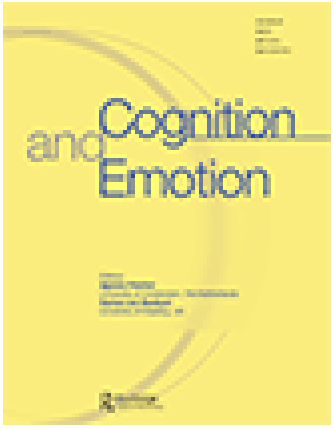

Cognition and Emotion
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/pcem20

Hopelessly mortal: The role of mortality salience, immortality and trait self-esteem in personal hope

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Published online: 29 Apr 2015.

COGNITION AND EMOTION, 2015
http://dx.doi.org/10.1080/02699931.2015.1031643

Routledge
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Hopelessly mortal: The role of mortality salience, immortality and trait self-esteem in personal hope

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(Received 8 April 2014; accepted 16 March 2015)

Do people lose hope when thinking about death? Based on Terror Management Theory, we predicted that thoughts of death (i.e., mortality salience) would reduce personal hope for people low, but not high, in self-esteem, and that this reduction in hope would be ameliorated by promises of immortality. In Studies 1 and 2, mortality salience reduced personal hope for people low in self-esteem, but not for people high in self-esteem. In Study 3, mortality salience reduced hope for people low in self-esteem when they read an argument that there is no afterlife, but not when they read "evidence" supporting life after death. In Study 4, this effect was replicated with an essay affirming scientific medical advances that promise immortality. Together, these findings uniquely demonstrate that thoughts of mortality interact with trait self-esteem to cause changes in personal hope, and that literal immortality beliefs can aid psychological adjustment when thinking about death. Implications for understanding personal hope, trait self-esteem, afterlife beliefs and terror management are discussed.

Keywords: Hope; Death; Self-esteem; Afterlife beliefs; Religion; Mortality salience.

> To live without hope is to cease to live. (Fyodor Dostoevsky)
>
> While there's life, there's hope. (Cicero)

Self-awareness creates the potential for hope: the general expectation and feeling that future desired outcomes will occur. However, self-awareness also renders humans conscious of their own mortality (Greenberg, Pyszczynski, & Solomon, 1986). This awareness of mortality, that life is ultimately destined to end in biological decay and oblivion, offers a potentially potent and direct challenge to thoughts and feelings of hope. Indeed, hopelessness is associated with higher levels of death-related thought and suicidal ideation (Chochinov, Wilson, Enns, & Lander, 1998). In light of this, and a broad body of research demonstrating that hope is associated with greater psychological well-being, physical health, mental functioning and self-regulation (see Snyder, 2002, for review), research testing the role of mortality thoughts (mortality salience) on hope is an important research topic. To date, however, no research has explored the causal impact of mortality salience on perceptions of personal hope, or the potential factors that moderate this relationship. Drawing on Terror Management Theory (TMT; Greenberg et al., 1986), we hypothesised that

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mortality salience reduces hope for people low, but not high, in trait self-esteem. In addition, we predicted that cultural worldviews promoting literal immortality (either religious or scientific) ameliorate this reduction in hope.

TERROR MANAGEMENT THEORY

TMT (Greenberg et al., 1986) posits that self-esteem and cultural worldviews help people cope with a very basic, and potentially terrifying, psychological conflict. On the one hand, humans, like all animals, have a biological inclination towards survival; humans, however, developed a unique sense of symbolic self-awareness that renders them awareness that life is finite (Leary & Buttermore, 2003; Sedikides, Skowronski, & Dunbar, 2006; Solomon, Greenberg, & Pyszczynski, 2004). In response, a uniquely human symbolic solution arose: culture. By contributing to cultural worldviews that continue beyond one's own death, humans gain a sense of symbolic immortality (e.g., contributing to something that outlives the self) or literal immortality (e.g., afterlife belief) that aids in coping with the awareness of their own death. Further, according to TMT, self-esteem developed as a gauge by which people perceive that they are (or are not) living up to the values and standards of their cultural worldviews.

Hundreds of studies (see Burke, Martens, & Faucher, 2010) support the two primary TMT hypotheses. The *mortality salience hypothesis* posits that if self-esteem and cultural worldviews protect against the awareness (and threat) of personal mortality, then people should defend these structures more when reminded of mortality. Specifically, mortality salience has been shown to increase: support for people who share one's religious beliefs (Greenberg et al., 1990), violence against those who hold different worldviews (McGregor et al., 1998), in-group humanisation (Vaes, Heflick, & Goldenberg, 2010) and agreement with positive personality feedback (Dechesne et al., 2003). TMT also posits the *anxiety buffer hypothesis*, stating that affirmation of "cultural anxiety buffers" (e.g., self-esteem and cultural worldviews) prior to reminders of mortality should reduce subsequent defensive responses (e.g., self-enhancement and worldview defence). Consistent with this hypothesis, both self-esteem boosts and worldview affirmations reduce defensive responses after reminders of mortality (Arndt & Greenberg, 1999; Harmon-Jones et al., 1997; Schmeichel & Martens, 2005) and reduce death thought accessibility (Schmeichel & Martens, 2005). More recent TMT work extends these findings by showing that trait self-esteem is associated with improved psychological adjustment (e.g., feelings of vitality, less anxiety; Abeyta, Juhl, & Routledge, 2014; Routledge et al., 2010) when pondering death. Outside of TMT, there is also ample evidence that affirming the value of the self and strengthening group identity increases psychological resilience (Cohen & Sherman, 2014; Jetten, Haslam, Haslam, & Alexander, 2012). Together this research suggests that the cultural anxiety buffer functions as a kind of "psychological immune system" (Gilbert, Pinel, Wilson, Blumberg, & Wheatley, 1998; Wisman & Goldenberg, 2005) that protects people when thinking about death (Wisman, 2006), and even reduces death-related cognition (Arndt, Greenberg, Solomon, et al., 1997; Pyszczynski, Greenberg, & Solomon, 2000). Thus, importantly, TMT provides an explanation for why most people do *not* go through life psychologically paralysed with terror and death anxiety.

In a meta-analysis of over 175 studies (Burke et al., 2010), thoughts of death were compared to a wide range of comparison topics, some which were aversive (e.g., thoughts of pain, failure and social exclusion) and some of which were more neutral (television and no comparison topic). The results indicated that mortality salience reliably impacted self-esteem striving and worldview defence, regardless of the nature of the comparison condition (e.g., aversive or neutral). This suggests that the findings are unique to (and driven by) thoughts of death. Further, mortality salience effects have been found across a wide range of mortality salience primes (e.g., subliminal priming, written responses to two open-ended statements, proximity to a graveyard, temporality from a

natural disaster and answers to multiple choice true–false questions; Arndt, Greenberg, Pyszcynski, & Solomon, 1997; Greenberg et al., 1990; Jonas & Fischer, 2006; Pyszczynski et al., 1996) and cross-culturally (e.g., Heine, Harihara, & Niiya, 2002; Routledge et al., 2010).

HOPE AND TERROR MANAGEMENT

Many empirical and theoretical "positive psychology" oriented approaches have aimed at understanding hope (Lopez, Snyder, & Pedrotti, 2003). One popular perspective (Snyder, 2002) has proposed that hope is the sum of two cognitive beliefs: pathways thinking (the perceived ability to self-generate routes to desired outcomes) and agency thinking (the perceived capacity for the self to maintain and initiate action towards desired outcomes). Research, however, indicates that laypeople's perceptions of hope are associated with agency, but not pathways, thinking (Tong, Fredrickson, Chang, & Lim, 2010), and that hope is cognitive, and affectively pleasant (Bruininks & Malle, 2005; Staats & Stassen, 1985; Tong, 2014). In turn, we define hope as the general expectation and feeling that future desired outcomes will occur (largely independently of cognitions about how these outcomes will occur).[1]

From an existential perspective, personal hope should be effective in helping people cope with mortality thoughts. With hope, there is a sense that one's life will be positive in the future, regardless of one's current or past situation, making coping with any experience, including burdensome thoughts of death, manageable and worthwhile. Indeed, there is evidence that people are motivated to find, and maintain, hope when thinking about death. For instance, when people are confronted with serious health threats (e.g., lung cancer), they increase efforts to create hope (Salander, Bergknut, & Henriksson, 2014; Borneman, Irish, Sidhu, Koczywas, & Cristea, 2014), and women with "adaptive" coping styles following a breast cancer diagnosis also maintain high levels of hope (Stanton, Danoff-Burg, & Huggins, 2002). Additionally, Rutjens, van der Pligt, and van Harreveld (2009) found in several experiments that people agree less with essays describing humanity as not progressing after a mortality salience manipulation (progress being related to hope). These and other findings, indicating that hope is broadly and consistently associated with greater psychological well-being and self-regulation (see Snyder, 2002, for review), and that a lack of hope is associated with serious psychological maladjustment (e.g., Thimm, Holte, Brennem, & Wang 2013; Tucker et al., 2013), support our premise that hope plays an important role in helping to regulate existential concerns.

