



# Self-determined immortality: Testing the role of autonomy in promoting perceptions of symbolic immortality and well-being

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## Abstract

This pre-registered work was designed to replicate and extend previous research finding that autonomy is associated with greater extent of belief in symbolic immortality (feeling that some aspect of an individual will endure and/or be remembered long after death). Study 1 ( $n = 1185$ ) replicated this prior work, finding that self-reported autonomy predicted extent of belief in symbolic immortality, which mediated the relationship between autonomy and meaning in life. Study 2 ( $n = 117$ ) provided an experimental extension of Study 1, finding that reading about an individual with an autonomous (vs. controlled) life increased perceptions of that individual's symbolic immortality, which mediated the relationship between reading about the autonomous life and perceptions of the individual's satisfaction with life. Study 3 ( $n = 175$ ) replicated the results of Study 2 and also showed that the extent to which people viewed the target individual as feeling autonomous predicted perceptions of that individual's symbolic immortality even after controlling for perceived self-esteem.

**Keywords** Autonomy · Symbolic immortality · Terror management · Meaning in life · Satisfaction with life

## Introduction

“The symbolic self becomes his means of changing his situation from weakness to strength... character is really a series of techniques or a style of living, aimed principally at two things: to secure one's material survival; and to deny the fact that one really *has no control* over his finitude...” Ernest Becker (1971, *The Birth and Death of Meaning*, p. 142).

For thousands of years, humans have written about the issue of mortality—that death is inevitable, and that the lack of control over such finitude is a troubling psychological dilemma. Yet, some people appear to face death with more equanimity than others; for instance, as illustrated in the poem entitled “funeral” by Rupi Kaur (2017), the narrator describes death by saying, “when i go / let it be a celebration / for i have been here / i have lived / i have won at this game called life.” How might people live a life that allows them to face death with such peace and equanimity? Building from terror management theory (TMT; Greenberg et al.,

1986) and self-determination theory (SDT; Deci & Ryan, 1985), the present paper assesses whether perceiving that one is living life autonomously—that is, feeling a sense of self-authorship for one's life—may be one such way to promote well-being in the face of death by bolstering perceptions of symbolic immortality. That is, perceived autonomy should support the sense that a person has an enduring and lasting legacy that will continue after death, ameliorating death-related existential concerns and supporting well-being. Although prior research has found that autonomy alleviates the need for defensive strivings toward symbolic immortality following reminders of death (e.g., Vail et al., 2020), only two correlational studies have addressed the specific relationship between feelings of autonomy and perceptions of symbolic immortality (Horner et al., 2021a). The present research was designed to replicate and extend this prior work by assessing the role of perceived autonomy in promoting perceptions of symbolic immortality and well-being.

## Self-determination and well-being

According to self-determination theory (SDT; Deci & Ryan, 1985; Ryan & Deci, 2017), healthy psychological functioning is supported through the experience of competence, relatedness, and autonomy. Satisfaction of these

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three psychological needs is associated with greater overall well-being, higher satisfaction with life, and various indices of mental health (e.g., Reis et al., 2000; Sheldon et al., 1996). Central to this perspective is the important role of autonomy in supporting well-being. Specifically, according to SDT, autonomous/self-determined behavior—defined as choiceful, volitional, and personally-endorsed actions and engagement with life—is crucial for healthy psychological functioning. In other words, SDT posits that feeling autonomous and self-directed helps promote creativity, exploration, and the integration of novel experiences into one's sense of self. As a result, people can view their lives as worthwhile and meaningful (Weinstein et al., 2012b).

Empirically, feeling a sense of ownership over one's actions is indeed related to well-being. For example, those who report feeling autonomous also report greater feelings of competence and relatedness (e.g., Adie et al., 2008). Autonomy is also associated with greater positive affect, vitality, personal growth, and meaning in life (e.g., Martela et al., 2018; Steger & Samman, 2012; Weinstein et al., 2012a). These findings illustrate the important role of autonomy, showing that a sense of self-authorship for one's life can help promote well-being.

### **Autonomy, terror management, symbolic immortality, and well-being**

Various existential scholars and thinkers have posited that autonomy's role in supporting well-being stems from its capacity for managing death-related anxieties and concerns. For instance, Viktor Frankl (1959/2006) argued that exercising choice can help people quell existential concerns and sustain a sense of meaning, and Otto Rank (1932/1989) proposed that self-directed and creative behavior is a way to immortalize a sense of self and thereby manage the awareness of the inevitability of death. Empirical work derived from TMT (Horner, 2019; Vail et al., 2020) appears to support such perspectives, finding that autonomy/self-determination, like relatedness, competence, and self-esteem (Greenberg et al., 2014), helps to quell existential anxiety and reduces the need for defensive strivings toward symbolic immortality. Ultimately, autonomy might support well-being by bolstering perceptions that some aspect of oneself will endure and/or be remembered long after death.

### **Terror management theory**

Based largely on the work of cultural anthropologist Ernest Becker (1971, 1973), TMT (Greenberg et al., 1986, 2014) posits that the awareness of the inevitability of death has the potential to produce debilitating terror, or existential anxiety. As the possible end of one's existence, death is associated with fear when imminent, and the potential to experience

anxiety otherwise. The desire to avoid or postpone death is clear in many human endeavors, including medicine, consumer advocacy, military actions, and social justice efforts. Regardless of these efforts to forestall death, we know it will come to each of us, and so there will always be a potential for anxiety regarding mortality.

To manage this potential anxiety, people invest themselves into cultural worldviews, conceptions of reality that imbue life with meaning and provide standards for being "good" and valued (e.g., Christianity emphasizing prayer and repentance to be a good devotee, academia placing importance on publishing to be a good researcher, athletics emphasizing strong records and milestones to have a good career). Importantly, these worldview-prescribed standards of worth provide people with paths to transcend death, either literally (e.g., through reincarnation or an afterlife) and/or symbolically (e.g., through one's family, contributions, achievements). By living up to their worldview-prescribed standards of value, people garner a sense of personal value (i.e., self-esteem) and can feel like "an object of primary value in a world of meaningful action" (Becker, 1971, p. 79), gaining the sense that they are on the path to obtaining their worldview-prescribed immortality; that is, they can gain the sense that they will "live on" in some way after their death—via literal immortality (literally living on through an afterlife or through reincarnation) and/or symbolic immortality (having some aspect of oneself or one's identity live on by leaving a mark of oneself, having a lasting impact, and/or being remembered by others long after death). Common bases of a sense of symbolic immortality include feeling part of, and/or being remembered by offspring or an ongoing group who continue beyond one's lifespan, and valued achievements that are remembered or have a continued impact after one's death, such as a novel, work of art, business, or scientific achievement. Therefore, by maintaining faith in their worldviews and striving toward self-esteem, people can defend against existential anxiety. Moreover, theory and research suggest that because positive close relationships help to validate people's worldviews and can help bolster a sense of legacy through offspring, an extended social group, and remembrance, they play an important role in this anxiety buffering system. Because people's worldviews, self-esteem, and close relationships help quell concerns about death by contributing to the sense that some aspect of self continues beyond it, people are motivated to uphold and defend these structures.

Indeed, research has shown that making mortality salient (mortality salience; MS) increases the potential to experience anxiety and increases death-related concerns among those who are not sufficiently buffered (e.g., Greenberg et al., 1992, 2003; Juhl & Routledge, 2016; Routledge & Juhl, 2010), and also motivates hostility toward those with different beliefs (for a review, see Routledge & Vess, 2019),

self-esteem striving in worldview-relevant domains (e.g., Peters et al., 2005; Zestcott et al., 2016), efforts to maintain close relationships (e.g., Cox & Arndt, 2012), and the desire for offspring (Fritsche et al., 2007). However, high dispositional or experimentally-bolstered buffers (such as high self-esteem) prevent MS-induced defensiveness and harm to well-being (e.g., Routledge et al., 2010; Schmeichel & Martens, 2005). For recent reviews of the TMT literature, as well as critiques and alternative perspectives, see Hart (2019) and Routledge and Vess (2019).

### Terror management and autonomy

A considerable amount of prior TMT-guided research shows that reinforcing feelings of competence and relatedness buffers people from existential concerns, and that threatening those feelings increases such concerns (for reviews, see Greenberg et al., 2014; Routledge & Vess, 2019). More recently, TMT research has also shown that autonomy/self-determination can help manage existential anxiety and reduce MS effects. For example, MS increases death-related anxiety among participants primed with controlled-oriented concepts, but not among those primed with autonomy-oriented concepts (Horner, 2019). Moreover, MS increases self-esteem striving and worldview defense, but not among those given an opportunity for self-expression (Routledge et al., 2004) or among those high in openness to experience (Boyd et al., 2017), orientations that presumably support autonomy and choice. Additionally, MS increases worldview defense among those primed with a controlled orientation, but not among those primed with an autonomous orientation (Vail et al., 2020). These studies converge with other findings showing that autonomous and self-determined orientations help to reduce death-related anxiety and concerns. For instance, older adults who have achieved more intrinsic goals over the course of their lives report more death acceptance and lower death anxiety (Van Hiel & Vansteenkiste, 2009). Thus, autonomy/self-determination appears to support terror management and buffers against death-related concerns.

### The role of autonomy in promoting symbolic immortality and well-being

One possible explanation for such findings is that autonomy bolsters and affirms a sense of symbolic immortality. As suggested elsewhere (e.g., Greenberg et al., 1995; Pyszczynski et al., 2003), living life autonomously might support a sense of personal value that is particularly durable in the face of death, providing a sense of value based on internal and intrinsic (rather than external and contingent) standards of worth. Accordingly, autonomy could support a sense of symbolic immortality beyond general feelings

of self-esteem. While self-esteem deals with feeling successful in one's pursuits to live up to worldview-prescribed and often contingent standards of worth (Pyszczynski et al., 2004), autonomy deals with exercising a sense of choice and self-direction in life; in other words, autonomous functioning is that in which people feel their actions are volitional and represent their most important personal values and feelings, rather than representing external and contingent standards of value. Research has shown that being valued for intrinsic qualities reduces defensiveness (Arndt et al., 2002; Schimel et al., 2001), and MS motivates worldview defense among those with high extrinsic esteem orientations, but not among those with low extrinsic esteem orientations (e.g., Williams et al., 2010). That is, those with more intrinsic and self-determined sources of personal value are better able to manage death-related anxiety.

