(80) = 2.33$, $p < .05$. In contrast, at high levels (1 SD) of PNS, MS participants reported somewhat more meaning in life compared to participants in the unexpected outcome condition ($\beta = .27$, $SE = .28$), $t(80) = 1.84$, $p = .07$. Ancillary analyses involving affect mirrored those found in Study 1b.

Study 1d Method

Participants and Procedure

Thirty-nine introductory psychology students participated in exchange for course credit. Due to a clerical error, gender was not recorded in this study. Participants arrived at the lab in groups of 1–6 per session and were seated at private cubicles.

Materials

Personal need for structure. As in Study 1, PNS was measured using M. M. Thompson et al.'s (2001) PNS scale ($M = 3.07$, $SD = 0.73$, $\alpha = .81$).

Death-thought accessibility. Rather than relying on the salience manipulations used in Studies 1a–1c to induce thoughts of death, the present study directly assessed levels of death-thought accessibility (DTA). Participants were given a word-completion task (e.g., Greenberg et al., 1994; Mikulincer & Florian, 2000), which presented 28 word fragments, 6 of which could be completed with a neutral or a death-related word. For example, the fragment COFF_ _ could be completed as COFFEE (a neutral word) or COFFIN (a death-related word). The possible death-related words were *buried*, *murder*, *grave*, *skull*, *stiff*, and *coffin*. DTA scores were computed by summing the number of death words created by each participant ($M = 1.98$, $SD = 0.82$). Higher scores indicate greater accessibility of death-related thoughts.

Meaning in life. Finally, participants completed the Kunzendorf and Maguire (1995) No Meaning Scale used in Study 1a. Scores were again reverse scored to facilitate interpretation ($M = 3.50$, $SD = 0.47$, $\alpha = .87$).

Study 1d Results

Initial analyses examining the zero-order correlations between the primary variables revealed no significant associations. DTA was not correlated with meaning in life ($r = -.24$, $p = .14$) or PNS ($r = .03$, $p = .84$), and PNS was not correlated with meaning

in life ($r = -.01$, $p = .96$). Meaning in life scores were then regressed onto DTA (centered), PNS (centered), and their interaction to examine the critical hypotheses. The results revealed no significant DTA ($\beta = -.24$, $p = .16$) or PNS ($\beta < .01$, $p = .99$) main effects, but the predicted DTA × PNS interaction (see Figure 4) was significant ($\beta = .51$, $SE = .11$), $t(35) = 3.58$, $p < .01$. The DTA simple slopes were tested at high and low levels of PNS (± 1 SD from the PNS mean) to unpack this interaction. At low levels of PNS, DTA was negatively associated with perceptions of meaning in life ($\beta = -.81$, $SE = .12$), $t(35) = 3.82$, $p < .01$. At high levels of PNS, DTA was unrelated to meaning in life, though the pattern was in the positive direction ($\beta = .25$, $SE = .11$), $t(35) = 1.27$, $p = .21$.

Studies 1a–1d Discussion

Using three different measures of meaning in life, three separate control conditions, and two operationalizations of death-focused cognitions and ruling out the influence of a relevant third variable (i.e., affect; King, Hicks, Krull, & Del Gaiso, 2006), the results of Studies 1a–1d indicate that the influence of death-focused cognitions on perceptions of meaning in life is moderated by the extent to which individuals construe reality in simple and unambiguous ways. There is a consistent pattern of results among individuals high in PNS suggesting that they experienced a sustained or even somewhat bolstered sense of meaning in life when death concerns were activated. In contrast, low-PNS individuals appeared to be rendered vulnerable to feelings of meaninglessness when death-focused cognitions were accessible. Taken together, these results provide convergent support for the hypothesis that differences in PNS play a critical role in shaping the impact of death-focused ideation on meaning in life.

The robust nature of the deleterious effect of MS on meaning for low-PNS individuals raises interesting questions about how they might affirm perceptions of life's meaning when death thoughts are activated. As described in the introduction, our current analysis led us to hypothesize that low-PNS individuals might derive terror-assuaging meaning from more open epistemic orientations rather than from the structure seeking characteristic of high-PNS individuals. We therefore designed Studies 2–5 to directly test whether low-PNS individuals respond to heightened death-thought activation by seeking out open epistemic orientations and whether such orientations allow them to affirm meaning in their lives when confronted with thoughts of their mortality.

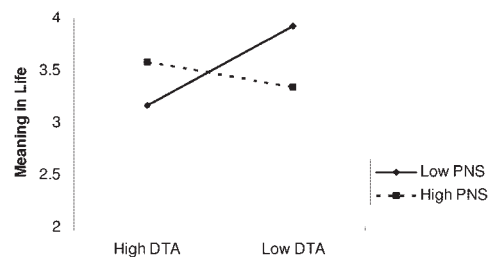


Figure 4. Death-Thought Accessibility (DTA) × Personal Need for Structure (PNS) interaction on meaning in life scores in Study 1d. Higher meaning in life scores indicate greater perceptions of meaning. PNS values are plotted at ± 1 SD from the PNS mean.

Study 2

As discussed earlier, low-PNS individuals, in contrast to their high-PNS counterparts, do not exhibit a pronounced motivation to maintain simple, consistent, and stable interpretations of reality. Indeed, research has demonstrated that low-PNS individuals are more tolerant of ambiguity and open to experience (Neuberg & Newsom, 1993), suggesting that they possess an orientation to the social world that is characterized by an openness to novelty and flexibility. Furthermore, low-PNS individuals appear to be proficient at integrating novel and unfamiliar experiences into preexisting knowledge (e.g., M. M. Thompson et al., 2001), and a study by Dijksterhuis, van Knippenberg, Kruglanski, and Schaper (1996) showing that low-PNS individuals recalled more stereotype-inconsistent information suggests that they may be particularly motivated to do so. From a terror management perspective, whereas high-PNS individuals cling to familiar and structured knowledge as a basis of terror-assuaging meaning, low-PNS individuals may manage mortality concerns by seeking meaning through a relatively more flexible and open orientation to the world. If this analysis is accurate, then increasing the salience of mortality should lead low-PNS individuals to show greater flexibility and to seek out novelty.