Hope, however, is directly challenged by the prospect of death. Death is a reminder that one's life will end in biological decay—and also represents the stopping point for, and ultimate obliteration of, all desired outcomes. Consistent with this, there is also ample evidence that some people experience reduced hope, and even lose hope altogether, when dealing with terminal illnesses (Herth, 1990), or the death of a loved one (Michael & Snyder, 2005). Trait level thoughts of death (and suicidal ideation) are also associated with lower levels of hope (Chochinov et al., 1998). Ironically, people who lose hope when facing reminders of personal mortality may even be at greater risk of death (Baumeister, 1990). But, who loses hope (and who does not) when thinking about death?

TRAIT SELF-ESTEEM, MORTALITY AND HOPE

Recall that TMT proposes that self-esteem protects people from mortality concerns as it serves as

[1] There is ample evidence that hope is related to, but distinct from, optimism (e.g., hope is more affective and more future oriented than optimism; Bruininks & Malle, 2005) and from self-efficacy and self-esteem (hope persists even when people perceive no control over desired outcomes; Aspinwall & Leaf, 2002; Smith & Ellsworth, 1985).

a gauge of a person leading a meaningful, valued life in the context of one's cultural worldview. At least three lines of research support this notion. First, thoughts of death heighten the pursuit of self-esteem (e.g., increase agreement with positive personality feedback; Dechesne et al., 2003, and credit taking following successes; Mikulincer & Florian, 2002). Second, thoughts of death are directly associated with self-esteem; challenging people's sense of self-worth heightens death thought accessibility (Hayes, Schimel, & Williams, 2008), and high trait self-esteem is associated with less death thought accessibility (Harmon-Jones et al., 1997). Perhaps the strongest evidence for the role of trait self-esteem in effectively coping with thoughts of one's own mortality, however, is evidence that it moderates psychological adjustment when thinking about one's own mortality (Routledge et al., 2010). For people low, but not high, in trait self-esteem, mortality salience reduces life satisfaction and feelings of vitality, while it increases overall negative affect and, in particular, anxiety (Abeyta et al., 2014; Routledge et al., 2010). In addition, high trait level thoughts of death are associated with poorer psychological well-being, but only for people low in trait self-esteem (Routledge et al., 2010). Low, but not high, trait self-esteem is also associated with more negative self-awareness, and unhealthy behaviours aimed at reducing negative self-awareness (such as consuming large quantities of alcohol; Wisman, Heflick, & Goldenberg, 2014), when people are reminded of death. Finally, people at the end of life also have less anxiety when they have high levels of trait self-esteem (Neel, Lo, Rydall, Hales, & Rodin, 2013). Thus, trait self-esteem is associated with greater psychological well-being when thinking about death. It follows that people with low self-esteem have greater difficulties dealing with existential concerns than people high in self-esteem (Routledge et al., 2010; Wisman, 2006). As such, our first hypothesis is that mortality salience lowers personal hope for people low, but not people high, in self-esteem.

IMMORTALITY BELIEFS, DEATH AWARENESS AND HOPE

It has been theorised that cultural worldviews promising an afterlife emerged in tandem with the symbolic self (e.g., self-awareness), and that these beliefs have existed since the earliest forms of human cultural existence (Sedikides et al., 2006; Winzeler, 2008). Afterlife belief directly helps to solve the problem of death awareness (e.g., "I will die—but I will not really die because I will live on"); indeed, it is arguably the most direct way to cope with mortality concerns (Vail et al., 2010). Supporting this, correlational research indicates that spiritual beliefs (i.e., belief in God and life after death) are associated with less death anxiety (e.g., Harding, Flannelly, Weaver, & Costa, 2005) and less end of life despair (McClain-Jacobson et al., 2004). Death row inmates also frequently mention afterlife belief in the statements they make directly before being executed (Cooney & Phillips, 2013; Heflick, 2005). Further, in experiments, when people read mock scientific evidence of an afterlife (but not when provided with the alternative certainty that life merely ends), they subsequently display less worldview defence and self-enhancement (Dechesne et al., 2003). This is true for atheists, theists and agnostics (Heflick & Goldenberg, 2012). There is also evidence that immortality beliefs impact feelings of hope. The effect of religious beliefs on physical and mental health (e.g., Koole, McCullough, Kuhl, & Roelofsma, 2010) is mediated by hope (e.g., for women with breast cancer; Hasson-Ohayon, Braun, Galinsky, & Baider, 2009). Moreover, religious beliefs have been found to comfort hospice patients by offering a sense of hope via life after death (Pevey, Jones, & Yarber, 2008).

In sum, there is solid evidence that mortality concerns are assuaged by promises of literal immortality (belief that the self will continue to live) via belief in an afterlife. From a TMT perspective, this should also occur when literal immortality is promised in alternative ways (e.g., medical advances), though research as far as we

know has not tested this. As such, our second hypothesis states that the promise of literal immortality ameliorates the effect of mortality salience on reduced hope for people low in self-esteem (high self-esteem individuals are hypothesised to not have reduced hope after mortality salience regardless of the immortality prime). That is, people with low self-esteem will experience reduced hope when thinking about death, but this will not occur when they read promises of literal immortality.

OVERVIEW AND HYPOTHESES

We conducted four studies to examine the hypothesis that reminders of mortality reduce personal hope for people low in self-esteem, but not people high in self-esteem. In addition, we tested our hypothesis that offering "evidence" promising immortality, whether via life after death or medical advances, can help to neutralise the decreased personal hope that we expect to find among people low in self-esteem after reminders of mortality. This is because although death threatens the expectation of positive future outcomes, immortality beliefs can help to restore these expectations of a positive future by providing people with a sense of literal immortality. However, to date, no studies have experimentally tested if mortality thoughts cause changes in personal hope (or if this is moderated by trait self-esteem), or if promises of literal immortality buffer the influence of mortality salience on psychological well-being.

Studies 1–2 examined the effect of mortality salience on personal hope directly by measuring trait self-esteem, and then having participants write about their own death or an aversive control topic (i.e., their own physical pain). Hope was then measured using a variety of measures (Staats, 1989; Snyder et al., 1996) that collectively assessed the cognitive and affective components of both short- and long-term hope. In Study 3, we repeated this design but additionally had participants read either an essay arguing that there is scientific "evidence" of life after death or an essay arguing that there is no evidence for life after death. In Study 4, we tested these ideas by replacing an afterlife affirmation with an essay ostensibly describing medical advances that could promise immortality. All methods, materials and analyses conducted across all four studies are reported in accordance to journal policy.[2]

STUDY 1

In Study 1, we sought to test the hypothesis that mortality salience (reminders of personal mortality) reduces feelings of personal hope, but only for people low in self-esteem. To do so, we utilised Staats Hope Index (1989), a measure that taps both cognitive and affective components of hope by assessing fit between desires and expectations of their future. The greater the fit between people's desires and expectations about the future, the more hope they have. Merely desiring positive outcomes does not reflect the construct of hope very well (Staats, 1989). For instance, people would not be extremely hopeful if they wished for less rain while living in a high precipitation area, if they do not also expect less rain (and not expecting highly desired outcomes to occur is associated, if anything, with poor mental health; see e.g., Baumeister, 1990). We predicted that people low in self-esteem would uniquely experience lowered feelings of personal hope after thinking about their own mortality. This is consistent with abundant research showing that self-esteem functions as an anxiety buffer against the negative cognitive and affective consequences of death awareness (Arndt & Greenberg, 1999; Harmon-Jones et al., 1997; Routledge et al., 2010).

