



Personality Psychology

Nothing Is Certain Except Taxes and the Other Thing: Searching for Death Anxiety in a Large Online Sample

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Philosophical and psychological literature has suggested that death anxiety has a profound impact on people's lives and is a fundamental aspect of what it means to be human. Such claims motivated us to examine how people express their emotions and attitudes toward death in short free-text responses. We explored a qualitative dataset where 803 Americans stated their thoughts about either death or physical pain (toothache). Comparing these, we found that death prompts caused the expression of less negative affect and more positive affect than toothache prompts. The reactions to death were quite diverse and did not appear to be dominated by existential anxiety. We discuss whether this pattern may be due to psychological defense against death causing negative emotions, or whether the pattern reveals a "true" preference for contemplating death rather than toothache. The article serves as a companion for an open dataset, to allow other researchers to explore and reuse it.

How do people cope with the realization that they one day will die? Philosophers and psychological scholars (such as Becker, 1973; Freud, 1915; Greenberg et al., 1986; Kierkegaard, 1849; and Nietzsche, 1901) have argued that becoming aware of death causes great existential unease or distress, often known as "death anxiety". They have argued that death anxiety (or the potential for death anxiety) plays a significant role for human motivation and behavior, and shapes cultures and society. Such grand claims are not made for other types of distress, which implies that death anxiety is seen as a distinct human experience.

Inspired by such claims, we performed an explorative study of how people describe their emotions toward death compared to their emotions toward physical pain. Although this study was not designed to evaluate theories about how people relate to death, this dataset may provide insight into people's thoughts about their mortality and can be explored through different lenses and frameworks. To our knowledge, there are few comparable datasets publicly available (one exception can be found here: Nilsson & Sinclair, 2018).

Theoretical approaches to how people relate to death

Existential philosophers such as Kierkegaard and Nietzsche emphasized how awareness of death impacts people's spirituality (Bonthius, 1948; Nietzsche, 1901). Nietzsche (1901) stated that people strive for spiritual immortality

and a higher purpose, and they are drawn to cultural and spiritual systems to achieve this. Kierkegaard (1849) argued that what he called a "sickness unto death" is an inherent factor of being human, and that people may relieve this condition by establishing a vital relationship with God (Bonthius, 1948). Without this relationship with God, people are subject to existential dread and despair that come with being able to contemplate one's mortal existence.

This idea can be contrasted with stoic traditions that have argued that people are able to accept the reality of death without the need to resolve it through spirituality or other mechanisms. An early example is how Marcus Aurelius argued that death is a natural part of life and should be accepted without fear or anxiety (Aurelius, 2001). Nevertheless, the existentialist idea that people will need to seek out certain actions or cultural systems to handle the threat of death appears to have had a deeper impact on modern psychology.

The influential book *The Denial of Death* (Becker, 1973, p. xvii) argued that people's death anxiety is a universal, natural, and basic fear that "haunts the human animal like nothing else". This existential anxiety will motivate people to pursue projects that make them feel a part of something that will last longer than their own lives. Devoting oneself to religion may be such a project, or it could be publishing a book or having children. If they do not have such a project, people are instead drawn to hedonistic pleasures such as drugs or alcohol use, or materialism. In other words, hu-

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mans seek out certain activities to repress death anxiety, and this anxiety is therefore one of the primal forces of motivation for people's behavior.

Ideas from Becker's work were formalized into the "terror management theory" (TMT). This influential framework in psychology argues that being aware of one's mortality leads to an overwhelming existential anxiety ("terror") that needs to be resolved (Greenberg et al., 1986; Pyszczynski et al., 2015). Resolution of this anxiety can come through two different mechanisms: Either through actions and mindsets that increase one's self-esteem and protect one's worldview (distal defenses), or through denying or suppressing the thought of death (proximal defenses).

Similar to other psychoanalytic theories, the TMT states that certain unconscious mental processes are employed to avoid, distract from, deny, or otherwise reduce emotional states that would otherwise be distressing, often known as "psychological defense mechanisms" (Greenberg et al., 1986). If these defense mechanisms are not sufficiently developed, the awareness of being mortal will cause great psychological stress.

The TMT has formed the framework for several hundred experiments on the effects of death reminders, often known as mortality salience (MS) effects. This research tradition has attempted to show associations between reminders of one's mortality and increased in-group bias and protection of one's worldview (Burke et al., 2010, 2013). A considerable number of empirical studies have claimed to support MS effects. At the time of writing, the term "mortality salience" returns 16,300 results on Google Scholar. However, there is substantial variation among the studies, and there has not emerged a consensus on an experiment design that should support a given hypothetical claim. Further, most of the studies claiming to support MS were conducted before 2011, and thus had different methodological approaches from what one would expect from more recent psychological research. They thus typically lack preregistrations, statistical power, open data, and analysis code, and a given study may have included a number of measures and conditions that leave considerable room for flexibility in analysis and reporting (Wicherts et al., 2016). Recent endeavors involving open data or preregistered replications of MS effects have yielded non-significant or otherwise divergent results (Klein et al., 2022; Pepper et al., 2017; Rodríguez-Ferreiro et al., 2019; Sætrevik & Sjøstad, 2022; Schindler et al., 2021). These replication challenges have cast doubt upon the robustness and empirical foundation of MS effects.

Earlier work on mapping emotions and attitudes toward death

Empirical and theoretical research has over the last decades attempted to study and describe people's relation to their mortality by classifying common emotions and attitudes toward death and dying. Spilka et al. (1977) used factor analysis to derive eight different commonly occurring beliefs about one's death based on responses from a Christian sample ($N = 328$). Four of these beliefs were negative in valence (pain and loneliness, forsaking others, fail-

ure, a journey to the unknown), one was neutral (indifference), and three were positive (a natural end, an afterlife of reward, courage). Using a similar approach, Hoelter (1979) developed a "multidimensional fear of death scale" for indexing different types of fear related to death. This scale contained eight dimensions derived from factor analyses of responses from an American undergrad sample ($N = 375$), with items drawn from other scales and his previous work. These dimensions were: Fear of being destroyed, fear of premature death, fear of conscious death, fear of the unknown, fear of the dying process, fear of the dead, fear for significant others, and fear of the body after death. Later, Benton et al. (2007) grouped Hoelter's eight subscales into two distinct types of death anxiety: Existential death anxiety, related to ceasing to exist and what might happen after death, and tangible death anxiety, related to the physical body and the process of dying.

