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Openness to experience predicts intrinsic value shifts after deliberating one's own death

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ABSTRACT

Individual differences that might moderate processes of value shifting during and after deliberating one's own death remain largely unexplored. Two studies measured participants' openness and relative intrinsic-to-extrinsic value orientation (RIEVO) before randomly assigning them to conditions in which they wrote about their own death or dental pain for 6 days, after which RIEVO was assessed again up to 12 days later. When participants confronted thoughts about their own death over a sustained period, high openness to experience helped them shift toward intrinsic values. Implications for understanding openness' role in value reorientation from existential deliberation processes are discussed.

Thinking about death can generate existential anxiety and uncertainty, and a long line of research in social and personality psychology has uncovered myriad defenses people use to deal with uncomfortable existential realities (see Solomon, Greenberg, & Pyszczynski, 2004 for a review). Several studies suggest that a tendency to orient toward the “extrinsic” values of money, fame, and image (Kasser & Ryan, 1996) may be among those defenses. Specifically, experimental studies have shown that when people are made aware of their own mortality, they have higher expectations about their future financial status and act in greedier ways (Kasser & Sheldon, 2000), become more oriented toward high-status consumer items (Heine, Harihara, & Niiya, 2002), and place higher priority on extrinsic values (Sheldon & Kasser, 2008). Such findings occur especially after a brief delay of at least a few minutes between viewing death-relevant stimulus materials and completing dependent measures of values (Kosloff & Greenberg, 2009).

These findings notwithstanding, as people age and naturally approach death, extrinsic values generally diminish in importance and “intrinsic” values (for self-acceptance, affiliation, and community feeling; Kasser & Ryan, 1996) become more appealing (Sheldon & Kasser, 2001; also see Cozzolino, Sheldon, Schachtman, & Meyers, 2009). Further, existential threat sometimes acts as a catalyst in this process.

For example, people who have had real-life brushes with death often report reorganizing their life priorities around intrinsic values (e.g., caring more about family), with a parallel disavowal of extrinsic values (e.g., caring less about status; Lykins, Segerstrom, Averill, Evans, & Kemeny, 2007; Tedeschi & Calhoun, 2004; see also Ring, 1984; Wheeler, 2001). In an experimental test that attempted to closely mimic such real-life encounters with death, Cozzolino, Staples, Meyers, and Samboceti (2004) asked some participants to engage in thinking about a specific hypothetical situation in which they ultimately died and how they would think about their lives up to that point. Participants with highly extrinsic values who underwent this deeper form of death reflection became significantly less greedy (Study 1) than did participants in a control condition or those exposed to a briefer, more impersonal manipulation of mortality awareness. Lykins et al. (2007) similarly reported shifts toward intrinsic (and away from extrinsic) values when people wrote about mortality (vs. dental pain) for six straight days. Importantly, the methodology used by Lykins et al. (2007) diverged from typical mortality salience (MS) research using a multiday writing paradigm, which may have prevented participants from using facile defenses and quickly returning to baseline after a single encounter with thoughts of their mortality.

In summary, it appears that people respond to mortality threats by shifting toward extrinsic values

when they have relatively brief encounters with those threats, but they respond by shifting toward intrinsic values when those encounters are more intense or sustained. Although some predictors of value shifts under sustained encounters with death have been identified, including perceived severity of threat (Lykins et al., 2007) and imminence of death (Cozzolino et al., 2004), relatively little is known about individual difference variables that might also predict which people make value shifts under extended experiences of heightened awareness of death. Given its conceptual and empirical links to the cognitively deep, exploratory processing likely to promote value reprioritization, the present studies tested the potential role of *openness to experience* in predicting value shifts in the context of death deliberation.

Openness to experience and cognitively exploring death

The majority of psychological research on responses to mortality awareness, conducted from the theoretical viewpoint of terror management theory (Solomon et al., 2004), suggests that brief reminders of one's own death (usually through a mortality salience manipulation) typically lead people to engage in a variety of defenses intended to excise thoughts of death from one's mind. As noted above, MS studies typically yield shifts toward extrinsic values (Sheldon & Kasser, 2008). In contrast, those studies that have revealed shifts toward intrinsic values after exposure to thoughts of death have typically encouraged people to process the fact of their own death more deeply and personally over a longer time period (Cozzolino et al., 2004; Lykins et al., 2007); such manipulations seem more similar to the real-life brushes with death that prompt reorientations toward intrinsic values (Tedeschi & Calhoun, 2004). It thus seems that lengthier, cognitively deeper encounters with the fact of one's own death may allow people to move beyond the kinds of defensive responses to mortality that simply aim to remove death thoughts from awareness.