[2] For all reported studies, we report all data exclusions and all included measurements in text, in accordance with journal policy. Sample size was determined using an end of semester stopping point (Studies 1 and 3) or using a planned sample size (Studies 2 and 4) that would provide at least 80% power based on the average effect size of .35 (found across hundreds of studies priming mortality; see Burke et al., 2010, but see Yen & Cheng, 2013, for slightly smaller estimates). At no point were additional data collected after data were initially analysed.

Method

Participants

Seventy undergraduate students (53 women and 17 men, M_{age} = 21.60, *SD* = 5.54) from the University of Kent participated for course credit in a study ostensibly concerned with personality characteristics.

Procedure and materials

Participants completed materials in a laboratory on a standard PC equipped with Authorware 7.1 software. After completing several personality questionnaires to convey the cover story, participants were presented with the Rosenberg's Self-Esteem Scale (Rosenberg, 1965), which measures global feelings about the self with 10 items such as, "I take a positive attitude toward myself" and "I certainly feel useless at times" (reversed). Responses were assessed using a 5-point agreement format, where 1 = *strongly disagree* and 5 = *strongly agree*. In a review of major measures of self-esteem (Blascovich & Tomaka, 1991), Rosenberg's Self-Esteem Scale was found to have sufficient psychometric properties, such as internal consistency, test–retest reliability, and convergent and discriminant validity. Consistent with this, in our study, we found the scale to have good internal reliability (α = .85; *M* = 3.68, *SD* = 0.71).

Following the assessment of self-esteem, participants were then randomly assigned to a mortality salience or an aversive control condition (e.g., Greenberg et al., 1990). In the mortality salience condition, participants responded to two open-ended questions: "Briefly describe the emotions that the thought of your own death arouses in you" and "Jot down, as specifically as you can, what you think will happen to you physically as you die and once you are physically dead". The aversive control condition consisted of two parallel items regarding the experience of physical pain (e.g., "Briefly describe the emotions that the thought of your own physical pain arouses in you"). A few studies have found that pain salience has effects that more closely approximate mortality salience effects (though mortality salience has stronger effects; Holbrook, Sousa, & Hahn-Holbrook, 2011). Thus, using pain salience provided, if anything, a more rigid test of our hypothesis than using more neutral control conditions.

The effects of mortality salience (on worldview defence, self-esteem striving and affective states) occur after a delay when thoughts of death are active, but no longer conscious (i.e., when they have receded from consciousness after being made conscious; see Arndt, Greenberg, Solomon, et al., 1997). In turn, after the mortality salience manipulation, participants completed the 20-item Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) to provide the necessary delay. Specifically, participants indicated the extent to which each of 10 positive affect items (e.g., attentive: α = .88; *M* = 3.10, *SD* = 0.71) and 10 negative affect items (e.g., angry: α = .86; *M* = 1.70, *SD* = 0.64) reflected how they felt right at that moment (1 = *very slightly or not at all* and 5 = *extremely*). Including the PANAS also enabled us to control for any potential influences of positive and negative affect after the mortality salience prime; however, based on hundreds of studies (e.g., Routledge et al., 2010), we did not expect this to occur, nor did we expect any change in affect immediately following mortality salience (Routledge et al., 2010).[3] After the mood measurement, to further enable thoughts of death to recede from consciousness (Arndt, Greenberg, Solomon, et al., 1997), participants also completed a "dot" to "dot" task in which they drew lines to connect numbered dots in order to create a tree image.

Finally, for the dependent variable, participants completed the personal hope subscale of the Staats

[3] In Study 2, we found a marginally significant mortality salience by self-esteem interaction on positive affect, *B* = .02, *SE* = .01, *t* = 1.91, *p* = .060. However, importantly, covarying positive affect and negative affect did not significantly impact any of the significant interaction effects across all four studies. There was a main effect of self-esteem on positive affect (related to higher levels) and negative affect (related to lower levels), but no interaction effect or mortality salience main effect emerged on either positive or negative affect in Studies 1, 3 and 4.

Hope Index (Staats, 1989), which assesses both affective and cognitive components of hope. Specifically, each of the eight items consisted of two sub-items that measured to what extent participants *wished* (1 = *not at all* and 5 = *very much*) a certain outcome (e.g., "To be happy") and to what extent they *expected* this to happen (1 = *not at all* and 5 = *very much*). To create an overall score of personal hope, we subtracted both scores on each single item ("expect" minus the "wish scores") and summed up the subtracted score (such that lower scores reflect lower levels of hope) into an average personal hope index (α = .74; M = −0.66, SD = 0.49) that formed our dependent variable (Staats & Stassen, 1985). A higher match between wishes and expectations (the more positive the resulting value) indicates higher levels of hope.

Results

To test the hypothesis that death thoughts reduce personal hope for individuals with low, but not high, self-esteem, we carried out a regression analysis with the main effects for the experimental manipulation (dummy coded) and self-esteem (mean centred) entered at Step 1, and their interaction entered at Step 2 (Aiken & West, 1991). There was a main effect of self-esteem, indicating that high self-esteem was associated with more hope, B = .03, SE = .08, $t(67)$ = 4.83, p < .001, adjusted R^2 = .17. The main effect for the mortality salience manipulation was not significant (p = .12). However, as hypothesised, there was a significant interaction at Step 2 between self-esteem and mortality salience, B = −.04, SE = .02, $t(66)$ = −2.52, p = .014, adjusted R^2 = .23.

We then conducted predicted mean comparisons at one standard deviation above and below the standardised self-esteem mean. Consistent with our hypothesis, mortality salience, relative to the control condition, decreased hope at low levels of self-esteem (−1 SD), B = −3.90, SE = 1.34, $t(66)$ = −2.91, p = .005, but not at high levels of self-esteem (1 SD), B = 1.08, SE = 1.41, $t(66)$ = 0.45, p > .44. Moreover, low levels of self-esteem predicted decreased hope as compared with high levels of self-esteem in the mortality salience condition, B = −.42, SE = .09, $t(66)$ = −4.83, p < .001, but not in the control condition, B = −0.07, SE = 0.11, $t(66)$ = −0.61, p = .54 (see Figure 1).

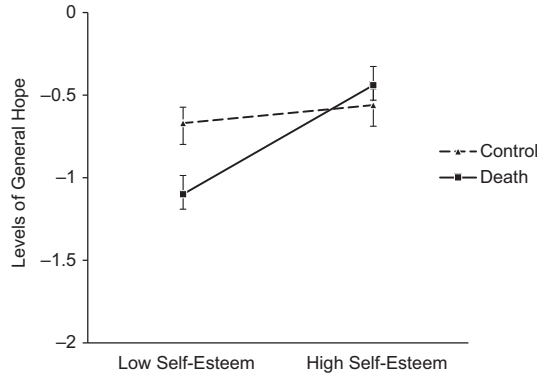

Figure 1. *General personal hope as a function of mortality salience and trait self-esteem (Study 1). Note:* Lower numbers denote less hope.

Discussion

The findings of Study 1 provided support for our hypothesis: reminders of mortality (compared to pain salience) decreased personal hope, but only for participants with low self-esteem. This was found when measuring hope as the (cognitive and affective) fit between expectations and desires about the future. Further, the effects also occurred within the mortality salience condition, but not within the pain condition. This is consistent with the notion that mortality thoughts are reducing hope for people with low self-esteem (in contrast to pain salience driving the effect). One limitation of this study, however, is the relatively small sample size.

STUDY 2

In Study 2, we sought to replicate the findings of Study 1 with different measures of hope and a larger sample. One measure assesses cognitive hope in terms of immediate goals (i.e., "Adult State Hope Scale"; Snyder et al., 1996). This scale consists of two subscales: pathways thinking and

agency thinking. "Pathways thinking" refers to the belief that one can effectively plan for/conceptualise paths towards goals, whereas "agency thinking" refers to the belief that one can maintain action to achieve goals (i.e., desired outcomes). The other hope measure we created specifically to assess people's current, general, feelings and expectations about the future (what we call "state future hope"). Thus, these two scales enabled us to distinctly test people's current hope, related to either the immediate future or the more distant future. As "pathways thinking"—or beliefs about how desired outcomes will be met—is not related to people's perceptions of hope (Tong et al., 2010), we made no hypothesis regarding this variable. But, we expected the "agency thinking" aspect of the Adult State Hope Scale, as well as scores on the state future hope scale we created, to be lowered for people with low self-esteem (but not high self-esteem) when thinking about death. One final addition to Study 2 was that we tested our hypotheses using an American Internet sample (which tend to be older on average than student samples) instead of a British student sample and recruited a higher number of participants.

