



Diverging effects of mortality salience on variety seeking: The different roles of death anxiety and semantic concept activation[☆]



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HIGHLIGHTS

- Mortality salience has anxiety-inducing as well as concept-activation effects
- Death anxiety leads people to choose less variety in order to avoid novelty
- Activation of death-related concepts increases the variety of choices
- The concept-activation effect is mediated by a global processing style
- Whether death is thought in relation to oneself determines which effect occurs

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ABSTRACT

Thoughts about one's death can not only induce death anxiety but also activate death-related semantic concepts. These effects of mortality salience have different implications for judgments and behavior. We demonstrate these differences in an investigation of variety-seeking behavior. Four experiments showed that the anxiety elicited by thinking about one's own death decreased the variety of participants' choices in an unrelated multiple-choice decision situation, whereas activating semantic concepts of death without inducing anxiety increased it. Moreover, inducing cognitive load decreased the anxiety-inducing effect of mortality salience, leading its concept-activation effect to predominate. The accessibility of death-related semantic concepts spontaneously induces a global processing style that increases the range of acceptable choice alternatives in a variety-seeking task, and this occurs regardless of how mortality salience is induced. However, the effect of inducing death anxiety, which is driven by a desire for stability, may override the effect of semantic concept activation when participants think about their own death.

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People encounter death-related information nearly every day and thoughts about their own or others' mortality are hard to avoid. The effects of these thoughts on attitudes and behavior are manifold (Pyszczynski, Greenberg, Solomon, & Maxfield, 2006; Solomon, Greenberg, & Pyszczynski, 2004). For example, thinking about one's mortality can lead to more indulgent choices in domains that have implications for self-esteem (Ferraro, Shiv, & Bettman, 2005). Thus, it can increase preferences for products such as suntan lotion that enhance perceptions of one's physical attractiveness (Routledge, Arndt, & Goldenberg, 2004). At the same time, the anxiety that results from awareness of one's mortality can increase the desire for stability. This, in turn, can increase people's commitment to cultural norms and values

and motivate them to preserve their worldview (Greenberg et al., 1990).

However, the anxiety-inducing influences of mortality salience have rarely if ever been separated from the effects of death-related semantic concepts that are activated in the course of contemplating one's mortality. In the research we report, we show that the two effects of mortality salience can have diametrically opposite consequences for judgments and behavior. On one hand, the anxiety induced by contemplating one's death leads to cautiousness and a need for stability. On the other hand, activating concepts of death, which is an abstract and temporally distal event, can induce a global processing strategy (Trope & Liberman, 2003; Trope & Liberman, 2010; see also Dhar & Kim, 2007; Hansen, Kutzner, & Wänke, 2013) that influences responses to stimuli that are unrelated to death per se.

To examine this possibility, we considered a domain in which these opposing effects are particularly likely to be evident. People often have occasion to choose a number of different options (e.g., things to do on vacation, television programs to watch, or the types of tea to drink

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over a period of several days). In these conditions, people could either choose the same option repeatedly (e.g., to play golf every day while on vacation) or choose a variety of options (e.g., to play golf, to surf at the beach, and to visit a museum). Variety seeking could increase with the breadth of the concepts that individuals use in construing the choice alternatives (Kahn & Isen, 1993; Laran, 2010; Pham & Chang, 2010; Viswanathan & Childers, 1999). However, it could decrease with the motivation to avoid novel and unfamiliar options (Lieberman, Idson, Camacho, & Higgins, 1999). To the extent that everyday life experiences spontaneously activate concepts of mortality, they could influence the extent to which these opposite tendencies are manifested, depending on whether the concepts activated are accompanied by death anxiety.

These considerations suggest that differences in variety seeking not only provide a diagnostic tool in separating the concept-activation and anxiety-arousing effects of mortality salience but also have implications for an understanding of its effects on decision making outside the laboratory. The two effects of mortality salience are hard to separate using traditional manipulations of this factor (e.g., Greenberg, Pyszczynski, & Solomon, 1986; Solomon, Greenberg, & Pyszczynski, 1991). That is, the anxiety that is induced by thinking about one's own death is necessarily elicited by semantic concepts that compose these thoughts. However, death-related concepts may be activated without inducing anxiety. By employing this strategy, we found that activating death-related concepts without inducing death anxiety increased the variety of options that individuals chose in a multiple-option decision situation whereas inducing death anxiety decreased the variety of their choices. The effects of death anxiety are particularly evident when the choice alternatives are unfamiliar. At the same time, putting individuals under cognitive load interfered with their attempt to defend against death anxiety, leading the consequences of activating death-related semantic concepts to become more dominant. We also showed that the crucial distinction between these effects is the extent to which people experience anxiety about their *own* mortality rather than about others' mortality or mortality in general. Thus, if individuals think about another's death without considering their own, the anxiety-mediated effect of mortality salience is not apparent.

Theoretical background

General effects of mortality salience

Research on the effects of mortality salience has been largely stimulated by terror management theory (Greenberg et al., 1986; Solomon et al., 1991). According to this theory, people have an inherent fear of death and are motivated to defend against the existential anxiety that results from thinking about it. This anxiety results in part from the fact that death and dying are fraught with uncertainties. Consequently, individuals who become conscious of their mortality attempt to reduce their death anxiety by reassuring themselves that the world is predictable, meaningful and orderly. For example, they often show escalated commitment to their cultural values and increase their liking for others who embrace these values while derogating persons who oppose them (Greenberg et al., 1990; McGregor et al., 1998; Rosenblatt, Greenberg, Solomon, Pyszczynski, & Lyon, 1989). These defensive reactions serve to maintain a stable and meaningful perception of the world.

In addition, reminding people of their mortality increases their motivation to engage in behavior that enhances their self-esteem (Dechesne et al., 2003; Goldenberg, McCoy, Pyszczynski, Greenberg, & Solomon, 2000; Pyszczynski, Greenberg, Solomon, Arndt, & Schimel, 2004). This behavior can help individuals to convince themselves that they are living up to the standards of their society and can also increase feelings of stability.

Attachment to significant others can also provide a buffer against death anxiety. Thus, people whose mortality is salient show an increased desire for stable and close relationships (Florian, Mikulincer, &

Hirschberger, 2002) and consequently an increased tendency to think about parents and significant others (Cox et al., 2008).

However, not all effects of mortality salience can be easily interpreted as defensive reactions to death anxiety. For example, unobtrusively priming death-related concepts leads people to judge their life to be more valuable (King, Hicks, & Abdelkhalik, 2009). Because attaching greater value to one's own life would be expected to increase one's fear of losing one's life rather than decreasing it, this finding is hard for terror management theory to explain. Liu and Aaker (2007) also demonstrated that thinking about another person's death by cancer leads people to plan their future activities within a broader temporal framework. This effect also cannot be readily accounted for by terror management theory, which predicts that death-related thoughts lead to a desire for immediate materialistic indulgence rather than long-term goal attainment (see Arndt, Solomon, Kasser, & Sheldon, 2004; Kasser & Sheldon, 2000).

A Two-stage process conceptualization of mortality salience

In conceptualizing the non-anxiety-related effects of mortality salience, we recognized that death is an inherently abstract concept whose referent cannot be personally experienced. Moreover, death is perceived by most people to be a temporally distal event and might be construed in abstract terms for this reason (Trope & Liberman, 2003; Trope & Liberman, 2010). Thinking abstractly in a particular domain can spontaneously activate a more general disposition to process information globally (e.g., Hansen et al., 2013; Nussbaum, Trope, & Liberman, 2003) that, once activated, generalizes over stimulus domains. Consequently, the disposition can affect behavior and decisions in subsequent unrelated task situations (Schooler, 2002; Schooler, Fiore, & Brandimonte, 1997), the nature of which we elaborate presently.

We assumed that when individuals contemplate death, their thoughts spontaneously activate semantic concepts associated with it. However, these concepts do not always elicit anxiety. When people think about death in a way that is void of emotion, however, their motivation to defend their worldview is decreased (Simon et al., 1997) and defensive reactions may not be evident. For instance, people who watched a car accident on video showed less nationalistic bias if the video stimulated them to think about death in general than if it led them to think about dying personally (Nelson, Moore, Olivetti, & Scott, 1997). Moreover, people who are exposed to cancer-related information exhibit defensive reactions to the death-related thoughts it elicits only when they feel personally vulnerable to the specific cancer described (Arndt, Cook, Goldenberg, & Cox, 2007).