Dechesne, Janssen, and van Knippenberg (2000) provided some indirect support for this possibility. Whereas MS typically engenders a rigid defense of group identities, low-PNS individuals in this study were more likely to respond to MS by flexibly distancing themselves from a negatively portrayed group identification following reminders of death. Suggestive support was also provided by Landau et al. (2004) where MS led low-PNS individuals to request more information that portrayed a crime victim in a positive light and thus ran counter to preexisting beliefs that the world is a just place. Beyond these findings, however, insights into the ways that low-PNS individuals respond to mortality concerns have been relatively inconclusive. Landau et al. (2004), for example, failed to find any significant effects of MS on liking for behaviorally consistent or inconsistent targets, balanced interpersonal relationships, or benevolent causation among low-PNS individuals. Similarly, Landau et al. (2006) did not find that MS influenced evaluative preferences for modern art among low-PNS individuals. Thus, while some evidence supports the potential for more flexible responses to existential concerns among low-PNS individuals, there remains some ambiguity regarding the specific types of responses that are most likely to be operative.

Why have some studies shown MS effects among low-PNS individuals while others have not? We suggest that a critical factor is whether the studies measured active search for novel information. TMT posits that the activation of death-focused thoughts engenders efforts to affirm important sources of meaning, and research has shown that MS does not directly influence responses that do not provide an opportunity for affirmation (e.g., Simon et al., 1998). Simple evaluations of behaviorally consistent or inconsistent targets and modern art may not actively engage the explorative processes by which low-PNS individuals affirm meaning; therefore, low-PNS individuals do not differ on these measures as a function of MS. In contrast, directly measuring an active willingness to explore novel or unfamiliar information may provide a more sensitive means of testing whether low-PNS individuals derive terror-assuaging meaning from novelty seeking.

To examine this possibility, participants in Study 2 were reminded of mortality or of an aversive control topic and were then exposed to an instrument designed to assess interest in exploring novel information relevant to predominant cultural views of reality. Specifically, participants expressed their interest in viewing documentaries that examined the difficulties of being a Chinese immigrant in American society and how U.S. foreign policy impacts the rise of global terrorism. We predicted that following MS, low levels of PNS would be associated with a greater interest in exploring the topics of these documentaries.

We also examined the specificity of the hypothesized effect. Although we propose that the effect is due specifically to individual variations in need for epistemic structure, the effect may alternatively reflect the influence of other constructs known to impact terror management effects and interest in novelty. Previous research has shown that individual differences in attachment anxiety and avoidance (Griffin & Bartholomew, 1994) moderate certain terror management effects (Mikulincer, Florian, & Hirschberger, 2003) and are related to an interest in exploring novel information (Green & Campbell, 2000). In addition, there is some evidence of gender differences on variables associated with exploration (e.g., openness to ideas; Costa, Terracciano, & McCrae, 2001). Therefore, we assessed the potential influence that these variables might have on the hypothesized effect.

Method

Participants and Procedure

One hundred forty-six (83 female) psychology students participated in exchange for course credit. Given the nature of the dependent variable and its focus on minority experiences (described below), only Caucasians were included in the sample. The study was conducted in a large lecture hall. Participants were given a randomly assigned questionnaire packet, instructed to work through the materials in the order they were presented, and asked to refrain from talking or discussing the materials until all had finished. The content and order of the packets are described below.

Materials

Personal need for structure. PNS was again assessed by M. M. Thompson et al.'s (2001) PNS scale ($M = 3.54$, $SD = 0.75$, $\alpha = .84$).

Attachment security. Following the PNS scale, participants completed a portion (13 items) of Griffin and Bartholomew's (1994) Relationship Scales Questionnaire. This scale measures general attachment styles and was used to calculate individual differences in attachment anxiety (e.g., "I worry about being abandoned"; $M = 2.45$, $SD = 0.93$, $\alpha = .83$) and avoidance (e.g., "I find it difficult to trust others completely"; $M = 2.52$, $SD = 0.79$, $\alpha = .86$). Item responses were made on a scale of 1 (*not at all like me*) to 5 (*very much like me*).

Salience manipulation. Death-focused cognitions were induced by asking participants to complete Boyar's (1964) Fear of Death Scale. This scale consists of 15 true-false questions about anxieties associated with death (e.g., "Does the thought of leaving loved ones behind when you die disturb you?", "Do you worry about dying?") and has been used in previous research as a method

for activating thoughts of mortality (e.g., Arndt, Greenberg, Simon, Pyszczynski, & Solomon, 1998). Participants in the control condition responded to a parallel survey regarding fears of future uncertainty (e.g., "I am really scared about what might happen in the future"), a topic that others (e.g., Van den Bos, Poortvliet, Maas, Miedema, & Van den Ham, 2005) have argued may account for MS effects.

Delay. Following the salience manipulations, all participants completed the same word-search puzzle utilized in Studies 1a and 1c.

Interest in exploring novel cultural information. Participants were then exposed to a brief paragraph informing them that the university was working with a local theater to assess student interest in a variety of documentaries that the University of Missouri's (MU) student life department was considering showing in the future. They were instructed to read over brief descriptions of the documentaries and to indicate their interest in viewing each. Critically, two documentaries covered topics that detailed potentially unfamiliar aspects of American culture. One documentary focused on the difficulties of living in American society from the perspective of a Chinese immigrant, while the other detailed the role of American foreign policy in the rise of global terrorism (see Routledge & Arndt, 2009, for complete film descriptions). After reading each description, participants responded to the questions "How interested are you in seeing this documentary?" and "If MU did in fact bring this documentary to campus, how likely is it that you would go see it?" Responses were made on a scale of 1 (*not at all*) to 7 (*extremely*) and were averaged together to create a composite interest score ($M = 3.74$, $SD = 1.38$, $\alpha = .80$). These materials have been used in previous research (Routledge & Arndt, 2009) and have shown convergent validity with Green and Campbell's (2000) measure of willingness to engage in environmental, social, and intellectual exploration ($r = .42$, $p < .05$).

Results

Initial Analyses

Composite documentary interest scores were regressed onto MS (dummy-coded), PNS (centered), and their interaction. The results revealed no significant effects of MS ($\beta = -.06$, $p = .50$) or PNS ($\beta = -.08$, $p = .32$). The MS \times PNS interaction, however, approached significance ($\beta = .21$, $SE = .30$), $t(143) = 1.71$, $p = .09$ (see Figure 5). We tested the hypothesis that MS would be

associated with greater interest in exploring the documentaries among low-PNS individuals by examining the effects of MS at ± 1 SD from the PNS mean. At low levels of PNS, MS led to somewhat more documentary interest relative to the salience of future uncertainty ($\beta = .20$, $SE = .33$), $t(143) = 1.70$, $p = .09$. At high levels of PNS, however, interest in the documentaries did not vary as a function of MS ($\beta = -.09$, $p = .47$).