Method

Participants

Participants were 100 American users of Amazon MTurk (60 women and 40 men; M_{age} = 35.3, *SD* = 13.1) who received $0.35 for participating in a study ostensibly concerned with personality.

Procedure and materials

Prior to the measures of hope, the design for Study 2 was identical to the design in Study 1, with one exception. Instead of the dot to dot task following the PANAS, participants read a short story by Albert Camus that functioned as a delay (e.g., Greenberg, Pyszczynski, Solomon, Simon, & Breus, 1994) and was easier to administer through MTurk. As in Study 1, the Rosenberg's Self-Esteem Scale (*M* = 3.81, *SD* = 0.71) was found to have sufficient reliability (α = .90) as was the Negative Affect Schedule (α = .90; *M* = 1.52, *SD* = 0.68 and the Positive Affect Schedule (α = .91, *M* = 2.73, *SD* = 0.91) of the PANAS.

For the dependent variable, participants completed the Adult State Hope Scale (Snyder et al., 1996) that consists of six items. Three items are theorised to measure participant's cognitive sense of agency to achieve current personal goals (1 = *Definitely false* and 5 = *Definitely true*; e.g., "At this present time, I am energetically pursuing my goals"; α = .71, *M* = 3.60, *SD* = 0.73) and three items to measure participants cognitive sense of pathways to achieve current personal goals (e.g., "There are lots of ways around any jam that I am in now"; α = .82, *M* = 3.50, *SD* = 0.70). This was followed by a state personal future hope scale consisting of 5 items (α = .90; *M* = 3.51, *SD* = 0.86), which we designed to measure "state future hope"—state perceptions and feelings of hope in terms of future goals ("Right now, my future looks bright", "Right now, I am hopeful about most aspects of my life", "Right now, I believe my dreams come true" and "Right now, when I think about my future I feel happy"). Responses were assessed using a 5-point agreement format, where 1 = *strongly disagree* and 5 = *strongly agree*. Finally, we gauged participants afterlife beliefs ("I believe in life after death"; 1 = strongly disagree, and 9 = strongly agree), followed by standard demographic items.

Results

First, we examined if reminders of death predict less *state* hope (in terms of immediate goals) for people low, but not high, in self-esteem in terms of "agency thinking". The main effect of mortality salience was not significant (p = .31), but the main effect of self-esteem was significant, indicating that low self-esteem was associated with lower levels of agency thinking, *B* = .12, *SE* = .03, $t(97)$ = 4.23, $p < .001$, adjusted R^2 = .15. Additionally, as hypothesised, this effect was qualified by a significant interaction in the second step, *B* = −.16, *SE* = .06, $t(96)$ = −2.61, p = .011, adjusted R^2 = .20. To probe this interaction further, we conducted predicted mean comparisons at one standard deviation above and below the

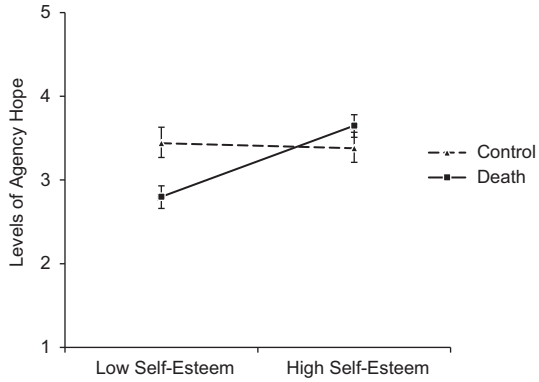

Figure 2. *Agency hope for immediate goals as a function of mortality salience and trait self-esteem (Study 2). Note:* Lower numbers denote less hope.

standardised self-esteem mean. As in Study 1, mortality salience, relative to the control condition, decreased agency thinking at low levels of self-esteem (−1 *SD*), $B = 1.90$, $SE = .70$, $t(96) = 2.70$, $p = .01$, but not at high levels of self-esteem (1 *SD*), $B = -.82$, $SE = .66$, $t(96) = -1.25$, $p > .22$. Furthermore, low levels of self-esteem predicted decreased agency thinking relative to high levels of self-esteem in the mortality salience condition, $B = .15$, $SE = .030$, $t(96) = 5.07$, $p < .001$, but not in the control condition, $B = -.012$, $SE = .055$, $t(96) = -.21$, $p = .83$ (see Figure 2).

We repeated this regression analysis switching "agency thinking" for "pathways thinking" as the dependent variable. There was a main effect of self-esteem, indicating that low self-esteem was associated with lower levels of state pathways thinking, $B = .046$, $SE = .007$, $t(97) = 6.67$, $p < .001$. Furthermore, a marginal main effect of mortality salience emerged, indicating that thoughts of death were associated with lower levels of state pathways thinking, $B = .23$, $SE = .11$, $t(97) = 1.99$, $p = .050$, adjusted $R^2 = .33$. This effect of mortality salience was not qualified by a significant interaction in the second step, $B = -.01$, $SE = .02$, $t(96) = -.77$, $p = .44$. Thus, as anticipated, mortality salience did not interact with self-esteem to influence pathways thinking. Rather, mortality salience reduced current pathway thinking for both people low and high in self-esteem.

To test the proposed self-esteem by death thoughts interaction using a measure of "state future hope", we carried out another regression analysis. As with agency hope, there was a main effect of self-esteem, indicating that high self-esteem was associated with higher levels of state future hope, $B = .07$, $SE = .01$, $t(97) = 9.85$, $p < .001$, and a main effect of mortality salience approaching significance, $B = .20$, $SE = 12$, $t(97) = 1.69$, $p = .09$, adjusted $R^2 = .51$. However, again, these effects were qualified by a significant interaction in the second step, $B = -.04$, $SE = .02$, $t(96) = -2.47$, $p = .015$, adjusted $R^2 = .53$. To probe this interaction, we again conducted predicted mean comparisons at ±1 *SD* from the mean. Low levels of self-esteem (−1 *SD*) predicted less state future hope as compared with high levels of self-esteem (1 *SD*) in the mortality salience condition, $B = .82$, $SE = .08$, $t(96) = 10.06$, $p < .001$, and in the control condition, $B = -.040$, $SE = .02$, $t(96) = 2.57$, $p = .009$. However, mortality salience, compared to the control condition, decreased general hope at low levels of self-esteem, $B = .57$, $SE = .19$, $t(96) = 3.01$, $p = .003$, but not at high levels of self-esteem, $B = -.13$, $SE = .18$, $t(96) = -.70$, $p = .49$ (see Figure 3).

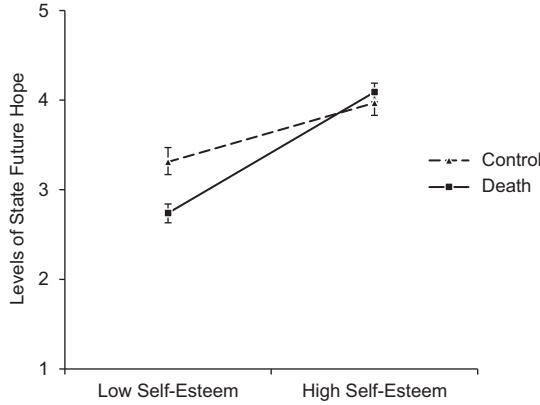

Figure 3. *State future hope as a function of mortality salience and trait self-esteem (Study 2). Note:* Lower numbers denote less hope.

Finally, we tested if belief in an afterlife is correlated with our measurements of hope. We found a positive correlation between belief in an afterlife and the agency hope scale ($r(100) = .29$, $p < .001$), the state personal future hope scale ($r = .29$; $p < .005$) and the state pathways hope scale ($r = .31$; $p < .005$).