Thus, the anxiety-inducing effects of mortality salience are likely to depend on whether thoughts about one's own death are evoked and death anxiety is elicited by these thoughts. When this anxiety is *not* experienced, the effects of activating death-related semantic concepts should predominate. Our research focused on implications of this difference for multiple-choice decision making.

Effects of mortality salience on variety seeking

To isolate the concept-activation and anxiety-eliciting consequences of mortality salience, we chose a task in which both factors were likely to play a role. Variety seeking, which is characterized by a tendency to distribute choices over a series of decision episodes (Ratner, Kahn, & Kahneman, 1999; Read & Loewenstein, 1995; Van Trijp, Hoyer, & Inman, 1996), was particularly useful in accomplishing this. Variety-seeking behavior can be affected by various factors, and thus it may capture the divergent effects of different components of mortality salience. For example, variety seeking can be motivated by impression management (Ratner & Kahn, 2002), a need for stimulation (Kahn & Isen, 1993), a desire to relieve boredom (Fishbach, Ratner, & Zhang, 2011), and a preference for stability (Lieberman et al., 1999).

Variety seeking can also result from the use of broad categories to construe the choice alternatives available. When people are confronted with a number of decision alternatives, individuals with a more global processing style are likely to form a relatively larger consideration set (Pham & Chang, 2010) and so their choices of items from this set are likely to be more diversified (Laran, 2010). Therefore, if the activation of death-related semantic concepts leads people to adopt a global processing style, it should increase their tendency to seek variety.

By the same token, variety seeking may be less when individuals are motivated to limit their choices to a few, familiar options. We therefore expected that mortality salience can either increase or decrease the variety of individuals' choices in a multiple-choice situation and that the direction of its effect depends on which factor—its impact on death-related concept accessibility or its influence on death anxiety—is likely to predominate.

Anxiety-inducing effects of mortality salience on variety seeking

To reiterate, individuals who experience death anxiety when their mortality is called to their attention are motivated to preserve a familiar and stable view of the world (Greenberg et al., 1990; McGregor et al., 1998; Rosenblatt et al., 1989). This motivation may be reflected in an aversion to novel stimuli or experiences that could potentially disrupt one's sense of stability. In a decision situation, therefore, it could be manifested in the avoidance of unfamiliar choice alternatives and consequently a decrease in the variety of the options that are selected (Lieberman et al., 1999).

Concept-activation effects of mortality salience on variety seeking

Death is an inherently abstract concept whose referent cannot be personally experienced. That is, it is psychologically remote (Trope & Liberman, 2010; see also Liu & Aaker, 2007). Consequently, activating this concept could dispose individuals to construe stimuli in terms of broad and abstract categories (Bless & Schwarz, 2010; Förster & Dannenberg, 2010; Liberman, Sagristano, & Trope, 2002; McCrea, Wieber, & Myers, 2012). If this is so, and if the use of broad concepts increases the diversity of choice alternatives that individuals are likely to choose in a multiple-choice decision situation (Kahn & Isen, 1993; Laran, 2010; Pham & Chang, 2010; Viswanathan & Childers, 1999), it could increase variety seeking (for evidence that variety seeking can reflect the use of a cognitive procedure that is activated by behavior in a previous ostensibly unrelated situation, see Shen & Wyer, 2010; Wyer, Xu, & Shen, 2012).

There is an important distinction between the anxiety-eliciting effects of mortality salience and its concept-activation effects on variety seeking. The former effects of mortality salience on variety seeking are localized in the avoidance of novelty. Thus, these effects are more likely to occur when the choice alternatives are unfamiliar. In contrast, the concept-activation effects of mortality salience that result from the activation of a global processing style should influence the variety of choices independently of their familiarity.

Overview of experiments

Four experiments examined the implications of our conceptualization. Participants in Experiment 1 performed one of two tasks. In some conditions, mortality salience was induced by asking participants to think about their own death and what would happen to them physically and emotionally as they die (e.g., Cox et al., 2008; Dechesne et al., 2003; Rosenblatt et al., 1989). This procedure presumably activates semantic concepts associated with death as well as death anxiety (Arndt, Greenberg, Solomon, Pyszczynski, & Simon, 1997; Greenberg, Pyszczynski, Solomon, Simon, & Breus, 1994; Simon et al., 1997). Individuals in other conditions performed a scrambled sentence task that required the use of death-related words (for the use of this procedure to activate semantic concepts

unconsciously in other domains, see Srull & Wyer, 1979; see also Bargh, Chen, & Burrows, 1996). We expected that performing this task would increase the variety of their choices in a subsequent multiple-choice decision situation whereas participants who contemplated their own death would experience anxiety, the effects of which would override the effects of accessible semantic concepts and decrease the variety of their choices.

The remaining studies were intended to confirm further implications of our conceptualization. Experiment 2 was aimed at showing that putting participants under cognitive load while they performed the decision task eliminated the defensive processing that underlies the anxiety-inducing effects of mortality salience on their choices and led its concept-activation effects to be more evident.

The purpose of Experiment 3 was to show that the anxiety-inducing effects of mortality salience on variety seeking were evident only when participants were unfamiliar with the choice alternatives they considered and were motivated to avoid novel options, whereas the effects of death-related concept activation were evident regardless of the familiarity of the choice alternatives.

Finally, Experiment 4 was aimed to test our assumption that the anxiety-inducing effect of mortality salience occurs only when people think about their own death. When they think about someone else's death, this anxiety-inducing effect occurs only if these thoughts happen to draw attention to their own mortality as well.

Experiment 1

Experiment 1 was aimed to demonstrate that mortality salience had both anxiety-inducing and semantic components and that these components had opposite effects on variety seeking.

Method

Participants and design

One hundred twenty-nine students (43 males, $M_{\text{age}} = 20.86$) from a university in Hong Kong participated for pay of about \$4 USD. They were assigned to conditions of a 2 (primed content: mortality vs. control) \times 2 (priming task: semantic concept activation vs. anxiety induction) between-subjects design along with a single no-priming condition.

Procedure and materials

Participants were told that they would take part in both a series of language ability tasks and an unrelated consumer behavior survey. The first study was ostensibly being conducted in collaboration with Center for Language Ability Development and was intended to test how people perceive word relationships. On this pretense, participants in *semantic concept activation* task conditions were given 20 sets of six words each and told to choose five of the words that would form a grammatically correct sentence. In the *mortality* priming condition, eight out of the 20 sentences required the use of a death-related word (e.g., "Egyptian kings built large tombs," "they can't meet the deadline"; and death-related words included died, tombs, dead, coffin, death, extinct, deadline, and passed away). In the *control* priming condition, the death-related words were replaced by neutral ones (e.g., "Egyptian kings built large palaces," and "they can't meet the requirements").

In *anxiety-induction* conditions, participants were asked to perform a mental simulation task that was ostensibly used to assess imagination ability. The task was similar to that employed in previous research on mortality salience (e.g., Cox et al., 2008; Dechesne et al., 2003; Rosenblatt et al., 1989). Participants were told that they would be given a scenario and would be asked to imagine it. In the *mortality* priming condition, participants were told (a) to "imagine, as vividly as you can, what will happen to you physically as you die and once you are physically dead," and (b) "...to try to feel the emotions that the thought of your own death arouses in you." In contrast, participants in the *control* priming condition were asked to imagine and write about the

experience of undergoing dental pain. Because previous research indicated that the effects of mortality salience induced by this task occur only after a delay (Greenberg, Arndt, Simon, Pyszczynski, & Solomon, 2000; Pyszczynski, Greenberg, & Solomon, 1999), an unrelated filler task (i.e., a word search puzzle) was inserted immediately after the imagination task. In the *no-priming* condition, participants did not complete either the scrambled sentence task or the imagination task.