Secondary Analyses

We conducted an additional set of analyses in an attempt to clarify the influences of PNS and MS by controlling for attachment anxiety, attachment avoidance, and gender. As noted earlier, attachment security has been linked to the willingness to explore (Green & Campbell, 2000) and has been shown to moderate the impact of MS on reactions to culturally relevant stimuli (Mikulincer & Florian, 2000). Similarly, gender differences have been found on constructs related to exploration (e.g., openness to ideas; Costa et al., 2001). In the present research, regression analyses revealed no significant effects of attachment avoidance ($\beta = -.15$, $p = .14$), attachment anxiety ($\beta = .09$, $p = .39$), or gender ($\beta = -.11$, $p = .20$). The direction of the avoidance and gender effects were, however, consistent with previous research. Regression analyses controlling for the influence of these variables revealed no significant main effects of MS ($\beta = -.06$, $p = .51$) or PNS ($\beta = -.08$, $p = .38$), but the predicted MS \times PNS interaction did emerge ($\beta = .24$, $SE = .31$), $t(139) = 1.94$, $p = .05$. At low levels of PNS, MS led to marginally more documentary interest relative to the salience of future uncertainty ($\beta = .22$, $SE = .33$), $t(139) = 1.85$, $p = .07$. At high levels of PNS, however, interest in the documentaries did not vary as a function of MS ($\beta = -.11$, $p = .36$).

Discussion

The pattern of results observed in Study 2 provide preliminary support for the hypothesis that low-PNS individuals primed with mortality (relative to future uncertainty) would be more interested in exploring culturally unfamiliar perspectives and may thus derive terror-assuaging meaning through novelty seeking. In contrast, MS did not appear to influence interest in the documentaries among high-PNS individuals. At first glance, this null effect at high levels of PNS may seem to run counter to previous work showing that these individuals are averse to nonstructured information following MS (e.g., Landau et al., 2004). There are, however, two potential explanations for this finding. First, the documentaries were framed in easily interpreted ways. In the aforementioned Landau et al. (2006) findings, the MS-induced distaste for visually ambiguous artwork among high-PNS individuals was eliminated when the artwork was accompanied by a title that clarified its meaning. Such framing presumably facilitated a clear and simple interpretation of the artwork and in this way attenuated the aversion to ambiguity that high-PNS individuals typically show in response to MS. The coherence and clarity of the documentary titles in the present study may have functioned similarly. In addition, this finding is consistent with the findings of Routledge and Arndt (2009) in which MS impacted documentary interest only when individuals were primed to think creatively (i.e., in a less rigidly structured manner). Routledge and Arndt suggested that the

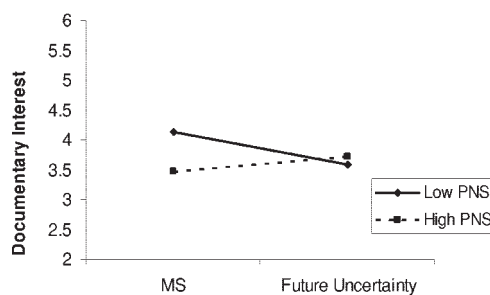


Figure 5. Mortality Saliency (MS) \times Personal Need for Structure (PNS) interaction on documentary interest composite in Study 2. PNS values are plotted at ± 1 SD from the PNS mean.

measure asks about interest in exposing oneself to countercultural perspectives and not about the evaluative component that is characteristic of most worldview-defense measures. In other words, the measure appears to be more sensitive to capturing explorative interest than dogmatic defensiveness.

Although the overall pattern of results was consistent with the guiding conceptual analysis, the interactive effect of MS and PNS was significant only when the influences of attachment security and gender were controlled for. This introduces some ambiguity about the overall strength of this effect. One possible explanation for why this effect was less pronounced than expected, however, may be that it does not offer a pure reflection of the willingness to explore novelty (e.g., it is only modestly correlated with Green & Campbell's, 2000, exploration scale, $r = .42$). In particular, it is unclear whether or not the documentary topics were truly novel to participants. The idea that U.S. foreign policy might contribute to terrorism, for example, may have been familiar to participants given the attention this topic has received in the media over the past few years. Separate analyses examining the MS \times PNS interaction on interest in each of the documentaries separately tentatively support this possibility. While an MS \times PNS interaction did emerge for the "Chinese perspective on American society" documentary ($\beta = .26, p = .03$), one did not emerge for the perhaps more familiar "U.S. impact on terrorism" documentary ($\beta = .10, p = .44$). The ambiguity concerning the precision of this instrument for assessing exploration of novelty suggests that, although the results were generally consistent with hypotheses, Study 2 may not have offered the most appropriate test of them. Study 3 was conducted to potentially clarify this issue using the Green and Campbell (2000) exploration measure, an instrument specifically designed to capture a willingness to explore novel and complex information.

Study 3

Study 3 was designed to further examine the hypothesis that death-focused cognitions may engender an increased desire to explore novelty among low-PNS individuals. Whereas Study 2 used an experimental induction of MS, Study 3 employed the continuous measure of DTA featured in Study 1d. Moreover, and perhaps most critically, Study 3 utilized Green and Campbell's (2000) more general and less content-specific (relative to the documentary measure) index of the desire to explore novelty. Thus, Study 3 offered a more rigorous test of the guiding hypothesis and was consequently positioned to provide additional clarity to the findings observed in Study 2.

Method

Participants and Procedure

Sixty-one (37 female) introductory psychology students participated in exchange for course credit. They completed questionnaire packets, the content of which is described below.

Materials

Personal need for structure. PNS was assessed via M. M. Thompson et al.'s (2001) PNS scale ($M = 3.68, SD = 0.71, \alpha = .82$).

Death-thought accessibility. The accessibility of death-relevant cognitions was assessed by the same word-completion task (e.g., Arndt et al., 1997) used in Study 1d ($M = 1.43, SD = 0.88$).

Exploration. Interest in exploring novelty was indexed with Green and Campbell's (2000) exploration scale, which asks participants to indicate the extent to which a series of statements describes them at the present moment using a scale of 1 (*not at all*) to 8 (*very much*). Example items include "If given the chance, I would enjoy exploring unusual ideas or theories," and "I would like to have the chance to meet strangers." Responses were averaged to create a single willingness-to-explore composite score ($M = 5.59, SD = 1.04, \alpha = .87$).