Thus, although self-esteem is indeed an important psychological resource for managing death-related anxiety (e.g., Greenberg et al., 1992; Routledge et al., 2010) and is associated with feelings of symbolic immortality (Lifshin et al., 2021), autonomous functioning may also support this sense of death transcendence by providing a route to feeling a sense of symbolic immortality based not on a sense of achievement or success per se, but instead based on the ability to exercise a sense of self-determination (or self-authorship for one's life). By feeling active and agentic in one's life, as opposed to simply going through the motions, people can perhaps feel that their role in their ongoing cultural and social worlds will have a more personal and distinctive impression, such that it is really truly them leaving their own personal self-authored mark on the world. In other words, autonomy allows one to feel in control of their life and create "a concretization of [their] personality" (Menaker, 1982, p. 34), providing the sense that some aspect of themselves will continue or be remembered by others long after death, viewed as a testament of a fully-fledged and self-determined life. By living in accordance with one's most important values and feelings, a person is able to feel like an active, authentic, and unique contributor to something meaningful and enduring, perceiving themselves as making a unique lasting contribution that truly represents who they are. Indeed, this feeling of mattering—that one's life has a unique and enduring impact—is proposed as a central component of viewing life as meaningful (e.g., George & Park, 2016); moreover, correlational research has found that, after accounting for self-esteem, autonomy is a significant predictor of symbolic immortality, which in turn is associated with greater meaning in life (Horner et al., 2021a).

Ultimately, autonomy helps promote the perception of a fulfilling life—one characterized by vitality, self-endorsement, and an orientation toward growth (Menaker, 1998; Ryan & Deci, 2004). As such, one can feel that they have engaged life in a truly self-authored way, helping provide a

uniquely-personal and durable sense of death transcendence beyond general feelings of self-esteem. By autonomously engaging with one's life, an individual can feel satisfied and feel like they have contributed to a meaningful world, which should ultimately support well-being.

## The present research

The theoretical and empirical work highlighted above shows that (a) autonomy is associated with various indices of well-being, (b) existential thinkers have often noted that this relationship could be due to the role of autonomy in helping people manage death-related concerns, and (c) autonomous orientations indeed help people manage death-related concerns, potentially because autonomy helps to support feelings of symbolic immortality. As such, the present analysis suggests that perceived autonomy should be tied to higher perceived symbolic immortality, which in turn should be associated with greater well-being. And as the present analysis suggests, feelings of autonomy/self-authorship for one's life should be important for bolstering perceptions of symbolic immortality beyond feelings of success, i.e., controlling for self-esteem. To our knowledge, only two previous cross-sectional correlational studies have addressed these specific relationships; this prior research found that people's self-reported autonomy predicted extent of belief in symbolic immortality, which mediated the relationship between autonomy and perceptions of meaning in life (Horner et al., 2021a) and held after controlling for participants' self-reported self-esteem. The present research was designed to replicate this prior work and also extend this analysis by experimentally testing whether perceived autonomy would increase perceptions of symbolic immortality and well-being. Thus, this work was not designed to test autonomy as a buffer of MS effects per se, as demonstrated in previous research (e.g., Vail et al., 2020); it was instead designed to test the basic relationship between autonomy and symbolic immortality, as well as whether symbolic immortality would mediate the relationship between autonomy and various indices of well-being.

Study 1 was designed to assess the replicability of the correlational findings that symbolic immortality would mediate the relationship between autonomy and meaning in life. Study 2 was an experimental extension of Study 1, and it was designed to test whether reading about an autonomous life vs. a successful but clearly non-autonomous life would increase perceptions of symbolic immortality for that person and whether such perceptions of symbolic immortality would mediate the impact of the autonomy manipulation on perceptions of the person's satisfaction with life. We chose to have participants focus on someone else because it allowed us to assess whether a more autonomous life would be seen as more affording of a sense of symbolic immortality

without grappling with participants' own motivations and investments or the complex problems of altering people's perceptions of their own symbolic immortality and level of autonomous functioning, perceptions people often already have strong beliefs about (e.g., Florian & Mikulincer, 1998; Ryan & Deci, 2017) and which can be difficult to experimentally manipulate (e.g., Bradshaw et al., 2021; Horner et al., 2021b). In addition, we used a story about an older adult, as they have had more time to establish the accomplishments in life that could contribute to a sense of symbolic immortality. Study 3 was a replication of Study 2, and it was designed to extend the analysis to perceptions of regret. Measures of satisfaction with life and meaning in life were used in the present work because they are often assessed in studies investigating the relationship between autonomy and well-being, as noted earlier. Because the present work was also assessing these relationships (along with the hypothesized mediator of symbolic immortality), we opted to use these two measures. The measure of regret was also included in the third study to investigate the interesting possibility that autonomy, or the lack thereof, might impact how people view life pursuits as falling short of achieving symbolic immortality and in turn be tied to the sense that one could have done more in life. Each study was pre-registered on the AsPredicted website; materials, data, analyses code, and pre-registrations can be accessed at: <https://researchbox.org/340>.

## Study 1

The first study was designed to test the basic hypothesized relationship between autonomy, symbolic immortality, and well-being. Specifically, Study 1 was a replication of previous correlational research finding that symbolic immortality mediated the relationship between autonomy and meaning in life (Horner et al., 2021a). We hypothesized that (1) symbolic immortality would mediate the relationship between autonomy and meaning in life, and (2) autonomy would remain a significant predictor of symbolic immortality after accounting for self-esteem. We also explored whether the proposed mediational path would remain significant after controlling for self-esteem.

## Participants

Data were obtained from a mass survey assessing introductory psychology students' attitudes and personality traits. Students who completed the survey received credit toward a departmental research requirement. We anticipated approximately 1000 respondents; however, no specific sample size was pre-registered, as data was collected by any and all students opting to participate in the survey during the academic semester in which the study was conducted.

**Table 1** Correlations between variables in Study 1

Measure	1	2	3
1. Symbolic Immortality	–		
2. Meaning in Life	.444	–	
3. Autonomy	.254	.389	–
4. Self-Esteem	.412	.442	.253

All  $ps < .001$

The sample ( $n = 1185$ ) was comprised mostly of young adults, ranging in age from 18 to 50 years (age  $M = 19.04$ ,  $SD = 2.70$ , 2 did not report; year in college  $M = 1.48$ ,  $SD = .88$ , 70.21% first-year students), including 836 females, 341 males, and 8 people selecting “other.” Participants were mostly White (823 White, 46 Black or African American, 15 American Indian or Alaska Native, 103 Asian, 4 Native Hawaiian or Pacific Islander, 193 “other” or mixed, 1 did not report).

## Materials and procedure

Participants completed the survey online; the measures were presented using the Qualtrics online research platform. After completing basic demographic items, participants responded to the target measures in the order described below (other items unrelated to this research were also included as part of the large departmental mass survey; more information about these items is available from the corresponding author). Refer to Table 1 for correlations between variables.

### Self-esteem

Following Horner et al. (2021a), participants rated their agreement with a single statement (“I have high self-esteem”) using a 9-point Likert-type scale (1 = *Fully disagree*, 9 = *Fully agree*). This item has been found to correlate strongly with the Rosenberg Self-Esteem Scale (Rosenberg, 1965) with strong convergent validity (Robins et al., 2001). A higher score indicates higher general self-esteem ( $M = 5.45$ ,  $SD = 2.10$ ).

### Meaning in life

Participants rated their agreement with four items from the presence of meaning subscale of the Meaning in Life Questionnaire (Steger et al., 2006). Sample items include “I understand my life’s meaning” and “I have a good sense of what makes my life meaningful.” Although Horner et al. (2021a) presented six items from this subscale, only four items were used in this study due to space constraints in the online survey. Participants rated their agreement with each statement using a 7-point Likert-type scale (1 = *Absolutely*

*untrue*, 7 = *Absolutely true*). A composite score was computed, such that higher scores indicate higher perceived presence of meaning in life ( $\alpha = .86$ ,  $M = 19.05$ ,  $SD = 5.42$ ).

### Autonomy

Following Horner et al. (2021a), participants responded to the five items comprising the authorship/self-congruence subscale of the Index of Autonomous Functioning (Weinstein et al., 2012a). Sample items include “My decisions represent my most important values and feelings” and “My decisions are steadily informed by things I want or care about.” Participants rated their agreement with each statement using a 5-point Likert-type scale (1 = *Not at all true*, 5 = *Completely true*); a mean score was computed, such that higher scores indicate greater autonomous functioning ( $\alpha = .82$ ,  $M = 3.78$ ,  $SD = .68$ ).

### Symbolic immortality

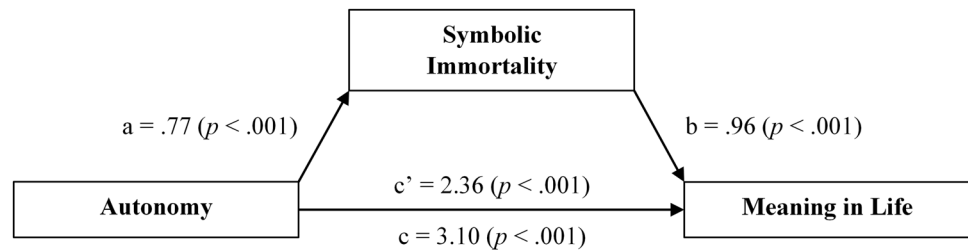
Instead of the single-item measure used in Horner et al. (2021a), participants in this study rated their agreement with two items (“After I die, my impact on the world will continue” and “Some aspect of myself, such as my name or accomplishments, will be remembered long after I die”). These items were used to measure participants’ extent of belief in a sense of symbolic immortality. Measures of symbolic immortality have been used in previous research (Florian & Mikulincer, 1998), and this specific two-item measure has been found to correlate with variables theoretically related to symbolic immortality (e.g., greater worldview identification, lower accessibility of death-related cognition; Lifshin et al., 2021). Participants rated their agreement using a 9-point Likert-type scale (1 = *Not at all true*, 9 = *Definitely true*); a mean score was computed, such that higher scores indicate greater extent of belief in symbolic immortality ( $\alpha = .86$ ,  $M = 4.85$ ,  $SD = 2.07$ ).

## Results

### Symbolic immortality as mediator between autonomy and meaning in life

A basic mediation analysis (Model 4) using the PROCESS statistical macro for SPSS (Hayes, 2017) was conducted to examine whether symbolic immortality mediated the relationship between autonomy and meaning in life. Autonomy was significantly associated with meaning in life (total effect;  $B = 3.10$ ,  $SE = .21$ ,  $p < .001$ ), and this relationship remained significant after controlling for symbolic immortality (direct effect;  $B = 2.36$ ,  $SE = .20$ ,  $p < .001$ ). Using bootstrapping with 5000 resamples, the indirect effect of autonomy on meaning in

**Fig. 1** Path diagram illustrating indirect effect of self-reported autonomy on meaning in life through symbolic immortality in Study 1. Direct and total effects also shown. Unstandardized coefficients presented for each path



life through symbolic immortality was significantly different from zero (indirect effect = .74,  $SE = .10$ , 95% CI [.55, .93]). As illustrated in Fig. 1, autonomy was significantly associated with symbolic immortality (a path;  $B = .77$ ,  $SE = .09$ ,  $p < .001$ ), and symbolic immortality was significantly associated with meaning in life (b path;  $B = .96$ ,  $SE = .07$ ,  $p < .001$ ). Thus, symbolic immortality mediated the relationship between autonomy and meaning in life.