All participants then completed a variety-seeking measure similar to that employed by Shen and Wyer (2010) as ostensibly part of a consumer preference survey. They were given a set of four products in each of three categories. In one category, tea, the options were Nestle, Taoti, Itoen and Chai Li Won; in a second category, potato chips, the options were Calbee, Coastal California, Lay's and Jack'n Jill; and in the third category, books, the options were mystery, romance, history and humor. In the case of tea and chips, participants were told to choose the brand they would like to consume on each of the next four days. In the case of books, they were asked to indicate the type of books they would like to read on each of the following four weeks. In each case, the number of different options selected was used as an index of variety seeking.

Afterwards, participants performed two tasks that were aimed to validate the activation of the semantic and anxiety-eliciting components of mortality salience. First, they performed a lexical decision task consisting of 42 letter strings, being asked in each case to indicate whether the letter string was a word or nonword. The task began with 10 practice trials followed in random order by eight death-related words (e.g., deadly, killed, and skull), eight neutral words (e.g., essential, quote, and mineral) and sixteen nonwords. The mean time to respond to the death-related words was taken as an indicator of death-thought accessibility.

Second, participants were asked to indicate their agreement that the first task they performed in the experiment (a) "made me feel afraid of thinking beyond the threshold of my death," (b) "brought up the upsetting idea that my entire personality would disappear forever with my death," and (c) "made me think about the disturbing idea that I would never be able to think and experience after death" along a scale from 1 (*strongly disagree*) to 7 (*strongly agree*). These three items were averaged to form a single index of death anxiety ($\alpha = .83$).

Finally, we also measured several mood states (happy/sad/upset/bored/nervous) along scales from 1 (*not at all*) to 7 (*very much*). Consistent with previous research (e.g., Arndt, Greenberg, & Cook, 2002; Greenberg, Simon, Pyszczynski, Solomon, & Chatel, 1992), however, mortality salience had no influence on participants' mood along dimensions that were not specific to death anxiety ($ps > .05$). This was also true in the other experiments to be reported. Therefore, these effects will not be discussed further.

Table 1
Death-thought accessibility, death anxiety and variety seeking as a function of primed content and priming task (Experiment 1).

Variable	Mortality priming	Control priming	No priming
Death-thought accessibility (ms)			
Semantic concept activation	670.29 ^a (101.47)	770.97 ^b (123.51)	801.38 ^b (133.69)
Anxiety induction	671.73 ^a (122.39)	763.54 ^b (153.75)	
Death anxiety			
Semantic concept activation	3.71 ^a (1.55)	3.92 ^{ab} (1.56)	3.85 ^{ab} (1.87)
Anxiety induction	4.56 ^b (1.54)	3.50 ^a (1.63)	
Variety seeking			
Semantic concept activation	3.18 ^a (0.60)	2.65 ^{bc} (0.62)	2.72 ^{bc} (0.65)
Anxiety induction	2.49 ^c (0.61)	2.88 ^b (0.70)	

Note. Standard deviations are shown in parentheses. Means with different superscripts are different at $p < .05$.

Results

This experiment comprised a 2×2 factorial design along with a single no-priming control condition. In most of the analyses to be reported, we first performed a one-way analysis involving all five conditions, which allowed us to obtain a pooled error term for use in performing two sets of planned contrasts. The first contrast compared responses in these three conditions: the no-priming condition and the two control task (semantic concept activation and anxiety-induction) conditions in which mortality was not primed. As indicated in Table 1, there were no significant differences among these three conditions in analyses of any of the dependent variables we considered (death-thought accessibility, death anxiety and variety seeking; $ps > .10$). The second set of contrasts comprised the main and interactive effects of priming task and primed content independently of the no-priming condition.

Death-thought accessibility

Response time data were log-transformed (natural logarithm) before analysis, and responses that were incorrect (10.3%) or three SDs from the cell mean (0.99%) were excluded (cf. Bargh & Chartrand, 2000; Fazio, 1990). Effects on response times to neutral words or nonwords were not significant and are not discussed.

For ease of comprehension, raw response times (in milliseconds) are shown in the top section of Table 1. We expected that priming mortality salience would increase the speed of responding to death-related words and that this would be true in both semantic and anxiety-inducing task conditions. Results confirmed these expectations. Analyses of response times as a function of primed content and priming task indicated that participants responded faster to death-related words when mortality was primed ($M = 670.98$ ms) than when it was not ($M = 767.70$ ms), $F(1, 124) = 16.25, p < .001, \eta_p^2 = .12$, and that this was true regardless of whether or not the task was anxiety-eliciting ($F < 1$).

Death anxiety

Although both manipulations of mortality salience influenced the accessibility of death-related concepts, only imagining one's death affected death anxiety. Data summarized in the second section of Table 1 indicate that imagining one's own death resulted in higher death anxiety than imagining dental pain (4.56 vs. 3.50, respectively), $F(1, 124) = 5.07, p < .05, \eta_p^2 = .04$, whereas activating semantic concepts had no effect on anxiety regardless of whether the concepts concerned mortality or not (3.71 vs. 3.92, respectively; $F < 1$). The interaction of primed content and priming task was significant, $F(1, 124) = 3.88, p < .05, \eta_p^2 = .03$.

Variety seeking

We hypothesized that imagining one's death would decrease variety seeking whereas activating death-related semantic concepts would increase it. Preliminary analyses of the number of different responses as a function of experimental variables and product type yielded no significant interaction effects involving the latter variable ($F_s < 1$). Data pooled over product types, shown in the third section of Table 1, confirmed our expectations. The interaction of primed content and priming task was significant, $F(1, 124) = 13.42, p < .001, \eta_p^2 = .10$. Priming death-related semantic concepts increased variety seeking relative to control conditions (3.18 vs. 2.65, respectively), $F(1, 124) = 9.56, p < .005, \eta_p^2 = .07$, whereas inducing death anxiety decreased variety seeking (2.49 vs. 2.88, respectively), $F(1, 124) = 4.55, p < .05, \eta_p^2 = .04$.

These effects are presumably mediated by different underlying mechanisms. That is, the decrease in variety produced by the anxiety-inducing priming of mortality is presumably mediated by death anxiety, whereas the positive effect of concept-activation is mediated by its impact on the accessibility of death-related semantic concepts. Results of bootstrapping analyses (Preacher & Hayes, 2004) supported these assumptions. That is, death anxiety mediated the effect of anxiety-eliciting priming on the tendency to choose variety (based on 5000

samples, bias-corrected 95% CI [−0.36, −0.02], excluding zero) whereas death-thought accessibility did not (95% CI [−0.11, 0.20], including zero). In contrast, death-thought accessibility mediated the effect of semantic priming on variety seeking (95% CI [0.01, 0.34], excluding zero) whereas death anxiety did not (95% CI [−0.06, 0.03], including zero).

Discussion

Experiment 1 confirmed the distinction between the effects of death anxiety and the effects of death-concept accessibility. Increasing the accessibility of death-related semantic concepts without affecting death anxiety increased the variety of participants' choices in the product decision task, and this effect was mediated by death-thought accessibility. In contrast, imagining one's death, which increased both death-related concept accessibility and death anxiety, decreased the variety of participants' later choices, and this effect was mediated primarily by death anxiety.

Two alternative interpretations of our findings might be noted. First, unscrambling sentences containing death-related words may be more structured or boring than writing about one's mortality, and thus could motivate participants to seek variety in order to counteract boredom. If this were so, however, an increase in variety seeking should also have been evident in the semantic priming control condition, in which a similar task was performed. This was not the case.

Second, the task we employed to activate death-related concepts in the absence of anxiety differed in a number of ways from the traditional method of inducing mortality salience, giving rise to the possibility that the effects we observed were due to factors other than a difference in the anxiety the tasks elicited. Although the nature of these factors was unclear, the procedures employed in Experiment 4 eliminate this problem, as will be seen.

Experiment 2

To reiterate, our conceptualization assumes that thinking about one's mortality spontaneously activates abstract concepts of death and that these concepts, once activated, induce a disposition to apply broad concepts in construing the implications of information in an unrelated situation. However, the effects of this spontaneous processing on variety seeking are overridden by the defensive processes that result from death anxiety.