Langs (2004) postulated three forms of death anxiety based on clinical and a psychoanalytical theoretical framework. These were: Predatory death anxiety due to fear of being harmed or annihilated, which triggers the fight or flight response; predator death anxiety due to fear of harming or annihilating others, which evokes feelings of guilt; and existential death anxiety due to awareness of being mortal. More recently, Petty et al. (2015) created a "death perspective scale" based on work by Kastenbaum and Aisenberg (1976). This scale was designed to measure two opposing perspectives on death: The overcoming perspective, believing that death is the end of one's existence, associated with feelings of defeat and surrender; and the participating perspective, believing that death is a natural process and marks the beginning of an afterlife, associated with feelings of acceptance and honor.

Research needs

People's relation to death has gained much interest in both psychology and philosophy. As discussed above, various influential literature has argued that the anxiety people experience toward death is unique from other types of anxiety, and particularly influential on people's mental health, cultural worldviews, and significant life decisions. The influential psychological framework TMT has even argued that resolving death anxiety is one of the core motivations for how people operate and make decisions in their daily lives (Pyszczynski et al., 2015). However, despite considerable theoretical and clinical interest, questions remain concerning the strength of the empirical support for the core tenets of the hypothesis. Few studies have reliably measured how people relate to their mortality, and fewer yet while controlling for other negative events. Moreover, although there have been attempts at categorizing and mapping death thoughts, the observations are often limited by a preconceived theoretical framework. There could therefore be value in taking an atheoretical approach to comparing how people say they think about death to how they think about other distressing events. Qualitative analysis and categorization of the responses may illuminate what may be unique about how people relate to death.

Table 1. A summary of predictions from the two opposing hypotheses for two different types of outcomes.

	Negative emotions	Positive emotions
H1: "Toothache" causes most negative affect	H1a: More negative emotions expressed for "toothache" than for "death"	H1b: More positive emotions expressed for "death" than for "toothache"
H2: "Death" causes most negative affect	H2a: More negative emotions expressed for "death" than for "toothache"	H2b: More positive emotions expressed for "toothache" than for "death"

Current study

The current work presents a dataset ($N = 803$) of free-text responses where half of the participants describe their emotions toward the thought of dying, and the other half describe their emotions toward the thought of having toothache. The study used the same questions as are traditionally used to elicit death anxiety in classic TMT experiments (Rosenblatt et al., 1989). We aim to explore the contents of these responses, with particular interest in seeing how the respondents describe their experience of thinking about death, and the associated emotions. Toothache therefore functions as a control condition, allowing us to discover the potentially unique characteristics of people's emotions related to death compared to their emotions related to physically painful experiences.

Hypotheses and preregistration

The main aim of this work was to provide a qualitative exploration of the text responses to death and to curate the public dataset. While our emphasis was on this qualitative analysis, we also wanted to see if categorization of emotional content of the responses can be used to address a priori claims about what emotions the thought of death would provoke. Before the quantitative analysis, we therefore preregistered two opposing hypotheses (<https://osf.io/sw6md>). Our intention for the hypotheses was to structure some assumptions about how emotions would be distributed in the case that thinking about death leads to an uncomfortable state compared to in a case where thinking about death leads to a more muted response. The qualitative analysis will then be used to provide further perspective to either outcome.

The first hypothesis (H1) stated that "death" would lead to less overt expression of negative affect. This was operationalized as H1a for more negative and H1b for less positive emotions for "toothache" than for "death". The opposing second hypothesis (H2) stated that "death" would lead to more overt expression of negative affect. This was operationalized as H2a for more negative and H2b for less positive emotions for "death" than for "toothache". [Table 1](#) presents a 2×2 layout of the different outcome predictions.

Methods

Research setting

The data described in the current article were originally collected as free-text responses to the manipulation questions in an experiment on mortality salience (see Sætrevik & Sjøstad, 2022, for report of the experiment). The original experiment concluded that the manipulation did not produce the expected MS effects. However, the responses to the manipulation questions were not examined in the original experiment and have not been studied in detail. A qualitative analysis of the text responses from the original experiment allows us to explore what emotions the respondents report to have experienced when thinking about death. The plan for the current study was preregistered after completing the report of the original experiment, but before examining the content of the text responses.

Procedure

Data collection

Eight hundred and three American adult participants were recruited with Amazon's Mechanical Turk (MTurk; Buhrmester et al., 2011; Hauser & Schwarz, 2016) to answer a Qualtrics online survey (Qualtrics, Provo, UT). The sample size and selection criteria were determined by the original study. Data were collected in July 2019. From the original 803 respondents in the raw data file, we excluded 19 respondents who were marked with identical ID numbers as other respondents. As part of our qualitative analysis (see details later), we found that the far majority of the remaining respondents had provided unique, relevant, and considered responses. After the two rounds of coding, only 13 additional respondents (eight from the toothache condition) were considered to have free-text responses that were impossible to interpret and classify as reasonable responses to the questions.¹ These responses have been excluded from our analysis. To allow readers to verify or to assess the effect of our exclusions, we have included them in the public dataset (there they are marked as "duplicate" ID numbers or "other" for unclassifiable responses). The low number of "other" responses speaks to the quality of the dataset, as it indicates that the far majority of the responses were from humans who read and understood the questions,

¹ Examples are "This is moment death is do not feel the life. Because what is death and how the feel that for whole life" and "A person who has a severe illness may experience thanatophobia because they are anxious about dying, though ill health is not necessary for a person to experience this anxiety".

considered them, and gave meaningful answers. Additional assessments of these responses also reveal little resemblance to typical behavior of bots or server farms identified in (Chmielewski & Kucker, 2019; i.e., phrases that repeat portions of the question, single-word answers, and answers that do not align with the question). The final selection consisted of $N = 380$ responses for the death condition (62.4% female, mean age 37.7) and $N = 391$ responses for the toothache condition (60.9% female, mean age 38.9 years).