### Autonomy as significant predictor of symbolic immortality

A multiple regression analysis was conducted, regressing symbolic immortality on autonomy and self-esteem. The overall model was significant,  $F(2, 1174) = 141.25$ ,  $R^2 = .19$ ,  $p < .001$ . Inspection of the coefficients suggested that symbolic immortality was positively associated with self-esteem ( $B = .37$ ,  $SE = .03$ ,  $\beta = .37$ ,  $t = 13.72$ ,  $p < .001$ ) and also autonomy ( $B = .49$ ,  $SE = .08$ ,  $\beta = .16$ ,  $t = 5.91$ ,  $p < .001$ ). These results suggest that, controlling for self-esteem, autonomy is a significant predictor of symbolic immortality.

### Symbolic immortality as mediator controlling for self-esteem

To explore whether the proposed indirect effect would hold after controlling for self-esteem, we re-ran the mediational analysis reported above, this time including self-esteem as a covariate in the model. Notably, the indirect effect of autonomy on meaning in life through symbolic immortality was still significantly different from zero (indirect effect = .34,  $SE = .07$ , 95% CI [.21, .48]).

### Brief discussion

Results from Study 1 support prior research finding that autonomy is associated with perceptions of meaning in life (Martela et al., 2018; Steger & Samman, 2012). Additionally, these results replicate prior research (Horner et al., 2021a), finding that (1) symbolic immortality mediated the relationship between autonomy and meaning in life, and (2) autonomy remained a significant predictor of symbolic immortality after accounting for self-esteem. Together,

these results suggest that autonomy may bolster the extent to which people believe in a sense of symbolic immortality, and this in turn may help support the sense of a meaningful life. Further, the above-noted indirect effect remained significant after controlling for self-esteem, suggesting that autonomy may play a distinct role in bolstering perceptions of symbolic immortality and well-being.

We acknowledge here that testing mediational models with cross-sectional data limits the causal claims that can be made; however, we maintain that using this analytical approach in Study 1 was useful to replicate prior work (Horner et al., 2021a) and to illustrate the theoretical relationship between autonomy and symbolic immortality. As suggested elsewhere (e.g., Thoemmes, 2015), rather than testing alternative correlational models in Study 1, we conducted further studies using experimental paradigms to assess our conceptual/theoretical framework in Studies 2 and 3.

## Study 2

The second study aimed to extend beyond the correlational nature of Study 1 and was designed to provide an experimental test of the impact of perceived autonomy on perceptions of symbolic immortality. It is the first study, to our knowledge, to experimentally test this relationship. Although the prior correlational research examined these variables for self-perceptions, if this idea has validity, it should also extend to how perceiving autonomy in others relates to how much symbolic immortality those others have. Examining this relationship in perceptions of another person avoids two difficult problems. One is that it is likely difficult to manipulate a person's own perception of autonomy in their lives. The other is that when people report their own perceptions of autonomy and symbolic immortality, those reports can be affected by self-serving and self-presentational biases, whereas this is much less likely when judging a stranger. We hypothesized that people asked to read about an individual who has lived an autonomous (vs. controlled) life would perceive the individual as having higher symbolic immortality. Additionally, we examined whether these perceptions of symbolic immortality would mediate the impact

of the autonomy condition on perceptions of the individual's satisfaction with life.

## Participants

Undergraduate psychology students completed the study and received credit toward a departmental research requirement. Adopting a sample size planning strategy to achieve 80% power given a medium to large effect size (VanVoorhis & Morgan, 2007; see also Cohen, 1992), the minimum recommended sample size is 60 participants (30 per condition). To account for potential missing data and a weaker effect, we aimed to reach a minimum sample size of 100 participants, and we offered 150 study openings to provide participation opportunities to students during the academic semester in which the study was conducted.

One hundred and forty-two participants completed the study; however, 8 participants were removed for completing the study more than once with different responses, and 17 participants were removed for violating one or more of the pre-registered exclusion criteria (e.g., having entirely blank manipulation responses, missing the attention check item). Thus, the final sample included 117 participants.

These participants were mostly young adults, ranging in age from 18 to 50 years (age  $M = 20.15$ ,  $SD = 5.24$ ), including 84 females, 30 males, 1 non-binary person, and 1 person selecting "other" (1 did not report). Participants were mostly White (80 White, 3 Black or African American, 4 American Indian or Alaska Native, 7 Asian, 21 multiracial or "other," and 2 did not report).

## Materials and procedure

The study was listed with the title "Personality, attitudes, and reading preferences" on the undergraduate research participation website. Participants completed the study online; it was presented using the Qualtrics online research platform. After providing informed consent, participants completed the materials in the order below. Participants were fully debriefed upon completion of the study.

### Filler measure and attention check

To bolster the cover story that the study was about personality, participants completed the 60-item Positive and Negative Affect Schedule Expanded Form (Watson & Clark, 1994); participants rated the extent to which they felt various feelings and emotions using a 5-point Likert-type scale (1 = *Very slightly or not at all*, 3 = *Moderately*, 5 = *Extremely*). An attention check item was embedded in this measure, asking participants to select the "Moderately" option for that particular item.

## Article excerpt manipulation

Participants were randomly assigned to one of two article excerpt conditions. In both conditions, participants were presented with instructions stating that the provided paragraph was taken from an interview series in which older adults are interviewed and asked to reflect on their life. Participants were instructed to read the excerpt and respond to questions about the excerpt on the following page. The excerpts were written specifically for this study. They both conveyed the same level of success (a proxy for matched self-esteem between conditions) and differed only in the extent to which the interviewee reported living autonomously; the excerpt was written from the perspective of the interviewer, offering a recap of the presumed interview.

In the autonomous condition, participants read a portion of the presumed interview in which the interviewer recaps a conversation with a man describing his life as filled with personal choice and autonomy:

This was an interview I liked to do. I started out like the other ones, asking for name, age, where they were from, and all the other usual questions. Then I asked the big one! When I asked him to tell me his life story, he joked and said, "The whole thing? Where do I begin?" He told me about growing up, his days in high school and college, and how he has worked for most of his life. "Besides a few ups and downs, I think there were lots of successes. I did well in school growing up, graduated with good grades in college, had a good career, a good home. Always thought I was doing good. And ya know, I always really felt like there was a lot of 'me' in there. I never felt pressured to do lots of things, instead did things because I felt I wanted to, a lot of working toward success for things I really cared about. And I mean, I was successful, and I just think looking back I feel like I had a lot of choice and control over what I did." We then talked about the type of work that he did, and he said he did many jobs.

In the controlled condition, participants read the same prompt in which the interviewee responded with the same focus on having had success and doing well, but in the second half of the excerpt, the interviewer recaps the man as describing his life as not filled with much personal choice or autonomy:

"The whole thing? Where do I begin?" He told me about growing up, his days in high school and college, and how he has worked for most of his life. "Besides a few ups and downs, I think there were lots of successes. I did well in school growing up, graduated with good grades in college, had a good career, a good home. Always thought I was doing good. But ya know,

I never really felt like there was much ‘me’ in there. I felt pressured to do lots of things, did things because I felt I had to, just a lot of working toward success for things I didn’t really care about. And I mean, I was successful, but I just think looking back I feel like I didn’t have much choice or control over what I did.” We then talked about the type of work that he did, and he said he did many jobs.

After reading the excerpt, participants responded to an open-ended question asking them to summarize the section in their own words.

As noted earlier, the decision to use excerpts describing another individual’s life, rather than having participants write about their own life, was due to several reasons. First, it can be difficult to meaningfully manipulate how autonomously individuals view their own life pursuits, and we thought this might be especially true for online research. Indeed, some recent research has illustrated that online inductions aimed at impacting people’s own sense of autonomy might not produce intended effects (e.g., Bradshaw et al., 2021; Horner et al., 2021b). Second, it makes sense that a sense of autonomy would be linked to symbolic immortality especially with regard to things one has already accomplished in life; so, rather than have students focus on their limited accomplishments to date, we wrote the excerpts as referring to an older adult. Finally, some research has shown that people can be motivated to uphold their worldviews at the expense of enhancing their own sense of value (Landau et al., 2009). Therefore, having participants view excerpts describing another individual’s life seemed to help limit these issues in the present work, at least to some extent.

### Manipulation check

Following the excerpts, participants responded to two items assessing how autonomous they think the interviewee felt about his life (“Thinking about the man’s story, how much do you think his decisions represented his most important values and feelings?” and “In your opinion, how strongly do you think he identified with the things he did?”). These items were adapted from the Index of Autonomous Functioning (Weinstein et al., 2012a). Participants rated their agreement with each statement using a 5-point Likert-type scale (1 = *Not at all*, 3 = *Somewhat*, 5 = *Completely*); a mean score was computed, such that higher scores indicate greater perceived autonomy ( $\alpha = .78$ ,  $M = 3.34$ ,  $SD = 1.12$ ).

### Perceived symbolic immortality

Participants responded to two items assessing the extent to which they perceived the target individual as having

symbolic immortality (“How much do you think his impact on the world will continue after he dies?” and “Do you think some aspect, such as his name or accomplishments, will be remembered long after he dies?”). Participants responded to both statements using a 9-point Likert-type scale (1 = *Not at all*, 9 = *Definitely*); a mean score was computed, such that higher scores indicate greater perceived symbolic immortality ( $\alpha = .83$ ,  $M = 4.15$ ,  $SD = 1.72$ ).

### Perceived satisfaction with life

Participants were asked to rate their agreement with two items regarding the target individual’s satisfaction with life (modified from Diener et al., 1985). Specifically, participants were asked how much they agree with the following two statements: “The man is satisfied with his life” and “If the man could live his life over, he would change almost nothing.” Participants responded to both statements using a 7-point Likert-type scale (1 = *Strongly disagree*, 4 = *Neither agree nor disagree*, 7 = *Strongly agree*); a mean score was computed, such that higher scores indicate greater perceived satisfaction with life ( $\alpha = .85$ ,  $M = 4.30$ ,  $SD = 1.92$ ).

