Death Awareness and Prosocial Behavior: The Differential Effects and Mechanisms of Death Reflection and Death Anxiety

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Abstract

This study simultaneously examined both the negative and positive dimensions of death awareness by exploring and comparing the effects of death anxiety and death reflection on prosocial behavior and their underlying mechanisms. Study 1 and Study 2 examined the impact of death anxiety and death reflection on prosocial behavior, as well as the mediating role of value orientations, using prosocial tendency, public goods game behavior, and real donation behavior as indicators through questionnaire surveys and laboratory experiments. The results indicated: 1) Death anxiety negatively predicted or reduced individuals' prosocial behavioral tendencies and behaviors; death reflection positively predicted or increased individuals' prosocial tendencies and behaviors. 2) The influence of death reflection and death anxiety on prosocial behavior follows a dual-pathway mediation mechanism. Self-enhancement values mediated the effect of death anxiety on prosocial behavior; self-transcendence values mediated the effect of death reflection on prosocial behavior. 3) Donation context served as a moderating variable in the influence of death reflection and death anxiety on donation behavior. In public donation contexts, participants in the death anxiety group donated higher amounts; in anonymous donation contexts, participants in the death reflection group donated higher amounts. Donation context positively and negatively moderated the two mediating pathways through which death awareness influences prosocial behavior. This study reveals the positive and negative effect mechanisms through which death awareness influences prosocial behavior, providing further evidentiary support for the positive effects of death awareness.

Full Text

Preamble

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Response: (1) This study simultaneously examined and compared the effects of two cognitive forms of death awareness—death anxiety and death reflection—on prosocial behavior from both negative and positive perspectives of death awareness, revealing the positive and negative effect mechanisms through which death awareness influences prosocial behavior. (2) Using both laboratory prosocial behavior and real donation behavior as outcome measures, this study for the first time revealed the mechanisms underlying the effects of death reflection and death anxiety on prosocial behavior, demonstrating a dual-path mediation mechanism: self-enhancement values mediate the negative effect of death anxiety on prosocial behavior, while self-transcendence values mediate the positive effect of death reflection on prosocial behavior.

2. Have you published or submitted any articles using the same data as this study? If yes, please attach them for review.

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3. Non-experimental, non-intervention studies in management, clinical, personality, and social psychology that rely solely on self-report (questionnaire) methods need to examine common method bias. What methods did you use to control for or demonstrate that such bias does not affect the validity of your conclusions?

(For literature on common method bias, see: http://journal.psych.ac.cn/xlkxjz/CN/abstract/abstract894.shtml
Studies based on cross-sectional data with only self-reports and convenient

sampling are easy to conduct but typically lack innovative value and have low acceptance rates.

Response: Study 1 used a questionnaire survey and employed Harman's single-factor test to examine common method bias. The results showed that the first unrotated factor explained only 18.90% of the variance, which is below the 40% threshold. This suggests that serious common method bias is unlikely in our data.

4. Did you report and analyze effect sizes (e.g., Cohen's d for t-tests, ^{2} for ANOVA)? Did you report 95% CIs for statistical analyses?

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Response: For Study 1, using G*Power 3.1 with $\alpha = 0.05$ and medium effect size (f = 0.25), the required total sample size for 80% statistical power was at least 159; we actually recruited 481 participants. For Study 2, using the same parameters, the required sample size was at least 159; we actually recruited 231 participants.

6. (Question appears to be about reporting p-values and Bayesian factors, but the text is fragmented)

Response: Our paper reports precise p-values (not just $p < 0.001$ intervals) and includes 95% CIs for all key effects.

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Death Awareness and Prosocial Behavior: Differential Effects and Mechanisms of Death Reflection and Death Anxiety

Abstract

This study simultaneously examined and compared the effects of different forms of death awareness—death anxiety and death reflection—on prosocial behavior from both negative and positive perspectives of death awareness, and revealed the positive and negative effect mechanisms through which death awareness influences prosocial behavior. Study 1 and Study 2 used prosocial tendencies, public goods game behavior, and real donation behavior as outcome measures to investigate the effects of death anxiety and death reflection on prosocial behavior through questionnaire surveys and laboratory experiments, as well as the mediating role of different value orientations. The results showed that: (1) Death anxiety negatively predicted or reduced individuals' prosocial behavioral tendencies and behaviors, whereas death reflection positively predicted or increased individuals' prosocial tendencies and behaviors. (2) The effects of death reflection and death anxiety on prosocial behavior constituted a dual-path mediation mechanism: self-enhancement values mediated the negative effect of death anxiety on prosocial behavior, while self-transcendence values mediated the positive effect of death reflection on prosocial behavior. (3) Donation context moderated the effects of death reflection and death anxiety on donation

behavior. In public donation contexts, participants in the death anxiety group donated more money, whereas in anonymous donation contexts, participants in the death reflection group donated more. The donation context positively and negatively moderated the two mediating paths between death awareness and prosocial behavior, respectively. This study reveals the positive and negative effect mechanisms of death awareness on prosocial behavior, providing further evidence for the positive effects of death awareness.

Keywords: death awareness; death anxiety; death reflection; prosocial behavior; self-transcendence values; self-enhancement values

1. Introduction

"Since ancient times, who has escaped death?"—death is an eternal topic. As living beings of nature, all individuals must eventually experience death. Death awareness represents humans' feelings and understanding of death as living beings, and it is a continuously developing process. Previous psychological research on death awareness has primarily focused on individuals' negative reactions to death, such as denial, fear, anxiety, and insecurity triggered by death (Hoelter, 1979; Greenberg et al., 1986; Florian & Mikulincer, 2004). In recent years, scholars have begun investigating the positive effects and adaptability of death awareness (Frias et al., 2011; Wade-Benzoni et al., 2012). This paper simultaneously compares the effects of different aspects of death awareness—negative and positive—on prosocial behavior, revealing both the positive and negative effect mechanisms through which death awareness influences prosocial behavior.

