

Understanding the Paradox of Opposition to Long-term Extension of Human Life

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Human beings, like all other living things, have a strong propensity for self-preservation and continued experience. But unlike any other species, human beings are aware that death is inevitable, could come at any time, and could entail a great deal of pain and suffering. *Terror management theory* (TMT; Greenberg, Pyszczynski, & Solomon, 1986) posits that awareness of death in an animal that wants desperately to live creates the potential for overwhelming terror, which would seriously undermine adaptive behavior and make life unlivable unless effectively managed. Given this profound desire for life and deeply rooted fear of death, it is paradoxical that “a large portion of the general public reject the idea that it may be a good thing to combat aging by medical means” (de Grey, cited in Moody et al., 2010). The proposed research will address the psychological processes that lead people to oppose efforts to radically extend the human lifespan by remediating the aging process.

Research suggests that people point to a variety of potential societal problems, such as overpopulation, inequitable distribution of life-extending treatments, and other potential risks as reasons they oppose scientific advances that could produce greatly enhanced longevity (e.g., Underwood, Bartlett, Hall, Partridge, & Lucke, 2009). Although such rational considerations likely play a role in producing opposition to long term life extension (LTLE), the vociferousness of some objections to this possibility suggest that less rational fears and motives may also be involved. The proposed research will use ideas and research methods from TMT to: (1) explore psychological and cultural factors that encourage opposition to LTLE by illuminating the interplay between rational and irrational forces that encourage such attitudes, (2) specify individual differences and situational forces that promote more and less favorable attitudes toward LTLE, and (3) set the stage for developing strategies to promote greater acceptance and support for research aimed at LTLE.

There is a long history of psychological analyses of the interplay between rational and irrational factors in the genesis of attitudes, beliefs, and judgments (e.g., Kruglanski, 1980; Petty & Caccippo, 1986). For example, Kruglanski’s (1980) *lay epistemology theory* posits that attitudes result from the dynamic interplay of the needs for structure (a quick and simple conclusion), the fear of invalidity (desire for accurate conclusions), and the need for specific beliefs (conclusions that fit one’s unique psychological needs). Our own *biased hypothesis-testing model* of social inference (Pyszczynski & Greenberg, 1987) explores the ways these competing needs influence the cognitive processes that produce beliefs and attitudes. This work suggests that in order for need-fulfilling conclusions to be effective, people must maintain an *illusion of objectivity* so that they can believe that their conclusions are logically derived from the available information. This leads people to preferentially seek information and generate ideas that fit their desired conclusions. This suggests that people’s attitudes toward long-term life extension likely entail a process in which rational reasoning is biased by their fears and needs. To

maintain their illusion of objectivity, people are likely to generate seemingly rational arguments to support attitudes that are ultimately driven by deep fears of which they may have little conscious awareness.

How the Fear of Death Affects Life

TMT posits that early humans “solved” the problem of death by using the same sophisticated intellectual abilities that made them aware of this unfortunate reality to create cultural worldviews that help them manage their terror. The potential for terror put a “press” on emerging explanations for existence so that there were strong payoffs for people to invent beliefs and ideas that kept their anxiety at bay by providing hope of transcending death, either literally or symbolically. Literal immortality is provided by cultural beliefs that promise that life will continue in some form after physical death. Symbolic immortality is provided by cultural beliefs, values, and institutions that enable people to believe that some part of themselves continues to exist after physical death. People attain symbolic immortality by construing themselves as valued parts of something greater than themselves, such as a family, community, nation, or scientific discipline. Because these death-denying beliefs are fragile human constructions that often defy observable experience, they require consensual validation for their maintenance and effective functioning. Those who share one’s worldview increase one’s faith in it; those with different worldviews threaten it. This leads to the ubiquitous human tendency to be attracted to those who share one’s worldview and repulsed by those with conceptions different from one’s own. TMT posits that the fear of death lies at the root of the human needs for meaning and personal significance (self-esteem) and consequently plays an important role in much of what people do.