Results

Initial analyses examined the zero-order correlations between DTA, PNS, and exploration. PNS was negatively associated with exploration ($r = -.44, p < .001$) but unrelated to DTA ($r = -.14, p = .27$). DTA and exploration were also not correlated ($r = .13, p = .32$). Total exploration scores were then regressed onto DTA (centered), PNS (centered), and their interaction. There was a significant main effect of PNS ($\beta = -.43, SE = .18, t(57) = 3.62, p < .01$), but no main effect of DTA ($\beta = .07, p = .57$). These were qualified by the predicted DTA \times PNS interaction ($\beta = -.25, SE = .18, t(57) = 2.14, p < .05$), presented in Figure 6. Simple slopes tests at high and low levels of PNS ($\pm 1 SD$ from the PNS mean) were conducted to examine the nature of this interaction. Consistent with predictions, DTA was positively associated with exploration scores at low levels of PNS ($\beta = .29, SE = .18, t(57) = 1.87, p = .07$), but was not associated with exploration at high levels of PNS ($\beta = -.17, p = .29$).

Discussion

Study 3 showed that death-related cognitions led to an increased desire to explore novelty among low-PNS individuals. Specifically, the cognitive accessibility of death-related cognitions was positively associated with a desire to explore among low-PNS individuals. DTA and the desire to explore were unrelated among high-PNS individuals. This finding suggests that low-PNS individuals seek out open orientations toward novelty when death thoughts are active. However, whether or not open epistemic orientations help low-PNS individuals reaffirm a sense of meaning

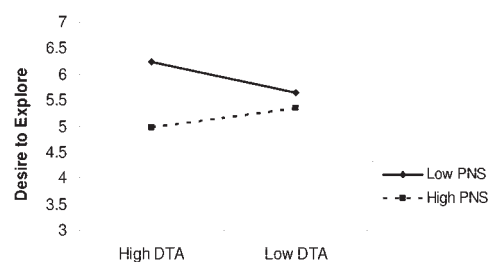


Figure 6. Death-Thought Accessibility (DTA) \times Personal Need for Structure (PNS) interaction on total exploration scores in Study 3. PNS values are plotted at $\pm 1 SD$ from the PNS mean.

in life when thoughts of death are active has yet to be examined. Studies 4 and 5 were designed to address this question.

Study 4

Study 4 was conducted to identify the existential implications of exploration by examining how the consideration of novel or familiar information following MS influences perceptions of meaning in life as a function of PNS. After completing a few filler measures, including a measure of openness to experience (John & Srivastava, 1999) that allowed us to account for the potential influence of individual differences in openness to novel information, participants were reminded of mortality or an aversive control topic and subsequently completed a task designed to manipulate the type of explorative responses measured in Studies 2 and 3. Specifically, participants were asked to consider exploring information on a topic that was either familiar or novel to them. After this task, all participants completed the Steger et al. (2006) MIL-P measure utilized in Study 1b.

If considering novel information does indeed facilitate a sense of meaning for low-PNS individuals faced with the awareness of mortality, then consideration of a novel topic (relative to a familiar one) after MS should affirm perceptions of meaning in life for low-PNS individuals. It is less clear, however, how these manipulations will affect high-PNS individuals' meaning perceptions. On the one hand, these individuals typically show aversion to ambiguity and preferences for simple forms of knowledge in response to MS. Leading them to confront novel information may therefore threaten their sense of meaning. On the other hand, the results of Landau et al. (2006) indicated that high-PNS people are not threatened by unfamiliar stimuli as long as it is couched in readily interpretable ways. Similarly, the current Studies 2 and 3 found that high-PNS individuals did not significantly decrease exploration in response to MS. Thus, it is also possible that the consideration of a novel topic after MS will have no effect on meaning for high-PNS people.

Method

Participants and Procedure

Ninety-three (54 female) introductory psychology students participated in exchange for course credit. One participant was excluded from analyses because she did not complete all of the experimental materials. Participants arrived at the lab in groups of 1–6 per session and were escorted into partitioned cubicles for privacy. The experimenter introduced the study as investigating the association between personality characteristics and visualization ability. Each participant was given a randomly assigned questionnaire packet that contained a few filler measures and the experimental materials critical to the present study.

Materials

Personal need for structure. As in the previous studies, M. M. Thompson et al.'s (2001) PNS scale was used to assess individual differences in the need for personal structure ($M = 3.76$, $SD = 0.70$, $\alpha = .79$).

Salience manipulation. MS was manipulated via the two open-ended questions about death utilized in previous studies.

Control participants in the present study responded to parallel questions about future uncertainty used in prior research on uncertainty management (e.g., Van den Bos et al., 2005).

Affect. As in the previous studies, participants completed Watson et al.'s (1988) PANAS immediately after the salience manipulations.

Delay. Participants completed the same word-search puzzle as in the previous studies.

Topic familiarity manipulation. To induce participants to consider information that was either familiar or unfamiliar to them, participants were asked to first rank order six topics based on how familiar each was to them. We included three topics expected to be familiar ("Current Trends in Pop Culture," "The Typical Day for American College Students," and "Inside the Shopping Mall") and three topics expected to be unfamiliar ("Living with the Aborigines of Australia," "The Hidden Meaning of Abstract Art," and "The Customs and Rituals of the Iranian People"). After rank ordering these topics, participants were asked to imagine that they were conducting an Internet search on one of these topics. Participants in the familiar condition were instructed to imagine searching on the topic they ranked as most familiar, and participants in the unfamiliar condition imagined searching the topic they ranked as least familiar. Finally, they were instructed to think about the important information that the search would yield, write down what they thought would be the three most important pieces of information resulting from the search, and visualize themselves reading over that information.

Presence of meaning in life. As in Study 1b, perceptions of meaning in life were assessed by the MIL-P subscale of Steger et al.'s (2006) Meaning in Life Questionnaire ($M = 4.72$, $SD = 1.16$, $\alpha = .85$).

Topic familiarity manipulation check. Following the MIL-P, participants responded to a question that served as a check on our familiarity manipulation: "How familiar were you with the topic that you visualized searching for?" Also, to assess the alternative possibilities that the hypothesized effect was simply due to the enjoyment or difficulty of the visualization exercise, we asked participants, "How difficult was it to visualize conducting the internet search?" and "How much did you enjoy the visualization exercise?" All responses were made on a scale of 1 (*not at all*) to 7 (*extremely*).

