

## Research article

# Death awareness and body–self dualism: A why and how of afterlife belief

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### Abstract

*Belief in life after death offers potential comfort in the face of inevitable death. However, afterlife belief likely requires not only an awareness of death but also body–self dualism—the perception that the self (e.g., the mind) is distinct from the physical, undeniably mortal, body. In turn, we hypothesized that mortality salience (MS) should heighten afterlife belief only when dualism is facilitated. Study 1 found that MS increased belief for people high, relative to low, in trait mind–body dualism. In Study 2, MS only increased belief when people first wrote about their thoughts and personality, which a pilot study confirmed facilitated dualistic belief, relative to thinking about the physical self. Study 3 used the brain–computer interface technology to induce a dualistic experience: MS increased belief when participants accurately “typed” without the use of their external body (i.e., no hands). Together, these findings support the position that mortality awareness and body–self dualism constitute a “why” and “how” of afterlife belief. Copyright © 2015 John Wiley & Sons, Ltd.*

Belief in life after death has existed in virtually every culture and religion throughout history (Segel, 2004). From the perspective of Ernest Becker (1971, 1973) and terror management theory (TMT; e.g., Greenberg, Pyszczynski, & Solomon, 1986), there is a clear motivational impetus—a “why”—that helps drive these beliefs. People want to live but know they will die, so they are motivated to pursue immortality. But amidst indisputable evidence that the physical body dies, mere awareness of death is likely not sufficient for belief. Specifically, as others have noted (e.g., Bering, 2002), afterlife belief also requires body–self dualism (a “how”), or the perception that the self (the mind or spirit) is distinct from, and hence capable of existing independently of, the physical body. In this article, we integrate these ideas and present evidence across three studies that thinking about one’s own mortality (mortality salience (MS)) increases afterlife belief (only) when people perceive themselves dualistically.

### Death Awareness

The theologian and philosopher St. Augustine (397/1963) wrote that life’s finitude caused him formidable angst. He argued that afterlife belief—and the immortality it promised—was the only way to assuage this distress. From the perspective of TMT (e.g., Greenberg et al., 1986), St. Augustine was not alone in these sentiments. People, in general, have a need to manage the potential “terror” associated with the paradox of wanting to live and knowing they will die. This occurs via meaning systems that provide either symbolic immortality (e.g., being a valued member of a belief system that outlives

the self; see for empirical review, Solomon, Greenberg, & Pyszczynski, 2004) or literal immortality (i.e., afterlife belief).

Research supports TMT’s premise that belief in literal immortality assuages mortality concerns. Afterlife belief is typically negatively correlated with death anxiety (e.g., Cohen et al., 2005; Thalbourne, 1996) and is associated with less hopelessness for individuals with advanced cancer (e.g., McClain-Jacobsen et al., 2004). Reading an essay arguing that near-death experiences “prove” that there is an afterlife also reduces *symbolic* immortality striving (i.e., worldview defense and self-enhancement; Dechesne et al., 2003) and restores personal hope (Wisman & Heflick, 2014), when mortality is salient. An essay presenting evidence against the tenability of life after death does not (Dechesne et al., 2003; Wisman & Heflick, 2014), suggesting that belief in life after death buffers mortality concerns above and beyond providing an answer to what happens when we die (even for atheists; Heflick & Goldenberg, 2012). Thus, although there are many motivations that contribute to belief in spiritual concepts (e.g., compensatory control; Kay, Gaucher, McGregor, & Nash, 2010, and attachment; Granqvist, Mikulincer, & Shaver, 2010), from a TMT perspective, mortality concerns are a clear motivational impetus for belief in life after death (Vail et al., 2010).

Given the palliative function of afterlife belief, one might expect that MS would heighten belief, but the evidence is mixed. Willar (2009) found that MS increased afterlife belief. Osarchuk and Tatz (1973) found that only people who identified as religious showed heightened afterlife belief when shown a clip of a gory automobile accident. Both Norenzayan and Hansen (2006) and Vail, Arndt, and Abdollahi (2012)

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found similar results regarding belief in supernatural agents. Others, however, have not found any relationship between death salience and afterlife belief (e.g., Ochsmann, 1984). But what can account for this inconsistency?

Goldenberg and colleagues (e.g., Goldenberg, Pyszczynski, Greenberg, & Solomon, 2000) argued that the animalistic aspects of the human body (sweating, bleeding, and defecating) undermine the symbolic structures (i.e., self-esteem and cultural worldviews) that provide people with a sense of meaning, significance, and in a symbolic sense, immortality. In turn, fleeing from one's own sense of animality—and the body itself—protects people from existential concerns. Supporting this, mortality reminders increase agreement with an essay arguing that humans are unique from other animals (Goldenberg et al., 2001) and the belief that humans did not evolve from other animals (Tracy, Hart, & Martens, 2011). Mortality reminders also cause people to report reduced interest in physical bodily pleasure during sex (but not romantic aspects of sex; Goldenberg et al., 2002) and to inhibit movement of their body (Goldenberg, Heflick, & Cooper, 2008). In turn, fleeing from the human body—and its associated animal nature—has been found to be a means of coping with mortality awareness. To date, however, no experimental research has tested the role of psychologically distancing from the human body in the propensity to utilize the most direct form of coping with mortality concerns: belief in life after death.