### Additional questions

To further bolster the cover story that the study was about personality and reading preferences, participants were presented with four questions asking about their opinions on the presumed interviewer’s writing style. An exploratory measure of death-thought accessibility (DTA) using a word-stem completion task (e.g., Arndt et al., 1997) was also included at the end of the study; 25 partially-completed words were presented, and six of them could be completed to create either a neutral or death-related word depending on participants’ levels of active death-related cognition. For example, the partial word COFF\_ \_ could be completed as either COFFEE or COFFIN. The six target words were the following: buried, dead, grave, killed, skull, coffin. Death-related completions were scored as one and non-death-related completions were scored as zero. DTA was computed by summing the number of death-related word completions ( $M = 2.33$ ,  $SD = 1.07$ ). Perhaps reading of someone with a sense of autonomy in their lives would lead to lower DTA than reading of someone who feels controlled. However, this is a tenuous idea given that participants’ own sense of autonomy and symbolic immortality were unlikely to be affected by reading about an anonymous other.



## Demographics and final items

At the end of the study, participants responded to basic demographic questions (i.e., age, gender, race). Participants also completed several questions used to probe for suspicions and to identify participants who indicated that their data should not be used or that they completed the study in more than one sitting.

## Results

### Impact of article excerpt on perceived autonomy

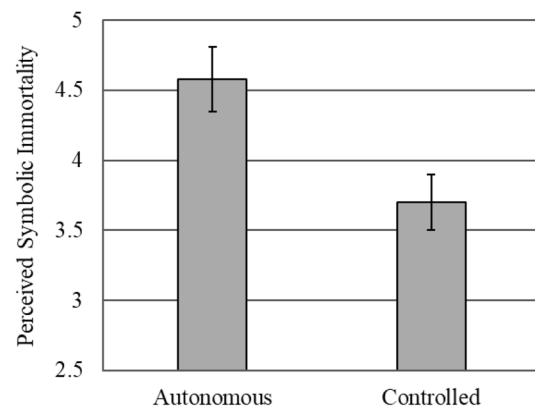
We conducted an independent samples *t*-test to test for differences in perceived autonomy between the two article excerpt conditions. All reported confidence intervals were obtained using bootstrapping with 5000 resamples. As intended, participants who read the excerpt about the individual living an autonomous life perceived that individual as having a higher sense of felt autonomy ( $M = 4.15$ ,  $SD = .67$ ; 95% CI [3.98, 4.32],  $SE = .09$ ) compared to those who read the excerpt about the individual living a non-autonomous and controlled life ( $M = 2.49$ ,  $SD = .84$ ; 95% CI [2.28, 2.72],  $SE = .11$ ),  $t(115) = 11.85$ ,  $p < .001$ ,  $d = 2.19$ .

### Impact of article excerpt on perceived symbolic immortality

We conducted an independent samples *t*-test to test for differences in perceived symbolic immortality between the two article excerpt conditions. All reported confidence intervals were obtained using bootstrapping with 5000 resamples. As predicted, participants who read the excerpt about the individual living an autonomous life perceived that individual as having greater symbolic immortality ( $M = 4.58$ ,  $SD = 1.77$ ; 95% CI [4.14, 5.01],  $SE = .22$ ) compared to those who read the excerpt about the individual living a non-autonomous and controlled life ( $M = 3.70$ ,  $SD = 1.56$ ; 95% CI [3.31, 4.12],  $SE = .20$ ),  $t(115) = 2.83$ ,  $p = .005$ ,  $d = .52$ . Thus, as illustrated in Fig. 2, participants who read an excerpt about an autonomous (vs. controlled) life perceived the target individual as having greater symbolic immortality. Moreover, the extent to which participants perceived the target individual as feeling autonomous predicted perceived symbolic immortality ( $B = .44$ ,  $SE = .14$ ,  $\beta = .29$ ,  $t = 3.22$ ,  $p = .002$ ).

### Perceived symbolic immortality as mediator between autonomous excerpt and perceived satisfaction with life

We also conducted a basic mediation analysis (Model 4) using the PROCESS statistical macro for SPSS (Hayes, 2017) to examine whether perceived symbolic immortality



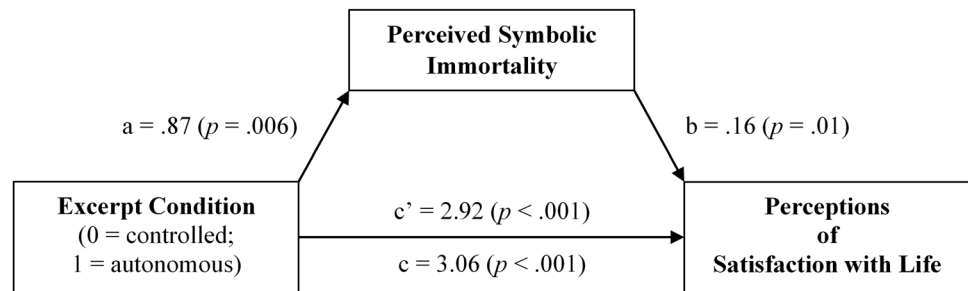
**Fig. 2** Participants in Study 2 who read an excerpt about an autonomous life perceived the target individual as having greater symbolic immortality than participants who read about a non-autonomous/controlled life. Error bars represent standard error (obtained using bootstrapping with 5000 resamples)

mediated the impact of the autonomy manipulation excerpts on perceptions of the target individual's satisfaction with life. Results showed that reading about an autonomous life was significantly associated with perceptions of the target individual's satisfaction with life (total effect;  $B = 3.06$ ,  $SE = .21$ ,  $p < .001$ ), and this relationship remained significant after controlling for perceived symbolic immortality (direct effect;  $B = 2.92$ ,  $SE = .22$ ,  $p < .001$ ). Using bootstrapping with 5000 resamples, the indirect effect of the excerpts on perceived satisfaction with life through perceived symbolic immortality was significantly different from zero (indirect effect = .14,  $SE = .08$ , 95% CI [.02, .32]). As illustrated in Fig. 3, reading the autonomous excerpt was significantly associated with perceived symbolic immortality (a path;  $B = .87$ ,  $SE = .31$ ,  $p = .006$ ), and perceived symbolic immortality was significantly associated with perceived satisfaction with life (b path;  $B = .16$ ,  $SE = .06$ ,  $p = .01$ ). These findings suggest that participants who read an excerpt about an autonomous (vs. controlled) life perceived the target individual as having greater symbolic immortality, which in turn predicted perceptions of the individual's satisfaction with life.

### Impact of article excerpt on death-thought accessibility

We conducted an independent samples *t*-test to explore if there were differences in DTA between the two article excerpt conditions. All reported confidence intervals were obtained using bootstrapping with 5000 resamples. Results showed that DTA did not differ between the two conditions (autonomous life:  $M = 2.40$ ,  $SD = .96$ ; 95% CI [2.16, 2.64],  $SE = .12$ ; controlled life:  $M = 2.26$ ,  $SD = 1.17$ ; 95% CI [1.95, 2.56],  $SE = .15$ ),  $t(115) = .69$ ,  $p = .49$ ,  $d = .13$ . These results are discussed further in the General Discussion.

**Fig. 3** Path diagram illustrating indirect effect of autonomous excerpt condition on perceptions of the target individual's satisfaction with life through perceived symbolic immortality in Study 2. Direct and total effects also shown. Unstandardized coefficients presented for each path



## Brief discussion

To our knowledge, Study 2 is the first study to experimentally test the impact of autonomy on perceptions of symbolic immortality. The results showed that participants who read about an individual with an autonomous life perceived that individual as having greater symbolic immortality, and the extent to which participants thought the individual felt autonomous predicted this perceived symbolic immortality. Further, perceived symbolic immortality mediated the impact of the autonomy condition on perceptions of the individual's satisfaction with life.

## Study 3

The third study was designed as a replication of Study 2, and we hypothesized that people asked to read about an individual who has lived an autonomous (vs. controlled) life would perceive the individual as having higher symbolic immortality. Additionally, we examined whether these perceptions of symbolic immortality would mediate the impact of the autonomy condition on perceptions of the individual's well-being, namely satisfaction with life and regret. In this study, rather than specifying the target person's gender as male, we left out any information on the target's gender. We also used a sample from Prolific rather than undergraduate psychology students.

## Participants

Data were obtained from the participant recruitment website Prolific; participants who completed the study received \$1.95 in compensation, and the study took approximately 15 minutes to complete. Adopting a similar sample size planning strategy as Study 2, and to use the available financial resources allocated for this study, we aimed to reach a sample size of 200 participants. Two hundred participants were initially recruited; however, 25 participants were removed for violating one or more of the pre-registered exclusion criteria (e.g., having entirely blank manipulation responses). Thus, the final sample included 175 participants.

These participants were mostly young to middle-aged adults, ranging in age from 18 to 76 years (age  $M = 33.74$ ,  $SD = 12.59$ ), including 103 females, 70 males, and 2 non-binary persons. Participants were mostly White (136 White, 13 Black or African American, 1 American Indian or Alaska Native, 16 Asian, and 9 multiracial or "other").

## Materials and procedure

The materials and procedure were the same as Study 2, with the exception of (1) a revised article excerpt manipulation, (2) the inclusion of a measure of perceived regret, and (3) the inclusion of a measure of perceived self-esteem; each of these changes are described below. As in Study 2, participants responded to the measures assessing: perceived autonomy ( $\alpha = .80$ ,  $M = 3.31$ ,  $SD = 1.15$ ), perceived symbolic immortality ( $\alpha = .83$ ,  $M = 4.10$ ,  $SD = 1.98$ ), and perceived satisfaction with life ( $\alpha = .89$ ,  $M = 4.50$ ,  $SD = 1.79$ ).

## Article excerpt manipulation

Participants were randomly assigned to one of two article excerpt conditions. The excerpts were the same as those used in Study 2; however, they were slightly modified so that the target individual was given a gender-neutral name ("Pat"), and the excerpts used the pronoun "they" rather than "he" when describing the interviewee. Dependent measures referencing the interviewee were also re-worded accordingly (e.g., removing pronouns or replacing "he" with "they"). As in Study 2, after reading the excerpt, participants responded to an open-ended question asking them to summarize the section in their own words.

## Perceived regret

Participants were asked to rate their agreement with two items assessing how regretful they thought the target individual feels about their life (modified from Schwartz et al., 2002). Specifically, participants were asked how much they agree with the following two statements: "When thinking about how they are doing in life, Pat often thinks about opportunities that were passed up" and "Pat is curious about

what would have happened if they chose to live life differently.” Participants responded to both statements using a 7-point Likert-type scale (1 = *Completely disagree*, 7 = *Completely agree*); a mean score was computed, such that higher scores indicate greater perceived regret ( $\alpha = .92$ ,  $M = 4.03$ ,  $SD = 1.99$ ). This measure was counterbalanced in presentation with the perceived satisfaction with life measure.