Results

Manipulation Checks

Familiarity. Preliminary analyses returned only a significant main effect of topic familiarity on responses to the question "How familiar were you with the topic that you visualized searching for?" Participants in the familiar topic condition indicated that they were more familiar with the topic they envisioned searching for than did participants in the unfamiliar condition ($M_{fam} = 5.8 > M_{unfam} = 1.7$), $t(90) = 18.19$, $p < .001$.

Difficulty. For the task difficulty item, regression analyses yielded only a significant MS \times Topic Consideration interaction ($\beta = -.36$), $t(85) = 2.00$, $p < .05$. Following MS, individuals who imagined searching on a familiar topic found the task to be less difficult than individuals who imagined searching on an unfamiliar topic ($M_{fam} = 2.05 > M_{unfam} = 3.17$), $F(1, 88) = 5.69$, $p < .05$.

In contrast, there was no such difference among participants who reflected on future uncertainty ($M_{\text{fam}} = 2.83 > M_{\text{unfam}} = 2.61$) $F(1, 88) = 0.22, p = .64$.

Enjoyment. No significant effects emerged on the task enjoyment item, indicating that task enjoyment did not vary as a function of MS, topic familiarity, or PNS. This null finding helps rule out the potential alternative that MS, PNS, and the consideration of novelty simply influence pleasure or enjoyment, rather than meaning per se.

Primary Analyses

Data screening revealed a PNS value more than three standard deviations away from the mean, and this participant was consequently excluded from analyses.³ Meaning in life scores for the remaining participants were regressed onto MS (dummy-coded), topic familiarity (dummy-coded), PNS (centered), and all possible interactions. The results revealed only a significant main effect of PNS ($\beta = .28, SE = .16, t(88) = 2.82, p < .01$, and the predicted 3-way interaction ($\beta = .58, SE = .66, t(84) = 2.64, p = .01$).

To decompose this interaction, a series of predicted means tests was conducted at high and low levels of PNS ($\pm 1 SD$). First, we examined the effects of the topic familiarity manipulation within the MS and uncertainty salience conditions at both high and low PNS (see Figure 7). Within the MS condition, low-PNS individuals who considered an unfamiliar topic reported higher levels of meaning in life relative to those who considered a familiar topic ($\beta = .58, SE = .52, t(42) = 2.53, p < .05$). In contrast, the topic familiarity manipulation had no impact on meaning in life among high-PNS participants within the MS condition ($\beta = -.12, p = .59$). For participants in the uncertainty condition, the topic familiarity manipulation did not engender differences in meaning in life at low levels of PNS ($\beta = -.04, p = .85$). However, following uncertainty salience, high-PNS individuals reported higher levels of meaning in life after considering an unfamiliar (relative to familiar) topic ($\beta = .39, SE = .43, t(42) = 2.09, p < .05$).⁴

We also examined the effect of MS within the unfamiliar topic condition. After considering an unfamiliar topic, MS (relative to uncertainty) led to higher levels of meaning in life for low-PNS individuals ($\beta = .67, SE = .47, t(42) = 3.15, p < .01$). In contrast, MS had no impact on perceptions of meaning in life for high-PNS individuals within the unfamiliar topic condition ($\beta = .25, SE = .43, t(42) = 1.30, p = .20$).⁵

Ancillary Analyses

We conducted a series of regression analyses to test the primary predicted effects while controlling for potentially relevant third variables. First, regressions that controlled for the effects of negative and positive affect, as assessed by the PANAS, were conducted. Next, analyses controlling for the effects of topic familiarity task enjoyment were conducted. This allowed us to account for positive feelings specific to the task posited to bolster meaning, in contrast to the more free-floating positive feelings assessed by the PANAS. We also conducted analyses that controlled for the effects of task difficulty to rule out the alternative explanation that differences in effortful processing as a function of topic familiarity might underlie the observed results. Finally, separate analyses controlling for openness to experience were conducted to assess

the specificity of PNS. Critically, controlling for each of these variables did not attenuate the significant MS \times Topic Familiarity \times PNS interaction reported above ($|\beta_s| > .56, ps < .05$).

Discussion

The results of Study 4 showed that low-PNS participants who imagined searching for information about a novel topic, relative to a familiar one, reported higher levels of meaning in life when thoughts of death were activated. Furthermore, after considering an unfamiliar topic, low-PNS participants in the MS condition perceived their lives to be more meaningful than did those in the uncertainty salience condition. In contrast, mortality-salient high-PNS participants did not differ in meaning perceptions as a function of which topic they imagined exploring, and after contemplating a novel topic, their meaning perceptions were not affected by the MS manipulation. These effects could not be accounted for by differences in affect, task enjoyment, perceived difficulty, or dispositional differences in openness to experience. Thus, the results of the present study complement the findings from Studies 2 and 3. High-PNS participants did not seem to actively avoid meaningfully framed novelty, nor did they experience shifts in meaning when considering unfamiliar topics following MS. Low-PNS individuals, on the other hand, did show an increased desire to explore novelty, and considering it appeared to bolster a sense of meaning when thoughts of death were activated.

³ Additional procedures for detecting multivariate outliers (Tabachnick & Fidell, 2001) were conducted to assess the influence of this particular case. First, we computed Mahalanobis distance (MD) values for all participants. The excluded participant had an MD value of 37.57, which exceeds the critical chi-square value at the $p = .001$ level (24.32). This was the only significant MD value observed. In addition, we also examined Cook's distance values for all participants. Not surprisingly, given the MD value, the PNS outlier had a Cook's distance value of .40, which exceeds a conventional cutoff of $4/(n - k - 1)$ or Cook's distance = .05 for the present study. This value was notably 5 times greater than the next closest Cook's distance value.

⁴ This effect within the uncertainty condition was unexpected. At first blush, that high-PNS participants would show higher meaning in life after imagining searching on an unfamiliar (vs. familiar) topic does not seem to follow from existing theories, which postulate a central role of uncertainty as an existential threat. Future work is therefore needed to understand this reaction. However, such a finding clearly indicates that while this type of uncertainty manipulation may lead to particular effects, it does not engender effects parallel to reminders of mortality. Moreover, this effect in the uncertainty condition does not compromise interpretation of the finding that low-PNS participants, after reminders of mortality, reported more meaning in life when they imagined searching on an unfamiliar versus familiar topic or than did low-PNS participants who imagined searching on an unfamiliar topic after reminders of future uncertainty.