If this is so, then people who have a dispositional tendency to respond to information, even threatening information, in an exploratory or integrative manner may be particularly likely to shift toward intrinsic values and away from extrinsic values when they are reminded of their own death. The big five trait of openness to experience seems an apt descriptor of just such a disposition. For example, DeYoung (2015) notes:

Openness/Intellect describes individual differences in cognitive exploration, the tendency to seek, detect,

appreciate, understand, and utilize both sensory and abstract information (DeYoung, 2015; DeYoung et al., 2012) ... and involve[s] the motivation and ability to create new interpretations of the world. (pp. 32–33)

Further, openness is positively related to cognitive flexibility and curiosity (McCrae & Sutin, 2009, p. 258) and negatively related to defensive traits such as authoritarianism/dogmatism (Trapnell, 1994), as well as to endorsements of prejudices and negative out-group evaluations that are indicative of worldview defensiveness (Flynn, 2005). Openness is also negatively related to the tendency to seize on unambiguous answers but positively related to cognitively exploring and considering alternatives before forming conclusions (Cacioppo & Petty, 1982; Tetlock, Peterson, & Berry, 1993; Webster & Kruglanski, 1994; as reviewed in McCrae & Sutin, 2009). From a biopsychological perspective, openness is strongly associated with numerous cognitive faculties linked to the dopaminergic brain system, which assigns reward to novelty and facilitates manipulation of information (DeYoung, Peterson, & Higgins, 2005). Further, the covariance between openness and extraversion forms the meta-trait known as plasticity or engagement, which is characterized by approaching and integrating novel information and exploring the environment for rewards (DeYoung, 2006; Digman, 1997).

This literature thus suggests that openness may predict the extent to which a person responds to potentially alarming information in an exploratory (vs. closed) manner and integrates that information into one's model of the world and ongoing pursuits. Several studies provide indirect support for this process. In a study of a subset of women from the Mills Longitudinal Study (Helson, 1967), a measure of openness at age 21 predicted open and exploratory processing of a distressing life event that had occurred by age 52, which in turn predicted maturity as assessed by a clinically trained interviewer at age 61 (Pals, 2006). In cross-sectional studies of ambulance drivers (Shakespeare-Finch, Gow, & Smith, 2005) and the elderly (Gregory, Nettelbeck, & Wilson, 2010), openness has been positively associated with posttraumatic growth. However, little research has focused on the motivational changes that are likely to conduce to these positive life outcomes, and even less has done so prospectively and experimentally. Because intrinsic values provide greater levels of need satisfaction and psychological well-being than extrinsic values (Deci & Ryan, 2000; Kasser, 2002; Niemiec et al., 2009), openness may allow people to engage existentially challenging information in ways that help them to align their value systems with the pursuits that are best able to provide for optimal

fulfillment during their lives (similar to the operation of an organismic valuing process; Rogers, 1951; Sheldon, Arndt, & Houser-Marko, 2003). Empirical tests for these propositions may provide some insight into the reasons why, following trauma, some people attempt to make meaning or exhibit posttraumatic growth, whereas others do not attempt to make meaning or experience decreased functioning (Park, 2010).

The present studies

We suggest that openness will help people be receptive to existentially challenging information in a manner likely to lead to the types of integrative/evaluative processes that would encourage the prioritization of intrinsic values and the deprioritization of extrinsic values. In contrast, low levels of openness may make it difficult to process existentially challenging information, inhibiting people's likelihood of making intrinsic value shifts, and perhaps even inclining the person to shift toward extrinsic values. To test these ideas, across two studies we built on experimental procedures developed by Cozzolino et al. (2004) and Lykins et al. (2007) and had participants respond to death (or control) writing prompts for each of six successive days. We assessed participants' values before the writing intervention and again 2 days (Study 1) and 12 days (Study 2) after completion of the writing intervention. We hypothesized that trait openness to experience would predict shifts toward intrinsic and away from extrinsic values under death deliberation, whereas thinking about a negative but more banal topic, such as dental pain, would not pose significant challenges to one's interpretations of the world and thus would provide no basis for shifting one's values, regardless of one's standing on openness.

Study 1

Study 1 was originally designed to test a similar set of hypotheses but had not made a priori hypotheses about individual differences; as such, the analyses presented in Study 1 are based on exploratory data analyses of measures that were originally included in the project for exploratory purposes. For expediency, we present only the analyses that informed our replication effort in Study 2. Study 2 subsequently presents a focused confirmatory study.

Method

Participants and procedure

Participants were 40 undergraduate students in introductory and mid-level psychology courses at a small Midwestern college in the USA. Ten participants

dropped out of the study, leaving a final n of 30¹ (22 female of 28 reporting; age $M = 19.0$, $SD = 1.10$). Gender, openness, and initial value orientation were unrelated to attrition.²

Data were collected over three phases. Participants completed Time 1 materials in a mass pretest through the internet for course credit. At Time 2, between 8 and 14 weeks after Time 1, participants arrived in the laboratory and were randomly assigned to an experimental writing group. Participants completed the first writing exercise in the laboratory, and completed subsequent writing exercises through the internet on each of the following 5 days (making six writing tasks total). Two days after the final writing activity, participants completed the Time 3 dependent measure of values through the internet. Monetary rewards were based on participation from Time 2 onward, with a maximum reward of 20 USD.