### Body–Self Dualism

Dualistic views of the self and body have a long history in both religion and philosophy. Ancient Egyptians believed that when the body dies, the “ba,” or soul personality, separates from the body. Likewise, in Christianity, God is described as giving humans an immortal soul separate from the mortal body. Outside religion, Descartes (1641/1984) reasoned that the body and mind are necessarily distinct because the mind can think about the body, whereas the body cannot think about the mind. Similarly, Thomas Aquinas (1266/1981) argued that physical objects cannot understand; because the mind can understand, it must itself not be a physical object, making it distinct from the physical body.

Despite contemporary scientific understanding that thoughts and mental processes derive from a physical brain, evolutionary and developmental psychologists (Bering, 2002, 2006; Bloom, 2004) have noted that humans maintain an intuitive belief in dualism. From this perspective, mind–body dualism (and afterlife belief) emerged from human's advanced cognitive ability to infer mental traits in others, which lead to people distinguishing between unseen minds and physical bodies (see also Boyer, 2003). Supporting the notion that humans are intuitive dualists, people tend to perceive that epistemic traits survive death, but biological and physical traits do not (Bering & Bjorklund, 2004). People are also prone to believing that their mere thoughts, independent of physical bodily action, can impact the physical world; when thinking about an event prior to it happening, such as someone becoming ill or behaving in a certain manner, people perceive that they caused it (Pronin, Wegner, McCarthy, & Rodriguez, 2006; Wegner, Sparrow, & Winerman, 2004). Further, approximately 10% of the population (Irwin, 1985) reports having had an out-of-body experience

(i.e., induced by drugs, meditation, or a near-death experience; Hansen, Jensen, Chandresh, & Hilden, 1988; Ring, 1980) in which they perceive that their mind has entirely left their body and views it from above. In sum, there is evidence that people tend to perceive the mind as existing and functioning independently of the physical body.

Consistent with evolutionary arguments that afterlife belief arise from evolved cognitive tendencies (Bloom, 2004), there is also evidence that dualistic thinking is associated with belief in life after death. Research indicates that people assign more “mind” to dead people than robots, living animals (e.g., frogs), and even people in persistent vegetative states (Gray, Knickman, & Wegner, 2011). Moreover, “mind” is positively correlated with the belief that a being has a soul (Gray, Gray, & Wegner, 2007). Additionally, several studies (Preston, Ritter, & Hepler, 2013; Riekkki, Lindeman, & Lipsanen, 2013; Thalbourne, 1996) have found that belief in mind–body dualism positively correlates with afterlife belief. People who have reported having near-death experiences—that they left their physical body while being close to death—also typically believe more strongly in life after death after these experiences (e.g., Ring, 1980). In sum, there is preliminary evidence that perceptions of the mind as distinct from the body are associated with belief in life after death. To date, however, this has not been examined experimentally.

### Dualism, Death Awareness, and Afterlife Belief

Given strong evidence that afterlife belief assuages mortality concerns (e.g., Dechesne et al., 2003), MS is a clear, direct motive behind afterlife belief. However, we argue that mortality awareness and body–self dualism work in tandem as a “why” and “how” of afterlife belief (i.e., a motivation and a mechanism, respectively). Thus, although life after death represents a good defense against mortality concerns (perhaps the most direct defense, Vail et al., 2012), not everyone, in every situation, is going to believe more in response to mortality awareness. Specifically, MS should only increase afterlife belief when dualistic self-perceptions are salient as these perceptions are consistent with these beliefs. We explored this hypothesis in three studies.

In Study 1, we assessed mind–body dualism at the trait level. In Study 2, dualism was manipulated by having participants focus on the non-physical, compared with physical, aspects of their self; past research has found that focusing on the mind increases dualism relative to focusing on the physical body (Forstmann, Burgmer, & Mussweiler, 2012). In Study 3, we had participants use the brain–computer interface (BCI) technology to “type” without their (external) body (using the P300 event-related potential). This enabled the impression that one was typing with the mind independently of the physical body. In all three studies, MS was manipulated, and belief in life after death served as the dependant variable.

## STUDY 1

In Study 1, we sought to test if trait mind–body dualism interacts with MS to influence belief in life after death. We

hypothesized that MS would increase belief in an afterlife only for individuals high in trait mind–body dualism.

## Method

### Participants

One hundred native English-speaking American participants were recruited using Amazon MTurk<sup>1</sup>; two participants were excluded though for participating despite not meeting those restrictions. The remaining sample ( $M_{\text{age}} = 32.3$ ,  $SD = 9.9$ ) had the following self-reported gender composition: 54 men, 42 women, one transgender, and one other. All participants received \$0.35 for completing the study materials.

### Procedure and Materials

Participants first answered a series of items including, “My self is distinct from my physical body” (1 *strongly disagree* to 5 *strongly agree*). This item was chosen as a measure of dualism because it taps directly into perceptions of the mind and body as entirely qualitatively different (i.e., reflective dualism; Riecki et al., 2013), which show the strongest correlation with supernatural beliefs (Riecki et al., 2013; in contrast to dualistic views of the mind and body as only somewhat distinct, or monistic views of the mind and body). Further, it accomplishes this without confounding dualism with other variables that are associated with supernatural beliefs (e.g., scientific research; Preston et al., 2013), and without directly priming mortality itself (i.e., some items used, for instance, in Preston et al., 2013).