1.1 The Negative and Positive Aspects of Death Awareness: Death Anxiety and Death Reflection

Most research on death awareness has been conducted within the framework of Terror Management Theory (TMT; Greenberg et al., 1986). This theory posits that humans face an irresolvable conflict when confronting death—the conflict between the desire for survival and the awareness that death is inevitable. Fear of this conflict generates intense anxiety about death. However, focusing solely on death-induced anxiety cannot fully capture the understanding of death awareness. Growth-oriented Self-Determination Theory suggests that individuals have autonomy in controlling and determining their existence (Deci & Ryan, 2000), and that death awareness is an adaptive response in human evolution whose more important function should be to trigger growth-oriented adaptive responses (Wang, Wang, et al., 2019). Recent research has consistently concluded that not everyone exhibits hostility and self-protection after contemplating death or encountering death-related stimuli; instead, they may demonstrate attitudes and behaviors that help others and the world (Cozzolino, 2006; Cozzolino et al., 2004; Grant & Wade-Benzoni, 2009; Lykins et al., 2007; Vail et al., 2012).

To explain these divergent findings regarding the positive and negative aspects

of death awareness, Grant and Wade-Benzoni (2009) proposed a dual-existence system model of death awareness by integrating terror management theory and generativity theory. This model distinguishes death awareness into death anxiety and death reflection, suggesting that death anxiety generates existential concerns, leading to self-protective withdrawal motivations and behaviors, whereas death reflection generates prosocial motivations and behaviors. The model proposes that different reactions to death occur because individuals learn about their own mortality through two independent information processing systems (Metcalfe & Mischel, 1999). The first pathway is the abstract existential system based on terror management theory, where individuals rely on a "hot" system characterized by intuition, emotion, and impulse to understand death. Research shows that exposure to abstract death cues induces death anxiety (Gailliot, 2008). Terror management theory typically uses the mortality salience (MS) paradigm to study changes in social behavior after individuals become aware of death. The mortality salience paradigm triggers death anxiety, including denial, fear, and insecurity (Hoelter, 1979; Greenberg et al., 1986; Florian & Mikulincer, 2004; Sliter et al., 2014). Death anxiety motivates individuals to engage in self-protective defenses, defend their worldview and self-esteem, and conform to salient social norms while exhibiting a pursuit of extrinsic values (Cozzolino et al., 2004; Goldenberg et al., 1999; Rosenblatt et al., 1989).

The second pathway is the concrete existential system, where individuals use their "cold" or cognitive system to view death. Related research indicates that concrete and personalized understanding of death can produce positive effects such as pursuing intrinsic growth, manifesting selfless behavior, and abandoning extrinsic value pursuits. Death reflection is the cognitive process through which individuals contemplate death (Yuan et al., 2019). Combining key features of near-death experiences (real death, life review, perspective-taking), Cozzolino et al. developed the death reflection paradigm (Cozzolino et al., 2004). In this paradigm, participants read materials describing real death scenarios and imagine themselves experiencing death, thereby triggering contemplation about death.

1.2 Death Awareness and Prosocial Behavior

Prosocial behaviors refer to all behaviors that conform to social expectations and benefit others, groups, or society, including helping, charitable donations, sharing, and cooperation. These behaviors range from completely altruistic actions to those conducted for self-interest (Carlo et al., 2007; Eisenberg et al., 2015). Although scholars have explored individuals' prosocial behavior under the mortality salience paradigm, few studies have distinguished and compared the different mechanisms through which specific cognitive states of death awareness affect prosocial behavior.

Terror management theory suggests that when individuals confront death, they produce two reactions: (1) maintaining their cultural worldview and (2) maintaining self-esteem to protect themselves from death anxiety (Greenberg et al.,

1986; Pyszczynski et al., 2004). Research shows that efforts to maintain mainstream cultural worldviews and self-esteem indeed reduce death anxiety (Burke & Martens, 2010). Materialistic pursuits reflect an individual's status and value as a social member, and individuals seek status to gain self-esteem, thereby alleviating internal death anxiety. Studies indicate that mortality salience manipulations increase individuals' materialistic and selfish tendencies (Arndt et al., 2005; Mandel & Smeesters, 2008; Sheldon & Kasser, 2008), and people cope with death anxiety through various forms of consumption behavior (Arndt et al., 2005; Fransen et al., 2008; Rindfleisch & Burroughs, 2004). For example, under mortality salience conditions, people prefer luxury goods that highlight status (Mandel & Heine, 1999), amplify the value of money (Zaleskiewicz et al., 2013), and become more greedy (Rindfleisch & Burroughs, 2009). Other related studies have also found negative effects of death anxiety on prosocial behavior: mortality salience reduces sympathy for people with disabilities (Hirschberger, 2005), decreases donations to charitable organizations (Hirschberger, 2008), and reduces contributions to out-group members (Jonas et al., 2013). Therefore, we hypothesize that death anxiety makes individuals more selfish and reduces their prosocial behavior.

Hypothesis 1: Death anxiety reduces individuals' prosocial behavioral tendencies and prosocial behaviors.