Saucier's (1994) Mini-Marker 8-item Factor V subscale measured openness to experience. Participants rated self-descriptive adjectives (e.g., *complex*) on a nine-point scale from 1 (*extremely inaccurate*) to 9 (*extremely accurate*). After dropping one item ("unintellectual") that was uncorrelated with the total score ($r = 0.01$), Cronbach's α was 0.70.

Participants also completed the aspiration index (Grouzet et al., 2005), in which they rated the importance from 1 (*not at all*) to 9 (*extremely*) of 57 aspirations falling into 11 value domains. The index yields three extrinsic domain scores for money, image, and popularity (12 items, $\alpha = 0.90$), and three intrinsic domain scores for self-acceptance, affiliation, and community feeling (15 items, $\alpha = 0.82$). To calculate relative intrinsic-to-extrinsic value orientation (RIEVO), we first mean-corrected overall value importance within each participant by subtracting out each participant's average score across all 11 domains from each domain constituting RIEVO. Finally, for the relative importance measure, averaged extrinsic scores were subtracted from averaged intrinsic scores, so higher values indicated greater weight placed on intrinsic relative to extrinsic values (cf. Sheldon & Kasser, 2008).

Manipulation phase

Participants were randomly assigned to one of three experimental writing conditions in the laboratory: death reflection ($n = 9$), mortality salience ($n = 13$), or a

¹The experimental condition variable was not recorded into the final data set for participants who dropped out. Thus it was not possible to maintain these participants through modeling procedures that can make use of observations with missing data.

²We verified that this sample's distribution of scores on openness ($n = 30$, $M = 6.36$, $SD = 1.02$) was comparable to that of American undergraduate ($n = 360$, $M = 6.65$, $SD = 1.10$) and community ($n = 11,125$, $M = 6.55$, $SD = 1.09$) norms (Saucier, 1994).

dental pain control condition ($n = 8$). In the death reflection condition, participants were presented with a passage in which they imagined being trapped on the 20th floor of a burning building, an attempt to escape, and their eventual demise; they then answered four questions encouraging reflection on intra and interpersonal aspects of their imagined death (from Cozzolino et al., 2004). In the mortality salience condition (Solomon et al., 2004), participants wrote short essays about the emotions aroused in them by thinking of their own death and how they thought death would proceed physically. In the dental pain condition, participants were asked a set of questions identical in structure to those for mortality salience but about the experience of dental pain instead.

After completing their first day of writing in the laboratory (day 1), participants were provided instructions for submitting writing the next 5 days through the internet. Following Lykins et al. (2007), participants completed full question formats on day 1. On days 2 and 4, they answered half of the questions relevant to their condition, with the other half answered on days 3 and 5. On the sixth and final day, participants again responded to full question formats.

Post-measures

Two days after completing their final writing task, participants again completed the aspiration index through the internet; they were then debriefed.

Results

We hypothesized that highly open people would shift toward intrinsic and away from extrinsic values after prolonged death-related writing. To prepare for analysis, we mean centered openness and created two dummy-coded condition vectors that represented the experimental conditions: Dummy 1, where DR = 1, MS = 0, and DP = 0, and Dummy 2, where DR = 0, MS = 1, and DP = 0. Interaction terms were products of centered openness and dummy codes. Regressing Time 3 RIEVO onto these predictors and Time 1 RIEVO revealed a significant effect for the two interaction terms (Table 2; see Table 1 for descriptives and correlations).

Simple effect analyses revealed that for participants low in openness (-1 SD), assignment to writing group bore no relation to shifts in values, $|t|s < 1.29$, $ps > 0.213$. However, for participants high in openness ($+1$ SD), those in the MS and DR groups both showed greater RIEVO than did their counterparts in the DP group, $\beta s > 0.58$, $ts \geq 1.92$, $ps < 0.067$ (Figure 1). Value shifts did not differ between DR and MS at high levels of

Table 1. Descriptive statistics and zero-order correlations, Study 1.

Variable	Zero-order correlations		Descriptives	
	2	3	Mean	SD
1. Time 1 RIEVO	0.43*	0.21	1.64	1.91
2. Time 2 RIEVO		0.39*	2.60	1.53
3. Openness			6.37	1.07

$n = 30$.

* $p < 0.05$.

RIEVO, relative intrinsic-to-extrinsic value orientation.

openness, $p = 0.65$. Analyzed differently, simple slopes of openness in the death writing conditions were positive, both $\beta s > 0.58$, $ts > 2.40$, $ps < 0.073$, whereas this slope was negative in the DP condition and did not approach significance $\beta = -0.35$, $t = -1.10$, $p = 0.284$.³ Together, these results suggest that the sustained death writing manipulations in combination with high openness to experience support a shift toward intrinsic values and away from an extrinsic values, whereas writing repeatedly about less existentially challenging information like dental pain does not lead to a shift in values.