Participants in the MS condition then responded to two items (e.g., “Jot down, as specifically as you can, what you think will happen when you physically die”), which have been used in dozens of past studies to prime thoughts about death (e.g., Rosenblatt et al., 1989). In the control condition, participants completed parallel items about a non-death-related topic (an unexpected outcome; Vess, Routledge, Landau, & Arndt, 2009) that is, from some perspectives, considered a meaning threat and expectancy violation (Proulx, Inzlicht, & Harmon-Jones, 2012). And, as in prior TMT research, the Positive and Negative Affect Schedule (PANAS, Watson, Clark, & Tellegen, 1988) was then completed to provide a delay and distraction that enables death thoughts to recede from consciousness (Greenberg, Arndt, Simon, Pyszczynski, & Solomon, 2000). Past research (e.g., Greenberg et al., 1990) has shown that MS effects on worldviews cannot be attributed to immediate changes in affect (even if fear is heightened; Lambert et al., 2014). Including the PANAS allowed us, however, to test for, and control for, any such effects. The reliability for both affect scales was high ( $\alpha$ 's > .85).

Next, participants were asked to respond by indicating not how they usually feel, but how they “feel at the current moment” to three items designed to assess afterlife belief (“At this moment, I am confident that there is an afterlife,” “It seems

<sup>1</sup>For Study 1, we recruited 100 people (25 per cell) and then analyzed the data. In Study 2, we recruited until the end of a semester. As we were satisfied with the resulting sample size (27 per cell), we then analyzed the data. Study 3 was smaller in sample size because of limited availability of the apparatus. Power analyses using an effect size of 0.3 (an MS meta-analysis found an average effect size of 0.35; Burke et al., 2010) indicated that our samples provided power of at least 90% in Studies 1 and 2.

unlikely that there can be any kind of life after death” (reverse scored), and “I am certain that there is some form of life after death”). These items were chosen because they measure afterlife belief generally, without using specific religious labels (e.g., “heaven”), without referring to potential aspects of afterlives (e.g., family members), and without any mention of valence (e.g., “positive”). They were Likert scored on a 1 (*not at all*) to 5 (*extremely*) scale ( $\alpha = .97$ ). Finally, participants reported demographic information including gender and age.

## Results

We conducted regression analysis with the manipulation (0 = MS, 1 = *unexpected outcome salience*) and trait mind–body dualism (mean centered) entered at Step 1, and the interaction term entered at Step 2. The results revealed a main effect for condition,  $b = .19$ ,  $t = 1.99$ ,  $SE = 0.83$ ,  $p = .049$ , with belief higher in the unexpected outcome group than the MS condition. There was also a main effect of dualism,  $b = .28$ ,  $t = 2.91$ ,  $SE = 0.83$ ,  $p = .004$ , with high dualism associated with more belief. Crucially, however, these effects were moderated by the two-way interaction,  $b = -.88$ ,  $t = -2.24$ ,  $SE = 0.69$ ,  $p = .027$ , adjusted  $r^2 = .15$  (Figure 1).

To deconstruct this interaction, we examined the effects of MS with mind–body dualism set to  $\pm 1$  SD from the mean ( $M = 2.93$ ,  $SD = 1.20$ ). Results indicated that within the MS condition, people high in trait dualism reported more afterlife belief than people low in trait dualism ( $p = .004$ ). Within the unexpected outcome group, no differences were found based on mind–body dualism ( $p > .5$ ). Additionally, MS and the control condition did not differ significantly at high levels of trait dualism ( $p > .8$ ), but at low levels, MS was associated with less belief ( $p = .003$ ).

We repeated the regression analysis covarying positive and negative affect and gender and age. Positive affect was associated with marginally higher belief ( $p = .097$ ) and age with significantly more belief ( $p = .021$ ; negative affect and gender did not predict belief,  $p$ 's > .45), but covarying these factors did not impact the significant MS  $\times$  Condition interaction ( $p < .01$ ). Additionally, MS did not impact positive affect or negative affect ( $p$ 's > .2). In turn, the effects of the MS  $\times$  Condition interaction on afterlife belief do not appear to be the result of changes in affect or differences in age or gender.

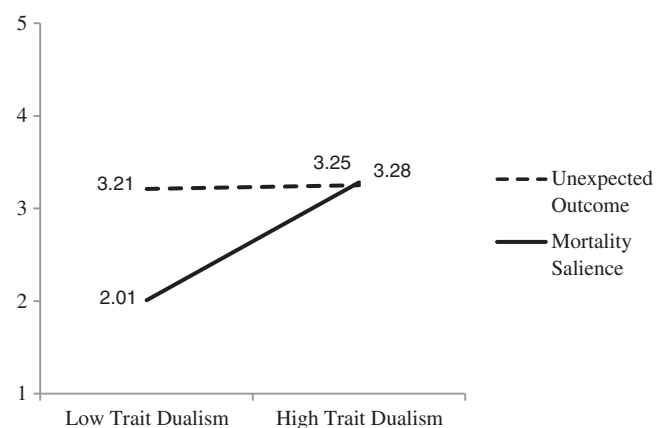


Figure 1. Afterlife belief as a function of trait dualism and mortality salience



## Discussion

These results provide some preliminary support to the hypothesis that afterlife belief is affected by the interaction of MS and dualism. As hypothesized, MS increased afterlife belief for people high in trait mind–body dualism, relative to those low in mind–body dualism. In contrast, trait mind–body dualism was unrelated to belief in the control condition.