Discussion

Using a more highly powered sample, Study 2 indicated that people low, but not high, in self-esteem experienced reduced feelings of personal hope for the distant future ("state future hope") when thinking about death relative to the control (pain) condition. This same effect was found when personal hope was assessed for agency thinking towards immediate (future) goals. As in Study 1, these results also occurred within the mortality salience condition, but not the pain condition. In conjunction with Study 1, the results of Study 2 indicate that mortality salience weakens hope for individuals with low self-esteem, both for cognitive and affective components, and for more immediate and more future-oriented desired outcomes. That the results were found using two distinct samples (American MTurk users and British college students) that consisted of different age ranges and gender compositions provides further support for the generalisability of mortality salience in lowering personal hope for people low in self-esteem. Additionally, there was a correlation between afterlife belief and hope. This raises the possibility that literal immortality could aid people (low in self-esteem) in preserving their feelings of hope when reminded of death.

Also, consistent with evidence that "pathways thinking" is not associated with laypeople's reports of hope (Tong et al., 2010), we found a main effect for mortality salience in lowering "pathways thinking" (as opposed to the interaction found with other measures of hope). Although we made no hypothesis regarding this variable, this effect makes sense in that there is no way to avoid death (e.g., "to get out a jam" as stated in the pathways scale). As such, when completing this scale, all participants (regardless of self-esteem) in the death thought condition may have been acutely aware that there are no real "pathways" available that can avoid the most salient problem: death (i.e., it is an inevitable "jam" that cannot be escaped). In contrast, the ability to maintain the belief that you can pursue your immediate goals (state "agency thinking") is not as directly challenged by the problem of death, nor is the belief that your future-oriented desires and expectations will come true (state future hope), enabling people with high self-esteem to maintain hope on those variables.

STUDY 3

Is there a way to preserve hope for people with low self-esteem when thinking about death? Mortality is a potential threat to hope, as it signals an end to all potential positive future outcomes. Ample research suggests that afterlife beliefs reduce psychological defensiveness when thinking about death (e.g., Dechesne et al., 2003). This makes sense, because with the belief in an afterlife the problem of mortality is averted. Moreover, the promise that life will continue, in one way or the other, seems for most people a more hopeful prospect than the process of organic decay (Solomon et al., 2004). As such, although no research we know of has explored the interaction between afterlife belief and mortality thoughts on psychological well-being, these beliefs should protect psychological well-being (preserve hope) for people with low self-esteem when they are thinking about death.

In Study 3, we sought to replicate the effects of Studies 1 and 2 showing that mortality salience reduces hope for people low, but not high, in self-esteem. Further, we wanted to test our second hypothesis, stating that this effect for people low in trait self-esteem will not occur if they are provided with promises of literal immortality. For people with high self-esteem, we did not predict that literal immortality promises would boost (or reduce) hope when death was salient, as they do not experience reduced or increased hope when thinking about death. This is consistent with TMT in that high trait self-esteem is reducing

all impact of death thoughts, possibly rendering the promises of literal immortality less influential.

Method

Participants

Eighty undergraduate students from the University of Kent in the UK (29 women and 51 men, M_{age} = 20.33; *SD* = 3.15) participated for course credit.

Procedure and materials

The materials and procedure were identical to Studies 1 and 2 through the PANAS mood scale. The Rosenberg's Self-Esteem Scale was again found to be a reliable scale (α = .93; *M* = 3.46, *SD* = 0.98), as was the PANAS mood scale for both positive affect (α = .84; *M* = 3.03, *SD* = 0.72) and negative affect (α = .86; *M* = 2.07, *SD* = 0.88). In this study, however, the PANAS was followed by a word search puzzle to increase delay to allow thoughts of death to recede from consciousness (Arndt, Greenberg, Solomon, et al., 1997). This was followed by our manipulation of afterlife belief, which was adapted from Dechesne et al. (2003).

Participants in the afterlife affirmation condition read:

> People who have near death experiences (NDEs) often report detailed descriptions of an afterlife. Recent research (Barkowski, 2005) revealed that these NDEs cannot be accounted for by chemical changes in the brain that occur during the process of dying. Moreover, it was found that NDEs show a remarkable congruity across different cultures. The latter suggests that NDEs are a product of the reality rather than a product of imagination. Overall, these findings suggest that there is support for the existence of life after death.

Participants in the afterlife disconfirmation condition read:

> People who have near death experiences (NDEs) often report detailed descriptions of an afterlife. Recent research (Barkowski, 2005) revealed that these NDEs can be accounted for by chemical changes in the brain that occur during the process of dying. Moreover, it was found that NDEs show a remarkable incongruity across different cultures. The latter suggests that NDEs are a product of the brain rather than a product of reality. Overall, these findings suggest that there is no support for the existence of life after death.

The afterlife manipulation was followed by two questions aimed at evaluating the presented NDE research. Specifically, we gauged participants agreement (1 = *strongly disagree* and 5 = *strongly agree*) with two items that rated the reliability and importance of the presented NDE research (e.g., "Research into near death experiences is very important" and "The research above sounds reliable to me"). These items were averaged to form the NDE research evaluation scale (α = .90; *M* = 3.03; *SD* = 0.74). This served to verify that participants did not differ in their general attitudes towards the two essays across conditions. Finally, as in Study 1, participants completed the Staats Hope Index (Staats, 1989) to measure participants' levels of hope (α = .71; *M* = −.78, *SD* = 0.68), followed by standard demographic items.

Results

First, we subjected our NDE research manipulation check to a two-group (afterlife argument: affirmation and disconfirmation) between-subjects analysis of variance (ANOVA). No significant main effect was found (p = .19). Participants in the afterlife disconfirmation condition (*M* = 2.91, *SD* = 1.05) evaluated the mock "scientific" evidence as equally important and valid as participants in the afterlife confirmation condition (*M* = 2.59, *SD* = 1.06). Thus, both the afterlife affirmation and afterlife disconfirming research were evaluated as equally important and valid. This suggests that our manipulations were successful in conveying the mock scientific evidence.

To test the hypothesis that participants with low self-esteem have lower levels of personal hope when thoughts of death are salient, but not when provided with evidence of life after death, we conducted a regression analysis with the main effects for the mortality salience manipulation (dummy coded), afterlife manipulation (dummy coded) and self-esteem (mean centred) entered at Step 1. At Step 2, we entered all possible two-way

interaction terms between the afterlife manipulation, mortality salience manipulation and self-esteem, and at Step 3, we entered the three-way interaction between those variables. In the first step, we again found a significant main effect of self-esteem, $B = .02$, $SE = .01$, $t(76) = 2.54$, $p = .013$, adjusted $R^2 = .06$, showing that low self-esteem was associated with decreased levels of personal hope, but mortality salience and the afterlife manipulation were not significant factors (ps > .18). At Step 2, only the mortality salience by self-esteem interaction approached significance, $B = -.03$, $SE = .01$, $t(73) = -1.85$, $p = .068$, adjusted $R^2 = .07$ (all other interaction effects, ps > .5). In the third step, as hypothesised, we found a significant three-way interaction between mortality salience, the afterlife manipulation and self-esteem, $B = -.06$, $SE = .03$, $t(72) = -2.09$, $p = .041$, adjusted $R^2 = .11$.

Given the significant three-way interaction, we then analysed the effects within the afterlife affirmation essay and within the afterlife disconfirming essay separately using the same regression approach (but excluding Step 3). At Step 1, we found a non-significant main effect of self-esteem, $B = .02$, $SE = .01$, $t(36) = 1.78$, $p = .084$, adjusted $R^2 = .04$. No main mortality salience effects were found ($p = .53$). However, within the afterlife disconfirmation condition, there was a significant self-esteem by mortality salience interaction at Step 2, $B = -.07$, $SE = .02$, $t(35) = -2.75$, $p = .009$, adjusted $R^2 = .18$. Predicted mean comparisons at ±1 *SD* from the standardised self-esteem mean indicated that mortality salience, relative to the control condition, decreased personal hope at low levels of self-esteem (−1 *SD*), $B = .82$, $SE = .32$, $t(35) = 2.53$, $p = .016$, but not at high levels of self-esteem (+1 *SD*), $B = -.50$, $SE = .32$, $t(35) = -1.58$, $p = .12$. Furthermore, low levels of self-esteem predicted decreased hope as compared with high levels of self-esteem in the mortality salience condition, $B = 0.061$, $SE = 0.018$, $t(35) = 3.34$, $p = .002$, but not in the control condition, $B = -.006$, $SE = .016$, $t(35) = -0.38$, $p = .71$ (see Figure 4).