If this interpretation is correct, preventing participants from engaging in this defensive processing should lead the effect of death-concept accessibility to be more apparent. Coping with death anxiety requires mental resources (Gailliot, Schmeichel, & Baumeister, 2006; Gailliot, Schmeichel, & Maner, 2007). In contrast, the disposition to apply broad concepts in comprehension and inference may occur automatically with a minimum of cognitive deliberation (Evans, 2008; see also Blair & Banaji, 1996; Ferreira, Garcia-Marques, Sherman, & Sherman, 2006). Consequently, requiring individuals to engage in extraneous cognitive activity at the time when they perform a choice task is likely to decrease the resources they can devote to coping with death anxiety and lead the effects of spontaneous cognitive processing to be more apparent. Evidence that putting individuals under cognitive load leads spontaneous processes to be more apparent has been demonstrated in numerous areas of research (e.g., Mendes & Koslov, 2013; Shen & Wyer, 2010; Shiv & Fedorikhin, 1999). In the present context, this suggests that putting participants under cognitive load at the time that they make their choices should interfere with the anxiety-coping processes activated by mortality salience and lead its effects on semantic concept activation, which are likely to occur automatically, to be more apparent.

To evaluate this possibility, cognitive load was induced while participants performed the choice task in which variety seeking was assessed. Previous research shows that when people are under high cognitive load at the time that they contemplate their own mortality, they lack

the resources to suppress death-related thoughts and so defensive behaviors are more likely to emerge at a later point in time (Arndt et al., 1997; Greenberg, Arndt, Schimel, Pyszczynski, & Solomon, 2001). In the present study, however, the induction of cognitive load was not aimed at interfering with the suppression of death-related thoughts. Rather, it was intended to disrupt participants' efforts to shield themselves from death anxiety at the time of judgment. To this end, cognitive load was not introduced until after participants had finished the priming task.

Method

Participants and design

Ninety-five Hong Kong university students (38 males, $M_{\text{age}} = 20.38$) participated for extra course credit. They were randomly assigned to conditions of a 3 (mortality priming: concept activation vs. anxiety induction vs. no priming) \times 2 (cognitive load: low vs. high) between-subjects design.

Procedure and materials

Participants were told that the experiment comprised several unrelated tasks. To prime the anxiety-inducing or semantic components of mortality salience, we used the same tasks employed in Experiment 1. Participants in control conditions did not complete either of the two priming tasks. After participants had performed these tasks, however, the experimenter indicated that the next task was intended to assess people's memory ability and on this pretense, asked them to memorize either a two-digit or a nine-digit number that they would be asked to recall later in the experiment. The number was printed on a piece of paper enclosed in an envelope, and participants were given 45 s to memorize it, after which they put the piece of paper back into the envelope. They were reminded that they might want to rehearse the number mentally from time to time so as not to forget it. This method has been used as a successful manipulation of cognitive load in past research (e.g., Gilbert & Hixon, 1991).

Next, participants proceeded to the variety-seeking measures. This experiment used two measures of variety seeking. One was the same consumption preference survey as that used in the previous experiment. The second one was adopted from a study by Goukens, Dewitte, Pandelaere, and Warlop (2007). That is, participants were told that a travel agent was promoting tours in Sri Lanka and was now holding a lucky draw in which the prize included round-trip tickets, accommodation, and four activities. Participants were given 16 events, four in each of four categories (cultural, wildlife exploration, sports and beach activities), and were asked to select the four activities they preferred. The number of different categories from which participants chose activities was used as an index of variety seeking. Note that although the consumption preference survey measured variety seeking within a given domain of stimuli, this measure assessed the tendency to seek variety across different domains. Thus, the use of these two measures increased the generality of the effects of Experiment 1.

At the end of the variety-seeking measures, participants wrote down the number that they held in memory. They then completed the same lexical decision task and death anxiety measure employed in Experiment 1 and finally were debriefed and dismissed.

Results

Death thought accessibility

We prepared the reaction time data for analysis by log-transforming the data and removing responses that were incorrect (6.70%) or lay beyond three SDs from the respective cell means (1.69%) (Bargh & Chartrand, 2000; Fazio, 1990). Analyses of these data yielded a significant effect of mortality priming, $F(2, 89) = 6.37, p < .005, \eta_p^2 = .13$, which was independent of cognitive load ($F < 1$). That is, participants responded more quickly to death-related words when either death-

Table 2

Variety seeking (consumption preferences and holiday activities) as a function of mortality priming and cognitive load (Experiment 2).

Variable	Semantic concept activation	Anxiety-induction priming	Control
Consumption preferences			
Low cognitive load	3.19 ^a (0.60)	2.56 ^b (0.63)	2.76 ^{ab} (0.90)
High cognitive load	3.09 ^a (0.51)	3.16 ^a (0.53)	2.61 ^b (0.70)
Holiday activities			
Low cognitive load	3.06 ^a (0.44)	2.50 ^b (0.63)	2.71 ^{bc} (0.73)
High cognitive load	3.27 ^a (0.80)	3.18 ^{ac} (0.73)	2.59 ^b (0.87)

Note. Standard deviations are shown in parentheses. Means with different superscripts are different at $p < .05$.

related semantic concepts had been activated ($M = 667.85$ ms), $F(1, 89) = 9.59$, $p < .005$, $\eta_p^2 = .10$, or death anxiety had been elicited ($M = 669.34$ ms), $F(1, 89) = 9.84$, $p < .005$, $\eta_p^2 = .10$, than they did under no-priming control conditions ($M = 768.46$ ms).

Death anxiety

Analyses of death anxiety as a function of experimental variables yielded a marginally significant main effect of mortality priming, $F(2, 89) = 2.78$, $p < .10$, $\eta_p^2 = .06$, which was independent of cognitive load ($F < 1$). More specifically, participants' death anxiety was induced significantly greater in anxiety-induction conditions ($M = 3.90$) than in concept-activation conditions ($M = 3.08$), $F(1, 89) = 4.98$, $p < .05$, $\eta_p^2 = .05$, and marginally greater death anxiety in the former condition than in no-priming control conditions ($M = 3.25$), $F(1, 89) = 3.05$, $p < .10$, $\eta_p^2 = .03$. Thus, as in Experiment 1, the anxiety-inducing priming of mortality increased participants' fear of death, but the priming of death-related semantic concepts did not.

Variety seeking

We predicted that the effect of activating death anxiety would be less apparent when participants were under high cognitive load, leading the effect of activating death-related semantic concepts to predominate. Analyses of both measures of variety seeking confirmed this hypothesis.

Participants' consumption preferences are shown in the top section of Table 2 as a function of mortality priming and cognitive load. Analyses of these data yielded a significant main effect of mortality priming, $F(2, 89) = 3.80$, $p < .05$, $\eta_p^2 = .08$, and a significant interaction of mortality priming and cognitive load, $F(2, 89) = 3.30$, $p < .05$, $\eta_p^2 = .07$. Priming death-related semantic concepts increased the variety of participants' consumption preferences relative to no-priming conditions (3.14 vs. 2.68, respectively), $F(1, 89) = 7.47$, $p < .01$, $\eta_p^2 = .08$, and this difference was virtually identical regardless of cognitive load. In contrast, although anxiety-inducing priming nonsignificantly decreased variety seeking when cognitive load was low, it increased variety seeking when cognitive load was high, and this increase was similar to that observed when semantic concepts of mortality were primed. The interaction of mortality priming and cognitive load was significant in a comparison of anxiety-inducing priming and no-priming conditions alone, $F(1, 89) = 5.25$, $p < .05$, $\eta_p^2 = .06$.

Bootstrapping analyses (Preacher & Hayes, 2004; Preacher, Rucker, & Hayes, 2007) involving concept-activation and control conditions indicated that death-thought accessibility mediated the effect of priming death-related semantic concepts on variety seeking (based on 5000 samples, bias-corrected 95% CI [0.07, 0.45], excluding zero). Moreover, a moderated mediation analysis involving anxiety-induction and control conditions indicated that cognitive load marginally moderated the mediating role of death anxiety when this anxiety was induced (90% CI [0.05, 0.42], excluding zero). That is, death anxiety mediated the effect of anxiety-inducing priming on variety seeking when cognitive load was low (90% CI [−0.42, −0.02], excluding zero) but not when it was high (90% CI [−0.07, 0.11], including zero).