⁵ Although the influence statistics support exclusion of the outlier, regression analyses with the outlier included were also conducted. The MS \times Topic Familiarity \times PNS interaction was marginally significant for these analyses ($\beta = .39, p = .06$). However, within the MS condition, there was no significant topic familiarity effect at low ($\beta = .35, p = .10$) or high ($\beta = .01, p = .98$) levels of PNS. No changes occurred within the uncertainty salience condition. Looking at the effect of MS within the unfamiliar topic condition, MS led to stronger perceptions of meaning in life at low levels of PNS ($\beta = .43, p < .05$) but had no impact on perceptions of meaning in life at high levels of PNS ($\beta = -.13, p = .52$).

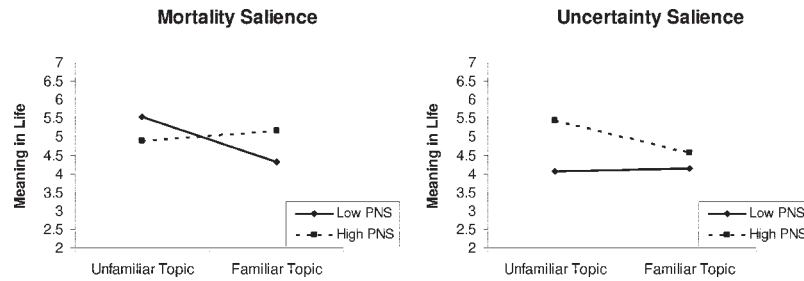


Figure 7. Simple Topic Familiarity \times Personal Need for Structure (PNS) interaction on meaning in life scores in Study 4. Higher meaning in life scores indicate higher perceptions of meaning in life. PNS values are plotted at ± 1 SD from the PNS mean. MS = mortality salience.

Study 5

Although Study 4 provided initial support for the hypothesis that explorative orientations to novelty facilitate the restoration of meaning for low-PNS individuals, it was limited in that participants only imagined exploring a novel topic rather than actually exploring it. This methodological feature, in large part, reflects an effort to better delineate the effects of interest by maximizing control. However, a study in which participants engage in actual exploration would provide a compelling complement to these findings and further support the validity of the present analysis. Study 5 was designed to address this issue.

Participants reflected on mortality or not and subsequently engaged in what we label an *existential counterfactual*—an exploration of how one's self or life would be different if a self-defining event had never occurred. Critically, however, we varied whether participants made an existential counterfactual relevant to their own lives or to that of a hypothetical other. Prior research has suggested that MS increases peoples' efforts to affirm sources of meaning that are of central importance to themselves and not those of others (Greenberg et al., 2008). On the basis of this, we predicted that, following MS, low-PNS individuals led to consider a personally relevant existential counterfactual would affirm the meaningfulness of their own lives but that considering an existential counterfactual relevant to a hypothetical other would not lead them to affirm the meaningfulness of the other's life. Support for this hypothesis would show that low-PNS individuals employ novel interpretations of themselves to secure meaning as a defense against mortality concerns and that this effect is specific to perceptions of meaning in one's own life and does not extend to ascriptions of meaning for another person's life.

Method

Participants and Procedure

One hundred twenty-nine (81 female) undergraduates took part in an ostensible study of personality and life events. Two participants were not included in analyses because they failed to complete critical experimental materials, leaving a final sample size of 127. In separate cubicles, participants completed a randomly assigned questionnaire packet, the content of which is described below.

Materials

Personal need for structure. As in all previous studies, PNS was assessed via the M. M. Thompson et al. (2001) PNS scale ($M = 3.29$, $SD = 0.67$, $\alpha = .83$).

Salience manipulation. MS was manipulated via the two open-ended questions about death utilized in previous studies. Control participants in the present study responded to parallel questions about the experience of intense physical pain (similar to Study 1b).

PANAS-X. Following the MS or pain salience inductions, all participants completed Watson & Clark's (1991) Positive and Negative Affect Schedule—Expanded Form (PANAS-X). This is an extended 60-item version of the 20-item PANAS featured in the previous studies. Because of its greater length, the PANAS-X also served as the delay exercise between the salience manipulations and the dependent measure.

Existential counterfactual manipulation. Participants in the personal existential counterfactual condition were asked to think about a past event (e.g., meeting a specific person) that significantly influenced their lives. They were then asked to write a few sentences describing how their lives would be different if that event had never occurred. Participants in this condition were therefore led to consider novel alternatives to preexisting interpretations of their lives. Participants in the other-relevant existential counterfactual condition were given a vignette about a fictional other (Chris) who met a teacher that inspired and encouraged Chris to pursue a satisfying career. Participants in this condition were then asked to describe how Chris's life would be different if she or he had never met that teacher.

Perceptions of meaning. After the existential counterfactual exercise, participants responded to the following item designed to assess perceptions of meaning given the existential counterfactual: "If that event never happened, I/Chris would continue to find meaning in my/his or her life." Responses were made on a scale of 1 (*completely disagree*) to 7 (*completely agree*; $M = 3.57$, $SD = 1.70$). Thus, high scores on this item reflect an affirmation of life's meaning.

Results

Meaning scores were regressed onto MS (dummy-coded), existential counterfactual (dummy-coded), PNS (centered), and their interactions. Only the predicted 3-way interaction was significant

($\beta = .39, SE = .88, t(119) = 2.29, p < .05$ (all other effects, $t < 1.44, p > .15$). As in Study 4, this interaction was decomposed via predicted mean analyses at high and low levels of PNS. First, we explored the effect of MS separately within each of the existential counterfactual conditions (see Figure 8). Within the personally relevant existential counterfactual condition, low-PNS participants showed a stronger affirmation of meaning in their lives under MS compared to intense pain salience ($\beta = .53, SE = .62, t(119) = 2.98, p < .01$). A similar effect did not emerge within the existential counterfactual about Chris condition ($\beta = .13, p = .47$). Looked at differently, within the MS condition, low-PNS participants showed a stronger affirmation of meaning for their own lives after considering a personally relevant existential counterfactual relative to the meaning of a hypothetical person's life after considering an existential counterfactual relevant to his or her experience ($\beta = .37, SE = .60, t(119) = 2.10, p < .05$). There were no significant effects of MS or existential counterfactual among high-PNS participants ($ts < 1.00, ps > .47$).