Grant and Wade-Benzoni (2009) argue that death reflection is an inducer of prosocial behavior. Death reflection motivates people to pay more attention to prosocial behavior (Goštautaitė & Bučiūnienė, 2014) and maintain positive connections with others (Yuan et al., 2019). Compared with participants under mortality salience conditions, those under death reflection paradigm manipulation show greater motivation to donate blood (Cozzolino et al., 2011) and participate in more public blood donation activities (Blackie & Cozzolino, 2011). Frias et al. (2011) found that the gratitude level of the death reflection group was significantly higher than that of the mortality salience group. Research on post-traumatic growth shows that individuals who experience post-traumatic growth typically exhibit a shift toward intrinsic goals, which aim to build meaningful, lasting resources that satisfy basic human needs for autonomy, relatedness, competence, and organization (e.g., building closer relationships and cooperative partnerships, helping make the world a better place) rather than focusing on extrinsic goals that only build temporary resources and satisfy surface needs (e.g., being attractive, earning more money) (Wei et al., 2015; Kasser, 2002; Kasser et al., 1995). Studies of near-death experiences indicate that death reflection can expand individuals' focus beyond their narrow career goals to consider helping others and doing good deeds (Cozzolino et al., 2004; Lykins et al., 2007). In summary, individuals under death reflection conditions become more intrinsically motivated and prioritize helping others. Therefore, we propose:

Hypothesis 2: Death reflection increases individuals' prosocial behavioral tendencies and prosocial behaviors.

1.3 Death Awareness, Values, and Prosocial Behavior

Values represent people's beliefs about what is important in life and determine the meaning of their existence. Schwartz (1992) proposed a system of ten distinct values: universalism, benevolence, tradition, conformity, security, power, achievement, hedonism, stimulation, and self-direction, organized into four dimensions: self-transcendence, self-enhancement, openness to change, and conservation. Research shows that Schwartz's values can predict a range of behaviors, including environmental protection (Karp, 1996), intergroup contact (Sagiv & Schwartz, 1995), voting (Barnea & Schwartz, 1998), and prosocial and antisocial behavior (Bond & Chi, 1997; Schwartz, 1992; Bardi & Schwartz, 2003; Schwartz & Bardi, 2001).

Schwartz (2015) noted that self-enhancement values are extrinsic and self-protective; individuals with such values focus on personal concerns, emphasize their status within groups, and strive for social prestige and personal achievement. In contrast, self-transcendence values are intrinsic and self-growth-oriented, transcending the narrow self to emphasize concern for others' welfare and nature protection. Dual-existence system research shows that concrete and personalized understanding of death leads individuals to pursue intrinsic growth, abandon extrinsic values, and reorient their values (Kang, 2022). For example, individuals who have experienced near-death events shift their value orientation from extrinsic to intrinsic, become less greedy, and experience enhanced gratitude and a sense of transcendence (Cozzolino, 2006; Cozzolino et al., 2004; Frias et al., 2011). In contrast, individuals under death anxiety are oriented toward self-protection and extrinsic values, often being competitive, materialistic, insecure, and depressed (Wei et al., 2015). Self-transcendence values promote harmonious interpersonal relationships and social support more than self-enhancement values (Crocker et al., 2016). For instance, Abramson et al. (2018) found that participants with self-transcendence values engaged in more costly sharing behavior in resource allocation tasks. Miao et al. (2017) found that participants who endorsed self-transcendence values showed more prosocial intentions than those who endorsed self-enhancement values. Individuals with self-transcendence values experience more social connection emotions, such as empathy and compassion, which may generate more prosocial behavior (He & Zhu, 2016; Lim & Desteno, 2016). In summary, we speculate that there may be a mechanistic relationship between death reflection, death anxiety, and self-transcendence/self-enhancement values. Specifically, under death reflection conditions, individuals' value orientation shifts from extrinsic to intrinsic, self-transcendence values are enhanced, thereby affecting prosocial behavior; whereas death anxiety activates defense mechanisms similar to self-enhancement values, thus affecting prosocial behavior. Accordingly, we propose:

Hypothesis 3a: Death reflection enhances individuals' self-transcendence values and weakens self-enhancement values, with both values mediating the effect of death reflection on prosocial behavior.

Hypothesis 3b: Death anxiety enhances individuals' self-enhancement values and weakens self-transcendence values, with both values mediating the effect of death anxiety on prosocial behavior.

1.4 The Moderating Role of Donation Context

Charitable donation, as a typical prosocial behavior, refers to providing help or support to people or organizations in need with little or no reciprocal return, aiming to increase the welfare of recipients (Zhou et al., 2012). Terror management theory suggests that engaging in prosocial behavior can serve as a means to achieve cultural worldviews and gain self-esteem. However, individuals with death anxiety only exhibit prosocial behavior under certain conditions. Jonas et al. (2002) revealed a "Scrooge effect," where mortality salience participants only increased support for charities when they believed prosocial behavior was important to their cultural worldview. Gailliot et al. (2008) found that mortality salience individuals only increased their willingness to help others when reminded of the social value of helping. Jonas et al. (2013) found that mortality salience manipulation significantly reduced donations to overseas charities (out-groups). Other research found that mortality salience only led to higher donations when donation behavior was a source of self-esteem (Ferraro, Shiv, & Bettman, 2005). Similarly, individuals who endorse self-enhancement values show different prosocial behaviors across contexts—they may provide public help but rarely provide altruistic help, because public prosocial behavior can enhance the helper's social status and bring good reputation and self-esteem (Hirschberger et al., 2005; Knight et al., 2016; Yang & Hsee, 2022; Zhong, Bohns, & Gino, 2010). In private contexts, where people believe their behavior cannot be observed by others, their "public" consciousness decreases, attention focuses more on internal feelings, and the likelihood of donation and helping behavior decreases. Post-traumatic growth theory (Tedeschi, Park, & Calhoun, 1998) suggests that people who engage in death reflection help others because psychological growth changes their basic attitudes and motivations toward life, making them pursue intrinsic values and become more selfless toward others (Cozzolino, 2006; Cozzolino et al., 2004; Frias et al., 2011; Tedeschi et al., 2004). In summary, we speculate that individuals with death anxiety will donate more in public than anonymous donation contexts, with the negative predictive effect of self-enhancement values on donation behavior being weakened, whereas individuals with death reflection, seeking greater meaning, will donate more in anonymous contexts, with the positive predictive effect of self-transcendence values on donation behavior being stronger.