Holiday activities

Mortality salience had similar effects on the variety of holiday activities that participants chose, as shown in the second section of Table 2.

The overall effect of mortality priming was significant, $F(2, 89) = 4.10$, $p < .05$, $\eta_p^2 = .08$. Although the interaction of mortality priming and cognitive load was only marginally reliable, $F(2, 89) = 2.55$, $p < .10$, $\eta_p^2 = .05$, the pattern of results was identical to the effects on consumption preferences. Planned comparisons indicated that priming death-related semantic concepts increased variety seeking relative to no-priming conditions (3.16 vs. 2.65, respectively), $F(1, 89) = 8.00$, $p < .01$, $\eta_p^2 = .08$, and this effect was independent of cognitive load. However, although inducing anxiety nonsignificantly decreased variety seeking when cognitive load was low, it significantly increased it when cognitive load was high, and this increase was similar in magnitude to the effect of semantic priming. The interaction of mortality priming and cognitive load was significant in an analysis comparing anxiety-induction and control conditions alone, $F(1, 89) = 5.02$, $p < .05$, $\eta_p^2 = .05$.

Again, death-thought accessibility mediated the effect of semantic concept activation on holiday activities choice (95% CI [0.01 to 0.39], excluding zero). In addition, the moderated mediation analysis conducted in anxiety-induction and control conditions indicated that the interaction between death anxiety and cognitive load was marginally significant (90% CI [0.07, 0.47], excluding zero), such that death anxiety mediated the effect of anxiety-inducing priming of mortality salience on variety seeking when participants were under low cognitive load (90% CI [−0.40, −0.01], excluding zero) but not under high cognitive load (90% CI [−0.04, 0.19], including zero).

Discussion

Experiment 2 confirmed our assumption that thoughts about one's mortality activate death-related semantic concepts but that the effects of death anxiety normally override their influence. When participants are under cognitive load, however, they lack the cognitive resources required to defend against their anxiety, and so the effect of semantic concept activation becomes apparent. Although the decrease in variety seeking under these conditions was not significant when cognitive load was low, it was similar to that observed in Experiment 1 and was significantly different from the effect observed in high load conditions. Thus, it seems justifiable to conclude that imagining one's own death, which has been widely used as a manipulation of mortality salience, is likely to trigger both the anxiety-inducing and concept-activation effects of mortality salience simultaneously, but that the effects of anxiety typically predominate. When these effects are suppressed, however, the concept-activation effects are likely to emerge.

Experiment 3

According to our conceptualization, the negative effect of mortality salience on preferences for variety results from the impact of death anxiety on the desire to avoid novelty. If this is so, the effect should not be apparent when all available choice alternatives are familiar. In fact, death anxiety might actually increase choices of familiar options, which could give rise to feelings of stability and security (Hart, Shaver, & Goldenberg, 2005; Litt, Reich, Maymin, & Shiv, 2011). To examine these possibilities, we modified the measure of variety seeking we used in earlier studies. We presented participants with eight different

options in each of three product categories (herbal tea, snacks and juice) and asked them to choose as many options as they would like to try. In some conditions, participants were familiar with all options but in other conditions, they were unfamiliar with all of them. Unlike other experiments, the number of options that participants could choose in each category was not restricted. Thus, the number of different options that participants chose served as an indicator of their tendency to seek variety. We expected that the anxiety elicited by priming mortality would decrease the number of unfamiliar options that participants chose but not the number of familiar options they chose. In contrast, we expected that priming death-related semantic concepts, which induces a disposition to use more global criteria for judgment, would increase the number (and thus the variety) of choices that participants made regardless of whether the options were familiar or unfamiliar.

In addition, to confirm our assumption that the effect of mortality salience on variety seeking was determined in part by its impact on the disposition to process information globally, we obtained an independent index of this tendency.

Method

Participants and design

One hundred eleven university students (46 males, $M_{\text{age}} = 20.22$) in Hong Kong participated for either extra course credit or pay of about \$4 USD. They were randomly assigned to cells of a 3 (mortality priming: semantic concept activation vs. anxiety induction vs. no priming) \times 2 (option familiarity: low vs. high) between-subjects design.

Selection of stimuli

To select choice options that differed in familiarity, 37 pretest participants were asked to rate their familiarity with products in each of the three product categories (herbal tea, snacks, and juice) along a scale from 1 (*very unfamiliar*) to 9 (*very familiar*). Based on these data, eight familiar and eight unfamiliar stimuli in each category were selected. Examples of familiar options were Pringles, Lipton, and orange juice and examples of unfamiliar options were Coastal California, Ochaen, and mangosteen juice. Pretesting confirmed that within each category, the high familiarity choice set was significantly more familiar than the low familiarity set (for tea, 6.31 vs. 2.81; for snacks, 6.64 vs. 2.71; for juice, 6.82 vs. 3.56; in each case, $F(1, 36) > 90.25, p < .001$).

Procedure

The procedure used in this experiment was similar to that employed in Experiment 1. After finishing one of the two mortality salience priming tasks used in previous experiments, participants were asked to complete a variety-seeking measure purported to be a survey of consumption preferences. Specifically, they were given a list composed of either the eight familiar items in each category or the eight unfamiliar items in each category and were asked to choose as many options in each category as they would like to try. The average number of different items chosen in each category served as an indicator of variety seeking.

After completing the choice task, participants completed a global-local processing task similar to that used in earlier research (Navon, 1977). They were told that the task was intended to assess perceptions of physical stimuli. On this pretense, they were exposed to a series of 48 large (2.5 cm \times 2.5 cm) letters, each constructed from a number of small (0.5 cm \times 0.5 cm) letters. Of these stimuli, half of the stimuli were replications of four *global* stimuli (an *H* made of *F*s, an *H* made of *T*s, an *L* made of *F*s, and an *L* made of *T*s) and half were replications of four *local* stimuli (an *F* made of *H*s, a *T* made of *H*s, an *F* made of *L*s, and a *T* made of *L*s). On each trial, a fixation cross (+) appeared in the center of the screen for 500 ms followed by a stimulus, and participants were asked to press the *L* key if they saw the letter *L* but to press the *H* key if they saw the letter *H*. They were instructed to respond as quickly as possible while maintaining accuracy. The stimulus sequence consisted

of 12 practice trials that were not scored, 18 global target trials and 18 local target trials. Target trials were ordered randomly.

Upon finishing the global-local processing task, participants completed the lexical decision task used to assess death-thought accessibility and the death anxiety measure used in previous experiments. The death anxiety measure was expanded to include three additional items: "the [first] task (a) made me feel frightened by the idea that all my thoughts and feelings would stop when I am dead," (b) "...elicited the fearful thought that I will be dead someday," and (c) "...evoked the disturbing idea that my body would disappear after my death" ($\alpha = .92$ for all six items).

Results

Death anxiety

Analyses of death anxiety as a function of experimental variables indicated that participants reported greater anxiety in anxiety-induction conditions ($M = 4.00$) than in either concept-activation conditions ($M = 2.69$) or no-priming conditions ($M = 3.05$), $F(2, 105) = 12.97, p < .001, \eta_p^2 = .20$. No effects involving option familiarity were significant ($F_s < 1$).

Death-thought accessibility

Latencies to death-related words were log-transformed, and incorrect responses (9.60%) or data lying beyond three *SD*s from the cell mean (1.98%) were discarded before analysis (Bargh & Chartrand, 2000; Fazio, 1990). The pattern of raw response times was identical to that observed in Experiments 1 and 2. Participants responded more quickly to death-related words in both concept-activation conditions ($M = 695.77$ ms) and anxiety-induction conditions ($M = 720.67$ ms) than in no-priming conditions ($M = 801.81$ ms), $F(2, 105) = 6.55, p < .005, \eta_p^2 = .11$. No effects involving option familiarity were significant ($p_s > .10$).