It is not clear why individuals low in trait dualism had less belief when thinking about their mortality than when thinking about an unexpected outcome. One possibility is that for these individuals, who perceive the self as inseparably tied to the physical body, what makes more sense is disbelief. This is consistent with research finding that non-religious individuals (who are lower in mind–body dualism; Riecki et al., 2013) respond to mortality reminders by reporting less explicit belief in supernatural agents (Jong, Halberstadt, & Bluemke, 2012) and that MS heightens needs for psychological clarity, structure, and consistency (e.g., Landau et al., 2004; Landau, Greenberg, Solomon, Pyszczynski, & Martens, 2006), in addition to immortality striving. Critically, these findings demonstrate that reminders of mortality only increase belief in an afterlife when dualistic beliefs are also high and that other types of psychological threats (i.e., an expectancy violation) do not affect afterlife belief in a comparable manner. Thus, in contrast to approaches that view all psychological threats as interchangeable in the defenses they elicit (e.g., Proulx et al., 2012), thinking about death and thinking about an unexpected outcome did not produce similar results.<sup>2</sup>

## STUDY 2

Study 1 provided evidence that trait dualism was associated with more belief when mortality was salient, but not when an unexpected outcome was salient. In Study 2, we sought to test the effect of dualism and MS on afterlife belief by manipulating dualism. On the basis of previous research finding heightened dualism when people focus on their mental, versus physical, aspects (e.g., Forstmann et al., 2012), participants were simply asked to reflect on their non-physical self (mind and personality); (2) their physical selves (their body and physical experiences); or (3) an unrelated control condition (college experiences). We expected MS to increase afterlife belief only in the non-physical self condition. Before proceeding to the study, we conducted a pilot study to assure that our manipulation had the intended effect on dualism.

### Pilot Study

Sixty-two participants completed the materials for the pilot study via Amazon MTurk. After six participants who clearly took the study twice (verified using Amazon ID names and their IP address) were deleted, 56 participants' data were analyzed (29 men, 26 women, and one transgender;  $M_{\text{age}} = 34.32$ ,  $SD = 13.69$ ).

<sup>2</sup>This manipulation of *thinking* about an unexpected outcome differs from the experience of something surprising happening (see Proulx et al., 2012, for examples). However, this approach more closely approximates *thinking* about death.

Participants were first randomly assigned to write about either their physical self or their non-physical self. The goal was to test if mind focus, relative to body focus, increases perceptions of body–self dualism using our intended manipulation. All participants were told that they were receiving “some questions that comprise part of a recently developed, innovative personality assessment” and to “please think about what it is that comprises yourself.” Participants in the non-physical condition were then told “please do not focus on superficial aspects, but write about all aspects of your thoughts and personality.” In the physical self condition, the word “yourself” was replaced with “physical self,” and the phrase thoughts and personality was replaced with “physical self and experiences.” All other wording was identical between conditions.

They then completed a measure of positive and negative affect, as in Study 1. To assess dualism, participants were then given a measure of dualism, conceptually similar to the measure we employed in Study 1, but specifically found in past research to be alterable by focusing on the mind, relative to the body (Forstmann et al., 2012). This measure consisted of seven pairs of circles, and participants were asked which circle pair best represents the relationship between their mind and body. Within each pair, one circle represented the body and one the mind (mirroring self and partner as in Aron, Aron, & Smollan, 1992). Answering with a pair of circles with little to no overlap indicated higher levels of dualism, with scores ranging from 1 (*least dualistic/most overlap*) to 7 (*most dualistic/no overlap*).

A one-way ANOVA indicated that the non-physical self condition resulted in higher dualism ( $M = 3.74$ ,  $SD = 1.71$ ) than the physical self condition ( $M = 2.72$ ,  $SD = 1.93$ ),  $F(1, 54) = 4.36$ ,  $p = .042$ ,  $\eta_p^2 = 0.075$ . Positive affect was also higher in the non-physical self condition ( $p = .015$ ), but negative affect was not impacted ( $p = .15$ ). With positive and negative affect covaried, the manipulation remained a significant influence on mind–body dualism ( $p = .012$ ). These results are consistent with past studies showing that similar manipulations that adjust attention to the mind (vs. the body) increase dualism (Forstmann et al., 2012). We therefore proceeded with Study 2.

## Method

### Participants

One-hundred and sixty-two undergraduates (135 women and 27 men;  $M_{\text{age}} = 19.84$ ,  $SD = 3.21$ ) at an American university participated in Study 2 in exchange for course credit. As in Study 1, we limited participation to native English speakers; we also excluded data from participants ( $n = 1$ ) who answered each item of the dependent measure with the same response (indicating that they were not reading closely, because the measure included a reverse-scored item).