To date, well over 500 studies conducted in more than 20 countries have supported the fundamental propositions of TMT. This research has shown that: (a) increasing self-esteem or faith in their worldviews makes people less vulnerable to anxiety following death-related threats; (b) subtle reminders of death (mortality salience; MS) increases positive reactions to those who support one’s worldview and negative reactions to those who threaten it and increases striving for self-esteem; these effects have been obtained relative to a diverse array of control conditions; (c) increasing self-esteem or validating one’s worldview eliminates the effect of death reminders on worldview defense and self-esteem striving; (d) threats to self-esteem or worldview increase the accessibility of death-related thoughts; conversely, boosts to self-esteem or faith in one’s worldview reduce the accessibility of death-related thoughts; and (e) evidence of the existence of consciousness after physical death eliminates MS effects on self-esteem striving and worldview defense. These effects have been observed across a multitude of different aspects of cultural worldviews, sources of self-esteem, and types of interpersonal relationships. For a recent review of this research, see Greenberg, Solomon, and Arndt (2008).

Given the great lengths to which people go to deny their mortality, why do so many disapprove of scientific research aimed at drastically increasing human life expectancy by reversing the effects of aging? It seems likely that both rational and irrational forces are involved in producing these attitudes. On the rational side, people

attempt to integrate new information and ideas with their current understanding of the world and consider the implications of the new ideas for their projections for the future. New ideas that fit well with their pre-existing knowledge and imply good things for the future are usually accepted, whereas ideas that are difficult or impossible to integrate with their pre-existing conceptions and imply undesirable futures are usually rejected. This suggests that ideas about LTLE might be rejected, on a purely rational basis, because they contradict strongly held beliefs or imply plausible problems for the future. Thus the possibility of LTLE might be rejected because it conflicts with the strongly held belief that life must inevitably end, that the average life expectancy is 75 to 80 years, and that no human beings have yet been documented to live longer than 122 years. Consequently, people may thus conclude that LTLE is simply implausible. People may also believe that life extension treatments would not be affordable or won't be developed in time to help them, so it's not personally useful. They may also quite rationally imagine a variety of negative consequences of LTLE, such as overpopulation, greater scarcity of resources, and inequality in who gets access to these technologies, suggesting it is problematic for humankind.

Given the obvious connection between issues of longevity and the ubiquitous human fear of death, coupled with the role that extant cultural worldviews play in managing this fear, it is likely that less rational existential fears might also reduce acceptance of radical life extension technologies. To the extent that people need to maintain an illusion of objectivity regarding their attitudes, their "rational" arguments against these technologies may be at least partially driven by existential fears. We propose three general reasons why a fear of death might paradoxically motivate people to oppose LTLE.

First, such technologies may be construed as contradicting the beliefs and values that people currently use to manage their death concerns. Efforts to extend life indefinitely may seem to imply that we are simply material creatures rather than beings with an immortal soul. If there is an afterlife, extraordinary efforts to extend the lifespan should not be needed. "Solving" death by forestalling it threatens the sufficiency of the conventional solutions of belief in an afterlife and reliance on the symbolic immortality of making a permanent mark on the world. Thus, greatly expanding the lifespan runs counter to the standard bases of terror management we are socialized into as we become imbedded in our cultural worldviews. For many religious people, LTLE might also be construed as violating the wishes of the deity from whom they hope to obtain a blissful afterlife. Even widely accepted medical procedures are prohibited and derided as attempts to "play God" by some fundamentalist groups. TMT research has shown that reminders of death increase belief in God and life after death and that challenges to religious beliefs increase the accessibility of death-related thoughts, especially among highly religious persons and those with fundamentalist religious orientations (for a review, see Vail et al., 2010). Consistent with occasional newspaper reports, research has shown that after a reminder of death, certain religious beliefs lead people to reject even widely accepted current medical procedures that save lives. The fact that life-extending technologies are often associated with a scientific worldview that some people view as incompatible with religious faith may further increase resistance to such ideas among

those who heavily invested in religion. Even non-religious people may feel that efforts toward LTLE reflect human hubris, and go against the laws of nature