Global versus local processing

We hypothesized that activating the semantic component of mortality salience would increase the tendency to engage in global processing and that this tendency would underlie its effect on variety seeking. The disposition to engage in global versus local processing was inferred from the mean difference between response times to global target stimuli and response times to local stimuli. Thus, more negative differences indicate faster responses to global stimuli than to local ones. Response times were log-transformed, and data that were incorrect (4.78%) or lying beyond three *SD*s from the cell mean (2.36%) were excluded (Bargh & Chartrand, 2000; Fazio, 1990). Analyses of the difference in log-transformed response times to global versus local stimuli as a function of experimental variables yielded a significant main effect of mortality priming, $F(2, 105) = 4.16, p < .05, \eta_p^2 = .07$, which was independent of option familiarity ($F < 1$). That is, the time to respond to global (vs. local) stimuli was less in concept-activation conditions ($M = -81.13$ ms) than in either anxiety-induction conditions ($M = -21.22$ ms) or no-priming conditions ($M = -9.27$ ms).

Variety seeking

We expected that the anxiety-inducing priming of mortality would decrease the likelihood of choosing unfamiliar options but not familiar ones. In contrast, we expected that the effect of priming death-related semantic concepts would increase variety seeking independently of the familiarity of the options. Data summarized in Table 3 confirm these expectations. The interaction of option familiarity and mortality priming was significant, $F(2, 105) = 3.26, p < .05, \eta_p^2 = .06$. Activating death-related semantic concepts increased the variety of choices relative to no-priming conditions (3.56 vs. 2.71, respectively), $F(1, 105) = 7.78, p < .01, \eta_p^2 = .07$, and this was true regardless of option familiarity. However, inducing death anxiety decreased the variety of choices when the options were

Table 3
Variety seeking as a function of mortality priming and option familiarity (Experiment 3).

	Semantic concept activation	Anxiety-induction priming	No priming
Low option familiarity	3.47 ^a (1.72)	1.74 ^b (0.90)	2.46 ^{bd} (1.23)
High option familiarity	3.67 ^a (1.66)	3.37 ^a (1.21)	2.94 ^{ad} (0.66)

Note. Standard deviations are shown in parentheses. Means with different superscripts are different at $p < .05$.

unfamiliar but increased it when the options were familiar. Although these differences were not significant, the interaction of option familiarity and priming was significant in a comparison of anxiety-induction and no-priming conditions alone, $F(1, 105) = 3.47, p < .05, \eta_p^2 = .03$.

Mediation analyses

Bootstrapping analyses (Preacher & Hayes, 2004; Preacher et al., 2007) indicated that option familiarity marginally moderated the mediating role of death anxiety (with 5000 samples, bias-corrected 90% CI [0.01, 0.36], excluding zero) in anxiety-induction conditions. That is, death anxiety mediated the effect when options were unfamiliar (90% CI [−0.60, −0.04], excluding zero) but not when options were familiar (90% CI [−0.08, 0.40], including zero).

The effects of activating death-related semantic concepts on variety seeking were mediated by both death-thought accessibility (95% CI [0.04, 0.60], excluding zero) and global processing (95% CI [0.01, 0.84], excluding zero). Our conceptualization assumes that the semantic priming of mortality activates death-related semantic concepts and that this, in turn, induces a global processing strategy that increases variety seeking regardless of option familiarity. This assumption was marginally confirmed by a sequential mediation analysis involving both death-thought accessibility and global processing (90% CI [.001, .297], excluding zero) when option familiarity conditions were collapsed.

Discussion

Experiment 3 evaluated the mechanisms that underlie both the anxiety-inducing and the concept-activation effects of mortality salience on variety seeking. In the first regard, the anxiety-eliciting effect was driven by an avoidance of unfamiliarity. Thus, inducing death anxiety decreased the tendency to choose a variety of options when the options were unfamiliar. When all of the options were familiar, however, inducing death anxiety had, if anything, the opposite effect. Furthermore, our results confirmed the assumption that the increased tendency to choose variety when death-related semantic concepts were activated was mediated by a general disposition to process information globally rather than locally.

Experiment 4

We predicted that the key difference between traditional procedures for inducing mortality salience and the priming of death-related semantic concepts lies in the extent to which this procedure leads people to think about their own death and consequently experience death anxiety. When thoughts about death are not related to oneself, the anxiety-inducing effect of mortality salience should not occur. Furthermore, the effect should be similar to that induced by the scrambled sentence task. To test this prediction, we compared variety-seeking behaviors after participants imagined (a) their own death, (b) another person's death, or (c) an animal's death as well as after they performed the scrambled sentence task containing death-related words.

Method

Participants and design

One hundred eighty-three university students (64 males, $M_{\text{age}} = 20.65$) in Hong Kong participated for pay of about \$4 USD. They were assigned to cells of a 2 (primed content: mortality vs. control) \times 4

(target: self vs. another person vs. animal vs. semantic) factorial between-subjects design.

Procedure and materials

The procedure of this experiment was similar to that of Experiment 3 except for the differences in target. Specifically, we asked participants in mortality priming conditions to (a) “briefly describe the emotions that the thought of your own death/the death of an anonymous person in South America/the death of an animal arouses in you” and (b) “jot down, as specifically as you can, what you think will happen to [the target] physically as [it] dies and once [it is] physically dead.” Participants in the semantic mortality priming condition completed the scrambled sentence task as in Experiment 3. Finally, control participants responded to parallel questions about dental pain or unscrambled sentences that contained words or phrases related to dental pain (e.g., toothache, dental procedure, cavity, the dentist's, oral care, bad tooth, dentists, and swollen gum).

Then, after completing an unrelated filler task, participants completed a consumption preference survey similar to that used in Experiment 3 to assess variety seeking. In this case, however, choice sets were composed of eight options selected from the choice sets used in Experiment 3, four of which were familiar and four of which were unfamiliar.

After completing the variety-seeking task, participants completed the measures of processing style, death-thought accessibility and death anxiety employed in Experiment 3. Finally, they indicated (a) the extent to which the first task made them think of something about themselves and (b) the extent to which the content of the first task was related to themselves, along scales from 1 (*not at all*) to 7 (*very much*). Responses to these two questions were highly correlated ($r = .84$) and were averaged to provide a single measure of the extent to which participants related the task to themselves. Finally, participants were debriefed, thanked, and dismissed.

Results

Thought listings

Two independent raters unaware of our hypotheses were asked to judge whether the thoughts listed in the mortality writing task conveyed a concern with one's own mortality. Inter-rater agreement was 94.7% and discrepancy was settled by discussion. All participants in the self's mortality condition mentioned their own death, whereas none of the participants who thought about an animal's mortality did so. However, writing about another person's mortality evoked self-related death-thoughts in 13 out of 31 participants. For this reason, in all the analyses to be reported, we also made an internal comparison of the participants in this condition who did and did not think about their own death.

Relation to self

Priming mortality generally evoked more self-related thoughts than control (dental pain) priming (3.64 vs. 3.12), $F(1, 175) = 4.89, p < .05, \eta_p^2 = .03$. However, the effect of target was also significant, $F(3, 175) = 47.98, p < .001, \eta_p^2 = .45$, and the interaction effect did not reach significance, $F(3, 175) = 2.17, p > .05$, suggesting that the manipulation of target was similarly successful in both mortality and control conditions. Within mortality conditions, participants thought more about themselves when they were asked to write about their own mortality ($M = 5.64$) than when they were asked to write about another's

death ($M = 4.03$), $F(1, 175) = 18.30$, $p < .001$, $\eta_p^2 = .09$, or death of an animal ($M = 2.59$), $F(1, 175) = 56.40$, $p < .001$, $\eta_p^2 = .24$. Their self-relevant thoughts in the latter condition did not significantly differ from their thoughts when death-related concepts were activated by the scrambled sentence task ($M = 2.07$), $F(1, 175) = 1.60$, $p > .20$. A similar pattern of results was evident in control conditions (self: 4.93 vs. another person: 2.93 vs. animal: 2.81 vs. semantic: 1.89). In addition, when another person's mortality was written about, participants who had conveyed self-related thoughts reported thinking more about themselves ($M = 5.19$) than participants who had not ($M = 3.19$), $F(1, 29) = 23.72$, $p < .001$, $\eta_p^2 = .45$.