### Procedure and Materials

Participants completed materials in small groups. The study was described as a personality assessment. Thus, they first received measures of self-esteem and neuroticism for consistency with the cover story. Dualism was then manipulated as

in the pilot study, but we additionally included a neutral condition prompting people to focus on their college experiences. Participants were randomly assigned to one of these three conditions (non-physical self, physical self, and college experiences).

After this, participants wrote about either their own mortality, as in Study 1, or an aversive control condition (failing an exam) that has been used in dozens of past terror management studies (e.g., Arndt, Solomon, Kasser, & Sheldon, 2004). As in Study 1, the PANAS was again included to assess mood and to provide a delay for the thoughts of mortality to become less conscious (Greenberg et al., 2000), and again these scales were reliable ( $\alpha$ 's > .9). Additionally, a neutral word search puzzle was added to further this latter aim, as in past research (e.g., Arndt et al., 2004). Afterlife belief was then assessed exactly as in Study 1 ( $\alpha = .87$ ), except this time on a 1–9 scale, and basic demographic questions were asked.

### Coding

To verify that the manipulation for Study 2 heightened focus on the body or the non-physical self during the study, two coders blind to the study's hypotheses separately rated the open-ended dualism primes for a focus on the physical body and on thoughts and personality (1 = *not at all*, 5 = *completely*; inter-rater agreement,  $r = .78$  for physical and  $.68$  for thought and personality focus). In addition, these coders assessed response positivity for these primes on the same 1–5 scale (inter-rater reliability,  $r = .65$ ) and counted the number of lines participants wrote to see if potential differences between the open-ended prompts impacted our results.

## Results

### Manipulation Focus Check

As anticipated, there were significant effects of the dualism prompt on the physical content,  $F(2, 159) = 72.9$ ,  $p < .001$ , and non-physical content,  $F(2, 159) = 11.561$ ,  $p < .001$ , in participants' written responses. Simple main effect analyses indicated that in the non-physical self condition, participants focused more on their thoughts and personality ( $M = 4.7$ ) than in the physical self ( $M = 2.9$ ;  $p < .001$ ) and the college condition ( $M = 3.4$ ;  $p < .001$ ). In addition, participants in the physical self condition focused more on their physical body ( $M = 3.4$ ) relative to the non-physical self condition ( $M = 1.3$ ;  $p < .001$ ) and the college condition ( $M = 1.1$ ;  $p < .001$ ).

There was an unexpected main effect of the prompt on the valence of the written responses,  $F(2, 159) = 12.44$ ,  $p < .01$ . Simple effects testing indicated that participants wrote less positively about college ( $M = 2.9$ ) than their non-physical selves ( $M = 3.8$ ,  $p < .01$ ) and their physical selves ( $M = 3.5$ ,  $p < .01$ ), between which there was also a significant difference ( $p = .042$ ). In addition, length of response differed by condition,  $F(2, 159) = 6.22$ ,  $p < .01$ . Participants wrote less lines in the physical self condition ( $M = 7.4$ ) than in either the non-physical self ( $M = 9.7$ ,  $p < .01$ ) or college condition ( $M = 9.8$ ,  $p < .01$ ), which did not differ ( $p = .86$ ). In turn, we conducted our analyses with, and without, these variables entered as covariates.

### Main Analyses

We first conducted a 2 (MS and control)  $\times$  3 (prompt: non-physical self, physical self, and college experiences) ANOVA on afterlife belief. No main effects were significant ( $p$ 's > .3). As predicted, there was a significant MS  $\times$  Prompt interaction,  $F(1, 155) = 4.64$ ,  $p = .011$ ,  $\eta_p^2 = 0.056$  (Figure 2). Subsequent testing indicated that there was a significant effect within the non-physical condition,  $F(1, 155) = 7.35$ ,  $p < .01$ , with belief higher in the MS condition than the control condition ( $p < .01$ ). There were no differences within the physical self condition ( $p = .12$ , with the mean pattern of MS lowering belief) or the college condition ( $p = .88$ ). Further, within the MS condition, there was a significant effect of prompt,  $F(1, 155) = 4.65$ ,  $p < .01$ , but not within the control condition ( $p = .45$ ). Participants had higher belief in the non-physical condition than the physical condition ( $p < .01$ ) and the college condition ( $p = .04$ ), between which there was no difference ( $p = .39$ ). In sum then, MS increased belief only when dualism was manipulated.

### Ancillary Analyses

To test if the effects occurred independently of the differences in essay positivity and length across the prompts, we conducted a 2 (MS and control)  $\times$  3 (prompt: non-physical self, physical self, and college) analysis of covariance on afterlife belief, controlling for the length of participants' written responses and their positivity. The MS  $\times$  Prompt interaction remained significant ( $p = .045$ ), as did the significant *post hoc* testing between MS and the control condition, when the non-physical self was salient ( $p = .01$ ). Within the MS condition, the contrast test between the non-physical self condition and the physical condition also remained significant ( $p = .033$ ). (Additionally, there was a main effect of positivity on belief,  $r = .21$ ,  $p = .03$ , but not a main effect of length on belief,  $p > .4$ .)