We proceeded by looking at the effects within the afterlife affirmation manipulation only. We carried out the same regression analysis as when testing within the afterlife disconfirming condition effects. This analysis revealed a marginally significant main effect of self-esteem, $B = .02$, $SE = .01$, $t(38) = 1.82$, $p = .076$, adjusted $R^2 = .07$. No main effect of mortality salience was found ($p = .19$). Importantly, the results did not yield a mortality salience by self-esteem interaction ($p = .88$). Thus, in contrast to within the afterlife disconfirmation condition, and consistent with our hypothesis, mortality salience did not decrease personal hope for participant low in self-esteem, when hope for an afterlife was made salient (see Figure 5).

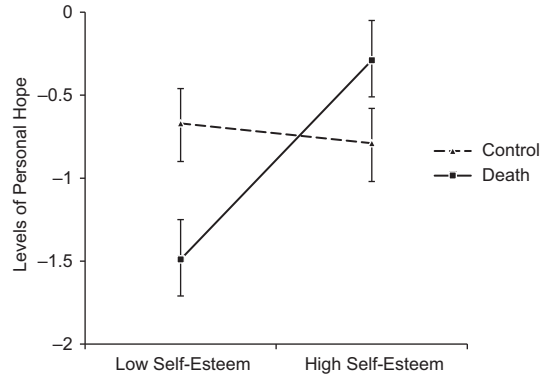

Figure 4. *General personal hope as a function of a mortality salience and trait self-esteem in the afterlife disconfirmation condition (Study 3). Note:* Lower numbers denote less hope.

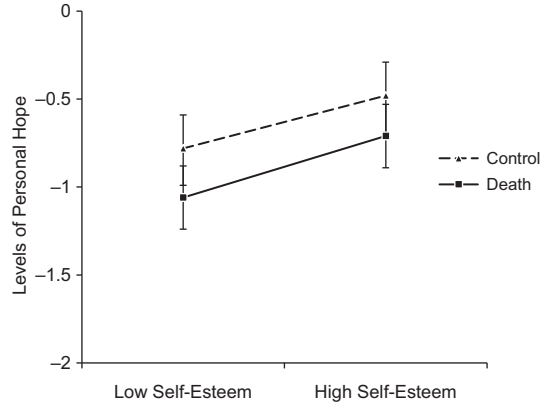

Figure 5. *General personal hope as a function of a mortality salience and trait self-esteem in the afterlife confirmation condition (Study 3). Note:* Lower numbers denote less hope.

Discussion

Consistent with Studies 1 and 2, mortality salience reduced personal hope for people low in self-esteem, but had no effect for people high in self-esteem, when promises of an afterlife were not salient. However, Study 3 found that arguments affirming the existence of an afterlife buffered the effects of mortality thoughts on personal hope for people low in self-esteem. This is consistent with our hypothesis that afterlife beliefs can help to preserve hope in the context of the awareness of death, particularly for people low in self-esteem. These findings are also consistent with the TMT-based argument that promises of immortality function as an existential anxiety buffer to protect people psychologically when they are reminded of their own mortality. They extend past research into this area by demonstrating that afterlife belief can protect psychological adjustment (in this case hope) when thinking about death (past research focused on reduced psychological defensiveness; Dechesne et al., 2003; Heflick & Goldenberg, 2012). Despite the consistency of these results with past research, and Studies 1 and 2, some caution is warranted given the small sample size of Study 3.

STUDY 4

Not all people believe in life after death. Can science-based promises of immortality—similarly to religious promises—protect people with low self-esteem's personal hope when they are thinking about death? Using a much larger sample than in Study 3, in Study 4, we sought to test if secular promises of literal immortality (via science and medicine) will function similarly to religious promises (afterlife belief) in preserving hope when thinking about death. We provided participants with mock "scientific" evidence that gene identification research will lead to a dramatic increase in life longevity. Similar to Study 3, we expected that such a promise of (near) immortality will attenuate the effect of mortality salience on reduced hope for people with low self-esteem. If true, this would suggest that such immortality beliefs buffer the deleterious effects of death thoughts on psychological well-being, regardless of if these beliefs are religious (and hence challenge the notion that religious beliefs are a stronger means of coping with mortality salience than secular means; e.g., Heflick & Goldenberg, 2012). To date, however, no research has directly tested the impact of scientific means of literal immortality on how people react to thoughts of death.

Method

Participants

Participants were 200 American users of Amazon MTurk (97 women and 103 men, M_{age} = 28.25; SD = 7.54) who received $0.50 for participating in a study ostensibly concerned with personality.

Procedure and materials

The materials and procedure were identical to Study 3; however, in Study 4, the Rosenberg's Self-Esteem Scale (α = .88; M = 3.75, SD = 0.71) was followed by a manipulation of life immortality.

Participants in the immortality condition read:

> Scientists have highlighted the importance of the gene let-418/Mi2 in certain non-human animals because it regulates ageing and stress resistance as well as being for essential for reproduction. They have discovered that when the gene is deactivated in adult animals in the laboratory, they live longer and are much more resistant to the negative effects of stress and aging. There is also preliminary evidence that de-activating the gene may enable the human body to enjoy a significant increase in life expectancy since it can help ward off diseases by bolstering the immune system.
>
> In summary, this line of research suggests that it is soon possible to increase the life expectancy of humans dramatically.

Participants in the no immortality condition read:

> Scientists have highlighted the importance of the gene let-418/Mi2 in certain non-human animals because it regulates ageing and stress resistance as well as being essential for reproduction. It has been discovered that when the gene is de-activated

> in these animals in a laboratory that they live shorter lives and are considerably less resistant to stress. Scientists have established, however, that this knowledge cannot be used to impact human responses to stress or human life expectancy. This is because it cannot impact the human immune system, thus having no impact on susceptibility to illness and aging. In summary, this line of research suggests that it will be impossible to increase the life expectancy of humans.

The immortality manipulation was followed by two questions aimed at evaluating the presented research. Specifically, we gauged participants' agreement (1 = *strongly disagree* and 5 = *strongly agree*) with two items that rated the reliability and importance of the presented research (e.g., "This research is very important" and "The research above sounds reliable to me"). These items were averaged to form a research evaluation scale (α = .75; M = 4.16, SD = 0.79). This served to test for different evaluations of the manipulations across conditions. After this, in the mortality salience condition, participant responded to either the same mortality-related items as in Studies 1–3. In contrast to Studies 1–3, the control condition asked parallel items about going to the dentist (e.g., "Briefly describe the emotions that the thought of a visit to the dentist arouses in you"). This was followed by the PANAS mood scale; both positive affect (α = .92; M = 2.70, SD = 0.89) and negative affect (α = .91; M = 1.50, SD = 0.69) were reliable. Finally, as in Study 2, participants completed our General Hope Scale to measure participants' levels of hope (α = .93; M = 3.84, SD = 0.84), followed by standard demographic items.

Results

First, we subjected our "immortality" research manipulation check to a two-group (immortality versus no immortality) between-subjects ANOVA. No significant main effect was found (p = .22). Participants in the no immortality condition (M = 4.09, SD = 0.82) evaluated the scientific "evidence" as equally important and valid as participants in the immortality condition (M = 4.23, SD = 0.77). Thus, both scientific research with a high promise of immortality and no promise of literal immortality were evaluated as equally important and valid. This suggests that our manipulations were successful in conveying the mock scientific "evidence".

To test the hypothesis that participants with low self-esteem have lower levels of personal hope when thoughts of death are salient, but not when provided with a promise of literal immortality, we conducted a regression analysis with the main effects for the mortality salience manipulation (dummy coded), immortality manipulation (dummy coded) and self-esteem (mean centred) entered at Step 1. At Step 2, we entered all possible two-way interaction terms between the immortality manipulation, mortality salience manipulation and self-esteem, and at Step 3, we entered the three-way interaction between those variables. In the first step, we once again found a significant main effect of self-esteem, B = .07, SE = .01, $t(195)$ = 10.88, $p < .001$, adjusted R^2 = .38, showing that low self-esteem was associated with decreased levels of personal hope. In addition, we found the immortality manipulation to increase levels of personal hope, B = .24, SE = .10, $t(195)$ = 2.51, p = .013. Consistent with Study 3, the mortality salience manipulation was not significant (p = .67). At Step 2, the mortality salience by immortality manipulation interaction was significant, B = −.53, SE = .19, $t(192)$ = −2.84, p = .005, adjusted R^2 = .42 (all other interaction effects, ps > .15). In Step 3, as hypothesised, we found a significant three-way interaction between mortality salience, the immortality manipulation and self-esteem, B = .08, SE = .03, $t(191)$ = 2.88, p = .004, adjusted R^2 = .44.