Brief discussion

The results of Study 1 supported our hypothesis concerning value changes. Specifically, openness predicted shifts in the priority people placed on intrinsic relative to extrinsic values among both groups of people who wrote about their own death for 6 days; this effect was evident 2 days after the final writing exercise. These results suggest that when open people are repeatedly confronted with the facts of their eventual nonexistence, their tendencies to explore and integrate ideas in a non-defensive manner (DeYoung et al., 2005; McCrae & Sutin, 2009) may lead them to reflect on the direction of their current lives and how rewarding it is likely to be. Perhaps this reflection helps them to come to the realization that, relative to extrinsic values, intrinsic values are more likely to provide need satisfaction and well-being (Kasser, 2002) and are thus worth valuing more. These results suggest that the combination of openness and death deliberation can generate the same kinds of changes attributed to the organismic valuing process in past research (Sheldon et al., 2003). The present effects were evident across two different ways

³Because traditional null hypothesis statistical testing cannot provide information about support for a null hypothesis, we computed the Bayes factor for favoring the null hypothesis of no simple slope of openness in the dental pain condition. Following the recommendations of Rouder, Speckman, Sun, Morey, and Iverson (2009) we used the Jeffrey-Zellner-Siow (JZS) prior for an "objective" assumption about the range of effect size. This analysis revealed a JZS Bayes factor of 29.70 in favor of the null (i.e., the null is more likely than the alternative by about 30:1).

Table 2. Parameter estimates for regression model predicting values at Time 2, Study 1.

	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	β	Semipartial r^2	Lower 95% CI	Upper 95% CI
Dummy 1	0.69	0.60	1.08	0.292	0.21	0.05	-0.63	2.01
Dummy 2	0.27	0.64	0.45	0.655	0.09	0.01	-0.96	1.50
Openness	-0.54	0.60	-1.10	0.028	-0.35	0.03	-1.56	0.48
Dummy 1 \times Openness	1.44	0.49	2.25	0.035	0.65	0.12	0.11	2.76
Dummy 2 \times Openness	1.48	0.64	2.08	0.049	0.48	0.11	0.01	2.96
Time 1 RIEVO	0.17	0.14	1.18	0.252	0.21	0.03	-0.13	0.46

$n = 30$.

Adjusted $R^2 = 0.29$.

Dummy 1: Death reflection = 1, mortality salience and control = 0. Dummy 2: mortality salience = 1, death reflection and control = 0.

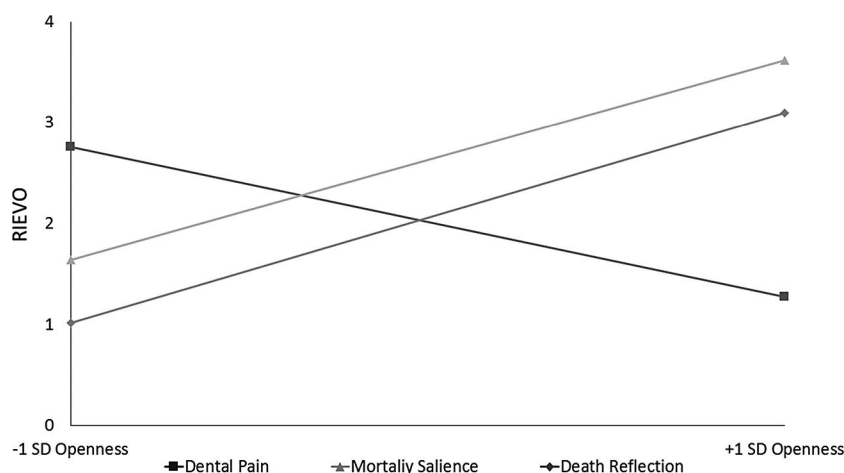


Figure 1. Relative intrinsic-to-extrinsic value orientation at time 2 as a function of openness (± 1 SD) and writing condition, controlling for time 1, Study 1.

of making people think about their own death that, in previous research, have exhibited divergent effects (Cozzolino et al., 2004). The sustained nature of the current writing tasks may have led the effects of these manipulations to converge over time, in contrast to previous research that only asked participants to write about their death a single time.

There are some notable limitations to the evidence provided by this initial study. For one, the sample size was small. Further, the operationalization of openness may have captured the core of the construct, but measures that go beyond a list of eight adjectives are likely to better assess the breadth of the construct. We therefore designed a second study to attempt a confirmatory replication and address some of limitations of Study 1's design.