Beyond these ways in which efforts to extend the lifespan threaten prevailing ways of coping with death, LTLE also may be disturbing simply because it runs contrary to what we have all been led to believe about reality: that death is inevitable. One of the hardest lessons we all learn as children is that life is short and death is certain. We also learn of the foolhardiness of historical and mythical characters' ultimately unsuccessful attempts to defeat death. Indeed, this theme has appeared in many cultural products, from the ancient Epic of Gilgamesh, to vampire and zombie stories, to Faust, to Frankenstein, to the recent film Prometheus. TMT research has shown that reminders of death increase preference for well-structured, conventional views of the world (for a review, see Greenberg, Landau, & Arndt, in press) and that threats to perceived structure increase the accessibility of death-related thoughts; these effects are strongest among people with high needs for structure. A third irrational contributor to LTLE is cognitive dissonance reduction (Festinger, 1957) in the form of the "sour grapes" effect. Because it seems inconsistent to want something you cannot have, as long as people doubt a very long lifespan is feasible for them, they are likely to try to reduce such dissonance by convincing themselves that they do not want what they cannot have. Research has shown that reminders of death increase such efforts to change one's attitudes to reduce cognitive dissonance (Jonas et al., 2003).

An ironic consequence of these three irrational psychological forces is that although people consciously or unconsciously wish death was not inevitable, the possibility of LTLE is likely to bring death thoughts closer to mind, increasing resistance to this idea because it violates their existing security-providing view of the world. In these ways, the desire for immortality and enhanced longevity might encourage irrational rejection of life-extending scientific advances.

TMT research has shown that the problem of death increases the tendency to cling to one's cultural worldview primarily when such thoughts are outside of conscious awareness; that is, when they are highly accessible but outside of current focal attention (Pyszczynski, Greenberg, & Solomon, 1999). When thoughts of death are conscious, people tend to cope in more rational ways, by focusing on practical things they can do to increase their health and thus increase their longevity. For example, Routledge et al. (2004) found that immediately after a death reminder, sunbathers were more likely to choose sunscreen with *high* levels of SPF. This makes good sense because sunscreen is thought to provide protection against cancer. However, 10 minutes later, when death-related thoughts had faded from awareness but remained accessible, they chose especially *low* levels of SPF, to get a better tan, which serves their desired appearance and feeds their self-esteem. The effects of death reminders on thoroughness of breast self-examinations and intentions to exercise and quit smoking show a similar time course, with life-extending behavior increasing while thoughts of death are in conscious attention but worldview and esteem enhancing behaviors, which often run counter to a healthy and long life, increasing when such thoughts are on the fringes of consciousness. This

suggests that the fear of death will produce different effects on attitudes toward LTLE, depending on whether they are conscious or not.

These ideas suggest a rather complex interplay between rational and irrational forces affecting attitudes toward LTLE. Information suggesting implausibility or negative consequences of these technologies would be expected to decrease support for LTLE in a relatively rational manner. When concerns about one's own mortality are in current consciousness they are likely to promote rational self-interest; this may or may not lead to more favorable attitudes toward LTLE depending on perceived feasibility for oneself. However, when concerns about one's own mortality are on the fringes of consciousness they are likely to engage terror management processes that lead to less favorable attitudes toward LTLE. Depending on the person and his or her worldview, this might reflect death concerns increasing commitment to either the literal immortality associated with religious faith or the symbolic immortality associated with the value of rationality and scientific skepticism or simply to the widely accepted notion that death is inevitable and unavoidable. Regardless of which path fear-based rejection of LTLE takes, it would be expected to increase the appeal of arguments about the implausibility and negative societal consequences of LTLE because this provides a rational explanation and illusion of objectivity for one's rejection of the otherwise desirable prospect of LTLE.

Research Plan

All of the proposed studies will be conducted using state of the art research methods and statistical analyses that have been used extensively in our previous published research. Each of the research objectives presented below entails multiple studies with the goal of providing converging evidence for the central ideas in our analysis of psychological forces that affect attitudes toward LTLE. The nature of specific studies will depend on and build on the findings of our initial studies.

Preliminary assessment of predictors of attitudes toward LTLE. As a first step we will develop measures of beliefs regarding the plausibility, feasibility for self, and desirability of LTLE and endorsement of a variety of potential positive and negative consequences (used as objections) of LTLE. We will assess these in a survey conducted online along with variables that may be associated with such beliefs. We will include a wide range of demographic variables and personality attributes likely to be related to these beliefs, such as religiosity, religious fundamentalism, investment in science, need for structure, and the five basic dimensions of personality: agreeableness, extraversion, conscientiousness, openness to experience, and neuroticism. Although we view this phase as exploratory rather than specific hypothesis testing, we suspect openness to experience would correlate with more positive beliefs regarding LTLE and neuroticism with more negative beliefs. We will use multiple regression analyses to assess a model in which demographic and personality variables are used to predict endorsement of beliefs about positive and negative consequences of LTLE, which will then be used to predict beliefs about the plausibility, feasibility, and desirability of LTLE. We will also consider the relations among these outcome variables. For example, we expect feasibility to correlate

with desirability. This will provide an initial picture of correlates of attitudes toward LTLE that will inform the predictors and outcome measures we use in subsequent research.