Hypothesis 4a: For individuals under death anxiety conditions, donation amounts in public donation contexts will be significantly higher than in anonymous contexts; donation context moderates the latter half of the "death anxiety → self-enhancement values → donation amount" path, such that the negative effect of self-enhancement values on donation amount is weaker in public compared to anonymous contexts.

Hypothesis 4b: For individuals under death reflection conditions, there will be no significant difference in donation amounts between public and anonymous contexts; donation context moderates the latter half of the "death reflection → self-transcendence values → donation amount" path, such that the positive effect of self-transcendence values on donation amount is stronger in anonymous compared to public contexts.

Based on the dual-existence system model of death awareness, this study uses both questionnaire surveys and laboratory experiments to explore the effects of the negative and positive aspects of death awareness—death anxiety and death reflection—on prosocial behavior and their mechanisms, i.e., a dual-path model (see Figure 1 [Figure 1: see original paper]). Study 1 and Study 2 examine the effects of death anxiety and death reflection on prosocial behavior using prosocial tendencies, public goods game behavior, and real donation behavior as outcome measures, and test the mediating role of self-transcendence and self-enhancement values.

2. Study 1: Exploring the Relationship Between Death Awareness and Prosocial Behavioral Tendencies

Study 1 preliminarily explored the relationship between death awareness and prosocial behavioral tendencies through a questionnaire survey, examining the predictive effects of death anxiety and death reflection on prosocial tendencies and the role of self-transcendence and self-enhancement values.

2.1 Method

2.1.1 Participants Using G*Power 3.1 software, with a significance level of $\alpha = 0.05$ and medium effect size (f = 0.25), the required total sample size for 80% statistical power was at least 159. The questionnaire was distributed through the Wenjuanxing platform, and 481 university students (including undergraduates, master's students, and doctoral students) were recruited online using random sampling. After excluding questionnaires with missing responses or obvious response patterns, 439 valid questionnaires remained (effective rate = 91%). The sample included 185 males and 254 females, aged 18-36 years (M = 21.79, SD = 2.46). Participants received 2 RMB upon completion.

2.1.2 Materials and Procedure Participants completed the Death Anxiety Scale, Death Reflection Scale, Portrait Value Questionnaire, and Prosocial Tendencies Measure in sequence; the order of the death anxiety and death reflection scales was counterbalanced across participants.

(1) Death Anxiety Scale (Templer-Death Anxiety Scale, T-DAS): We used the localized Chinese version of the Death Anxiety Scale (CT-DAS) by Yang (2012). The scale consists of 15 death-related items rated on a 5-point scale, with higher scores indicating greater death anxiety. The internal consistency coefficient was 0.85.

(2) Death Reflection Scale (DRS): We used the Chinese revised version of the Death Reflection Scale for university students by Fang et al. (2022). The scale consists of 15 death-related items rated on a 7-point scale, with higher scores indicating greater death reflection. The internal consistency coefficient was 0.86.

(3) Portrait Value Questionnaire (PVQ-40): We used the self-transcendence and self-enhancement value subscales from the Portrait Value Questionnaire, which include 10 and 7 items respectively, rated on a 6-point scale. Higher scores indicate stronger self-transcendence or self-enhancement value orientation. The total scale internal consistency coefficient was 0.96, with 0.93 for self-transcendence values and 0.85 for self-enhancement values.

(4) Prosocial Tendencies Measure (PTM): We used the revised Prosocial Tendencies Measure by Kou et al. (2007), which includes 6 dimensions and 26 items rated on a 5-point scale. The internal consistency coefficient was 0.95.

2.1.3 Procedure The study was conducted through the Wenjuanxing platform. University students were recruited online using random sampling. All data were collected anonymously. After excluding invalid questionnaires, participants who completed the survey received 2 RMB through the platform.

2.2 Results

2.2.1 Common Method Bias Test Harman's single-factor test was used to examine common method bias. The first unrotated factor explained 18.90% of the variance, which is below the 40% threshold. This suggests that serious common method bias is unlikely in our data.

2.2.2 Correlation Analysis After controlling for gender, age, major, birthplace, and education level, partial correlations showed that death awareness, death anxiety, self-transcendence values, self-enhancement values, and prosocial tendencies were all significantly correlated ($p < 0.01$).

2.2.3 Relationship Between Death Awareness and Prosocial Behavioral Tendencies: Dual-Path Mediation Model Test We used Mplus 8.0 to test the mediating effects of self-transcendence and self-enhancement values in the relationships between death reflection/death anxiety and prosocial behavioral tendencies. After controlling for demographic variables, we constructed a mediation model with death reflection and death anxiety as independent variables, prosocial behavioral tendencies as the dependent variable, and self-transcendence and self-enhancement values as mediators. The bootstrap method with 5,000 resamples was used to examine mediation effects. The results showed that both death reflection and death anxiety could predict self-enhancement and self-transcendence values, and both value types could predict prosocial behavioral tendencies. Path coefficients are shown in Figure 2 [Figure 2: see original paper].