Design

This study was conducted as a between-group design where the participants were automatically randomized into one of two conditions. For the current analysis, the between-group conditions (“death” and “toothache”) functioned as the predictor variable, whereas the distribution of the emotional categories (“positive”, “negative”, and “neutral or mixed”) functioned as the outcome variable.

The questions we are analyzing here came first in the questionnaire (directly after an informed consent form) and the responses could therefore not be influenced by the later steps in the experiment. The respondents received two questions about either toothache or death. The first of these prompted the respondents to describe their emotions when thinking about this event: “*Briefly describe what feelings the thought of [your own death]/[toothache] arouses in you*”. The second question prompted the respondents to visualize and describe such an event: “*Write down, as specifically as you can, what you think will happen to you [physically as you die and once you are physically dead]/[the next time you get toothache and its aftermath]*”. During the initial screening of the first 50 responses, we observed that the responses to the second question rarely mentioned emotion and were rarely relevant for our research aim. We therefore preregistered that the responses to the first question would constitute our main outcome variable for the current analysis, and the responses to the second question would be used only when they could help clear up ambiguous responses to the first question. The responses to both questions are available in the accompanying dataset.

The respondents were instructed to give brief answers, and to reply with their first, natural response; please see the original “mortality salience” experiment materials online for more details on the study design (<https://osf.io/s3wxd/>). Note that these materials also include other measures in the experiment, and the questions that are analyzed in the current article are on pages 2 and 3.

Categorization criteria

The contents of the responses were interpreted and categorized according to whether they expressed “positive”, “negative”, or “neutral or mixed” emotions.² The categorization criteria resulted from discussions between the two

authors of this article based on a reading of previous work on classifying death thoughts. The criteria were not directly based on any existing framework, but were designed for distinct, non-overlapping categories to address the hypotheses. The suitability of the categorization criteria was tested on the first 50 responses before we preregistered the criteria and used them to categorize the full sample. This procedure resulted in the following criteria:

- Responses were classified as “negative” emotion if they explicitly stated experiencing states of negative affect (e.g., fear, sadness, anger), stated the desire to avoid the event in question (death/toothache), or described the event as an undesirable experience.
- Responses were classified as “positive” emotion if they explicitly stated experiencing states of positive affect, stated the desire to experience the event in question (death/toothache), or described the event as a desirable experience.
- Responses were classified as “neutral or mixed” emotion if they explicitly stated experiencing indifference, uncertainty, feelings of conflict, equally positive and negative emotions, or if they responded by avoiding the question.

Meaningful responses that avoided answering the question were classified as “neutral or mixed”, rather than excluded from the analysis, in order to assess whether they showed indications of psychological defense. As mentioned under Data collection above, responses that indicated that the respondent rather had misinterpreted or not understood the question were classified as “other”.

Consistent with our research question, we were most interested in capturing the respondents’ most dominant emotion(s). Responses that mentioned both positive and negative emotions were therefore categorized according to the emotion that was expressed with the most intensity. The classification of “neutral or mixed” was only used in cases where it was not possible to determine which emotional valence was more dominant or intense. The categorization was further instructed to be based on what the respondent described as their truly experienced emotion, not what they *tried* or *wished* to feel or think (e.g., “*it makes me feel sad, but I try to be brave*” was categorized as a negative valence).

During the first coder’s process of categorizing the full dataset, the following criteria were added to the instructions in order to resolve ambiguities in the predefined criteria:

- Responses were also classified as “negative” or “positive” emotion based on stating to have negative or positive reactions to thinking about death or toothache (e.g., “*thinking about death makes me want to cry*”).
- Responses were also classified as “neutral or mixed” emotion if they expressed emotions that do not have

² The “neutral or mixed” emotion category was referred to as “neutral” emotion in the preregistration.

a clear negative or positive valence (e.g., curiosity, acceptance, boredom).

Coding process

All responses were first categorized by one coder (author SS) based on the preregistration (<https://osf.io/sw6md>) and the adjusted approach, as described above. After examining and discussing these results (authors SS and BS), we preregistered an additional coding of the responses by a second and third coder to increase the validity of the coding (<https://osf.io/zjnd4>). The second coder (AP in the acknowledgments) was kept naïve to the categorization and frequency of each code used by the first coder, as well as to the study's overall theoretical approach and research question. The inter-rater reliability between the first and second coder was high (.901). The majority of the mismatches were between the use of “neutral or mixed” and “negative” codes. The responses with mismatched coding were examined by a third coder (author BS), who determined the final coding of these responses based on the study's categorization criteria and instructions.

We also preregistered a computer-assisted text analysis to assess the validity of the final coding (<https://osf.io/zjnd4>). The aim was to assess the validity of the human coding by measuring whether the responses that were categorized as positive and negative did in fact contain a higher frequency of positive and negative words. The computer analysis used the same dataset as the human coders, analyzing the first question and excluding the responses categorized in the final human coding as “other”. We used the “tidytext” package and the “bing” sentiment lexicon for R to perform the analysis. This analysis counted the number of words in each response that were recognized as positive or negative by the sentiment lexicon (excluding stop-words). We then calculated a ratio for the number of positive words plus total number of words, over the number of negative words plus total number of words (minus one). The R analysis script for this operation is available at OSF (<https://osf.io/hngck/>). The computer-assisted analysis supported the validity of the human coding by showing that responses categorized as “negative” by the human coders more frequently used words recognized as negative, and responses categorized as “positive” by the human coders more frequently used words recognized as positive. A one-way ANOVA showed that the sentiment score assigned by the computer-assisted analysis varied significantly between the human coding categories ($F(2, 73.32) = 52.53, p < .001$). However, as can be seen in [Figure 1](#), there was considerable overlap in the ranges of the sentiment scores that were sorted to each category. This shows that the given sentiment score (e.g., a score around zero) could indicate belonging to either of the human-coded categories. Thus, the automated text analysis supports the validity of the human coding, but shows that the human coding has a better precision, for example by picking up subtleties in the language or the context that the words were used in.