### Self-esteem

Following the perceived regret and perceived satisfaction with life measures, participants responded to a single-item measure assessing their perceived level of self-esteem of the target individual (modified from Robins et al., 2001). Specifically, participants rated their agreement with the statement “Pat has high self-esteem” on a 9-point Likert-type scale (1 = *Fully disagree*, 9 = *Fully agree*); higher scores indicate higher perceived self-esteem ( $M = 6.53$ ,  $SD = 1.72$ ).

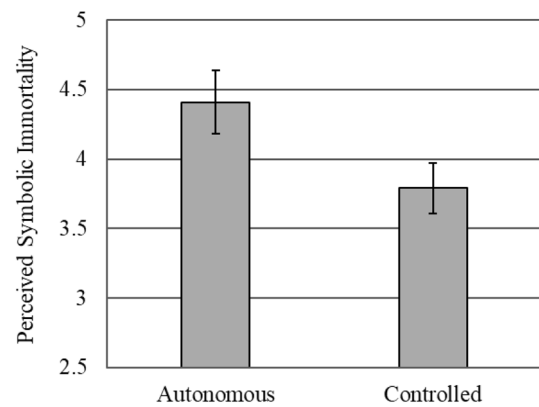
## Results

### Impact of article excerpt on perceived autonomy

We conducted an independent samples *t*-test to test for differences in perceived autonomy between the two article excerpt conditions. All reported confidence intervals were obtained using bootstrapping with 5000 resamples. As intended, participants who read the excerpt about the individual living an autonomous life perceived that individual as having a higher sense of felt autonomy ( $M = 4.07$ ,  $SD = .80$ ; 95% CI [3.90, 4.24],  $SE = .09$ ) compared to those who read the excerpt about the individual living a non-autonomous and controlled life ( $M = 2.55$ ,  $SD = .91$ ; 95% CI [2.35, 2.74],  $SE = .10$ ),  $t(173) = 11.75$ ,  $p < .001$ ,  $d = 1.78$ .

### Impact of article excerpt on perceived symbolic immortality

We conducted an independent samples *t*-test to test for differences in perceived symbolic immortality between the two article excerpt conditions. All reported confidence intervals were obtained using bootstrapping with 5000 resamples. As predicted, participants who read the excerpt about the individual living an autonomous life perceived that individual as having greater symbolic immortality ( $M = 4.41$ ,  $SD = 2.23$ ; 95% CI [3.97, 4.87],  $SE = .23$ ) compared to those who read the excerpt about the individual living a non-autonomous and controlled life ( $M = 3.79$ ,  $SD = 1.64$ ; 95% CI [3.45, 4.13],  $SE = .17$ ),  $t(173) = 2.08$ ,  $p = .039$ ,  $d = .32$ . Thus, as illustrated in Fig. 4, participants who read an excerpt about an autonomous (vs. controlled) life perceived the target individual as having greater symbolic immortality.



**Fig. 4** Participants in Study 3 who read an excerpt about an autonomous life perceived the target individual as having greater symbolic immortality than participants who read about a non-autonomous/controlled life. Error bars represent standard error (obtained using bootstrapping with 5000 resamples)

We note that participants who read the excerpt about an autonomous life also perceived the target individual as having greater self-esteem ( $M = 7.43$ ,  $SD = 1.37$ ) compared to those who read the excerpt about a controlled life ( $M = 5.62$ ,  $SD = 1.54$ ),  $t(173) = 8.21$ ,  $p < .001$ ,  $d = 1.24$ . Controlling for self-esteem, the effect of the manipulation was no longer significant,  $F(1, 172) = .08$ ,  $p = .77$ ,  $\eta_p^2 < .01$ . However, multiple regression analyses revealed that the extent to which participants perceived the target individual as feeling autonomous significantly predicted perceived symbolic immortality ( $B = .51$ ,  $SE = .15$ ,  $\beta = .30$ ,  $t = 3.47$ ,  $p = .001$ ), but the extent to which participants perceived the individual as having self-esteem was not a significant predictor ( $B = .11$ ,  $SE = .10$ ,  $\beta = .09$ ,  $t = 1.09$ ,  $p = .28$ ). Thus, perceived autonomy significantly predicted the extent to which participants viewed the target individual as having symbolic immortality.

### Perceived symbolic immortality as mediator of life satisfaction and regret

We also conducted two basic mediation analyses (Model 4) using the PROCESS statistical macro for SPSS (Hayes, 2017) to examine whether perceived symbolic immortality mediated the impact of the autonomous excerpt on (1) perceptions of the target individual’s satisfaction with life and (2) perceptions of the target individual’s regret.

Regarding perceived satisfaction with life, results showed that reading about an autonomous life was significantly associated with perceptions of the target individual’s satisfaction with life (total effect;  $B = 2.79$ ,  $SE = .17$ ,  $p < .001$ ), and this relationship remained significant after controlling for perceived symbolic immortality (direct effect;  $B = 2.73$ ,  $SE = .17$ ,  $p < .001$ ). Using bootstrapping with 5000 resamples, the indirect effect of the autonomous excerpt on

perceived satisfaction with life through perceived symbolic immortality was marginally different from zero (indirect effect = .07,  $SE = .05$ , 95% CI [.0002, .17]). Looking at the individual paths, reading the autonomous excerpt was significantly associated with perceived symbolic immortality (a path;  $B = .62$ ,  $SE = .30$ ,  $p = .039$ ), and perceived symbolic immortality was significantly associated with perceived satisfaction with life (b path;  $B = .11$ ,  $SE = .04$ ,  $p = .01$ ). To explore whether this indirect effect on perceived satisfaction with life would hold after controlling for perceived self-esteem, we re-ran the mediational analysis reported above, this time including self-esteem as a covariate in the model; the indirect effect was no longer different from zero (indirect effect = .005,  $SE = .02$ , 95% CI [−.03, .06]).

Regarding perceived regret, results showed that reading about an autonomous life was significantly associated with perceptions of the target individual's regret with their life (total effect;  $B = -3.02$ ,  $SE = .20$ ,  $p < .001$ ), and this relationship remained significant after controlling for perceived symbolic immortality (direct effect;  $B = -3.03$ ,  $SE = .20$ ,  $p < .001$ ). Using bootstrapping with 5000 resamples, the indirect effect of the autonomous excerpt on perceived regret through perceived symbolic immortality was not significantly different from zero (indirect effect = .01,  $SE = .04$ , 95% CI [−.08, .11]). Looking at the individual paths, reading the autonomous excerpt was significantly associated with perceived symbolic immortality (a path;  $B = .62$ ,  $SE = .30$ ,  $p = .039$ ), but perceived symbolic immortality was not significantly associated with perceived regret (b path;  $B = .02$ ,  $SE = .05$ ,  $p = .72$ ). We also re-ran the mediational analysis reported above, this time including self-esteem as a covariate in the model; the indirect effect was again not significantly different from zero (indirect effect = .005,  $SE = .03$ , 95% CI [−.05, .07]).

## Brief discussion

Results from Study 3 further demonstrate the impact of autonomy on perceptions of symbolic immortality. Specifically, as in Study 2, participants who read about an individual with an autonomous life perceived that individual as having greater symbolic immortality. Moreover, controlling for perceived self-esteem, the extent to which participants thought the individual felt autonomous predicted this perceived symbolic immortality. These results illustrate that autonomy can bolster perceived symbolic immortality (although the effect of the manipulation was non-significant after controlling for self-esteem, a finding that we revisit in the General Discussion). Finally, perceived symbolic immortality appeared to mediate the relationship between reading about an autonomous life and perceiving the individual as feeling more satisfied with life (although

this indirect effect was small), but it did not mediate the relationship between autonomy and regret.

## General discussion

Previous research has shown that feelings of personal volition, choice, and self-authorship in one's life—i.e., autonomy/self-determination—help to defend against death-related concerns and seem to alleviate the need for defensive strivings for symbolic immortality (e.g., Vail et al., 2020; Van Hiel & Vansteenkiste, 2009). However, the specific relationship between autonomy and perceptions of symbolic immortality had previously only been addressed in two correlational studies, which found that autonomous functioning is associated with greater extent of belief in symbolic immortality, which in turn predicts higher meaning in life (Horner et al., 2021a). The present research replicates and extends this prior work, showing that (1) self-reported autonomy predicts extent of belief in symbolic immortality, which mediates the relationship between autonomy and meaning in life; (2) reading about an individual with an autonomous (vs. controlled) life increases perceptions of that individual's symbolic immortality; (3) the extent to which one views an individual as feeling autonomous predicts perceptions of that individual's symbolic immortality, even after controlling for perceptions of self-esteem; and (4) perceived symbolic immortality may mediate the impact of reading about an autonomous life and perceptions of the target individual's satisfaction with life. These findings further the understanding of autonomy's role in promoting perceptions of symbolic immortality and well-being.

## Self-determination and symbolic immortality

As previously noted, various existential thinkers have observed that self-determined and choiceful engagement with life can help quell death-related anxieties and bolster well-being in the face of death (e.g., Frankl, 1959/2006; Rank, 1932/1989; see also Menaker, 1982). Additionally, research derived from TMT has demonstrated that autonomous orientations prevent MS-induced death anxiety (Horner, 2019) and defensive strivings toward symbolic immortality (e.g., Routledge et al., 2004; Vail et al., 2020), and that self-reported autonomy predicts extent of belief in symbolic immortality (Horner et al., 2021a), a finding replicated in Study 1. However, the present research extends beyond these findings by demonstrating a causal impact of autonomy on perceptions of symbolic immortality. In Study 2, participants who read about an individual with an autonomous and self-determined (vs. controlled) life rated this individual as having greater symbolic immortality. Additionally, the extent to which participants rated

the individual as feeling autonomous predicted perceived symbolic immortality. Similarly, participants in Study 3 who read about an autonomous (vs. controlled) life also rated the individual as having greater symbolic immortality. Notably, controlling for perceptions of the individual's self-esteem, the extent to which participants viewed the individual as feeling autonomous still predicted this perceived symbolic immortality.

These findings help inform previous research and shed light on potential future directions. First, these findings illustrate that autonomy seems to increase perceptions of symbolic immortality. In other words, viewing life as self-determined appears to bolster perceptions of symbolic immortality. These results suggest that the effects of autonomy in preventing typical terror management responses seen in previous research could be due to autonomous orientations affirming or increasing a sense of symbolic immortality. Indeed, some research has shown that affirming people's self-esteem and worldviews can mitigate MS effects (e.g., Schmeichel & Martens, 2005), presumably because such affirmations uphold a sense of death transcendence by bolstering people's sense of personal value and meaning. Moreover, high perceived symbolic immortality is associated with lower death-related fear and prevents typical MS-induced defensiveness (Florian & Mikulincer, 1998). Thus, in a similar vein, priming or affirming an autonomous orientation might also affirm a sense of death transcendence and prevent typical MS effects—and as the present findings suggest, this could be due to the role of autonomy in promoting a sense of symbolic immortality.