We also conducted the same analysis of covariance, replacing positivity and length with positive and negative affect PANAS scores as the covariates. The MS  $\times$  Prompt interaction remained significant ( $p = .02$ ), as did the *post hoc* test assessing differences between MS and the control condition within the non-physical self ( $p < .01$ ). The effects within MS, between the non-physical condition and the physical condition

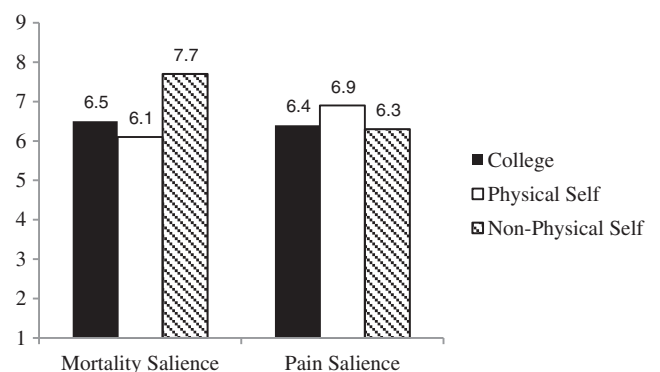


Figure 2. Afterlife belief as a function of self-focus and mortality salience

( $p < .01$ ) and the college condition ( $p = .03$ ) also remained significant. (Additionally, positive affect was positively associated with belief as a main effect,  $r = .25$ ,  $p < .01$ , but negative affect was not associated with belief,  $p = .38$ .) A separate series of ANOVAs indicated that neither positive nor negative affect was significantly impacted by either manipulation or the interaction between the two ( $p$ 's  $> .4$ ).

## Discussion

The results of Studies 1 and 2 yielded convergent evidence supporting our hypotheses. In Study 1, MS increased afterlife belief at high levels of trait dualism, relative to low levels of dualism, but this did not occur when participants wrote about an unexpected outcome. In Study 2, MS increased afterlife belief when dualism was manipulated, but not when the physical self or college experiences were primed. Further, although the manipulation of dualism increased positive affect in the pilot study, covarying positive and negative affect in Studies 1 and 2 (and the pilot) did not alter the pattern of the significant results. In turn, the effects seem to be occurring independently of potential changes in affect.

## STUDY 3

In Study 3, we introduced a more experiential manipulation of dualism. To this end, we used the P300 speller, a version of a BCI (Farwell & Donchin, 1988) that, by analyzing the electrical signals produced by people's brains as they focus on letters in a matrix, enables them to type without the direct use of their external body (e.g., their hands). The accuracy of this system naturally varies, and this variance is likely to increase when the system is not calibrated to individual participant's brain potentials recorded within the same session (e.g., Mak et al., 2011). To the extent that the BCI accurately outputs ("types") the letters participants focus their attention on—and thus, people experience their selves as exerting an influence on the external world with their thoughts and mind, and without the use of their body—dualism should be enhanced. Critically, this should not be the case when the BCI outputs inaccurate results. Thus, we intended to capitalize on the inherent variability in BCI performance and use accuracy as a moderator in our analysis. When participants received accurate BCI feedback and were therefore more likely to experience the self and body dualistically, we expected MS to increase afterlife belief. In contrast, when the BCI accuracy was low, we did not expect MS to influence belief.

## Method

### Participants

Thirty-eight undergraduates (21 women,  $M_{\text{age}} = 20.13$ ,  $SD = 2.78$ ) from an American university participated in this study. As in Studies 1 and 2, participation was restricted to native English speakers, and as in Study 2, data from one participant were excluded because he or she answered the highest score of agreement ("extremely") for each item that constituted the dependant variable, including the reverse-scored item.

### Apparatus

*P300 speller.* The P300 speller (Farwell & Donchin, 1988) enables people to communicate through computer software that analyzes their electrical brainwaves (electroencephalogram) recorded from electrodes placed on the scalp. The letters of the alphabet, nine digits, and a space bar are presented in a matrix on a computer screen. The participant focuses attention on a character to be "typed." Then, each row and each column of the matrix flash randomly 15 times per "typed" character. This, in turn, creates an "oddball paradigm" (e.g. Donchin & Coles, 1988), in which flashes including the chosen character are the rare events and elicit an event-related potential known as the "P300" (Sutton, Braren, Zubin & John, 1965). By detecting the P300, the BCI can identify the chosen character. In this way, people can "type" words and sentences by merely focusing their thoughts on the screen, without using their arms or hands or any part of their body (aside from their brain, of course).

Because there are individual differences in the spatiotemporal characteristics of the P300, individual classification rules to identify the P300 are often generated to maximize accuracy for each user (the target population for users of BCI technology is locked-in patients who do not retain muscle function to communicate but retain cognitive capacities required to use the BCI, e.g., Sellers & Donchin, 2006). In this study, because we wanted variable accuracy, a general classification rule, generated based on the data of a separate random sample of six previous BCI users, was used.