The public dataset on OSF (<https://osf.io/825gs/>) contains the categorizations from all three human coders and their comments about ambiguous responses, as well as the results of the computer-assisted text analysis.

Results

An initial inspection of the responses indicated that most participants responded earnestly to the questions, and shared personal thoughts. The majority of the respondents in both conditions wrote 2–3 sentences. Responses were slightly longer in the death condition (number of words $M = 31.2, SD = 19.2$) than in the toothache condition ($M = 28, SD = 16.3, t(769) = 2.5, p = .012$). The responses typically expressed one or more emotions, reactions, or associations to the topic (death or toothache), followed by an attempt to explain their origin or reason. The respondents expressed a wide range of sensations, thoughts, and personal experiences related to the topics. Below, we will first provide a rudimentary qualitative analysis to compare the response contents in the two conditions. Thereafter, we will provide a simple quantitative analysis that compares the distribution of emotions expressed in the conditions.

Qualitative analysis of the responses to toothache and death questions

Toothache response content

The content of the toothache responses provides a baseline for emotional response to an unwanted, but non-lethal event, that we can compare to how the sample responded to death. Most of the respondents expressed strong, negative emotions to the toothache question. Several respondents even mentioned that they would rather (re-)experience labor pains than toothache. Many of the respondents in the toothache condition reported that they had experienced severe toothache in the past, although some reported that they had not. Many respondents also expressed a fear of large expenditures related to consulting a dentist (note that economic concerns may be more pronounced for the MTurk sample than the general population). The specific emotions that were emphasized in the responses varied somewhat, but nearly all of them were negative emotions (see more on the distribution of emotional valence in the section “Distribution of emotions between conditions” below). A typical response in the toothache condition reads: *“A toothache arouses several emotions in me. First, annoyance that I am in pain. Then I start to worry about what might be wrong and also whether I should wait it out or go to the dentist. I also get upset and stressed over how much it will cost to fix it.”*

There were no positive responses to the toothache question, and only few neutral and mixed responses. The neutral and mixed emotion responses usually either avoided answering the question (such as *“Wow! I haven't had a toothache in years. I need to make an appointment with the dentist”*) or stated that they did not experience any specific

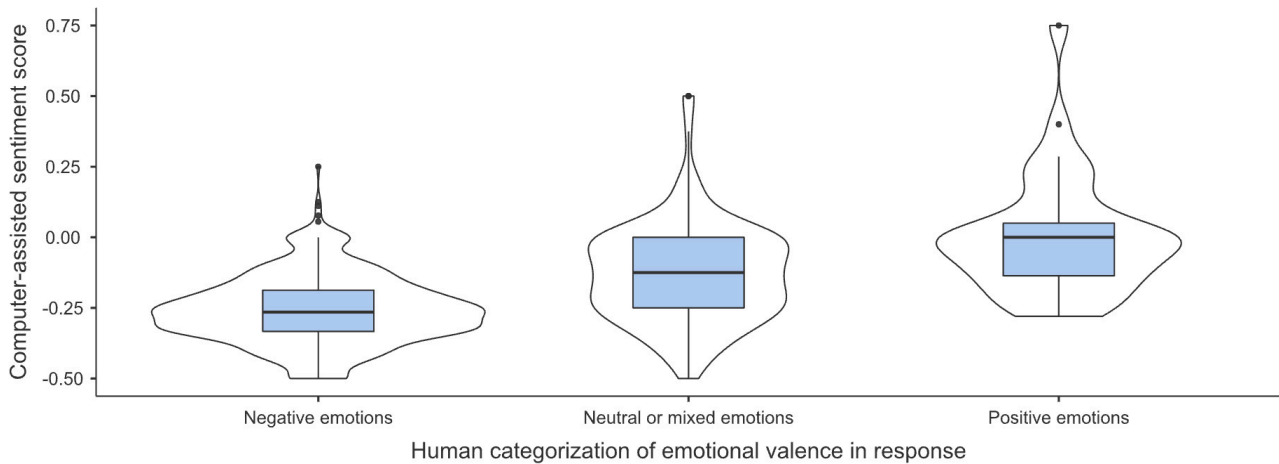


Figure 1. Violin plot comparing human coding to computer-assisted text analysis scores.

emotion (such as “*I feel no emotions at the mere thought of a toothache. A toothache in actuality would arouse concern*”).⁵

Death response content

The death responses expressed a wide range of emotions, thoughts, and mindsets. A great majority of these expressed more than one emotion, although most of these emotions were negative. Nevertheless, it was not uncommon to express ambivalent, mixed, or even positive emotions to death.

In general, we found that many of the respondents mentioned their opinions about what happens after death despite this not being explicitly queried in the first question. The respondents frequently discussed possibilities such as going to heaven, reincarnation, and nothingness, although most of them also expressed being uncertain about their confidence in these possibilities. When examining the responses, we also discovered two frequent, but opposing, types of statements: Some stated explicitly that they had no fear of death, while others stated that they were afraid of death. Furthermore, there were a few respondents who distinguished between their personal relation to dying and their concern about the effect their death would have on others. One respondent explained: “*I feel sad that my loved ones won’t have me in their lives. Personally, I am okay with the concept of my own death.*”

Of the death responses that were classified as negative emotions, the most commonly expressed emotions were fear, anxiety, concern, and sadness. However, there was a wide range of arguments and mindsets behind these emotions. Some recurring themes that were noticed (but were not included in our coding scheme) in the death responses were: (a) Sadness, disappointment, or concern for not yet having achieved their goals in life; (b) fear or anxiety of what might happen when and after they die; (c) sorrow for

leaving their loved ones behind; (d) concern or sadness on behalf of those left behind, especially children; (e) unease and confusion due to lacking comprehension and control associated with dying; and (f) fear of ceasing to exist, being “gone forever”. Somewhat less frequently, respondents also expressed (g) fear of pain when dying; (h) a feeling of emptiness; (i) a feeling of helplessness; (j) a feeling of disturbance or discomfort; and (k) being reminded of their loneliness. A typical response expressing negative emotion reads: “*I feel sadness, confused and anxious. Confusion of what is death and how does it occur. Anxiety of what life after death will be. Sadness of leaving my loved ones and the empty space that I would leave never to be filled again*” (expresses the mindsets e, b, and c).