Second, controlling for self-esteem, autonomy was a significant predictor of symbolic immortality in Study 1. Additionally, although both the autonomous and controlled article excerpts in Studies 2 and 3 expressed the same level of presumed success (e.g., a meaningful career), those who read about the individual attaining these successes through autonomy and self-direction (vs. the pressures of others) viewed the individual as having greater symbolic immortality. Finally, in Study 3, the extent to which participants viewed the individual as feeling autonomous predicted perceived symbolic immortality, even after controlling for the impact of the excerpts on perceived self-esteem. Together, these findings suggest that autonomy potentially serves a unique role in fostering a sense of symbolic immortality beyond general feelings of self-esteem.

### **Autonomy, symbolic immortality, and well-being**

In addition to testing the basic relationship between autonomy and symbolic immortality, the present research was also designed to assess whether symbolic immortality would mediate the relationship between autonomy and various

indices of well-being. The results of Study 1 showed that the relationship between self-reported autonomy and meaning in life was mediated by extent of belief in symbolic immortality. In Studies 2 and 3, perceived symbolic immortality also appeared to mediate the relationship between reading the autonomous excerpt and perceived satisfaction with life, although the indirect effect through perceived symbolic immortality was only marginally different from zero in Study 3 (however, merged data from Studies 2 and 3 show that this indirect effect is significantly different from zero and holds across the combined samples, indirect effect = .09,  $SE = .04$ , 95% CI [.03, .18]). Nevertheless, together these results suggest that the relationship between autonomy and well-being might, at least in part, be explained by heightened perceptions of symbolic immortality. By feeling a sense of choice and self-direction in life, people should be better able to defend against death-related anxieties and concerns; consequently, they should then feel a stronger sense of security and be better equipped psychologically to engage in meaningful, growth-oriented experiences that enhance well-being.

On this point, SDT suggests that people are naturally oriented toward personal growth, an orientation facilitated by the satisfaction of competence, relatedness, and—perhaps most importantly—autonomy (Ryan & Deci, 2017). Yet, such growth-oriented experiences can potentially be threatening—when one ventures into novel domains and is challenged or exposed to new information, there is potential to undermine a comforting sense of value or meaning (Greenberg et al., 1995). Thus, perhaps autonomy supports this natural orientation toward personal growth by first quelling death-related existential concerns. Indeed, autonomy has been associated with reduced defensiveness and anxiety, as well as decreased suppression of emotionally-distressing information (e.g., Hodgins et al., 2006; Quested et al., 2011; Weinstein & Hodgins, 2009). Moreover, just as competence and relatedness have been shown to support terror management processes (e.g., Cox & Arndt, 2012; Mikulincer & Florian, 2000; Miller & Taubman Ben-Ari, 2004; Taubman Ben-Ari et al., 1999), autonomy may also serve a defensive function, protecting people from death-related concerns. Importantly, by buffering against this existential anxiety, autonomous functioning in life might provide people with a more secure, intrinsic foundation from which they can then engage life more fully, pursue novel experiences, and venture toward personal growth. Such an analysis has been presented elsewhere (e.g., Vail & Juhl, 2015), and future research could more pointedly explore how autonomy might serve both a protective and growth-related function. Additionally, future studies could utilize similar designs as used in prior research showing that autonomy prevents typical MS effects, but then extend this work by also including measures of symbolic immortality before measured outcomes (e.g., worldview defensiveness) to causally test the

mechanism underlying the buffering quality of autonomy/self-determination.

We note that in Study 2, DTA did not significantly differ between conditions; that is, DTA did not differ between participants who read about the target individual living an autonomous life and those who read about the target living a controlled life. Although our theoretical analysis suggests that a person's sense of autonomy might reduce their DTA, this null result is not surprising given that someone else's autonomy and symbolic immortality does not protect one from one's own death-related thoughts and concerns. So, it is not surprising that participants' own DTA was not affected by which excerpt they read. This is why the inclusion of this DTA measure at the end of the study was considered exploratory. But, future research could certainly extend beyond the experimental paradigm used in the present work to test if more personal inductions of autonomy threat would increase DTA, and whether autonomy would prevent MS-induced increases in DTA. Also, future work could assess whether different measures of DTA are more sensitive to changes in death-related cognition following such threats (as responses to the typical word-stem completion task can be related to unrelated word dimensions such as usage frequency, e.g., Naidu et al., 2020).

### Limitations and directions for further research

This small set of studies was limited in a number of ways. First, our samples were consisted of mainly White Americans. Thus, replications are needed to assess whether the findings would hold for Latinx Americans, African Americans, Asian Americans, Middle Eastern Americans, and Native Americans, and also whether they would be found for members of other nations. Another issue would be whether these findings would replicate for samples of individuals from more collectivistic cultures, as cultural contexts can impact the effects of autonomous orientations (e.g., Tripathi et al., 2018). It may be that in more collectivistic cultures, a collective sense of immortality through group identification is more important for well-being, and so autonomy may be less central for such people than a sense of having fulfilled social duties and being connected to one's group. Yet, the relationship between

autonomy and well-being has been demonstrated cross-culturally (e.g., Chen et al., 2015; Church et al., 2012), so it may be especially relevant to identify the extent to which people actually autonomously endorse the individualistic or collectivistic values and norms of their culture, and to examine how this relates to their perceived symbolic immortality and well-being.

Second, these three studies used the same measures of symbolic immortality, so it would be useful to assess whether other operationalizations of this construct would yield similar results. In addition, Studies 2 and 3 asked participants to read about an older adult's life as being autonomous or controlled rather than one's own. As previously mentioned, we decided to do this for several reasons. First, it can be difficult to meaningfully manipulate how autonomously individuals view their own life pursuits, and we thought this might be especially true for online research. Second, it makes sense that a sense of autonomy would be linked to symbolic immortality, especially with regard to things one has already accomplished in life. This is why the excerpts referred to an older adult looking back over their life. However, further research is needed to determine if similar findings would hold if autonomy were successfully manipulated for oneself and for people in different stages of their lives.

Third, the excerpts focused on success, so future research could investigate how autonomy might promote a sense of death transcendence based not on a sense of achievement or success per se, but instead based on the ability to exercise a sense of control and self-authorship in life even without success. Moreover, future research could also investigate how self-determined functioning and autonomy-supportive environments might help people with disrupted sources of meaning and value (e.g., post-traumatic stress, Pyszczynski & Kesebir, 2011; low self-esteem, Routledge et al., 2010); although increasing meaning in life and self-esteem directly may be difficult, perhaps developing a sense of autonomy can more easily provide people a route to feeling that they are active, authentic, and unique contributors to something meaningful, which in turn could help bolster their sense of meaning in life and personal value.

Fourth, we note that while symbolic immortality mediated the relationships between autonomy and both

meaning in life and, to some extent, perceived satisfaction with life, these findings should be replicated.<sup>1</sup> Also, the indirect effect on perceived regret in Study 3 was not significantly different from zero. In other words, although reading the autonomous excerpt predicted perceived symbolic immortality, symbolic immortality did not predict perceived regret. It makes sense that people may regret not having been more active in choosing their life path without symbolic immortality having anything to do with that. However, future research might continue to explore the impact of autonomy and symbolic immortality on regret, e.g., by testing whether reflecting on one's own autonomy (rather than reading about someone else) predicts feelings of regret through personal extent of belief in symbolic immortality.

More broadly, these varied results on the different well-being measures highlight important avenues for future research. Autonomy was significantly associated with meaning in life (Study 1) and predicted both satisfaction with life (Studies 2 and 3) and perceived regret (Study 3). Such findings are consistent with the view that autonomy helps to

support overall well-being (Ryan & Deci, 2017). However, symbolic immortality mediated this relationship for meaning in life and, to some extent, satisfaction with life, but not regret. Moreover, the indirect effect appeared stronger for meaning in life and held after controlling for self-esteem, whereas the indirect effect on satisfaction in life was non-significant after controlling for perceived self-esteem. These findings point to the possibility that various aspects of well-being may be differentially impacted by autonomy, self-esteem, and feelings of symbolic immortality.

One possibility is that a bolstered sense of symbolic immortality resulting from autonomous functioning might help to support the perception that life is meaningful and purposeful, and that qualms and regrets about life are tangential to whether or not people feel like they have made a lasting impression—in other words, although someone might regret not doing more in life or perhaps does not feel particularly satisfied, they may still feel certain that they have done at least enough to leave a lasting impression that will endure long after they die. Future research could contribute to this understanding by (1) experimentally testing the impact of autonomy on meaning in life through symbolic immortality, because the data in Study 1 were only correlational; (2) including multiple well-being outcomes and additional mediating variables along with symbolic immortality, allowing for comparisons of potential explanatory models; and (3) utilizing different autonomy manipulations, such as having participants describe how their own lives are autonomous and self-determined.

Finally, the present findings illustrate that autonomy and self-esteem may be similar yet different contributors to terror management processes, at least in regard to bolstering symbolic immortality. In Study 1, autonomy and self-esteem were significantly correlated (consistent with previous research, e.g., Hodgins et al., 2007), but both were distinct significant predictors of symbolic immortality. In Study 2, although both excerpts expressed the same level of measurable successes (e.g., career, home; used as proxies for self-esteem), participants who read the autonomous excerpt rated the target individual as having significantly higher symbolic immortality. In Study 3, this pattern of results remained, and although the manipulation effect was non-significant after controlling for its effect on perceived self-esteem, the extent to which participants viewed the target as living autonomously significantly predicted perceived symbolic immortality after controlling for perceived self-esteem. Thus, although autonomy and self-esteem appear to be related, the theoretical analysis presented above, as well as the combined findings from the present work, suggest that autonomy may contribute to symbolic immortality in ways that are separate from self-esteem.