### Procedure and Materials

Participants were first told that they would be using a system that allows people to spell out letters, words, and digits onto a screen just by focusing on them. Then, an electrode cap including 16 electrodes was applied to their scalp, and participants were provided with instructions on how to use the BCI. After the word "dog" was completed as practice, participants were randomly assigned to the MS or control condition. In the MS condition, participants "typed" the words "death" and "field"; in the control condition, "death" was replaced with "dealt." Participants were then informed that they would be "typing" two four-letter words of their choosing. After this, but not before (so that participants could be assured that the experimenter was not manipulating the outcome), participants reported to the experimenter their chosen words. The BCI segment of the study concluded with people again typing the two words previously given to them by the experimenter (containing "death" for half the participants) before being unhooked from the BCI.

Next, participants were given the questionnaire assessing afterlife belief using the same three items as Studies 1 and 2 on a 1–9 scale. Finally, participants reported demographic information including gender and age.

When the study was completed, the experimenter computed the percentage of characters typed that the BCI output correctly (excluding the practice item). This accuracy score served as the proxy for dualism: dualism should be facilitated only to the extent that participants were presented with evidence that their thoughts caused the typing response. As part



of the demographic questionnaire, participants were also asked to indicate “how accurate was the computer at typing your words?” on a scale ranging from 0 (*not at all*) to 7 (*very much*) to assure that participants were aware of the BCI’s accuracy.

## Results and Discussion

### Accuracy

On average, the BCI was accurate on 64.53% of participants’ responses. As expected, accuracy was highly variable ( $SD=31.81$ ). Unexpectedly, accuracy varied significantly between the three experimenters,  $F(2, 34)=3.8, p=.03$  (most likely because of variability in the amount of experience each experimenter had in applying electrodes, contributing to differences in the signal-to-noise ratio of the P300 compared with the background electroencephalogram); we therefore controlled for experimenter. Critically, no effect of MS on accuracy emerged,  $p=.52$  (or on perceived accuracy,  $p=.89$ ). Moreover, accuracy and participants’ self-reported perception of accuracy were highly correlated ( $r=.82, p<.001$ ), indicating that people were aware of the BCI’s accuracy.

### Afterlife Belief

We conducted regression analysis on afterlife belief with dummy-coded MS and mean-centered accuracy. Because of the experimenter effect on accuracy, experimenter was included as a covariate (dummy coded as two variables); because handedness plays a crucial role in brain lateralization, including P300 effects (Polich & Hoffman, 1998), we also covaried handedness (Polich & Hoffman, 1998).<sup>3</sup> Main effects were entered at Step 1 followed by the interaction between MS and accuracy at Step 2. No main effects were significant ( $p$ ’s  $>.4$ ) aside from one experimenter dummy variable ( $p=.01$ ). As predicted, however, there was a significant MS  $\times$  Accuracy interaction,  $b=-.586, t(35)=-2.22, p=.034$ , adjusted  $r^2=.23$  (Figure 3). We deconstructed the interaction by examining the effects of MS for participants 1  $SD \pm$  mean BCI accuracy ( $M=64.53, SD=31.81$ ; fixing high accuracy at around 95%). When the BCI accuracy was high, participants reminded of their mortality reported greater belief in an afterlife than control participants ( $p=.044$ ). When accuracy was low, MS had no significant effect on belief compared with the control condition ( $p=.23$ ). Within MS, high accuracy was marginally associated with greater belief ( $p=.086$ ), whereas within the control condition, there was no difference ( $p=.25$ ).

## Discussion

As hypothesized, MS increased afterlife belief when the BCI provided accurate feedback (i.e., providing evidence of the mind operating independently of the body, our operationalization of dualism). When the BCI was low in accuracy, mortality reminders did not affect afterlife belief. Further, although the slope was not significant within the MS condition, the pattern of the intercepts is consistent with the finding in Studies 1 and 2,

<sup>3</sup>Without covarying of handedness or experimenter, the MS  $\times$  Accuracy interaction was marginal ( $p$ ’s between .05 and .10).

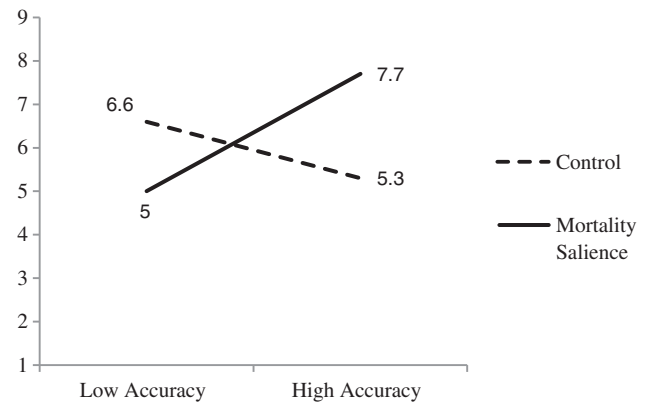


Figure 3. Afterlife belief as a function of brain–computer interface accuracy and mortality salience

revealing increased belief at high levels of dualism, relative to low levels.

## GENERAL DISCUSSION

Integrating TMT with scholarly approaches to dualism (e.g., Bering, 2002), we theorized that body–self dualism and death awareness interact to influence afterlife belief. Specifically, although MS motivates afterlife belief, we argued that actual belief also hinges on body–self dualism. Hence, we expected that MS would increase afterlife belief only to the extent that people perceive themselves dualistically.