Most of the responses sorted in the “positive” category expressed one of these mindsets: (l) Relief at seeing the end of a life they view as hard or painful (some of these responses mentioned living with chronic disease); (m) excitement related to having faith in a positive religious outcome, such as arriving in heaven and meeting God, Jesus or deceased loved ones; or (n) contentment due to feeling ready to die. One of the responses in this category reads: “*Honestly, the thought of my own death brings me relief. My life is a roller coaster and it’s hard to deal with sometimes. I don’t want to die, but it would be relief from life*” (expresses mindset l).

Responses that were sorted in the “neutral or mixed” emotion category usually expressed one (or more) of the following mindsets: (o) Conflicting emotions, usually a combination of the negative and positive emotions described in the previous paragraphs; (p) indifference toward death, or simply no distinct emotion; (q) acceptance of death, often expressed as a mindset that death is nothing to fear; (r) apathy or numbness due to having difficulties with grasping the concept of dying. Somewhat less frequently,

⁵ Note that this response was coded as “neutral or mixed” rather than negative because this study aims to examine the emotions aroused when *thinking about* a particular event, not when experiencing it.

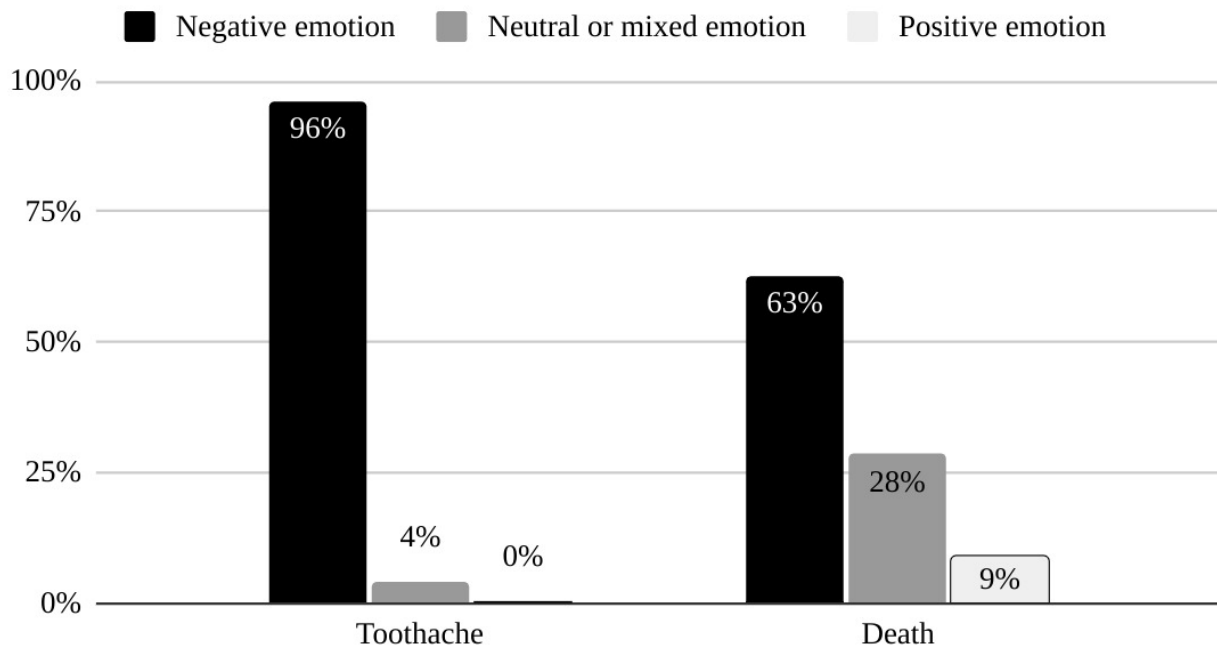


Figure 2. Proportion of the responses in each experiment condition that expressed “negative”, “neutral or mixed”, and “positive” emotion.

a few of the responses in the neutral or mixed category also (s) responded in a neutral or avoidant manner, without mentioning emotions. One neutral/mixed response in the death category reads: “*Current emotions I’m feeling if I were to die today are no emotions. I don’t feel anything and I wouldn’t care if I did die today. I’ve come to accept that no one will live forever and that death is part of life*” (expresses the mindsets p and q).

Distribution of emotions between conditions

Classifying the responses in both conditions according to emotional valence resulted in 376 “negative”, 15 “neutral or mixed”, and 0 “positive” responses in the toothache condition versus 238 “negative”, 108 “neutral or mixed”, and 34 “positive” responses in the death condition. Notably, in the toothache condition, almost all responses were negative, a few were neutral or mixed, and none were positive, whereas in the death condition, the majority of responses were also negative, but there were a substantial number of neutral and mixed emotions as well as some positive emotions. The relative distributions for both conditions are shown in [Figure 2](#).

When comparing these distributions, we see a clear difference between the conditions. The observed trend is more compatible with hypotheses H1 than H2, since they show more negative emotion for toothache than for death (H1a), and more positive emotions for death than for toothache

(H1b). We thus reject H2 and proceed to test H1 by testing the significance and size of the difference in positive and negative emotions between the two kinds of topics. To do this, we performed two separate χ^2 -tests of association, one comparing the ratios of negative emotion between the groups (testing H1a, negative emotion) and one comparing the ratios of positive emotion between the groups (testing H1b, positive emotion).⁴ The tests were conducted in accordance with our preregistration.

In the first test, we evaluate hypothesis H1a by examining the distribution of “negative” emotions versus non-negative emotions (i.e., either “positive” or “neutral or mixed” emotions) in the two conditions. This χ^2 -test for negative versus non-negative emotions showed $\chi^2(1, N = 771) = 133.62, p < .001$, indicating that significantly more negative emotions were expressed in the toothache condition than in the death condition. The effect size showed a Cramér’s V of .416, which may be considered a moderate effect size (Cohen, 2013).