Death-thought accessibility

Response times to death-related words were log-transformed and cleaned by eliminating incorrect responses (6.50%) and latencies lying beyond three SDs from cell means (2.41%) (Bargh & Chartrand, 2000; Fazio, 1990). As in previous experiments, death-related concepts were more accessible among participants in the mortality conditions ($M = 658.50$ ms) than in control conditions ($M = 751.78$ ms), $F(1, 175) = 25.67$, $p < .001$, $\eta_p^2 = .13$, and this difference did not depend on which target was primed ($F < 1$). Moreover, death-thought accessibility when mortality was primed had similar effects regardless of whether the target was self ($M = 653.82$ ms), another person ($M = 671.01$ ms) or an animal ($M = 659.25$ ms) and was not different in these conditions than it was when death-related concepts were activated by the scrambled sentence task ($M = 644.16$ ms). Internal analysis within the another-person's mortality condition also did not reveal any difference in death-thought accessibility ($F < 1$). Such results suggest that mortality salience priming activated death-related thoughts regardless of whose mortality the thoughts were about and regardless of how mortality was primed (writing task vs. sentence unscrambling).

Global versus local processing

As in Experiment 3, we inferred the disposition to process information globally versus locally from the difference between the time to respond to global targets and the time to respond to local ones. We excluded incorrect responses (3.90%) and responses that were greater than three standard deviations from the cell mean (1.47%). Analyses of log-transformed differences yielded a main effect of primed content. That is, the disposition to engage in global processing was generally greater when mortality was primed ($M = -63.94$ ms) than when it was not ($M = -11.87$ ms), $F(1, 175) = 12.44$, $p < .005$, $\eta_p^2 = .07$. Although neither the main effect of target, $F(3, 175) = 1.57$, $p > .20$, nor the interaction effect ($F < 1$) was significant, pairwise comparisons showed that mortality priming increased global processing relative to control conditions both when semantic concepts were primed by the scrambled sentence task (-95.55 ms vs. -16.04 ms, respectively), $F(1, 175) = 5.87$, $p < .05$, $\eta_p^2 = .03$, and when the target was animals (-76.45 ms vs. -20.07 ms, respectively), $F(1, 175) = 4.40$, $p < .05$, $\eta_p^2 = .02$, but not when the target was self (-24.74 ms vs. -2.08 ms, respectively; $F < 1$) or another person (-61.46 ms vs. -9.33 ms, respectively), $F(1, 175) = 1.64$, $p > .10$. Moreover, when participants wrote about another person's mortality, they had a marginally greater tendency to process information globally when they had not expressed self-related thoughts than when they had (-94.60 ms vs. -15.58 ms, respectively), $F(1, 29) = 3.17$, $p < .10$, $\eta_p^2 = .09$.

Death anxiety

Analyses of death anxiety showed significant main effects of both primed content, $F(1, 175) = 20.16$, $p < .001$, $\eta_p^2 = .10$, and target, $F(3, 175) = 7.81$, $p < .001$, $\eta_p^2 = .12$, and a significant interaction of these variables, $F(3, 175) = 3.10$, $p < .05$, $\eta_p^2 = .05$. Mortality priming led to greater death anxiety than control priming when the target was either oneself (4.31 vs. 2.50, respectively), $F(1, 175) = 20.79$, $p < .001$, $\eta_p^2 = .10$, or another person (3.33 vs. 2.33, respectively), $F(1, 175) = 7.73$, $p < .01$, $\eta_p^2 = .04$, but not when it was an animal (2.67 vs. 2.34,

Table 4

Variety seeking (choice of familiar options and choice of unfamiliar options) as a function of primed content and target (Experiment 4).

Variable	Self	Another person	Animal	Semantic concepts
Choice of familiar options				
Mortality prime	2.55 ^{ab} (0.65)	2.45 ^{ab} (0.75)	2.70 ^{bc} (0.69)	2.79 ^c (0.57)
Control	2.22 ^a (0.51)	2.26 ^{ab} (0.72)	2.40 ^{ab} (0.67)	2.20 ^a (0.71)
Choice of unfamiliar options				
Mortality prime	0.44 ^a (0.48)	1.18 ^b (1.00)	1.83 ^c (0.81)	1.81 ^c (0.75)
Control	0.98 ^b (0.92)	1.16 ^b (0.96)	1.21 ^b (0.81)	1.11 ^b (1.10)

Note. Standard deviations are shown in parentheses. Means with different superscripts are different at $p < .05$.

respectively; $F < 1$), or when death concepts were semantically primed (2.27 vs. 1.92, respectively; $F < 1$). When participants had written about another person's death, they reported greater death anxiety if they had mentioned themselves ($M = 4.14$) than if they had not ($M = 2.74$), $F(1, 29) = 9.71$, $p < .005$, $\eta_p^2 = .25$. Thus, the more participants had thought about death in relation to themselves, the greater the death anxiety they experienced.

Variety seeking

Unlike Experiment 3, in which option familiarity was manipulated between-subjects, the set of choice alternatives that participants considered in this experiment contained both familiar and unfamiliar options. Analyses of the number of familiar options that participants chose, summarized in the top section of Table 4, yielded only a main effect of primed content, $F(1, 175) = 12.47$, $p < .005$, $\eta_p^2 = .07$. That is, participants chose a greater number of familiar options when their mortality was primed than under control conditions (2.60 vs. 2.20, respectively), and this difference did not significantly depend on the target ($p > .10$). Thus, these effects were presumably attributable to the activation of death-relevant semantic concepts, which were accessible in all target conditions.

In contrast, analyses of the number of unfamiliar options selected (summarized in the second section of Table 4) yielded an interaction of primed content and target, $F(3, 175) = 4.75$, $p < .005$, $\eta_p^2 = .08$. Priming mortality significantly increased the number of unfamiliar options that participants selected both when death-related semantic concepts were activated by the scrambled sentence task (1.81 vs. 1.11 under mortality priming vs. control conditions, respectively), $F(1, 175) = 6.86$, $p < .05$, $\eta_p^2 = .04$, and in animal target conditions (1.83 vs. 1.21, respectively), $F(1, 175) = 5.43$, $p < .05$, $\eta_p^2 = .03$. However, it significantly decreased the variety of unfamiliar choices when participants had thought about their own death (0.44 vs. 0.98, respectively), $F(1, 175) = 4.12$, $p < .05$, $\eta_p^2 = .02$. When participants had written about another person's death, the variety of unfamiliar choices did not differ from control conditions (1.18 vs. 1.16, respectively; $F < 1$). However, participants chose fewer unfamiliar options when they had mentioned themselves while writing about another ($M = 0.51$) than when they had not ($M = 1.67$), $F(1, 29) = 14.47$, $p < .005$, $\eta_p^2 = .23$.

Mediation analyses

Three bootstrapping mediation analyses (Preacher & Hayes, 2004) were conducted to confirm that the processes underlying the effects we observed. First, death-thought accessibility and global processing mediated the influence of mortality salience on the variety of choices of familiar options, as confirmed by a sequential mediation analysis involving all four target conditions (based on 5000 samples, bias-corrected; 95% CI [0.001, 0.044], excluding zero). These variables also mediated the concept-activation effect of mortality salience on choices of unfamiliar options when participants did not think about themselves (i.e., under semantic priming conditions, animal target conditions, and another-person target conditions in which participants did not list self-relevant thoughts; 95% CI [0.01, 0.10], excluding zero). In both self

target conditions and another-person target conditions in which participants reported thoughts about themselves, however, death anxiety mediated the effect of mortality salience on the variety of choices of unfamiliar options (95% CI [−0.80, −0.26], excluding zero).

Discussion

Experiment 4 confirmed the crucial difference between the anxiety-inducing and semantic components of mortality salience. Which of these components predominates depends on whether anxiety about one's own death is evoked. Stimulating participants to write about their own mortality induced death anxiety and led them to avoid unfamiliar choice alternatives. This avoidance was also evident when participants thought about their own death in the course of writing about another person's mortality. When participants' death-related thoughts did not refer to themselves, however, the semantic concepts activated by these thoughts gave rise to a global processing style that increased the number of unfamiliar options they chose. Moreover, priming semantic concepts of mortality increased the number of familiar options that participants chose regardless of how these concepts were primed.