However, caution should be exercised against claiming definitively from these findings that autonomy plays a role

<sup>1</sup> Recent recommendations (e.g., Pieters, 2017) suggest that mediation models should be based on a priori theoretical analyses building on prior research, and the ones we developed and tested were indeed based on an a priori integration of theory and research concerning terror management and self-determination. However, an anonymous reviewer asked us to test an alternative model in which autonomy increases life meaning or satisfaction, which in turn increases symbolic immortality, and we are thankful for the suggestion. The reviewer posited this alternative model would fit the meaning maintenance model (Heine et al., 2006), which, much like cognitive dissonance theory, proposes that people strive to sustain expected connections among their cognitions, and when cognitions do not fit, people compensate by increasing meaning in some way. We do not believe this model offers predictions regarding if or how autonomy and symbolic immortality relate to life meaning or satisfaction. If a person views their life as meaningful, it is not clear from the meaning maintenance model why they would need autonomy or symbolic immortality at all, or why these two variables would relate to more meaning or satisfaction. In contrast, TMT and SDT posit clear functions of perceived autonomy and symbolic immortality for well-being, and these are supported by their research programs. However, it is plausible from a self-determination perspective that autonomy might make life seem more meaningful or satisfying, and this might lead people to feel that they are making a more permanent mark on the world, thus increasing symbolic immortality. Indeed, when we tested whether there was an indirect effect of autonomy on symbolic immortality through meaning and satisfaction with life, the indirect effects were significant: Study 1 (indirect effect = .48,  $SE = .05$ , 95% CI [.40, .58]), Study 2 (indirect effect = 1.03,  $SE = .41$ , 95% CI [.23, 1.87]), and Study 3 (indirect effect = .94,  $SE = .38$ , 95% CI [.20, 1.70]). This suggests that either the a priori mediation model or this alternative mediation model could account for the relations among the variables, and longitudinal studies would be needed to determine if it is more likely that greater perceived symbolic immortality leads to more subsequent meaning and satisfaction with life or that more meaning and satisfaction with life contributes to subsequent greater perceived symbolic immortality.

entirely separate from self-esteem. Our intent was to try to manipulate autonomy without manipulating self-esteem, and the results of Study 3 indicated that we did not accomplish that. In addition, using self-report data, self-esteem has been found to be related to symbolic immortality across multiple samples in other work (Lifshin et al., 2021) as well as in Study 1. In contrast, rather than self-report data, Study 3 assessed people's perceptions of a target individual. It is possible that assessing someone else's self-esteem with this measure is not as sensitive as people assessing their own self-esteem. This is another reason why future research is needed to attempt to assess our hypotheses by trying to manipulate mature adult participants' own sense of having lived an autonomous vs. controlled life. So, although the measure of perceived autonomy seemed to be more predictive of perceived symbolic immortality than the measure of perceived self-esteem, further research will be needed to be definitive about the relative roles of the clearly related variables of autonomy and self-esteem in perceived symbolic immortality and well-being.

## Conclusion

The present work replicates previous correlational research by showing that self-reported autonomy predicts extent of belief in symbolic immortality, which mediates the relationship between autonomy and meaning in life. It also provides the first experimental evidence for the impact of autonomy on increasing perceptions of symbolic immortality. Specifically, participants who read about a successful individual with an autonomous (vs. controlled) life reported greater perceptions of the target individual's symbolic immortality, and the extent to which people viewed the target individual as feeling autonomous predicted their perceptions of the individual's symbolic immortality. The findings shed light on the potential unique role of autonomy in bolstering a sense of death transcendence beyond general self-esteem. This topic has been relatively unexplored, so further research is needed to better understand the dynamic between autonomy and self-esteem in their contributions to supporting a sense of death transcendence. We hope these novel findings contribute to this understanding and help facilitate future theoretical and empirical advancements.

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**Data availability** Data for this research are available online: <https://researchbox.org/340>.

## Declarations

**Conflict of interest** No potential conflict of interest was reported by the authors.

## References

- Adie, J. W., Duda, J. L., & Ntoumanis, N. (2008). Autonomy support, basic need satisfaction and the optimal functioning of adult male and female sport participants: A test of basic needs theory. *Motivation and Emotion*, 32(3), 189–199. <https://doi.org/10.1007/s11031-008-9095-z>
- Arndt, J., Greenberg, J., Solomon, S., Pyszczynski, T., & Simon, L. (1997). Suppression, accessibility of death-related thoughts, and cultural worldview defense: Exploring the psychodynamics of terror management. *Journal of Personality and Social Psychology*, 73(1), 5–18.
- Arndt, J., Schimel, J., Greenberg, J., & Pyszczynski, T. (2002). The intrinsic self and defensiveness: Evidence that activating the intrinsic self reduces self-handicapping and conformity. *Personality and Social Psychology Bulletin*, 28(5), 671–683. <https://doi.org/10.1177/0146167202288011>
- Becker, E. (1971). *The birth and death of meaning* (2nd ed.). Free Press.
- Becker, E. (1973). *The denial of death*. Free Press.
- Boyd, P., Morris, K. L., & Goldenberg, J. L. (2017). Open to death: A moderating role of openness to experience in terror management. *Journal of Experimental Social Psychology*, 71, 117–127. <https://doi.org/10.1016/j.jesp.2017.03.003>
- Bradshaw, E. L., Ryan, R. M., Noetel, M., Saeri, A. K., Slattery, P., Grundy, E., & Calvo, R. (2021). Information safety assurances increase intentions to use COVID-19 contact tracing applications, regardless of autonomy-supportive or controlling message framing. *Frontiers in Psychology*, 11, 1–11. <https://doi.org/10.3389/fpsyg.2020.591638>
- Chen, B., Vansteenkiste, M., Beyers, W., Boone, L., Deci, E. L., Van der Kaap-Deeder, J., Duriez, B., Lens, W., Matos, L., Mouratidis, A., Ryan, R. M., Sheldon, K. M., Soenens, B., Van Petegem, S., & Verstuyf, J. (2015). Basic psychological need satisfaction, need frustration, and need strength across four cultures. *Motivation and Emotion*, 39(2), 216–236. <https://doi.org/10.1007/s11031-014-9450-1>
- Church, A. T., Katigbak, M. S., Locke, K. D., Zhang, H., Shen, J., de Jesús Vargas-Flores, J., Ibáñez-Reyes, J., Tanaka-Matsumi, J., Curtis, G. J., Cabrera, H. F., Mastor, K. A., Alvarez, J. M., Ortiz, F. A., Simon, J. R., & Ching, C. M. (2012). Need satisfaction and well-being: Testing self-determination theory in eight cultures. *Journal of Cross-Cultural Psychology*, 44(4), 507–534. <https://doi.org/10.1177/0022022112466590>
- Cohen, J. (1992). A power primer. *Psychological Bulletin*, 112(1), 155–159.
- Cox, C. R., & Arndt, J. (2012). How sweet it is to be loved by you: The role of perceived regard in the terror management of close relationships. *Journal of Personality and Social Psychology*, 102(3), 616–632. <https://doi.org/10.1037/a0025947>
- Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. Plenum.
- Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The satisfaction with life scale. *Journal of Personality Assessment*, 49(1), 71–75. [https://doi.org/10.1207/s15327752jpa4901\\_13](https://doi.org/10.1207/s15327752jpa4901_13)
- Florian, V., & Mikulincer, M. (1998). Symbolic immortality and the management of the terror of death: The moderating role of



- attachment style. *Journal of Personality and Social Psychology*, 74(3), 725–734. <https://doi.org/10.1037/0022-3514.74.3.725>
- Frankl, V. E. (1959). *Man's search for meaning* (I. Lasch, Trans.). Beacon Press
- Fritsche, I., Jonas, E., Fischer, P., Koranyi, N., Berger, N., & Fleischmann, B. (2007). Mortality salience and the desire for offspring. *Journal of Experimental Social Psychology*, 43(5), 753–762. <https://doi.org/10.1016/j.jesp.2006.10.003>
- George, L. S., & Park, C. L. (2016). Meaning in life as comprehension, purpose, and mattering: Toward integration and new research questions. *Review of General Psychology*, 20(3), 205–220. <https://doi.org/10.1037/gpr0000077>
- Greenberg, J., Martens, A., Jonas, E., Eisenstadt, D., Pyszczynski, T., & Solomon, S. (2003). Psychological defense in anticipation of anxiety: Eliminating the potential for anxiety eliminates the effect of mortality salience on worldview defense. *Psychological Science*, 14(5), 516–519. <https://doi.org/10.1111/1467-9280.03454>
- Greenberg, J., Pyszczynski, T., & Solomon, S. (1986). The causes and consequences of a need for self-esteem: A terror management theory. In R. F. Baumeister (Ed.), *Public self and private self* (pp. 189–212). Springer.
- Greenberg, J., Pyszczynski, T., & Solomon, S. (1995). Toward a dual-motive depth psychology of self and social behavior. In M. H. Kernis (Ed.), *Efficacy, agency, and self-esteem* (pp. 73–99). Plenum.
- Greenberg, J., Solomon, S., Pyszczynski, T., Rosenblatt, A., Burling, J., Lyon, D., Simon, L., & Pinel, E. (1992). Why do people need self-esteem? Converging evidence that self-esteem serves an anxiety-buffering function. *Journal of Personality and Social Psychology*, 63(6), 913–922.
- Greenberg, J., Vail, K., & Pyszczynski, T. (2014). Terror management theory and research: How the desire for death transcendence drives our strivings for meaning and significance. *Advances in motivation science* (pp. 85–134). Elsevier Academic Press.
- Hart, J. (2019). What's death got to do with it? Controversies and alternative theories. In C. Routledge & M. Vess (Eds.), *Handbook of terror management* (pp. 65–83). Elsevier Academic Press.
- Hayes, A. F. (2017). *Introduction to mediation, moderation, and conditional process analysis* (2nd ed.). Guilford Publications.
- Heine, S. J., Proulx, T., & Vohs, K. D. (2006). The meaning maintenance model: On the coherence of social motivations. *Personality and Social Psychology Review*, 10(2), 88–110. [https://doi.org/10.1207/s15327957pspr1002\\_1](https://doi.org/10.1207/s15327957pspr1002_1)
- Hodgins, H. S., Brown, A. B., & Carver, B. (2007). Autonomy and control motivation and self-esteem. *Self and Identity*, 6, 189–208. <https://doi.org/10.1080/15298860601118769>
- Hodgins, H. S., Yacko, H. A., & Gottlieb, E. (2006). Autonomy and nondefensiveness. *Motivation and Emotion*, 30, 283–293. <https://doi.org/10.1007/s11031-006-9036-7>
- DE Horner 2019. *Mortality salience and the effects of autonomy on death anxiety* [Thesis]. Cleveland State University.
- Horner, D. E., Sielaff, A. R., & Greenberg, J. (2021). Autonomy, meaning, and the mediating role of symbolic immortality. *Journal of Humanistic Psychology*. <https://doi.org/10.1177/0022167821991376>
- Horner, D. E., Sielaff, A., Pyszczynski, T., & Greenberg, J. (2021b). The role of perceived level of threat, reactance proneness, political orientation, and coronavirus salience on health behavior intentions. *Psychology & Health*. <https://doi.org/10.1080/08870446.2021.1982940>
- Juhl, J., & Routledge, C. (2016). Putting the terror in terror management theory: Evidence that the awareness of death does cause anxiety and undermine psychological well-being. *Current Directions in Psychological Science*, 25(2), 99–103. <https://doi.org/10.1177/0963721415625218>
- Kaur, R. (2017). *The sun and her flowers*. Andrews McMeel Publishing.
- Landau, M. J., Greenberg, J., & Sullivan, D. (2009). Managing terror when self-worth and worldviews collide: Evidence that mortality salience increases reluctance to self-enhance beyond authorities. *Journal of Experimental Social Psychology*, 45(1), 68–79. <https://doi.org/10.1016/j.jesp.2008.08.007>
- Lifshin, U., Horner, D. E., Helm, P. J., Solomon, S., & Greenberg, J. (2021). Self-esteem and immortality: Evidence regarding the terror management hypothesis that high self-esteem is associated with a stronger sense of symbolic immortality. *Personality and Individual Differences*. <https://doi.org/10.1016/j.paid.2021.110712>
- Martela, F., Ryan, R. M., & Steger, M. F. (2018). Meaningfulness as satisfaction of autonomy, competence, relatedness, and beneficence: Comparing the four satisfactions and positive affect as predictors of meaning in life. *Journal of Happiness Studies*, 19(5), 1261–1282. <https://doi.org/10.1007/s10902-017-9869-7>
- Menaker, E. (1982). *Otto Rank: A rediscovered legacy*. Columbia University Press.
- Menaker, E. (1998). Otto Rank's conception of the will. *Journal of Religion and Health*, 37(1), 9–14. <https://doi.org/10.1023/A:1022952831767>
- Mikulincer, M., & Florian, V. (2000). Exploring individual differences in reactions to mortality salience: Does attachment style regulate terror management mechanisms? *Journal of Personality and Social Psychology*, 79(2), 260–273. <https://doi.org/10.1037/0022-3514.79.2.260>
- Miller, G., & Taubman Ben-Ari, O. (2004). Scuba diving risk taking: A terror management theory perspective. *Journal of Sport & Exercise Psychology*, 26, 269–282.
- Naidu, P. A., Hine, T. J., & Glendon, A. I. (2020). Methodological weakness of the death-word-fragment task: Alternative implicit death anxiety measures. *Death Studies*. <https://doi.org/10.1080/07481187.2020.1846228>
- Peters, H. J., Greenberg, J., Williams, J. M., & Schneider, N. R. (2005). Applying terror management theory to performance: Can reminding individuals of their mortality increase strength output? *Journal of Sport & Exercise Psychology*, 27, 111–116.
- Pieters, R. (2017). Meaningful mediation analysis: Plausible causal inference and informative communication. *Journal of Consumer Research*, 44(3), 692–716. <https://doi.org/10.1093/jcr/ucx081>
- Pyszczynski, T., Greenberg, J., & Goldenberg, J. L. (2003). Freedom versus fear: On the defense, growth, and expansion of the self. In M. R. Leary & J. P. Tangney (Eds.), *Handbook of self and identity* (pp. 314–343). Guilford Press.
- Pyszczynski, T., Greenberg, J., Solomon, S., Arndt, J., & Schimel, J. (2004). Why do people need self-esteem? A theoretical and empirical review. *Psychological Bulletin*, 130(3), 435–468. <https://doi.org/10.1037/0033-2909.130.3.435>
- Pyszczynski, T., & Kesebir, P. (2011). Anxiety buffer disruption theory: A terror management account of posttraumatic stress disorder. *Anxiety, Stress, & Coping*, 24(1), 3–26. <https://doi.org/10.1080/10615806.2010.517524>
- Quested, E., Bosch, J. A., Burns, V. E., Cumming, J., Ntoumanis, N., & Duda, J. L. (2011). Basic psychological need satisfaction, stress-related appraisals, and dancers' cortisol and anxiety responses. *Journal of Sport & Exercise Psychology*, 33, 828–846. <https://doi.org/10.1123/jsep.33.6.828>
- Rank, O. (1932). *Art and artist: Creative urge and personality development*. Norton.
- Reis, H. T., Sheldon, K. M., Gable, S. L., Roscoe, J., & Ryan, R. M. (2000). Daily well-being: The role of autonomy, competence, and relatedness. *Personality and Social Psychology Bulletin*, 26(4), 419–435. <https://doi.org/10.1177/0146167200266002>
- Robins, R. W., Hendin, H. M., & Trzesniewski, K. H. (2001). Measuring global self-esteem: Construct validation of a single-item measure and the Rosenberg self-esteem scale. *Personality and*