Self-transcendence values partially mediated the effect of death reflection on prosocial behavioral tendencies. The total effect of "death reflection → prosocial behavioral tendencies" was 0.259 (95% CI = [0.390, 0.773], $p < 0.001$), the direct effect was 0.195 (95% CI = [0.172, 0.336], $p < 0.001$), and the indirect effect was 0.064 (95% CI = [1.062, 2.444], $p < 0.001$). Self-enhancement values partially mediated the effect of death anxiety on prosocial behavioral tendencies. The total effect of "death anxiety → prosocial behavioral tendencies" was -0.381 (95% CI = [-0.843, -0.465], $p < 0.001$), the direct effect was -0.220 (95% CI = [-0.335, -0.160], $p < 0.001$), and the indirect effect was -0.161 (95% CI = [-1.905, -0.352], $p < 0.001$). Additionally, the mediation models for "death reflection → self-enhancement values → prosocial behavioral tendencies" and "death anxiety → self-transcendence values → prosocial behavioral tendencies" were also significant, with effect sizes of 0.146 and -0.167, respectively, and 95% CIs that did not include zero: [5.727, 8.081] and [-3.711, -1.112].

Figure 2. Dual-path model of death awareness effects on prosocial behavioral tendencies (Note: n = 439, *** $p < 0.001$; values in parentheses represent total effects).

In summary, the proposed dual-path model was supported. Death anxiety showed a significant negative predictive effect on prosocial tendencies, while death reflection showed a significant positive predictive effect. Both self-transcendence and self-enhancement values mediated the effects of death anxiety and death reflection on prosocial tendencies.

3. Study 2: Effects of Death Awareness on Laboratory and Real-World Prosocial Behavior

Study 1 preliminarily examined the relationships between death reflection/death anxiety and prosocial tendencies and their underlying mechanisms. Study 2 used experimental methods, selecting public goods game situations and real donation contexts from prosocial behavior research to examine the impact of death awareness on prosocial behavior, continuing to verify the mediating role of self-transcendence and self-enhancement values. Additionally, Study 2 examined boundary conditions for individuals with different death awareness when implementing prosocial behavior by setting up different donation contexts, further verifying the psychological mechanism through which death awareness affects prosocial behavior.

3.1 Method

3.1.1 Participants Using G*Power 3.1 software, with a significance level of $\alpha = 0.05$ and medium effect size ($f = 0.25$), the required total sample size for 80% statistical power was at least 159. Participants were undergraduate students from a university, with 231 participants recruited in total. After excluding incomplete data and participants who failed the lie-detection item, 204 valid

participants remained, including 81 males and 123 females, aged 18-27 years (M = 20.92, SD = 2.20). Participants received 20 RMB after the experiment.

3.1.2 Experimental Materials (1) Mortality Salience Paradigm (Cozzolino et al., 2004; Goldenberg et al., 1999; Rosenblatt, Greenberg, & Solomon, 1989): Participants answered two open-ended questions about death ("Please imagine and write down the thoughts, feelings, and emotions you experience when thinking about your own death" and "Please imagine and write as much as possible about the physical changes of your body at the moment of death and after death"). After a brief distraction task (18 three-digit arithmetic problems), the Death Anxiety Scale was administered as a manipulation check. This paradigm was used to induce death anxiety.

(2) Death Reflection Paradigm (Cozzolino et al., 2004): Participants read a concrete death scenario: "Imagine you are staying at a friend's house… At midnight, you are awakened from deep sleep by screams and suffocating smoke. You reach to turn on the bedside lamp and are shocked to see smoke rapidly filling the room… The moment you open the door, a huge wave of heat and billowing smoke rushes into the room, knocking you down… You gradually have difficulty breathing… You gasp for breath, weak and powerless, and at this moment you close your eyes and wait for death to come…" Participants then answered four open-ended questions about death: "Please describe in detail your thoughts and emotions when imagining the above scenario," "If you really experienced this, how would you handle your final moments?" "Imagine again that you really experienced this event, describe your life before this," and "If this really happened to you, how do you think your family would react?" The Death Reflection Scale was then administered as a manipulation check, and a lie-detection item was included.

(3) Emotion Scale: To rule out the influence of emotion on intertemporal decision-making, the PANAS (Positive and Negative Affect Schedule) was used to measure participants' emotions after death awareness priming. The scale consists of 9 positive and 9 negative emotion words rated on a 5-point scale.

(4) Prosocial Experimental Paradigm: Public Goods Game: Participants were told they would form a group with three other students to complete an investment game. The rules were as follows: At the start of the game, each group member received 100 game coins. The group would open a public account, and each member could deposit any amount (0-100 coins) into the public account, keeping the remainder for themselves. If the total deposited reached $\geq$ 200 coins, the public account would double and be distributed equally among all group members; if the total was $<$ 200 coins, the deposited coins would not be returned. The game consisted of 30 rounds, and participants' final earnings would be converted to real payment. Participants were later informed that the other three players were computer-simulated.

3.1.3 Procedure The experiment used a 3 (manipulation condition: death reflection group vs. mortality salience group vs. control group) × 2 (donation context: anonymous vs. public) between-subjects design, with participants randomly assigned to one of six conditions. University students were recruited through online posters, and the experiment could be conducted when each group had four participants. The experimenter informed participants that the experiment consisted of two parts: material completion and a computer task, with four participants completing certain parts together.