Discussion

These results support the hypothesis that, following MS, exploring novel interpretations of self-relevant information would lead low-PNS, but not high-PNS, individuals to affirm meaning in their own lives. Also as predicted, the interactive effect of MS and considering novel counterfactual interpretations of life influenced perceptions of meaning in one's own life and not, more generally, the meaning of a hypothetical other's life. In contrast to the results for low-PNS participants and consistent with the previous studies, no significant effects emerged among high-PNS participants. Taken together with the results from Study 4, these results further support the claim that low-PNS individuals invest in novel interpretations of the world and their experience as a source of meaning in life that provides protection against mortality concerns.

General Discussion

The first aim of this research was to reveal how the awareness of inevitable death influences perceptions of meaning in life differently as a function of an individual's predisposition to simple and unambiguous interpretations of reality. Previous research has shown that PNS is positively associated with efforts to seek out simple interpretations of reality when cognitions pertaining to death are heightened (e.g., Landau et al., 2004). Given TMT's position that coherent and unambiguous views of the world facilitate the maintenance of death-transcendent meaning, it was pre-

dicted that individuals high in PNS would maintain or even experience a bolstered sense of meaning following reminders of death, while those low in PNS would perceive life to be less meaningful. The results of four separate studies (Studies 1a–1d) generally supported this hypothesis. Notably, the use of three different measures of meaning in life and alternative operationalizations of MS, as well as controlling for a relevant third variable in affect, lends convergent support for the reliability of these effects.

The second aim of this research was to identify a potential means by which individuals low in PNS might affirm the perception that life is meaningful when death is accessible. Building from previous research (e.g., Landau et al., 2004, Study 5), Study 2 found that low-PNS individuals who reflected on personal mortality tended to show an increased interest in documentaries that presented alternative perspectives to culturally relevant topics. Study 3, in turn, found more directly that the cognitive accessibility of death was positively associated with a more general willingness to explore novelty among low-PNS individuals, setting the stage for the possibility that low-PNS individuals may affirm meaning through the explorative engagement of novel information when dealing with heightened concerns about death. Supporting this analysis, Study 4 showed that, after contemplating death, low-PNS individuals who imagined exploring an unfamiliar topic reported higher levels of meaning in life than individuals who imagined exploring a familiar one. Likewise, Study 5 found that, when mortality was salient, exploring a novel alternative to the course of one's life led low-PNS individuals to affirm the meaningfulness of their own life. Taken together, these findings provide convergent support for the hypothesis that more open and flexible orientations to the social world serve as a resource of meaning for low-PNS individuals dealing with existential concerns about the inevitability of death.

Death and Meaning in Life

The present findings help to elucidate how the awareness of death specifically influences perceptions of meaning in life. As noted in the introduction, TMT emphasizes the importance of existential meaning for managing the distress associated with the awareness of human vulnerabilities to death (e.g., Greenberg et al., 1997), but only a few TMT studies have directly examined how cognitions related to death influence the presence of meaning in life (Routledge et al., 2008; Simon et al., 1998). The present research extends this work by offering a systematic investigation into how dispositional differences in the preference for basic and

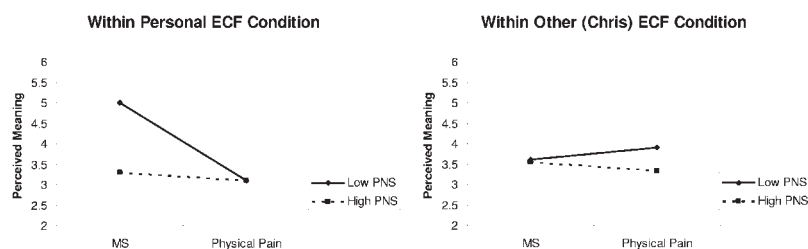


Figure 8. Simple Mortality Salience (MS) \times Personal Need for Structure (PNS) interactions on meaning scores in Study 5. Higher meaning scores indicate higher perceptions of life's meaning. PNS values are plotted at $\pm 1 SD$ from the PNS mean. ECF = existential counterfactual.

unambiguously structured interpretations of reality shape perceptions of meaning in life when death-focused cognitions are heightened. These findings reveal the dynamic potential of death-thought activation to both bolster and undermine perceptions of meaning, as well as critically identify a psychological factor (i.e., PNS) that reliably predicts how individuals' meaning in life will be influenced by death-relevant thoughts.

Beyond TMT, the present research contributes to an emerging literature on understanding the causal factors that give rise to perceptions of meaning in life. A number of variables have been emphasized in these efforts, including positive affect (e.g., King et al., 2006), social connectedness (e.g., Twenge, Catanese, & Baumeister, 2003), and the accessibility of one's true self (Schlegel, Hicks, Arndt, & King, 2009). Studies 1a–1d add existential concerns about death to this growing list but also highlight the unique influence that the awareness of mortality has on meaning in life. While these other variables appear to have a more straightforward effect, the results presented here demonstrate that the causal impact of mortality concerns on perceptions of meaning in life depends upon the extent to which individuals manage these concerns by seeking out simple and unambiguous interpretations of reality. That is, death-relevant cognitions do influence whether or not an individual views existence as meaningful, but they appear to do so by bringing underlying epistemic motivations to the surface.

As noted in the introduction, the significance of mortality concerns for shaping perceptions of meaning in life is consistent with a broader discussion of the variety of threats that may motivate people to reestablish a sense of meaning. For example, the recently proposed meaning maintenance model (Heine et al., 2006; Proulx & Heine, 2006) argues that when a source of meaning is threatened, individuals will seek to regain a sense of coherence by reaffirming an alternative source of meaning (i.e., fluid compensation). This process is similarly recognized by McGregor et al.'s (2001) focus on the threatening aspects of personal uncertainty, and some research has shown that personal uncertainty does indeed influence a meaning-relevant construct, validations of identity in the search for meaning. However, the search for meaning is distinct from the presence of meaning (e.g., Steger et al., 2006), and to our knowledge, no research from these other perspectives has directly focused on more general perceptions of the presence of meaning in life.

In this light, it is interesting to note that, in the present research, the general salience of an unexpected outcome (Study 1c) and the general salience of uncertainty (Studies 2 and 4) did not engender the same effects as MS. Furthermore, these effects were directly linked to the accessibility of death-relevant cognitions (Studies 1d and 3). This suggests that the salience of general uncertainty and the salience of mortality are not producing the same effects. Indeed, while the uncertainty manipulation engendered some interesting meaning-relevant effects of its own in Study 4, these effects were clearly different from those provoked by the MS induction. At the same time, it is worth noting that more potent inductions of uncertainty have engendered responses similar to MS in some (e.g., McGregor et al., 2001), though not all (e.g., desire for fame; Greenberg, Kosloff, Solomon, Cohen, & Landau, in press), domains. Thus, future research should continue to explore the types of threats that directly influence perceptions of meaning in life. Such research would complement the present findings and

provide a broader understanding of how diverse self-relevant threats can impact meaning perceptions.