In the second test, we evaluate hypothesis H1b by examining the distribution of positive emotions versus non-positive emotions (i.e., either negative or neutral/mixed emotions) in the two conditions. This χ^2 -test for positive versus non-positive emotions showed $\chi^2(1, N = 771) = 36.6, p < .001$, indicating that significantly more positive emotions were expressed in the death condition than in the toothache condition. The effect size showed a Cramér’s V of

⁴ Negative and positive emotion are analyzed separately because the relative ratio of neutral or mixed emotion may vary between the two conditions.

.218, which may also be considered a moderate effect size (Cohen, 2013).

The two χ^2 -tests thus showed a statistically significant difference between the two conditions, showing that our respondents reported experiencing both less negative emotion and more positive emotion if they were thinking about death than if they were thinking about toothache.

Discussion

What characterizes people's relation to death?

We observed a diversity in the way our respondents related to death, indicating a number of different mindsets. Both the qualitative and quantitative analyses indicated that distress was quite uniformly expressed in the toothache responses, while a greater variety of sensations and mindsets were expressed in the death responses. Furthermore, our analyses indicated that most people appear to have a considered conception of their mortality; that is, that they are aware of and have devoted some thought to their mortal existence. Their feelings related to this awareness not only vary substantially between people, but also usually involve a wider range and higher number of co-existing emotions than people's feelings towards physical pain. Some respondents also indicated disinterest and apathy toward death, but this was far from the dominant attitude in our sample.

Many of the themes expressed in the death responses coincided well with dimensions and categories of death thoughts postulated by both Spilka et al. (1977) and Hoelter (1979). For example, mentions of pain and loneliness, an afterlife of reward, fear of premature death, fear of the unknown, fear of the dying process, and indifference all occurred regularly in the death responses. The respondents often focused on ceasing to exist and leaving things behind rather than on the process of dying. In the taxonomy of Benton et al. (2007) this would correspond more closely to existential death anxiety than to tangible death anxiety. Compared to the perspectives on death described by Petty et al. (2015), we saw examples of both the overcoming perspective, those who saw death as the end of one's existence, and the participating perspective, those who saw death as a passage to an afterlife. Compared to the psychoanalytical perspective of Langs (2004), our findings mainly concern what he termed existential death anxiety, rather than predator and predatory death anxiety. This could be because the current survey questions specifically asked about emotions related to the awareness of being mortal, and not emotions caused by threats of harming others or being harmed.

Exploring indications of death anxiety

Our quantitative analysis indicated that considerably more positive and less negative emotions were expressed when thinking about death than when thinking about toothache. These results supported hypothesis H1, that "death" would not be described in excessively negative terms. On the other hand, there was little support for the opposing hypothesis H2, that "death" would lead to ex-

pression of strong negative affect. On the face of it this finding is paradoxical: We may assume that if given the choice most would prefer toothache over death. Nevertheless, when presented alone, more negative affect was expressed for toothache than for death. To explore this apparent paradox, we will compare some of the themes that emerged from our qualitative analysis with the theoretical frameworks for death thoughts and death anxiety.

Indications of death anxiety

In existential philosophy and terror management theory, the construct of "death anxiety" indicates that the idea of death is so terrifying to humans that it has a profound effect on most aspects of people's lives, and on culture in general (Becker, 1973; Kierkegaard, 1849; Nietzsche, 1901; Pyszczynski et al., 2015). Crucially, these theories assume that death anxiety is inherently more distressing and terrorizing to humans than other forms of anxiety. Although negative emotions were the most commonly stated emotion when our participants were asked to think about their death, these were typically expressed as reasonable and moderate emotions, and not "terror"-like experiences. We observed feelings such as fear, anxiety, and unease, which were typically related to reasonable and valid concerns related to dying (such as leaving loved ones, consequences for others, not reaching life goals, or facing unfamiliar prospects). We rarely observed emotions that could be described as unbearable, terrifying, severely distressful, or anything that would resemble descriptions of the psychological "terror" described in existential literature.

Indications of psychological defense mechanisms

One could argue that the respondents in our study were nevertheless influenced by terror-like death anxiety, but that psychological defense mechanisms prevented the strong negative emotions from being expressed in the responses. Theories that suggest a phenomenon may be concealed by a different phenomenon can be difficult to falsify, and it was not the ambition of our study to give any conclusive answer to this issue. We will nevertheless briefly explore our results in light of such theories.

According to the TMT, proximal defense mechanisms should have the effect that death cognitions are avoided, distracted, or denied in order to protect us from the strong negative emotions they would cause (Greenberg et al., 1986). We would thus assume that respondents who resort to these mechanisms will, in their responses, appear less genuine, disassociated with the "self", or have difficulties with responding properly to the question. This does not correspond well to our reading of the current responses about death. Instead, the emotions toward death appeared to be both genuinely experienced and personal reactions to the prospect of death, such as fear of ceasing to exist, sorrow for "leaving too soon", or fear of the aftermath of death. There was little avoidance, distraction, or denial, even if we include responses classified as "neutral or mixed".

The TMT further states that an alternative approach is to use distal defense mechanisms such as emphasizing self-esteem and cultural worldviews to better manage the awareness of death and reduce anxiety. A minority of our respondents expressed values that could represent such defense mechanisms. This particularly took the form of spiritual prospects about death (such as arriving in heaven, meeting God, meeting passed relatives and friends, and more). Nevertheless, a significant portion of our dataset is still left unexplained by the TMT framework, in terms of showing neither terror-like emotions, nor avoidance, denial, distraction, “comforting” cultural worldviews, or self-esteem protection. These responses instead displayed moderate and negative emotions without suggesting the need to repress these nor compensate with comforting belief systems. This appears difficult to align with the TMT framework and the existentialist concept of death anxiety. Considering that the psychological impact of death anxiety is assumed to be universal and to be evoked by indirect associations with death (Pyszczynski et al., 2015), the theory does not appear to account for how substantial parts of the population appear to be unaffected by death anxiety.