First, death awareness was manipulated through the mortality salience paradigm and death reflection paradigm. Control group participants answered two open-ended questions about toothache: "Please imagine and write down the thoughts, feelings, and emotions you experience when thinking about your own toothache" and "Please imagine and write as much as possible about the physical changes when you have a toothache." Participants then completed the PANAS scale, distraction task, Death Anxiety Scale, Death Reflection Scale, and Portrait Value Questionnaire, followed by the public goods game on computer, and finally the donation experiment.

After completing the public goods game, participants were told the experiment had ended and left the laboratory. A live donation activity was set up outside the laboratory (10 meters away to prevent participants from feeling it was part of the experiment). The donation experiment followed the procedure of White and Peloza (2009). Real charity advertisements were selected from the Zhengzhou Charity Federation website. To avoid stereotypes about special groups affecting donation willingness, we selected a common case of sick infants as experimental material, with consistent image formats and text across conditions. The anonymous context group was told donations would be completely anonymous, while the public context group was asked to sign their name on a public list after donating, which would be posted immediately.

3.2 Results

3.2.1 Emotional Differences Across Death Priming Conditions A one-way ANOVA with death awareness type (mortality salience, death reflection, toothache control) as the independent variable and positive/negative emotion as dependent variables showed no significant differences in positive emotion ($F(2,201) = 0.44$, $p = 0.64$) or negative emotion ($F(2,201) = 0.45$, $p = 0.64$) across groups.

3.2.2 Manipulation Check for Death Reflection and Death Anxiety One-way ANOVAs comparing death reflection and death anxiety scores across the three groups showed significant differences. For death reflection scores, the death reflection group was significantly higher than the mortality salience group ($t(135) = 2.56$, 95% CI = [2.199, 2.924], $p < 0.001$, $d = 0.44$) and control group ($t(132) = 0.77$, 95% CI = [0.399, 1.132], $p < 0.001$, $d = 0.13$), while the control group was significantly higher than the mortality salience group ($t(135) = 1.80$,

95% CI = [1.433, 2.159], p < 0.001, d = 0.31). For death anxiety scores, the mortality salience group was significantly higher than the death reflection group (t(135) = 1.82, 95% CI = [1.536, 2.105], p < 0.001, d = 0.31) and control group (t(135) = 1.46, 95% CI = [1.175, 1.744], p < 0.001, d = 0.25), while the control group was significantly higher than the death reflection group (t(132) = 0.36, 95% CI = [0.073, 0.649], p = 0.014, d = 0.06). These results indicate successful experimental manipulation.

3.2.3 Differences in Investment and Donation Amounts One-way ANOVA results showed significant differences in both public goods game investment amounts and donation amounts across groups. For investment amounts, the death reflection group was significantly higher than the mortality salience group (t(135) = 29.22, 95% CI = [24.716, 33.729], p < 0.001, d = 5.03) and control group (t(132) = 14.36, 95% CI = [9.803, 18.914], p < 0.001, d = 2.50), with the control group also significantly higher than the mortality salience group (t(135) = 14.86, 95% CI = [10.358, 19.371], p < 0.001, d = 2.56). For donation amounts, the death reflection group was significantly higher than the mortality salience group (t(135) = 2.38, 95% CI = [0.510, 4.240], p = 0.013, d = 0.41), with no differences between the control group and either experimental group. Thus, death anxiety had a significant negative effect on both investment and donation amounts, while death reflection had a significant positive effect on both.

3.2.4 Differences in Self-Transcendence and Self-Enhancement Values Self-transcendence and self-enhancement values differed significantly across experimental conditions. Using centered self-transcendence values as the criterion, the death reflection group was significantly higher than the mortality salience group (t(135) = 0.72, 95% CI = [0.563, 0.884], p < 0.001, d = 0.12) and control group (t(132) = 0.28, 95% CI = [0.113, 0.438], p = 0.001, d = 0.05), with the control group significantly higher than the mortality salience group (t(135) = 0.45, 95% CI = [0.288, 0.609], p < 0.001, d = 0.08). Using centered self-enhancement values as the criterion, the mortality salience group was significantly higher than the death reflection group (t(135) = 0.92, 95% CI = [0.730, 1.101], p < 0.001, d = 0.16) and control group (t(135) = 0.57, 95% CI = [0.390, 0.760], p < 0.001, d = 0.10), with the control group significantly higher than the death reflection group (t(132) = 0.34, 95% CI = [0.153, 0.528], p < 0.001, d = 0.06). These findings indicate that death reflection positively affected self-transcendence values and negatively affected self-enhancement values, while death anxiety showed the opposite pattern.

Table 1 Differences in Manipulation Checks, Values, Investment Amounts, and Donation Amounts Across Death Awareness Groups

Variable	Toothache Control (n=67)	Mortality Salience (n=70)	Death Reflection (n=67)	F-value
Death Reflection Score	2.92$±0.33	4.38±1.38	2.58±0.29	89.61∗∗
	$DeathAnxietyScore	5.32±0.85	3.52±1.59	6.09±0.39	102.76∗∗
	$InvestmentAmount	50.11±7.96	35.24±15.25	64.46±15.43	81.79∗∗
	$DonationAmount	4.30±5.35	3.41±4.87	5.79±6.33	3.21∗
	$Self-TranscendenceValues	0.11±0.35	−0.34±0.49	0.38±0.56	40.37∗∗
	$Self-EnhancementValues	0.06±0.53	0.64±0.53	−0.28±$0.62	

Note: $p < 0.05$, **p < 0.001

3.2.5 Correlation Analysis of Variables After controlling for gender, age, education level, and income, partial correlations showed that death awareness, death anxiety, self-transcendence values, self-enhancement values, and prosocial tendencies were all significantly correlated.