Three studies supported our hypothesis. In Study 1, trait dualism was associated with more belief when death was salient, but not when an unexpected outcome was salient. In Study 2, thoughts of death increased belief when dualism was manipulated by a focus on the non-physical aspects of the self, but not when the physical body or college experiences were primed to be salient. In Study 3, BCI technology was used to create a situation in which people were able to type with varying degrees of accuracy using their mind and not their external body. MS increased belief relative to the control condition when the BCI was accurate and a sense of dualism presumably induced, but not when the BCI was inaccurate. These effects remained when covarying positive and negative affect (Studies 1 and 2) and the positivity and negativity with which people wrote about themselves (Study 2).

Our results are consistent with research suggesting that focusing on the physical body poses a wide range of problems when people are reminded of their own mortality (Goldenberg et al., 2000). In response to MS, for instance, people express less interest in the physical aspects of sex, inhibit their physical activity, and are even less likely to undergo health screening for cancer (e.g., Goldenberg et al., 2002; Goldenberg & Arndt, 2008). The current studies extend this work by showing that focusing on the body, relative to the mind, can undermine belief in literal immortality by reducing the belief that the mind and body are distinct. Future research could test if avoiding physical activity when the body and mortality are salient occurs, in part, to help preserve belief in literal immortality.

These results potentially illuminate past research finding that MS heightens afterlife belief (and belief in God and

spirits; Norenzayan & Hansen, 2006) for people high, but not low, in religiosity (e.g., Osarchuk & Tatz, 1973). Religions typically emphasize the non-physical self (i.e., the soul) over the physical body, which likely promotes dualism. In turn, it seems likely that religiosity is associated with heightened belief in an afterlife when death thoughts are salient (as in past research) at least in part because of its association with dualism. Conversely, our findings could help explain why scientists are less likely than others to believe in an afterlife (Larson & Witham, 1997). Afterlife belief is arguably the most direct way to obtain immortality and hence “solve” the problem of mortality awareness. But to the extent that people do not perceive the mind and body dualistically—as is likely to be the case for scientists—this method of coping with mortality concerns is hindered.

Contrary to the findings of Study 2, we might have predicted that MS would lower belief when the physical self was salient. This is because MS motivates defenses consistent with one’s salient thoughts (e.g., Landau et al., 2004) and the body is incompatible with afterlife belief. Indeed, the pattern of means across studies is (nonsignificantly) suggestive of this possibility, and in Study 1, low trait dualism was indeed associated with less belief when mortality was salient relative to the control condition in which people thought about an unexpected outcome. We suspect that when the physical self is salient, however, the need for literal immortality overrides the need for psychological structure and consistency. In turn, this effect may be smaller and harder to detect than MS increasing belief when the non-physical self is highlighted, in which case both motivations lead to the same outcome: greater belief in life after death.

Proulx et al. (2012) recently argued that MS effects occur because thoughts of death represent a “meaning threat” or an “expectancy violation” in which people’s cognitive schemas are challenged or violated. Others have argued that MS effects occur because they elicit other psychological threats (e.g., uncertainty; Van den Bos & Lind, 2002), which are the true source of defensiveness (see Jonas et al., 2014, for review of these perspectives). The finding that thinking about an unexpected outcome in Study 1 (and physical pain in Study 2) did not interact with mind–body dualism in ways similar to thinking about death is more consistent, however, with research showing that MS interacts with other variables (e.g., dualism, need for structure) in ways unique from other meaning threats (e.g., Vess et al., 2009). Future research should continue to examine defensive responses to MS, compared with other psychological threats, in conjunction with a range of moderators (Hart, 2014). We believe, as others have argued, that it would be folly to overgeneralize across psychological threats in terms of the specific types of defensiveness they may elicit (i.e., not all threats will cause all types of defenses) or to conclude that any specific threat is the sole root of (any or all) psychological defense (Sullivan, Landau & Kay, 2012). Accordingly, we by no means intend to suggest that afterlife beliefs can be wholly attributable to mortality concerns, or even its interaction with dualistic beliefs (indeed in Study 1, people who were low in trait dualism had less belief when mortality was salient). However, we do think it is likely that the awareness of death presents a problem that is of special relevance to belief in life after death.

## Conclusion

Descartes (1641/1984) famously posited, “I think, therefore I am,” setting the foundation for philosophical dualism. Although Descartes was primarily concerned with validating his existence in this life, the experience of dualism is critical to a belief in life after death. In conjunction with these ideas, research based on TMT provides an explanation for a motivation behind afterlife belief. We suggest that body–self dualism together with an awareness of death represent a “why” and “how” of afterlife belief: people are motivated to believe by the reminder that their lives are temporary; they find the rational basis for belief in the notion that the immaterial self is separate from the physical, mortal body.

## ACKNOWLEDGEMENTS

We would like to thank Emanuel Donchin for sharing his BCI expertise and equipment, as well as Erin Blackwell, Rebecca Campbell, Blaine Dedenbach, Alexa Fernandez, Cierra Henderson, and Joseph Sorondo, for serving as experimenters or for coding data.

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