The effect of conscious and non-conscious death concerns on attitudes toward LTLE. These studies will manipulate mortality salience (MS; brief reminders of one's own mortality) using procedures that have been shown to increase adherence to one's cultural worldview in hundreds of previous studies. Attitudes toward LTLE and endorsement of beliefs about positive and negative consequences of LTLE will then be assessed, either immediately after MS or with a delay and distraction between the MS induction and attitude assessment, so that death concerns will be outside of attention and on the fringes of consciousness. Our reasoning suggests that effects of MS immediately after it is induced will depend on perceived feasibility: immediately after MS, attitudes toward LTLE should become more *positive* among those who view it as plausible, but have little effect among those who view it as implausible. However, after a delay and distraction, when death-related thoughts are on the fringes of consciousness, MS should consistently lead to more *negative* attitudes toward LTLE. We will also assess the role of various personality and demographic variables as possible moderators of these effects, with special focus on personal commitment to religion and scientific skepticism.

An alternative way of testing this reasoning about the role of conscious and unconscious processes in affecting attitudes toward LTLE is to compare the effects of the standard MS induction noted above, in which thoughts of death are first made conscious, with those of a subliminal MS induction, in which the word death is presented for approximately 30 msec. Our previous studies have shown that this technique activates death-related thought and leads to worldview defense even though participants have no awareness of the MS prime. As in previous studies using this technique (Arndt et al., 1997), subliminal MS priming should lead to more rejection of LTLE immediately after priming (because death concerns have been activated without conscious awareness).

Religious afterlife and scientific skepticism as alternative paths to opposition to LTLE. The next set of studies will assess the idea that death fears can promote negative attitudes toward LTLE in (at least) two general ways: (1) by increasing religious commitment, and therefore increasing rejection of ideas that are construed as inconsistent with one's religious beliefs and faith in an eternal soul, and (2) by increasing the desire to appear rational and skeptical of ideas that seem counter to the cultural worldview to which one subscribes. Our general strategy for these studies will be to manipulate MS as in the previous studies and then prime values associated with these different routes; specifically, one's religion or the value of scientific skepticism. We predict that priming either religion or scientific skepticism will reduce support for LTLE and that this effect will be especially potent when concerns about death have been activated. We will also assess the role that pre-existing attitudes toward religion and science play in these effects, since concerns about these distinct values may play a role primarily for those with chronic investment in these areas.

If death concerns lead to rejection of LTLE because of either religious or skeptical values, rejection of LTLE after MS should be reduced when LTLE is endorsed by respected religious or scientific authorities. To assess this possibility we will assess commitment to religion and scientific skepticism, manipulate MS, and then expose participants to compelling presentations by respected members of either the religious or scientific communities that argue for or against LTLE. Our reasoning suggests that whereas pro-LTLE presentations by authority figures will eliminate the effect of MS on attitudes toward LTLE, anti-LTLE presentations by such authority figures will increase the effect of MS on these attitudes. These effects will be most prominent with experts that epitomize the values (religious or scientific) that participants most strongly endorse

Does LTLE increase the accessibility of death thoughts? Much of our analysis is predicated on the proposition that the fear of death ironically plays a role in the promotion of negative attitudes toward LTLE. The above studies will assess various ways in which this may be the case and various ways in which this universal human fear might promote rejection of LTLE. Indeed, discussions of LTLE are intrinsically tied to concerns about death and might therefore serve as potent death reminder, in and of themselves. We will conduct a series of studies assessing the extent to which information about LTLE increases the accessibility of death-related thoughts and how the context in which LTLE is discussed affects this process.