Study 2

In Study 2, we sought to replicate the findings of Study 1 with a larger sample and with a more extensive operationalization of openness to experience. Study 2 also extends Study 1 by examining whether the value shifts in open people who reflected on death were maintained for even longer after the formal death reflection period ended than was demonstrated in Study 1. Thus, the

current study design can allay some concerns aroused by the small sample size of Study 1, allows for a test of longer term change, and can provide more confidence in the adequacy of our measurement of the openness construct. Following the results of Study 1, we hypothesized that openness to experience would predict shifts in RIEVO in the mortality salience condition, but not in the dental pain condition.

Participants

Participants were 60 students enrolled in an introductory psychology course at a large state school in the Midwestern United States. Three participants were dropped from analyses for not adequately completing Time 1 materials, as was one participant who completed all of the writing exercises on the final day of writing, leaving 56 participants for analysis (33 female, age $M = 18.6$, $SD = 1.09$). Participants received partial course credit for participation.

Method

The study design was similar to that of Study 1, save for a few details. First, due to the equivalent performance of

Table 3. Descriptive statistics and zero-order correlations, Study 2.

Variable	Descriptives		Zero-order correlations						
	Mean	SD	2	3	4	5	6	7	8
1. Openness summary	0.00	0.82	0.15	0.18	0.06	0.91	0.86	0.73	0.78
2. T1 RIEVO	1.31	1.09		0.72	0.85	0.11	0.13	0.30	-0.06
3. T2 RIEVO	1.19	1.07			0.88	0.12	0.01	0.39	0.00
4. T3 RIEVO	1.32	1.20				0.02	0.01	0.30	-0.12
5. Mini-marker openness	6.86	0.98					0.76	0.57	0.63
6. Intellect (BFAS)	3.59	0.57						0.47	0.59
7. Openness (BFAS)	3.60	0.59							0.33
8. Reflection (RRQ)	3.30	0.63							

$n = 56$.

BFAS, big five aspects scales (DeYoung et al., 2007). RRQ, rumination-reflection questionnaire (Trapnell & Campbell, 1999). Critical $r(54) = 0.27$ when $\alpha = 0.05$.

the death reflection and mortality salience manipulations in Study 1, participants were randomly assigned to one of only two conditions for 6 days: mortality salience ($n = 28$) or dental pain ($n = 29$). Further, participants completed assessments of RIEVO at three time points rather than two: a pretest measure, a posttest measure 2 days after the last writing exercise, and a final follow-up measure 12 days after the final writing exercise. We also assessed openness to experience more comprehensively than in Study 1, as outlined below.

Materials

Relative intrinsic-to-extrinsic value orientation

We assessed RIEVO following the same procedures as Study 1. Descriptive statistics for RIEVO and all following measures are provided in Table 3. The 15-item intrinsic scale was reliable at each time point (α s from 0.88 to 0.91), as was the 12-item extrinsic scale (α s from 0.87 to 0.93). The 56 participants submitted 148 responses on RIEVO across three assessments (an 88.1% response rate).

Openness

Participants completed four measures of openness to experience at Time 1. As in Study 1, participants completed the 8-item openness subscale from the Mini-Markers (Saucier, 1994; $\alpha = 0.76$).⁴ Further, participants completed both of the 10-item big five aspect scales for openness (DeYoung, Quilty, & Peterson, 2007), namely openness (e.g., “See the beauty in things others might not notice”; $\alpha = 0.71$), and intellect (e.g., “Can handle a lot of information”; $\alpha = 0.75$), indicating how much they agreed that each statement described them on a scale ranging from 1 *strongly disagree* to 5 *strongly agree*. Finally, participants completed the 12-item reflection scale from Trapnell and Campbell’s

(1999) rumination-reflection questionnaire (RRQ). This scale operationalizes a self-attentive epistemic curiosity (e.g., “I love analyzing why I do things.”) that Trapnell and Campbell (1999) demonstrated was strongly related to openness to experience and its NEO-PIR facets. The RRQ items were rated on a 1–5 agreement scale ($\alpha = 0.87$).

Results

Analytical strategy

Study 1 used a residual change approach to testing the change hypothesis. Though such an approach is often useful with two time points unfortunately, it is not straightforwardly implemented with three time points and it can create some inferential problems about change (Rogosa, 1995). Further, the three-time-point measurement of Study 2’s design creates more opportunities for data loss, and a participant who skipped a single measurement occasion would be treated as a complete loss under a residual change analysis. Mixed modeling can overcome these difficulties, so we proceeded with a mixed modeling approach for the analysis of Study 2.

Preliminary analysis: A measure of openness

We first conducted an exploratory factor analysis to examine whether all of the indicators of openness tapped a single underlying construct. We submitted the summary scores for each scale to a factor analysis with maximum likelihood estimation. A scree plot pointed to a clear single factor solution (first $\lambda = 5.34$, second $\lambda = 0.07$), and a χ^2 difference test of the alternative hypothesis that a multiple factor solution was preferable to a single factor maintained the null, supporting a single factor solution, $\chi^2(2) = 0.105$, $p = 0.591$. All variables loaded at 0.5 or higher in the factor pattern matrix. Based on this analysis, we created an openness summary variable by first z -scoring each measure of openness and then averaging them.