Given the significant three-way interaction, we then analysed the effects within the no immortality condition and within the immortality condition separately using the same regression approach (but excluding Step 3). Within the no immortality condition, there was a significant main effect of self-esteem at Step 1, B = .07, SE = .01, $t(101)$ = 8.38, $p < .001$, adjusted R^2 = .46. The mortality salience by self-esteem interaction at Step 2 was also significant, B = −.04, SE = .02, $t(100)$ = −2.15, p = .032, adjusted R^2 = .49. Predicted mean comparisons at ±1 SD from the standardised

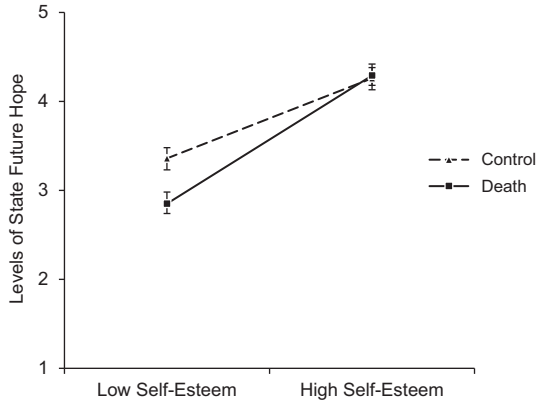

Figure 6. *State future hope as a function of mortality salience and trait self-esteem in the no immortality condition only (Study 4). Note:* Lower numbers denote less hope.

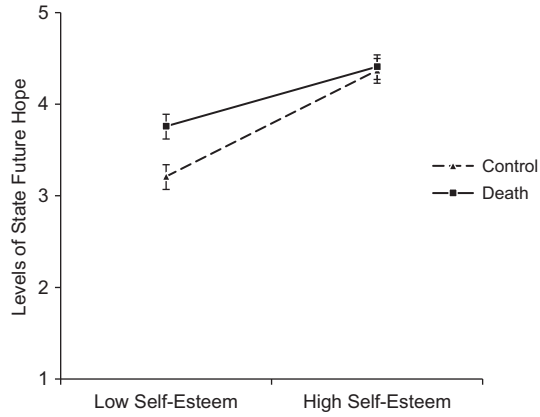

Figure 7. *State future hope as a function of mortality salience and trait self-esteem in the immortality condition only (Study 4). Note:* Lower numbers denote less hope.

self-esteem mean indicated that high self-esteem individuals had more hope than low self-esteem individuals within the neutral immortality condition when thinking about pain (−1 *SD*), $B = .06$, $SE = .01$, $t(100) = 4.87$, $p < .001$, and when thinking about death (+1 *SD*), $B = .10$, $SE = .01$, $t(100) = 8.44$, $p < .001$, showing that their levels of personal hope stayed relatively higher across conditions. Importantly, the mortality salience condition, relative to the control condition, also decreased personal hope at low levels of self-esteem (−1 *SD*), $B = .51$, $SE = .18$, $t(100) = 2.81$, $p = .006$, but not at high levels of self-esteem (+1 *SD*), $B = -.04$, $SE = .17$, $t(100) = -.21$, $p = .83$ (see Figure 6).

We proceeded by looking at the effects within the immortality condition only. At Step 1, again we found a significant main effect of self-esteem, $B = .06$, $SE = .01$, $t(93) = 6.72$, $p < .001$, adjusted $R^2 = .34$, showing that low self-esteem was associated with decreased levels of personal hope. At Step 2, the self-esteem by mortality salience interaction approached significance, $B = -.04$, $SE = .02$, $t(92) = -1.93$, $p = .057$, adjusted $R^2 = .37$. Predicted mean comparisons at ±1 *SD* from the standardised self-esteem mean indicated again that high self-esteem individuals had more hope than low self-esteem individuals within the immortality condition when thinking about pain, $B = .08$, $SE = .01$, $t(92) = 6.27$, $p < .001$, and when thinking about death, $B = -.04$, $SE = .01$, $t(92) = -3.39$, $p = .001$. However, the mortality salience condition, relative to the control condition, increased personal hope at low levels of self-esteem, $B = .55$, $SE = 0.19$, $t(92) = 2.96$, $p = .004$, but not at high levels of self-esteem, $B = -.03$, $SE = .020$, $t(92) = -0.16$, $p = .87$ (see Figure 7). Thus, the literal immortality promise preserved hope for people with low self-esteem when they were thinking about death.

Discussion

Study 4 replicated the effect of mortality salience reducing personal hope for people low, but not high, in self-esteem that was found in Studies 1–3. Additionally, it conceptually replicated the effect of Study 3 (with a larger sample), in that a promise of literal immortality attenuated this effect. Unlike Study 3, this was found using a manipulation of increased belief in immortality via scientific advances and an American Internet sample instead of a British student sample. It indicates that promises of scientific literal immortality can help people to maintain hope. As such, it provides initial empirical evidence that secular promises of literal immortality can protect people from the aversive consequences of thinking about death.

And, in conjunction with Study 3 and past research, it suggests that scientific promises of literal immortality function similarly to religious promises of literal immortality in helping people psychologically cope with thoughts of death.

GENERAL DISCUSSION

Death signals the potential for all aspects of hope to be completely obliterated. Drawing on TMT's argument that trait self-esteem can function like a sort of psychological immune system to protect people from existential concerns, we hypothesised that mortality salience would lower personal hope for people low, but not high, in self-esteem. In addition, we theorised that immortality beliefs, given their promise (or hope) that mortality is not the end of all existence, would enable people with low self-esteem to maintain hope when thinking about death.

Four studies, using American Internet and British student samples, demonstrated that people low, but not high, in self-esteem had less hope when thinking about death. This was found assessing cognitive and affective dimensions of hope, as well as hope for the immediate and extended future. In addition, Studies 3 and 4 supported our hypothesis that people with low self-esteem would not experience reduced feelings of hope in response to mortality salience when provided with "evidence" of life after death or a promise of heightened life longevity. Thus, all people maintained hope when thinking about death when provided with promises of literal immortality, but only people high in self-esteem maintained hope in the absence of these promises. The results of these experiments uniquely demonstrate that thoughts of death interact with trait self-esteem to impact personal hope, that literal immortality protects psychological well-being (in this case, hope) when thinking about death and that secular and religious promises of literal immortality may be interchangeable when coping with thoughts of death.

These studies also contribute to the long-standing debate into how to best operationalise hope. Snyder (2002) in his influential model of hope argued that it consists of both agency thinking (believing you can achieve goals) and pathways thinking (believing that you can generate routes to those desired outcomes). In Study 2, we found a main effect for mortality salience in lowering "pathways thinking", in contrast to mortality salience × self-esteem interaction found in Studies 1–4 for all other measures of hope (including agency thinking). This distinction between pathways thinking and hope is echoed by research (Tong et al., 2010) indicating that agency, but not pathways, thinking is associated with people's self-reports of hope across a wide range of domains (e.g., towards the future and retrospective feelings of hope). That people often maintain hope even when they believe that external—not internal—factors will lead to personally desired outcomes (Aspinwall & Leaf, 2002; Bruininks & Malle, 2005) further supports the notion that pathways thinking is not directly related to hope.