Supporters of existentialist theories could argue that the moderate, negative emotions to death are due to defense mechanisms operating in such an unconscious and sophisticated manner that they are not detectable by a qualitative analysis. However, these mechanisms appear difficult to support in a falsification approach if they can neither be detected directly (as we attempt in the current study) or indirectly (see the discussion above about attempting to replicate MS effects). Given this impasse, we will proceed to discuss how the current results could be accounted for outside of the TMT framework.

Reasons for death causing little distress

A crucial difference between the two experimental conditions is that while the respondent can expect to experience pain from having a toothache, death is instead a form of “nothingness”. Epicurus (as cited in Konstan, 2018) argued that “*Death (...) is nothing to us, since while we exist, our death is not, and when our death occurs, we do not exist*”, and thus argued that death is nothing to fear. Applied to our study, it could be that thoughts of death cause less negative affect since the respondents do not imagine themselves to be present to experience it. Reasoning along these lines appears to be present in some of our participants’ responses (e.g., “[I am] not sure about what emotions I feel. I won’t know I am dead. A void.”).

Nevertheless, the responses indicated that many also associate dying with more than “nothingness”. The emotional reactions to death were often influenced by dimensions such as their satisfaction with life, past experiences, age, health, and family situation. Some may see death as an abrupt hinder to fulfilling various life goals, while others state that they feel more prepared to die as they have reached those goals. Some stated that they regard death as separation from numerous joys in life, while others may perceive their life as more burdensome, and instead associate death with relief and the cessation of pain. The concept

of death may therefore have widely different meanings to different people, far beyond only loss and destruction.

Additionally, people may also have incorporated stoic principles in their lives, leading them to accept death as a natural part of life, and be less distressed by it. One respondent wrote “*I am pretty okay with my own death. Once I’m gone, I’m gone and it’s inevitable, so there’s no use in really being afraid about it. Sometimes it can feel overwhelming but if you realize that everyone is going to die, then it’s fine.*” Philosophic outlook can thus also vary between individuals, and some may hold stoic values that lead to acceptance of death without the need for psychological defense.

Thus, while some people may require defense mechanisms to resolve the distress that death awareness causes them, others may not experience death as equally distressing in the first place. People’s emotions towards their own death may vary depending on their life situation, experiences, personality traits, philosophic outlook, and more, which may explain why the death condition led to much more diverse, and less negative reactions than the toothache condition. We therefore believe that death awareness will lead to a multitude of different reactions to different people, rather than leading exclusively to aversion or defense.

Implications

Theoretical implications

We found that most of the respondents had complex, sophisticated, and direct relationships to death. It should be noted that we used the same question prompts as are used in traditional MS studies. On the face of it, these results are difficult to align with the TMT’s assumption of a universal death anxiety that exclusively leads to defense behavior. Attempting to account for the current findings within the TMT highlights the falsifiability issues of psychodynamic dual-process theories. Recent failed attempts at replicating MS effects (see e.g., Klein et al., 2022, and others cited in introduction) have indicated a need for high-powered tests of TMT’s basic assumptions. If future, more targeted studies also fail to support the idea of the universality of death anxiety and its psychological impacts, the theory may need to be revised or abandoned. It could be that the search for a single universal principle or set of mechanisms for how people relate to death will be futile, as people have idiosyncratic relationships with death.

The current study presented hypothetical scenarios of death and toothache, not actual threats. It is reasonable that more vivid, authentic, or visual stimuli would have had different effects on the respondents. Therefore, our conclusions may be limited to people’s personal perceptions of their reactions to hypothetical death and toothache, and we should be careful in drawing conclusions about how people would react if those situations should become personally relevant to them. Nevertheless, the theories of existential psychology (Becker, 1973; Kierkegaard, 1849; Nietzsche, 1901) tend to argue that the mechanisms are pervasive across people’s mundane experiences and influence most aspects of their lives. Moreover, a crucial com-

ponent of the TMT is that even indirect references to death would motivate the defensive thoughts and behaviors. If so, one would expect even the artificial and hypothetical scenarios used here to evoke at least some of the effects in question.

Applied implications

This dataset may provide insight into average Americans' mindsets and emotions toward death. It may be particularly useful to reflect on these issues for anyone who encounters such themes in a professional setting, such as healthcare workers, psychologists, and religious leaders or spiritual advisors. Our data show that it is not uncommon to have mixed, complex, or even positive emotions toward death. It is therefore important for both professional workers, relatives, and others to normalize and legitimize these feelings when speaking to people about such subjects. Further, such interactions may get off on the wrong foot if they approach these issues expecting everyone to have suppressed and hidden feelings about death or that they attempt to reveal some underlying death anxiety.

Methodological implications

The study shows that most people seem able to express their personal emotions when completing surveys online, even on uncomfortable topics. This is not a trivial issue, as it has been argued that interpersonal interaction is necessary to study such topics. Despite recent concerns about the quality of Mechanical Turk data collection (Chmielewski & Kucker, 2019; Webb & Tangney, 2022), the far majority of our sample was willing to provide fairly extensive, coherent, and thought-out free-text responses. Although the current findings should be supplemented with other types of data, the use of online surveys may be necessary to efficiently provide sufficient statistical power to examine these potentially small effects.

Asking participants what they think about death is frequently used as a manipulation when testing for MS effects. However, manipulation checks are rarely employed in these studies (Sætrevik & Sjøstad, 2022). Interestingly, our qualitative analysis did not indicate that asking these questions led to any particular discomfort or to uniformly initiate defense mechanisms. If the experimental manipulation used in MS studies is not always effective in making death thoughts more salient, this may partly explain the failure to support TMT mechanisms in recent experiments (e.g., Klein et al., 2022, and others cited in introduction). Therefore, future research should consider alternative manipulations for activating death thoughts. A minimum requirement should be to perform checks that the manipulation has the direct effect of activating death thoughts, in addition to the indirect effect of influencing other behavior.