⁴As in Study 1, the present sample’s distribution of scores on the Mini Markers measure ($M = 6.68$, $SD = 0.98$) was quite similar to American undergraduate norms ($M = 6.55$, $SD = 1.09$; Saucier, 1994).

This variable was then grand mean centered for the multilevel models below.

To examine the potential that missing data was missing not-at-random (Rubin, 1976), we conducted a set of logistic regressions in which initial RIEVO and openness predicted whether a particular data point was missing on subsequent reports of RIEVO. These analyses did not suggest any systematic effect of participant characteristics assessed at Time 1 on subsequent missingness. Thus these analyses suggest that the missing at random assumption may be tenable. Thus, below we use multilevel modeling with maximum likelihood estimation to accommodate missing at random data (Merkle, *Missing Data*, 2014).

Model building and hypothesis testing

To begin modeling, we determined whether there was sufficient within-person variability in values to motivate the multilevel approach. Thus, we constructed a null model in which there was only a random intercept for each person on the outcome and no fixed effects. This analysis revealed considerable nonindependence of the observations, $ICC = 0.83$, which underlines the necessity of the multilevel approach.

We began a model selection process using full information maximum likelihood to allow for model comparison. We first constructed a full model that included a random intercept term and a random slope for each participants' openness \times condition interaction. Because RIEVO was assessed within-person over varying time intervals, a heterogeneous autoregressive structure was specified for the errors. Time was always treated as categorical because of the varying intervals between measurements. The fixed effects were time of measurement for RIEVO, openness score, experimental condition, and all of the interaction terms up to the time \times openness \times condition interaction (a "full" fixed effect model given the design). We then pared the model down by examining changes in BIC and AICc after eliminating fixed effect terms. This process

led to a simple model in which AICc and BIC were both minimized, and considerably so compared to alternatives (e.g., BIC for the full model = 371.3, BIC for the selected model = 356.2). In this model, the only remaining term was the three-way interaction between time, condition, and openness. To test the model with unbiased parameter estimates, we then fit this model restricted maximum likelihood estimation (REML). The three-way interaction was significant, $F(6, 31.1) = 3.54, p = 0.009$. The predicted values from this model are shown in Figure 2. In the first panel (Time 1), there is no notable difference in the relationship between openness and RIEVO across the DP and the MS conditions. By Times 2 and 3, however, the slopes for DP and MS diverge, with the relationship between openness and RIEVO becoming substantially stronger in the MS condition while remaining weak in the DP condition. Together, the statistical and graphical evidence supports the hypothesis that openness predicts shifting toward greater RIEVO after death deliberation.

We note that presenting a model with only a higher order interaction term, regardless of information criteria, may be a disputable strategy in that it constrains lower order terms to be zero, which may not be a tenable assumption in many cases. Despite our a priori hypothesis regarding the three-way interaction, we proceeded to analyze the full fixed-effect model described above. The results of running this model with REML and the Satterthwaite (1946) procedure for calculating denominator degrees of freedom are presented in Table 4. As shown in the table, the three-way interaction term is not statistically significant. However, examination of the simple openness \times condition interaction effect once participants completed the writing exercises (i.e., at time two) supports the results presented above and in Figure 2. At time two, after 6 days of the writing exercise and a 2-day delay, the interaction between openness and condition was significant, $b = -1.18, SE = 0.45, t(27.0) = -2.64, p = 0.014$, just as it is clear in the second panel of Figure 2 that openness at time

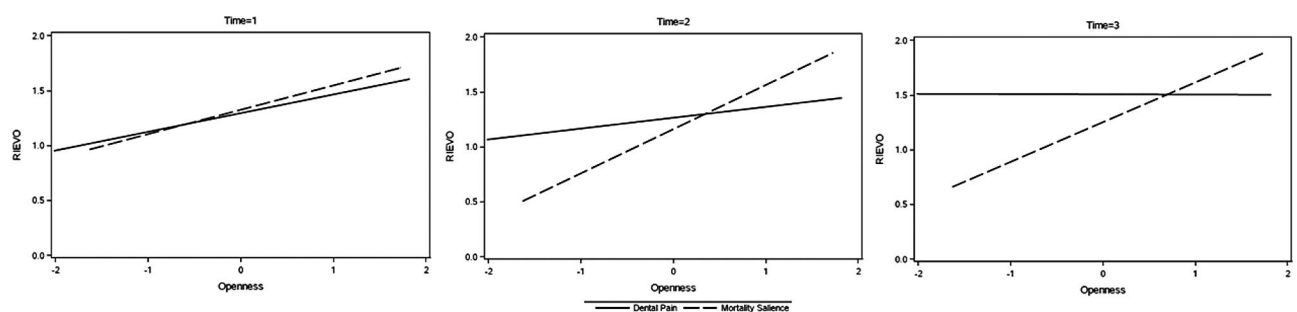


Figure 2. Relative intrinsic-to-extrinsic value orientation (RIEVO) as a function of openness (± 2 SD) and writing condition, Study 2. This figure illustrates the relation between the openness \times condition interaction and RIEVO across three assessments.