Low PNS and Terror Management

In addition to understanding the dynamic relationship between thoughts of death and meaning in life, the present research has also addressed ambiguities regarding the ways that low-PNS individuals respond to MS. Studies have shown, for example, that the awareness of death can influence low-PNS individuals' efforts to seek out positive information about a crime victim (Landau et al., 2004, Study 5) and flexibly distance themselves from a negatively cast ingroup (Dechesne et al., 2000) but that evaluations of stereotype-inconsistent targets (Schimel et al., 1999), preferences for balanced relationships (Landau et al., 2004), and evaluations of abstract art (Landau et al., 2006) are relatively unaffected by MS among these individuals. Thus, while much is known about the ways that high-PNS individuals respond to mortality concerns, a common critique of this work is that it has remained relatively unclear about how low-PNS individuals do so.

The present research has addressed this lack of clarity by examining the possibility that low-PNS individuals may respond to activated concerns about death with an increased interest in novel and unfamiliar information. This hypothesis is based on the dispositional orientations that these individuals show toward openness and tolerance for ambiguity and novelty (e.g., Neuberg & Newsom, 1993) and the TMT view that individuals invest in particular orientations toward the world and their lives as sources of meaning capable of managing mortality concerns. Studies 2 and 3 supported this analysis by demonstrating that low-PNS individuals were more interested in exploring divergent cultural perspectives and novelty when mortality concerns were heightened. Building on these findings, Studies 4 and 5 examined whether considering novelty helps low-PNS individuals affirm meaning in response to concerns about death. In Study 4, low-PNS individuals primed with mortality and subsequently led to consider novel (relative to familiar) information perceived their lives as especially meaningful. Similarly, in Study 5, low-PNS individuals primed with mortality and subsequently led to consider novel interpretations of their own lives showed a more affirmed sense of meaning than those primed with physical pain salience. Taken together, these findings not only provide much needed insight into the terror management responses of low-PNS individuals but also establish the utility of these responses for overcoming the deleterious influence of death-focused ideation on perceptions of meaning in life.

Terror Management and Integrative Processing

The finding that low-PNS individuals respond to mortality concerns in more flexible and explorative ways also has implications for theoretical issues surrounding the interface between defense- and growth-oriented human motives. While TMT has primarily focused on the defensively oriented motivation to quell existential insecurities, other perspectives have highlighted the obvious other side to human motivation characterized by growth and self-expansion (e.g., Deci & Ryan, 1985; Maslow, 1962). Despite attempts at theoretical integration between these seemingly disparate views (e.g., Greenberg, Pyszczynski, & Solomon, 1995), TMT research has overwhelmingly focused on the ways that mortality

concerns most often motivate rigid, defensively oriented efforts to bolster the validity of one's cultural worldview and sense of self-value.

Some work has begun to examine how engaging in self-enriching tasks such as creativity may foster less defensive responses to MS. Routledge, Arndt, and Sheldon (2004) showed that, following reminders of death, performing a creative task reduced the tendency to derogate an anti-American essay author. Similarly, Routledge and Arndt (2009) found that priming creativity as a culturally valued characteristic increased participants' willingness to explore novel cultural views after MS. Beyond creativity, reflecting on the growth-oriented aspects of death reduced defensively oriented greed among extrinsically oriented individuals, whereas the typical MS manipulation fostered enhanced greed (Cozzolino, Staples, Meyers, & Samboceti, 2004; Lykins, Segerstrom, Averill, Evans, & Kemeny, 2007). These findings provide initial insights into the situational cues that can promote self-expansive responses to the awareness of death. Building from this work, the present research has considered the functional significance of these growth-oriented responses to MS and suggests that the exploration of novelty confers a sense of existential meaning to individuals low in PNS who are dealing with the heightened awareness of death.

Limitations and Future Directions

There are, of course, some limitations of the present research that should be noted. First, there was a considerable focus on the responses of low-PNS individuals, and less attention was devoted to those high in PNS. This emphasis was in large part motivated by the ambiguities in the literature regarding the terror management of low PNS, as previous work examining TMT processes and PNS focused almost exclusively on high PNS (e.g., Landau et al., 2004, 2006). The present research thus positioned itself to extend understandings of the PNS construct in terror management. Nevertheless, by focusing on low levels of PNS, the present research may have obscured important nuances in the ways that mortality concerns influence meaning in life among high-PNS individuals. For example, the explanation for the observed effects among high-PNS participants was derived from TMT's view that unambiguous and rigidly structured interpretations of reality should facilitate the maintenance of coherent meaning when death concerns are heightened. Future work could thus further explore how the activation of confident knowledge structures (e.g., stereotypes; Schimel et al., 1999) might influence perceptions of meaning at varying levels of PNS.

Future research might also consider the potential positive social outcomes of the terror management strategies low-PNS people utilize to bolster meaning in the face of existential threat. The current initial examination of the interplay between PNS, MS, and meaning did not afford an opportunity to consider more applied implications directly; however, since low-PNS people were inclined to explore different cultural perspectives and ideas, the possibility that MS may promote prosocial behavior among these individuals seems promising. Specifically, considering that divergent thinking and novelty seeking are constructs associated with openmindedness and flexible problem solving, low-PNS people may respond to heightened death awareness in ways that promote perspective taking, compassion, and cultural diversity.

Concluding Remarks

In *Macbeth* (Act V, Scene V), Shakespeare noted that the inevitability of death may render life nothing more than a "tale/Told by an idiot, full of sound and fury, Signifying nothing," and a number of perspectives (e.g., Becker, 1973) would agree that the awareness of death has the potential to undermine the very significance of existence. Yet the present research suggests that not everyone is subject to this type of dread. Indeed, individuals dispositionally inclined toward stable and unambiguous interpretations of the world seem to acquire a bolstered sense of meaning when thinking about the finitude of personal existence. Individuals not so disposed, on the other hand, do experience threats to the meaning of existence but appear to be able to overcome these threats when given the opportunity to actively explore unfamiliar and novel interpretations of both the world and themselves. Perhaps, then, if we return to the quotation that opened this article, it was the exploration of novelty through his creative works that allowed Tolstoy to avoid the unraveling of life's meaning upon confrontation with the inescapable reality of mortality.

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