Note that the targets we considered in this study varied in psychological distance, which has been found in other research to influence global information processing (Bar-Anan, Liberman, & Trope, 2006; Kim, Zhang, & Li, 2008; Trope & Liberman, 2010). Considered in isolation, the interactive effects of mortality salience and target on the variety of unfamiliar options might be attributed to this factor. If differences in psychological distance had accounted for the effects of target on variety seeking, however, these effects would also have been evident in (a) control priming conditions in which concepts of dental pain were activated and (b) when options were familiar as well as when they were unfamiliar. Neither was the case.

Incidentally, results of this experiment eliminated a possible ambiguity concerning the effects of anxiety-induction and semantic-concept priming identified in earlier studies. In these studies, the procedure we used to activate death-related semantic concepts (a scrambled-sentence task) differed in many ways from the conditions employed in traditional studies in which mortality salience has been primed, and the differences we observed in these studies might be attributed to these differences. In the present study, however, thoughts about animals and thoughts about other persons were primed in much the same way as thoughts about one's own death, and the effects in these conditions did not differ appreciably from the effects of priming semantic concepts in the scrambled sentence task. Thus, our interpretation of the earlier experiments seems defensible.

General discussion

The exposure to death-related information is unavoidable, and concepts activated by this information can affect judgments and behavior in situations that are unrelated to the conditions that gave rise to their activation. When these concepts pertain to oneself, they can induce death anxiety that motivates defensive processes that are manifested in not only the desire to enhance one's self-esteem but the motivation to preserve one's cultural worldview. However, this anxiety can also give rise to a desire for stability that leads to the avoidance of unfamiliar options or courses of action.

On the other hand, mortality-related information may not only focus individuals' attention on themselves. It can also activate more general death-relevant concepts that are abstract and broad in scope. When these concepts are not accompanied by death anxiety, they can induce a general disposition to apply broad concepts in other, unrelated situations. In a multiple-choice decision task, therefore, they can lead individuals to select a greater variety of alternatives than they otherwise would.

When an experience elicits death anxiety, the effects of this anxiety typically override the effects of a semantic concept that the experience

activates. Nevertheless, the effects of these concepts become apparent when individuals are prevented from engaging in the coping behaviors that are stimulated by their anxiety. Thus, as Experiment 2 indicated, putting participants under cognitive load while they performed the variety-seeking task eliminated the negative impact of death anxiety and led the effects of semantic priming to predominate.

Two additional experiments provided further insight into the relative magnitude of the anxiety-inducing and concept-activation effects on mortality salience. Experiment 3 showed that when the choice alternatives available were all familiar, thus minimizing the threat to participants' feelings of stability, the negative impact of death anxiety on the variety of participants' choices was eliminated, leading the effects of concept activation to become apparent. Experiment 4 confirmed this conclusion. In addition, it showed that thoughts about death only induce the anxiety that decreases variety seeking when the thoughts pertained to participants *themselves*. That is, activating thoughts about the death of animals had no impact on death anxiety. Moreover, thinking about another person's death only had an impact if it led participants to think about their own death as well.

Alternative explanations

Alternative explanations of our findings should be considered. For example, awareness of one's mortality might sometimes give rise to growth motivation (Cozzolino, 2006; Vail et al., 2012). That is, they might encourage the exploration of novel experiences, and seeking variety could exemplify this exploration. However, the evidence that individuals avoided novel options when their own mortality was primed argues against this possibility.

A second possibility is that stability, which is characterized by a lack of variety, is among the values that compose individuals' cultural worldview. This might be particularly true among Asians, who have a collectivist orientation (H. S. Kim & Drolet, 2003). To this extent, motivating participants to preserve their cultural worldview by making their mortality salient could decrease variety seeking independently of the anxiety they experience. Moreover, it should lead participants to avoid choosing variety regardless of the familiarity of the options they consider. The results of Experiments 3 and 4 call this interpretation into question as well.

Finally, choosing variety could reflect a desire to assert one's personal freedom and feelings of control (Levav & Zhu, 2009). To this extent, participants whose mortality is salient might choose variety in order to counteract the feelings of restriction that are activated by thoughts about death (the ultimate restriction on freedom). However, our findings show the opposite tendency. That is, increasing death anxiety led participants to choose less variety rather than more. It therefore seems unlikely that participants chose variety to boost their self-esteem or feelings of control.

General implications for mortality salience

The key determinant of the different effects of mortality salience that we identified is the extent to which people experience anxiety about their own death. As Experiment 4 demonstrated, people who contemplated another's death without thinking about themselves did not experience existential anxiety. Consequently, the anxiety-inducing effects of mortality salience did not emerge although the effects of activating death-related semantic concepts were maintained. This distinction between anxiety-inducing and semantic components of mortality salience helps to understand the divergent effects of mortality salience in other studies (e. g., King et al., 2009). The effects of subliminally priming death-related concepts (Arndt et al., 2002) are also worth considering. This priming increases the accessibility of nationalistic tendencies of the sort that may bear on individuals' cultural worldview. These effects could be a consequence of the semantic association between death-related concepts and worldview-related concepts independently of the feelings that accompany these concepts.

The difference between anxiety-eliciting and concept-activation effects of mortality salience may of course be evident in other types of behavior as well. For example, thoughts about one's own death could decrease performance on creativity tasks that require novel ways of thinking (Arndt, Greenberg, Solomon, Pyszczynski, & Schimel, 1999; Routledge, Arndt, Vess, & Sheldon, 2008). However, the semantic priming of death-related concepts can increase the tendency to process information globally, and this processing style might increase creativity task performance (De Dreu, Giacomantonio, Shalvi, & Slighte, 2009; Schooler & Dougal, 1999; Schooler & Melcher, 1995).

The current findings expand our understanding of mortality salience beyond the motivation to defend against death anxiety. For one thing, they demonstrate that not all mortality is the same. Several procedures have been used to increase the salience of mortality, including (a) activating thoughts about one's own mortality (e.g., Cox et al., 2008; Dechesne et al., 2003; Greenberg et al., 1990; Rosenblatt et al., 1989), (b) stimulating thoughts about others' mortality (e.g., Ferraro et al., 2005; Landau et al., 2004), and (c) semantically priming death-related concepts (e.g., Arndt et al., 2002; Greenberg et al., 2000). As our research shows, however, these procedures can have quite different effects. Although previous research has focused on how mortality salience motivates people to engage in various social behaviors (Solomon et al., 1991; Solomon et al., 2004), we found that thoughts about death can influence individuals' general style of information processing, consequently affecting judgments independently of the type of information being processed.

Implications for variety seeking

Our consideration of variety seeking in this research was motivated primarily by its utility in distinguishing the concept-activation and anxiety-eliciting influences of mortality salience. Consequently, we have not considered all of the nuances of variety seeking that would be required to obtain a full understanding of this phenomenon. Nevertheless, general implications of our findings for the phenomenon are worth considering. Variety can be driven by external goals such as impression management (Ratner et al., 1999), internal goals such as a need for stimulation (Kahn & Isen, 1993) and a desire to alleviate boredom (Fishbach et al., 2011), or a cognitive procedure that has been activated in the course of performing an unrelated task (Shen & Wyer, 2010). However, the present research has identified a factor that can have divergent effects on variety seeking, depending on which component of it (i.e., anxiety-eliciting or concept-activation) predominates. Other factors that influence variety seeking through more than one underlying process may be worth investigating.

A distinction should be made between variety seeking and novelty seeking. The two constructs are obviously related. Menon and Kahn (1995), for example, found that a disposition to choose varied options might be motivated by a desire for novelty (see also Fishbach et al., 2011). Correspondingly, in Experiments 3 and 4 of our research, a decrease in variety seeking was motivated by a desire to avoid novelty. However, these two constructs are not identical. Considered in isolation, the evidence that individuals chose fewer unfamiliar options when their own mortality was salient, as in Experiments 3 and 4, is undoubtedly the result of a desire to avoid novelty. However, the positive effect of semantically priming mortality on the number of familiar options chosen cannot easily be interpreted as an increase in the desire for novelty. In other words, an increase in the novelty of choices may imply an increase in the variety of these choices, but an increase in variety does not necessarily imply an increase in novelty. The different effects of concept-activation and anxiety-inducing factors on variety seeking and preference for novelty are worth further consideration.

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