Table 4. Type III tests of RIEVO as a function of writing condition and openness, Study 2.

Fixed effects	<i>b</i>	<i>SE</i>	<i>df</i>	<i>t</i>	<i>p</i>	Lower 95% CL	Upper 95% CL
Intercept	1.50	0.18				1.13	1.87
Condition	−0.02	0.28	62.3	−0.08	0.94	−0.58	0.54
Openness	0.01	0.21	52.2	0.03	0.98	−0.42	0.44
Time	−0.22	0.12	88.1	−1.94	0.06	−0.45	0.00
Condition × Openness	1.48	0.52	25.1	2.85	0.01	0.41	2.54
Condition × Time	0.21	0.17	89.7	1.27	0.21	−0.12	0.55
Openness × Time	0.18	0.15	86	1.22	0.23	−0.11	0.47
Condition × Openness × Time	−0.36	0.22	73.6	−1.61	0.11	−0.81	0.09

N = 56.

Categorical predictors are coded such that the mortality salience condition and time three are the references.

two bore a stronger relation to RIEVO in the mortality salience condition than it had at time one, whereas this relation appears to be weaker in the dental pain condition. In addition, Table 4 shows that by Time 3, the strength of the interaction had increased compared to Time two, $b = -1.52$ [$-2.54, -0.50$], $SE = 0.50$, $t(27.1) = -3.06$, $p = 0.005$. Further, testing the simple effect of writing condition by Time three at high openness points to greater RIEVO in the mortality salience condition at the final assessment, $b = 1.20$ [$-0.06, 2.47$], $SE = 0.62$, $t(36.5) = 1.93$, $p = 0.062$. Simple slopes testing at time three also revealed a significant positive slope of openness in the mortality salience condition, $b = 1.53$ [$0.59, 2.47$], $SE = 0.45$, $t(19.3) = 3.40$, $p = 0.003$, whereas there was no effect of openness in the dental pain condition, $b = 0.01$ [$-0.42, 0.44$], $SE = 0.21$, $t(52.2) = 0.03$, $p = 0.979$.⁵ In sum, while the three-way interaction was not significant in the full model, closer examination of the full model supports the simpler model presented above that had pared down to the three-way interaction.

Discussion

In the present studies, we hypothesized that openness to experience would predict the extent to which participants placed increasing priority on intrinsic relative to extrinsic values following sustained periods of writing about their own death. The results of two studies converged to provide support for this hypothesis. Specifically, in Study 1, participants were assigned to one of three writing groups, two that asked them to write about death and one that asked them to write about dental pain. Across both death-content groups, openness predicted changes in RIEVO 2 days after the final experimental confrontation with the threat, with open individuals shifting toward intrinsic and away from extrinsic values. In Study 2, participants were assigned

to either a death-content (mortality salience) or no death-content control condition (dental pain) and completed a more comprehensive battery of openness measures. Once again, openness predicted changes in RIEVO in the sustained death-content writing condition, with open individuals shifting toward intrinsic and away from extrinsic values; no such effect was notable in the sustained dental pain writing condition. Further, this effect was evident well after the final writing exercise (12 days), pointing to a temporally robust change.

These findings contribute to a growing body of research suggesting that the values people endorse after reminders of death depend on the length of time they are presented with mortality stimuli and when dependent measures are administered relative to their exposure to those mortality stimuli. One study reports that immediately after being reminded of death, people derogate extrinsic values (Kosloff & Greenberg, 2009). Other studies show that after a brief delay of 5–15 min, people increase their focus on extrinsic values (Kosloff & Greenberg, 2009; Sheldon & Kasser, 2008). And still other studies show that if reflection on death is sustained over a longer time period, people shift away from extrinsic and toward intrinsic values (Cozzolino et al., 2004; Lykins et al., 2007). The current study shows that this latter occurrence is particularly likely to happen for individuals relatively high in openness to experience. The present study underlines the need to develop a fuller theoretical account of how people's values shift in response to death thoughts, one that can capture both defensive and integrative reactions and the complexity of how humans cope with awareness of their mortality.