In these studies, variables found in the previous studies to predict opposition to LTLE, such as religious commitment and scientific skepticism, will be assessed. Participants will then be exposed to presentations about LTLE or neutral presentations, after which their accessibility of death-related thoughts will be assessed, using measures that have been consistently useful in detecting enhanced death thought accessibility in previous research. One measure of death thought accessibility involves having participants provide words to complete a series of word-stems, some of which can be completed with either death-related or neutral words. For example, the word-stem COFF—can be completed as either COFFEE or COFFIN. The number of death-related completions reflects the accessibility of death-related thoughts. We will also use a lexical decision task (Schimmel et al., 2007), in which participants are shown strings of letters and asked to judge as quickly as possible whether they are words or not. Research has shown that people make faster judgments for words that are highly accessible or that have been recently primed. In our measures, some of the strings of letters are death-related words, some are neutral words, and some are non-words. Faster response times for the death than neutral words reflects high death thought accessibility.

If discussion of LTLE inherently activates death thoughts, then exposure to such presentations will increase death thought accessibility on both the word-stem completion and lexical decision task measures. After assessing the effect of a general presentation on LTLE on death thought accessibility, we will assess the effects of different types of presentations that address particular concerns shown to affect beliefs regarding LTLE in the previous studies. For example, we will assess the effect of favorable and unfavorable presentations by religious and scientific authorities and that address religious and scientific issues. Whereas high levels of resultant death thought accessibility should

indicate relatively threatening (and therefore ineffective) messages, low levels should indicate relatively non-threatening (and therefore effective) messages. We will also assess participants' beliefs regarding LTLE after the messages along with accessibility assessment to determine if, as we expect, level of death thought accessibility engendered by the LTLE messages affects attitudes toward LTLE.

Conclusion

Findings from these lines of research would clarify the roles of fear of death and cultural worldviews, both scientific and religious, in promoting opposition to research focused on the goal of LTLE. This would then suggest paths toward gaining greater acceptance of such research. Specifically, strategies for promoting such research in ways that are more compatible with the worldviews of targeted segments of the public, and in ways that do not engender heightened activation of thoughts of death could then be developed.

References

- Festinger, L. (1957). *A theory of cognitive dissonance*. New York: Academic Press.
- 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). New York: Springer-Verlag.
- Greenberg, J., Solomon, S., & Arndt, J. (2008). A uniquely human motivation: Terror management. In J. Shah & W. Gardner (Eds.), *Handbook of motivation science* (pp.113-134). New York: Guilford.
- Greenberg, J., Arndt, J., & Landau, M.J. (in press). Mortal cognition: Viewing self and the world from the precipice. In D. Carlston (Ed.) *Handbook of Social Cognition*. Oxford, England: Oxford University Press.
- Jonas, E., Greenberg, J., & Frey, D. (2003). Connecting terror management and dissonance theories: Evidence that mortality salience increases the preference for supportive information after decisions. *Personality and Social Psychology Bulletin*, 29, 1181-1189.
- Kruglanski, A. (1980). Lay epistemologic process and contents: Another look at attribution theory. *Psychological Review*, 87, 70-87
- Petty, R. E., & Cacioppo, J. T. (1986). *Communication and Persuasion: Central and Peripheral Routes to Attitude Change*. New York: Springer-Verlag.
- Pyszczynski, T., & Greenberg, J. (1987). Toward an integration of cognitive and motivational perspectives on social inference: A biased hypothesis-testing model. In L. Berkowitz, (Ed.), *Advances in experimental social psychology*, Vol. 20. (pp. 297-340). San Diego, CA: Academic Press.
- Pyszczynski, T., Greenberg, J., & Solomon, S. (1999). A dual process model of defense against conscious and unconscious death-related thought: An extension of terror management theory. *Psychological Review*, 106, 835-845.
- Routledge, C., Arndt, J., & Goldenberg, J.L. (2004). A time to tan: Proximal and distal effects of mortality salience on intentions to sun-tan. *Personality and Social Psychology Bulletin*, 30, 1347 - 1358.
- Underwood, M., Bartlett, H., Hall, W., Partridge, B. and J. Lucke. (2009). Community perceptions on the significant extension of life: An exploratory study among urban adult in Brisbane, Australia. *Social Science and Medicine*, 68, 496-503.

Vail, K. E., Rothschild, Z. K., Weise, D. R., Solomon, S., Pyszczynski, T., & Greenberg, J. (2010). A terror management analysis of the psychological functions of religion. *Personality and Social Psychology Review, 14*, 84-94.