3.2.6 Mediation Effect Test for Values With investment amount in the public goods game as the dependent variable: Using death reflection and death anxiety as independent variables, self-transcendence and self-enhancement values as mediators, and controlling for age, gender, and income, we tested the mediating effects using structural equation modeling in Mplus 8.0 (model coefficients shown in Figure 3 [Figure 3: see original paper]). The results indicated that both self-transcendence and self-enhancement values mediated the effects of death awareness on investment amount through four paths: "death reflection → self-transcendence values → investment amount," "death reflection → self-enhancement values → investment amount," "death anxiety → self-enhancement values → investment amount," and "death anxiety → self-transcendence values → investment amount," with effect sizes of 0.172, 0.092, -0.109, and -0.063, respectively. All 95% CIs excluded zero: [0.676, 2.364], [0.544, 1.767], [-1.005, -0.046], and [0.082, 1.234].

Figure 3. Dual-path model of death awareness effects on investment amount (Note: n = 204; ** p < 0.01, *** p < 0.001; values in parentheses represent total effects).

With donation amount as the dependent variable: Model coefficients are shown in Figure 4 [Figure 4: see original paper]. The four mediation paths—"death reflection → self-transcendence values → donation amount,"

"death reflection → self-enhancement values → donation amount," "death anxiety → self-enhancement values → donation amount," and "death anxiety → self-transcendence values → donation amount"—were significant, with effect sizes of 0.198, 0.143, -0.175, and -0.077, respectively. All 95% CIs excluded zero: [1.334, 5.314], [0.187, 0.259], [-4.796, -1.262], and [-0.125, -0.035].

Figure 4. Dual-path model of death awareness effects on donation amount (Note: n = 204; ** $p < 0.01$, *** $p < 0.001$; values in parentheses represent total effects).

In summary, death anxiety negatively predicted prosocial behavior, while death reflection positively predicted prosocial behavior. Under death reflection conditions, individuals' self-transcendence values were enhanced and self-enhancement values weakened, with both value types mediating the relationship between death reflection and prosocial behavior. Under death anxiety conditions, individuals' self-enhancement values were enhanced and self-transcendence values weakened, with both value types mediating the relationship between death anxiety and prosocial behavior.

3.2.7 Moderating Effect of Donation Context on Death Awareness and Donation Behavior A 3 (death awareness: death reflection, mortality salience, toothache) × 2 (donation context: public, anonymous) repeated-measures ANOVA on donation amounts showed no significant main effect of donation context, $F(1, 198) = 0.03$, $p = 0.96$. The main effect of death awareness was significant, $F(2, 198) = 3.47$, $p = 0.033$, $^2 = 0.34$. The interaction between death awareness and donation context was significant, $F(2, 198) = 5.19$, $p = 0.006$, $^2 = 0.50$. Simple effects analysis (see Figure 5 [Figure 5: see original paper]) showed that in the public context, donation amounts did not differ significantly among the toothache control, mortality salience, and death reflection groups, $F(2, 198) = 1.08$, $p = 0.34$. In the anonymous context, donation amounts differed significantly across groups, $F(2, 198) = 7.35$, $p = 0.001$, $^2 = 1.04$. Post-hoc tests showed that the death reflection group (SE = 0.17, $p = 0.001$, $^2 = 1.53$) and toothache control group (SE = 0.17, $p = 0.03$, $^2 = 1.03$) donated more than the mortality salience group, with no significant difference between the death reflection and control groups (SE = 0.18, $p = 0.66$).

Figure 5. Donation amounts across death awareness and donation contexts (error bars represent standard errors).

Moderating effect of donation context on the relationship between death reflection, self-transcendence values, and donation amount: Building on the significant mediation effect of self-transcendence values, we used Hayes's PROCESS macro (Model 14) in SPSS to test whether donation context moderated the relationship between death reflection, self-transcendence values, and donation amount. After controlling for education, age, gender, and income, the interaction between self-transcendence values and donation context significantly predicted donation amount ($b = -4.998$, $p < 0.001$), indicating a

significant moderating effect. Simple slope analysis (see Figure 6 [Figure 6: see original paper]) showed that in the public context, self-transcendence values positively predicted donation amount (b = 3.560, 95% CI = [1.805, 5.316], $p < 0.001$); in the anonymous context, the positive effect was also significant (b = 8.558, 95% CI = [5.921, 11.195], $p < 0.001$). However, the indirect effect of death reflection on donation amount via self-transcendence values was stronger in the anonymous context (b = 2.049, 95% CI = [1.142, 2.907]) than in the public context (b = 0.852, 95% CI = [0.478, 1.277]), with a significant difference between contexts (difference = 1.197, 95% CI = [-1.926, -0.384]). This indicates a significant moderated mediation effect.

Figure 6. Moderating effect of donation context on the relationship between self-transcendence values and donation amount.