These results also expand our knowledge of how individual differences influence responses to existential deliberation. For example, past research has demonstrated that people with a low personal need for structure (i.e., people who do not strongly prefer clear and stable knowledge [Neuberg & Newsom, 1993]), exhibit a desire to explore novelty following a single encounter with a mortality salience manipulation. At high personal need for structure, on the other hand,

⁵We computed the likelihood of the null hypothesis in the dental pain condition, following the procedures outlined in endnote 3. This analysis provided a JZS Bayes factor in favor of the null of 9.29 (i.e., the null of no effect is more likely than the alternative by about 9:1).

people rapidly draw conclusions about their life's meaning and direction (Vess, Routledge, Landau, & Arndt, 2009). One's interest in exploring novelty following reminders of one's mortality may facilitate the motivational lability that open people exhibited in the current research. Past research has also demonstrated that mindful people do not exhibit strong worldview defensive reactions to mortality salience (Niemic et al., 2010), but it is still unclear whether mindfulness can also facilitate salubrious motivational changes under mortality salience in the long term.

These results also fit into a growing literature on openness to experience and resilience to stress. A study of young adults demonstrated that meeting developmental challenges despite early adversity was linked, in part, to openness to experience (Shiner & Masten, 2012). Other research has suggested that openness negatively predicts reactivity to stressors despite being linked to greater exposure to adversity in childhood (Williams, Rau, Cribbet, & Gunn, 2009). Finally, openness is also negatively linked to coronary heart disease later in life (Lee et al., 2014). Together, this literature and the current research provide a plausible set of pathways through which openness facilitates staving off actual death while (and perhaps partly thanks to) engaging it cognitively.

These findings also have potentially important theoretical implications. First, they may help explain why a relatively small percentage of individuals experience posttraumatic growth (i.e., a response to trauma characterized by eventual increases in well-being), whereas most people return to pre-trauma levels of functioning or decline into posttraumatic stress disorder (Tedeschi & Calhoun, 2004). Perhaps people who are dispositionally high in openness are particularly well equipped to maintain the exploratory processing that promotes motivational reorientation in the face of sustained exposure to serious death or trauma, the kind of processing that can help to produce well-being outcomes in line with such reorientations. This notion is supported by the results of Cozzolino, Blackie, and Meyers (2014) who found that an open stance toward death (i.e., not being in fear and denial) was linked to personal efficacy and meaning, and even more directly by the results of Pals (2006), who found that openness facilitated maturity across the lifespan through exploratory processing of life's most distressing events. Additional support comes from cross-sectional demonstrations of a positive link between openness and growth outcomes in diverse populations that encounter frequent reminders of death, including emergency ambulance workers (Shakespeare-Finch et al., 2005) and the elderly (Gregory et al., 2010). The present

results add to these prior findings by demonstrating prospectively and experimentally the role of openness in facilitating motivational reorientations.

Limitations and future directions

The sample sizes across both studies were admittedly small. However, the fact that the pattern was confirmed in a replication attempt of the initial findings and that the pattern was evident in all three death-content conditions across two studies increases confidence in the reported effects. Future research will be needed to further confirm these results and to explore their generalizability beyond samples of American undergraduate students. Studies that extend the cross-sectional findings previously reported for ambulance worker and elderly populations (Shakespeare-Finch et al., 2005) are logical populations in which to conduct prospective field studies that examine value shifts as a function of openness to experience and experiences that induce death deliberation. Such studies may point to applied implications for human resources management and existential counseling.

The present studies used a time-intensive methodology intended to assess the dependent measures outside of the short-term compensatory defense window identified by threat and compensation researchers (Arndt, Routledge, & Cook, 2004; see also McGregor, 2006; Wichman, Brunner, & Weary, 2008). Further, the repeated nature of the deliberation task was intended to decrease the likelihood of the comparably facile return to baseline afforded by the majority of experimental threat paradigms. We suspect that these may be two key factors in observing growth outcomes after threat as we did in the present studies. Researchers might continue to address these factors with the aim of better understanding under what circumstances growth might be observed, as well as potential longstanding negative effects of experimental threats. Also, the question of just how longstanding the value shifts we observed remains. Future research can examine this question with yet more extended longitudinal designs.

Conclusion

Pondering death may not provide an impetus for positive motivational change for everyone, but it may for some. Our results suggest that extended deliberation about death is the sort of food for thought that people high in openness to experience are able to use to explore and reorganize their values in positive ways. More broadly, these results suggest that although people may often defensively process death, those who faced

it in a sustained manner and who have a tendency for cognitive exploration (i.e., the highly open) may come to the realization that the most rewarding life is one in which intrinsic values guide their actions. And rightfully so, as such values have been shown to be associated with a sense of authentic and capable goal pursuit, higher well-being, and contributing to one's community (Kasser & Ryan, 1996; Niemiec, Ryan, & Deci, 2009; Prentice & Sheldon, 2015). Our study thus calls into question mortality as an unconditionally defense-inducing threat and suggests instead that people with dispositions to engage the indeterminate, like those high in openness to experience, can derive inspiration for positive change by pondering what is at once life's surest bet and biggest question mark: its end.

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