AN EXISTENTIAL PERSPECTIVE ON HOPE

With hope, there is a sense that one's life will be positive in the future, regardless of one's current or past situations, making coping with any experience, including the potentially burdensome awareness of one's own mortality, manageable. For these reasons, we contend that in certain conditions hope may be of greater significance in coping with mortality concerns than self-esteem, because self-esteem is limited in ways that hope is not. For instance, it is feasible that a person dealing with a life-threatening illness benefits more from receiving information that there may be a cure (enhancing hope), than from news that colleagues think his or her work is brilliant (enhancing self-esteem). To test this direct comparison between hope and self-esteem in coping with thoughts of death, future research could assess trait (or state) levels of hope and self-esteem prior to thoughts of death and then compare them as potential moderators to a variety of indicators of psychological

defensiveness and psychological well-being. Such research could potentially shape the focus of clinical interventions to aim at improving hope, self-esteem or both, in response to a wide range of death-related situations (e.g., disease, grieving, natural disasters and war) and shape future theorising into the effects of mortality thoughts, and a wide range of psychological threats (Proulx, Inzlicht, & Harmon-Jones, 2012), on psychological well-being.

Although the current studies did not directly test whether hope can be a more effective means of coping with thoughts of death than self-esteem, they do suggest that they are at least distinct in coping with thoughts of death (consistent with evidence in other areas of research outside the domain of death thoughts; e.g., Ciarrochi, Heaven, & Davies, 2007). Specifically, Studies 3 and 4 (the only two studies that tested this directly) found that people with low self-esteem maintain hope when thinking about death when literal immortality is salient, indicating that hope can exist in the presence of low self-esteem; hope and self-esteem also correlated only between .07 and .52 in Studies 1 and 2 within the control condition. Several studies in our lab have also failed to find evidence that self-esteem boosts, after and before standard mortality salience manipulations, increase feelings of hope for people low in trait self-esteem (Wisman & Heflick, 2015). Research has also found that thoughts of death do not reduce explicit self-esteem (and when covarying fear, it marginally increases it; Lambert et al., 2014), and that related primes (terrorism salience) increase implicit self-esteem (Gurari, Strube, & Hetts, 2009), which is inconsistent with our results related to hope. For all these reasons, self-esteem and hope are unique constructs showing distinct outcomes when mortality is salient, making it seem implausible that our findings occurred because mortality salience exaggerated self-views (i.e., the possibility that people with low self-esteem had less self-esteem under mortality salience, and this is why we found reduced hope).

The current findings also highlight the interplay between hope and belief in literal immortality, whether secular or religious. People with lower levels of trait self-esteem experienced reduced hope in response to death thoughts, unless they were primed to believe in life after death or that their life was going to be significantly elongated via scientific advances. This suggests that the prospect of immortality can help to restore hopeful thoughts and feelings. Further, both hope and literal immortality beliefs are negatively correlated with death anxiety (e.g., Harding et al., 2005), indicating that they both are associated with better psychological health when thinking about death. Although our results suggest that hope and immortality are distinct concepts (people with high self-esteem had more hope, regardless of immortality primes in Studies 3–4), future research could test if both hope and immortality beliefs are interchangeable specifically in managing death thoughts.

TMT IMPLICATIONS

The current research is consistent with the TMT premise that trait self-esteem is a buffer against the potentially damaging cognitive and emotional effects of mortality awareness. It extends evidence that having low trait self-esteem is associated with reduced psychological well-being in response to thoughts of mortality (heightened negative affect, reduced meaning, increased self-escape and reduced feelings of vitality; Routledge et al., 2010; Wisman et al., 2014) into the domain of hope. This shows, in line with TMT, that trait self-esteem protects people against existential concerns.

This research also is consistent with the TMT argument that afterlife beliefs buffer people against concerns associated with their own mortality (e.g., Dechesne et al., 2003). Whereas past research has demonstrated this in the domains of worldview defence (Dechesne et al., 2003; Heflick & Goldenberg, 2012), the current research directly demonstrates that afterlife belief protects people's psychological well-being when reminded of their own mortality. It also extends this research by demonstrating the potential buffering effects of

afterlife belief in a domain (reduced hope) specific to people low in self-esteem, suggesting that promises of literal immortality might be especially important for these individuals when confronted with their own mortality. This is presumably because people with high self-esteem already have a well-functioning psychological immune system (e.g., secure worldviews) in place to cope with mortality thoughts (see Burke et al., 2010, for a meta-analysis of over a hundred studies demonstrating the benefit of worldviews and self-esteem in coping with thoughts of death).

Further, Study 3 is consistent with evidence (Dechesne et al., 2003; Heflick & Goldenberg, 2012) that mortality concerns are specifically ameliorated by belief in literal immortality and not simply by providing an answer to what happens when we die (as argued by Hohman & Hogg, 2011). In Study 3, both essays posited an answer (either we die or there is an afterlife) to what happens when we die that were rated as equally valid, but only the afterlife affirming essay protected feelings and cognition of hope in response to mortality salience. This is perhaps not surprising because simply knowing what happens after death, for instance, by elucidating the process of organic decay, is likely to be less hopeful and comforting for most people, than the promise of an afterlife. Nevertheless, future research should test these possibilities more directly as certainty over what happens when we die was not directly measured in the current research.

This is not to suggest that religious versions of literal immortality (afterlife belief) are superior to secular promises of literal immortality. Indeed, in Study 4, promises of increased life longevity via scientific advances also preserved hope when people with low trait self-esteem were thinking about their own mortality. Past research has not directly tested the (causal) role of secular literal immortality in terror management processes. In turn, this is the first direct evidence that we know of suggesting that secular means of literal immortality can function similarly to religious means in providing "terror management". As such, it appears that it is not necessarily a matter of religious defences or secular defences being superior (e.g., Heflick & Goldenberg, 2012; Rutjens, van Harreveld, & van der Pligt, 2013), but rather the promise that each provides for extending life (literal immortality) that determines its ameliorative impact in coping with mortality. We think this makes sense, as both means directly solve the immediate problem of death by providing a solution that promises a longer life, if not to avoid death at all.

LIMITATIONS

This research is not without limitations. First, we did not employ a neutral control condition to compare to mortality salience in any study. This raises potential concerns about whether the effects were being caused by mortality salience or the aversive control conditions (pain salience and dentist salience). Suggesting this is not the case, however, across all four studies, the effects were found within the mortality salience condition. Further, our effects replicated using two different aversive control conditions, making it unlikely that our effects were driven by one specific aversive control condition.

In Studies 3 and 4, we also did not have a neutral condition unrelated to literal immortality. The pattern of results, though, suggests that the immortality affirmation conditions were driving the effect of trait self-esteem and mortality salience on hope, as opposed to the arguments against literal immortality. The results in the disconfirming condition mirrored those of Studies 1 and 2 when literal immortality was primed, where the results in the afterlife affirmation condition did not. This is consistent with past research (Dechesne et al., 2003) that found that arguments against life after death do not exacerbate mortality salience effects relative to control conditions, but that arguments for life after death reduce these effects.

Additionally, Study 1, and especially Study 3, could benefit from direct replication using larger samples. However, the effect of Study 1 is bolstered by a conceptual replication in Study 2

with a larger sample, and Study 3 is bolstered by a conceptual replication in Study 4 using a secular promise of life longevity using a much larger sample. Thus, that mortality thoughts reduce hope for low self-esteem (but not high self-esteem) across four studies using three measures of hope, suggesting that this effect is robust.

Last, it is worth noting that we would not anticipate hope to be preserved for people with low self-esteem when reminded of death if the promise of literal immortality was highly aversive (e.g., belief that one is going to Hell or will reincarnate as an insect). It is difficult to imagine that a highly aversive future existence would provide much belief or feeling that the future will be full of desired outcomes; there is some evidence that priming "evidence" of Hell, for instance, does not reduce the impact of mortality salience on worldview defence (Heflick & Goldenberg, 2009). Thus, while we do not make this valence distinction in the article, we do not wish to imply that we think that all afterlives would preserve hope when thinking about death. In that vein, it is worth noting that the secular promise of literal immortality used in Study 4, while not promising someone a good or bad future, was clearly framed as a positive advancement.

CONCLUSION

Cicero once wrote that, "while there is hope, there is life". If this is true, then when pondering death, people may feel less alive and less hopeful. The current studies converge with past research (Routledge et al., 2010) to indicate that this is the precise double whammy that people with low self-esteem experience psychologically when thinking about their own mortality. Happily though, the prospect of literal immortality, whether through afterlives or medical advances, may revive hope for those who ponder death. Hence, the prospect of death need not leave people feeling hopelessly mortal, with or without religion.

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