Limitations

Data source

The current study used secondary data (Johnston, 2017) that were originally collected for a different purpose (see under Research setting, and see Sætrevik & Sjøstad, 2022 for description of the original study). We believe that this reuse of an extant dataset constitutes efficiency in research, respects the time invested by the participants, and allows for a larger dataset than we would get for a dedicated data collection for the current research question. However, there would also be advantages to performing a novel data collection that was more targeted to address our specific research questions on thoughts about death, existentialism, and defense mechanisms. A targeted study could have included supplementary questions about religious views, the importance of death in their everyday lives, personal experiences with death, and more. The original research design thus limits the scope and depth of the current analysis.

Study design and analysis

Our participants appeared to have been able to express personal thoughts and emotions in their responses. However, because the study is based on self-report, the participants could have been affected by social expectations, social desirability, or pressure from culture or religion to express certain attitudes or emotions, especially on the topic of death. Additionally, proponents of existential psychology may argue that expressions of terror-like death anxiety or defense mechanisms would emerge only in clinical interviews, where the volunteered information must be interpreted and interrogated further by a skilled clinical analyst. Confronted with such criticism, we can only state that we failed to find any clear positive indication of these phenomena characterizing the dataset in the current approach, and we encourage future research to expand on these findings with novel or alternative study designs.

Moreover, the primary objective of this analysis was to provide an initial overview of the emotions associated with contemplating mortality and physical pain. The quantitative and qualitative analyses therefore offer limited nuances, and our investigation into the mechanisms behind these trends must be viewed as preliminary. Notably, the assessment of emotion *intensity* relied only on qualitative evaluation. Consequently, we recommend that future investigations aiming to delve deeper into these mechanisms explore additional nuances related to the intensity and nature of death-related emotions. It would also be valuable to measure the presence of psychological defense in the responses, although it would be challenging to establish sufficiently rigorous theoretical and empirical definitions to allow hypotheses falsification. We have provided our dataset to allow other researchers to attempt more rigorous coding schemes or different approaches to computer-generated text-data analyses. Thus, others may capture other subtleties of emotion-related language or find support for different theoretical approaches than we have found.

The death and toothache conditions are assumed to be comparable as they both describe being affected by unwanted events. This experimental design is aligned with how these tasks are typically used in TMT or MS experiments. However, one may be concerned about whether toothache is sufficiently emotionally evocative and vivid to the respondents compared to the topic of death. Our examination of the responses indicates that most respondents could recollect and reimagine having toothaches. A few respondents reported never having experienced toothache or being more concerned with the financial implications than the pain involved. Nevertheless, we believe this has only a minor impact on the overall results, as the majority thought of toothache as highly evocative and associated with great pain. Although the intensity of the emotions was not coded, observations from the qualitative analysis indicate that the toothache condition was in general responded to with high-intensity negative emotions.

Another difference between the two conditions is that while most respondents reported having had direct experience with toothaches, naturally none of them had experience with having died. This difference in personal experience may have affected their baseline for reporting emotions associated with being presented with the hypothetical. While this may challenge the one-to-one comparison of the two conditions, it is fundamental to existential psychology that the mere idea of mortality should have fundamental effects on us.

As mentioned above, it may be a paradox that participants expressed more negativity to toothache than to death. This may be due to the conceptual issue related to the frame of reference induced by asking the questions in these types of studies. That is, a toothache would be a moderate pain and inconvenience, while one's death is an existential event, and may be experienced as a more abstract event that leads to a qualitatively different type of response. Previous research has suggested that abstract events may increase psychological distance (Baltatescu, 2014), and could thus mute the emotional reaction. Similar issues would also be relevant for previous studies that have found differences in how people relate to existential threats compared to physical but non-existential threats.

Generalizability

The sample was recruited through MTurk, which is largely self-recruited, rather than attempting to reach representative samples of the population. The sample may therefore contain some deviation from the average population (Chandler & Shapiro, 2016). However, studies have shown that Mechanical Turk participants are significantly more diverse than the typical college samples often used in similar studies (Buhrmester et al., 2011).

Attitudes toward death may be highly affected by culture, religion, and social norms. Therefore, the variables measured may vary greatly across the world. In this study, the respondents consisted of American citizens. The sample is expected to have largely Christian beliefs and values (63% of Americans identify as Christian and 58% of Americans say religion is very important in their lives; Pew Re-

search Center, 2022) and spiritual perspectives were mentioned in some of the responses. For other cultures with higher or lower religious influence, the connotations to death may be considerably different. Moreover, many respondents expressed concerns about how a toothache would affect their economic situation. It is therefore possible that reactions to toothache would vary among different socio-economic settings or countries with different health-care systems. It is unclear how physical pain and economic concerns would interact in other socio-cultural settings.

Conclusion

The current study found that the respondents self-reported significantly more positive and less negative emotions toward death than toward physical pain. Moreover, people were conscious of and could express diverse, realistic, and complex thoughts about their potential death, and could relate them to other aspects of their lives. These findings appear to deviate from how death anxiety is traditionally characterized as a uniquely distressing or unmanageable concern in many influential philosophical and psychological theories. However, as is the nature of dual-process theories (Evans & Stanovich, 2013) it may be challenging to determine whether a phenomenon (i.e., death anxiety) is absent, or if it is present but negated by a different phenomenon (i.e., defense mechanisms). Such interpretations of the theories make them unfeasible to test empirically in the scale and approach that we have attempted in the current study. We instead recommend studying individual differences in how people relate to death, and would be cautious in assuming that it would follow universal laws.

We should note that the current study only presents an initial analysis of the responses. We have made the dataset available for more stringent and sophisticated qualitative analyses, from a variety of theoretical viewpoints. We believe the current dataset could give interesting and unique insights into how people relate to their mortality, and we encourage other researchers to further explore the dataset for deeper insights.

Contributions

Collected the original data: BS
 Conceptualized the study: BS
 Planned and preregistered study: BS, SS
 Coded the data: SS, AP, BS
 Conducted the qualitative analysis: SS
 Conducted the quantitative analyses: BS
 Drafted the article: SS
 Revised the article: BS, SS
 Approved the submitted version for publication: BS, SS

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Competing interests

The authors declare no competing interests relevant for the current study.

Data accessibility statement

The full dataset, preregistration, descriptive data, and test of preregistered hypotheses can be found on this article's project page on OSF: <https://osf.io/gwszx/>

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Supplementary Materials

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