- Social Psychology Bulletin*, 27(2), 151–161. <https://doi.org/10.1177/0146167201272002>
- Rosenberg, M. (1965). *Society and the adolescent self-image*. Princeton University Press.
- Routledge, C., Arndt, J., & Sheldon, K. M. (2004). Task engagement after mortality salience: The effects of creativity, conformity and connectedness on worldview defense. *European Journal of Social Psychology*, 34(4), 477–487. <https://doi.org/10.1002/ejsp.209>
- Routledge, C., & Juhl, J. (2010). When death thoughts lead to death fears: Mortality salience increases death anxiety for individuals who lack meaning in life. *Cognition and Emotion*, 24(5), 848–854. <https://doi.org/10.1080/02699930902847144>
- Routledge, C., Ostafin, B., Juhl, J., Sedikides, C., Cathey, C., & Liao, J. (2010). Adjusting to death: The effects of mortality salience and self-esteem on psychological well-being, growth motivation, and maladaptive behavior. *Journal of Personality and Social Psychology*, 99(6), 897–916. <https://doi.org/10.1037/a0021431>
- Routledge, C., & Vess, M. (2019). *Handbook of terror management*. Elsevier Academic Press.
- Ryan, R. M., & Deci, E. L. (2004). Autonomy is no illusion: Self-determination theory and the empirical study of authenticity, awareness, and will. In J. Greenberg, S. L. Koole, & T. Pyszczynski (Eds.), *Handbook of experimental existential psychology* (pp. 455–485). Guilford Press.
- Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. Guilford Press.
- Schimmel, J., Arndt, J., Pyszczynski, T., & Greenberg, J. (2001). Being accepted for who we are: Evidence that social validation of the intrinsic self reduces general defensiveness. *Journal of Personality and Social Psychology*, 80(1), 35–52. <https://doi.org/10.1037/0022-3514.80.1.35>
- Schmeichel, B. J., & Martens, A. (2005). Self-affirmation and mortality salience: Affirming values reduces worldview defense and death-thought accessibility. *Personality and Social Psychology Bulletin*, 31(5), 658–667. <https://doi.org/10.1177/0146167204271567>
- Schwartz, B., Ward, A., Monterosso, J., Lyubomirsky, S., White, K., & Lehman, D. R. (2002). Maximizing versus satisficing: Happiness is a matter of choice. *Journal of Personality and Social Psychology*, 83(5), 1178–1197. <https://doi.org/10.1037/0022-3514.83.5.1178>
- Sheldon, K. M., Ryan, R., & Reis, H. T. (1996). What makes for a good day? Competence and autonomy in the day and in the person. *Personality and Social Psychology Bulletin*, 22(12), 1270–1279. <https://doi.org/10.1177/01461672962212007>
- Steger, M. F., Frazier, P., Oishi, S., & Kaler, M. (2006). The meaning in life questionnaire: Assessing the presence of and search for meaning in life. *Journal of Counseling Psychology*, 53(1), 80–93. <https://doi.org/10.1037/0022-0167.53.1.80>
- Steger, M. F., & Samman, E. (2012). Assessing meaning in life on an international scale: Psychometric evidence for the meaning in life questionnaire-short form among Chilean households. *International Journal of Wellbeing*, 2(3), 182–195.
- Taubman Ben-Ari, O., Florian, V., & Mikulincer, M. (1999). The impact of mortality salience on reckless driving: A test of terror management mechanisms. *Journal of Personality and Social Psychology*, 76(1), 35–45. <https://doi.org/10.1037/0022-3514.76.1.35>
- Thoemmes, F. (2015). Reversing arrows in mediation models does not distinguish plausible models. *Basic and Applied Social Psychology*, 37, 226–234. <https://doi.org/10.1080/01973533.2015.1049351>
- Tripathi, R., Cervone, D., & Savani, K. (2018). Are the motivational effects of autonomy-supportive conditions universal? Contrasting results among Indians and Americans. *Personality and Social Psychology Bulletin*, 44(9), 1287–1301. <https://doi.org/10.1177/0146167218764663>
- Vail, K. E., Conti, J. P., Goad, A. N., & Horner, D. E. (2020). Existential threat fuels worldview defense, but not after priming autonomy orientation. *Basic and Applied Social Psychology*, 42(3), 150–166. <https://doi.org/10.1080/01973533.2020.1726747>
- Vail, K. E., & Juhl, J. (2015). An appreciative view of the brighter side of terror management processes. *Social Sciences*, 4(4), 1020–1045. <https://doi.org/10.3390/socsci4041020>
- Van Hiel, A., & Vansteenkiste, M. (2009). Ambitions fulfilled? The effects of intrinsic and extrinsic goal attainment on older adults' ego-integrity and death attitudes. *The International Journal of Aging and Human Development*, 68(1), 27–51. <https://doi.org/10.2190/AG.68.1.b>
- VanVoorhis, C. R. W., & Morgan, B. L. (2007). Understanding power and rules of thumb for determining sample sizes. *Tutorials in Quantitative Methods for Psychology*, 3(2), 43–50.
- Watson, D., & Clark, L. A. (1994). *The PANAS-X: Manual for the Positive and Negative Affect Schedule—Expanded Form*. The University of Iowa.
- Weinstein, N., & Hodgins, H. S. (2009). The moderating role of autonomy and control on the benefits of written emotion expression. *Personality and Social Psychology Bulletin*, 35(3), 351–364. <https://doi.org/10.1177/0146167208328165>
- Weinstein, N., Przybylski, A. K., & Ryan, R. M. (2012a). The index of autonomous functioning: Development of a scale of human autonomy. *Journal of Research in Personality*, 46, 397–413. <https://doi.org/10.1016/j.jrp.2012.03.007>
- Weinstein, N., Ryan, R. M., & Deci, E. L. (2012b). Motivation, meaning, and wellness: A self-determination perspective on the creation and internalization of personal meanings and life goals. In P. T. P. Wong (Ed.), *The human quest for meaning: Theories, research, and applications* (pp. 81–106). Routledge/Taylor & Francis Group.
- Williams, T., Schimmel, J., & Martens, A. (2010). The moderating role of extrinsic contingency focus on reactions to threat. *European Journal of Social Psychology*, 40(2), 300–320. <https://doi.org/10.1002/ejsp.624>
- Zestcott, C. A., Lifshin, U., Helm, P., & Greenberg, J. (2016). He dies, he scores: Evidence that reminders of death motivate improved performance in basketball. *Journal of Sport & Exercise Psychology*, 38, 470–480. <https://doi.org/10.1123/jsep.2016-0025>

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