Moderating effect of donation context on the relationship between death anxiety, self-enhancement values, and donation amount: The moderation test showed that the interaction between self-enhancement values and donation context significantly predicted donation amount (b = 2.582, p = 0.032), indicating a significant moderating effect. Simple slope analysis (see Figure 7 [Figure 7: see original paper]) showed that in the public context, self-enhancement values negatively predicted donation amount (b = -3.395, 95% CI = [-4.749, -2.040], $p < 0.001$); in the anonymous context, the negative effect was also significant (b = -5.977, 95% CI = [-8.154, -3.800], $p < 0.001$). The indirect effect of death anxiety on donation amount via self-enhancement values was significant in both anonymous (b = -1.710, 95% CI = [-2.507, -0.958], $p < 0.05$) and public contexts (b = -0.971, 95% CI = [-1.435, -0.568], $p < 0.05$), with a marginally significant difference between contexts (95% CI = [-0.007, 1.504], p = 0.052). This indicates a significant moderated mediation effect.

Figure 7. Moderating effect of donation context on the relationship between self-enhancement values and donation amount.

In summary, donation context moderated the effects of death awareness on donation behavior. The context moderated the latter half of the "death anxiety → self-enhancement values → donation amount" path, with self-enhancement values showing a stronger negative effect on donation amount in anonymous contexts. The context also moderated the latter half of the "death reflection → self-transcendence values → donation amount" path, with self-transcendence values showing a stronger positive effect on donation amount in anonymous contexts.

4. Discussion

Previous research on death awareness has mostly focused on its negative effects, with fewer studies examining its positive utility and adaptability. This study measured, distinguished, and compared the effects and mechanisms of death anxiety and death reflection on prosocial behavior, proposing a "dual-path" model that provides supporting evidence for the dual-existence system model

(Grant & Wade-Benzoni, 2009) and expands research on the social adaptability of death awareness, offering new directions for positive death awareness research.

4.1 Relationship Between Death Awareness and Prosocial Behavior

Both studies showed that whether measured as prosocial behavioral tendencies, laboratory prosocial behavior, or real-world prosocial behavior, death reflection positively predicted prosocial tendencies and behaviors. These findings add empirical evidence for the effect of death reflection on prosocial behavior and align with research on positive death psychology, such as post-traumatic growth and near-death experiences (Cozzolino et al., 2004; Cozzolino, Sheldon, Schachtman, & Meyers, 2007; Frias, Watkins, Webber, & Froh, 2011; Niemiec, Cozzolino, Vansteenkiste, & Deci, 2006). Research on post-traumatic growth (Tedeschi et al., 2004) and near-death experiences (Ring, 1984) shows that individuals who undergo these psychological processes develop a death reflection consciousness that triggers various intrinsically oriented psychological needs (Cozzolino et al., 2004).

Studies 1 and 2 also showed that death anxiety negatively predicted prosocial tendencies and behaviors, consistent with previous research showing that death anxiety generally reduces prosocial behavior, and that its promotion of prosocial behavior is conditional (Gailliot et al., 2008; Hirschberger et al., 2008; Wade-Benzoni et al., 2012; Cai & Wyer, 2015). Arndt (2005) and Sheldon (2008) found that mortality salience increases materialistic and selfish tendencies, so individuals reduce prosocial behavior when helping others does not benefit them (e.g., through social recognition and praise). Jonas (2013) found that the effect of mortality salience on donations depends on salient norms (including social and personal norms) and values; for people who value money, mortality salience reduces donations. Cozzolino (2011) found that mortality salience participants only increased blood donation willingness when told national blood demand was high. Jonas (2002) found that mortality salience enhances compliance with prosocial behavior norms, with participants giving higher evaluations to charities they identified with and preferring to donate to in-group charities. In summary, individuals with death anxiety only exhibit prosocial behavior when it satisfies their pursuit of external values such as social prestige, achievement, and dominance over others; when the prosocial behavior context aligns with social value orientations; and when facing in-group members (Burke & Martens, 2010). However, this study did not distinguish the targets of prosocial behavior, which may explain our finding of a negative effect of death anxiety on prosocial behavior.

4.2 Mediating Role of Values

From the perspective of terror management theory, people facing death use defense mechanisms to offset their anxiety and fear, during which they pursue external values and goals (Cozzolino et al., 2004; Kosoloff & Greenberg, 2009). This reaction parallels self-enhancement values, which are extrinsic and

self-protective values that protect individuals by avoiding or controlling anxiety and threatening stimuli (Schwartz, 2015). Therefore, our finding that death anxiety reduces prosocial behavior by enhancing self-enhancement values further supports and validates the defense mechanism of death anxiety. Meanwhile, the role of self-transcendence values in mediating the effect of death reflection on prosocial behavior aligns with research on the positive effects of death awareness. As the saying goes, "Being-towards-death" and "Without knowing death, how can one know life?"—without profound reflection on death, one cannot understand the meaning of life. Death reflection research shows that individuals under death reflection consciousness typically exhibit less greed, higher spirituality and transcendence (Cozzolino et al., 2004), more gratitude (Frias et al., 2011), stronger self-identity (Blackie et al., 2016), and greater emphasis on intrinsic value-oriented life goals (Lykins et al., 2007). Individuals who have experienced major trauma and near-death events often undergo a "great enlightenment" transformation. Lykins (2007) found that individuals who experienced the 1994 Los Angeles earthquake and 9/11 events showed a significant shift from extrinsic to intrinsic goal orientation.

This study found that self-transcendence values only partially mediated the effect of death reflection on prosocial behavior, suggesting other factors may also influence this relationship. Frias et al. (2011) found that death reflection enhances gratitude, which promotes prosocial behavior (Wang & Wu, 2020). Other research shows that death reflection positively affects well-being (Liu & Li, 2022; Yue, 2021; Kang, 2022), and individuals with higher well-being exhibit more prosocial behavior (Yue, 2021). Some researchers note that sadness is a prominent emotional response after death awareness priming (Huang & Hu, 2023), and sadness helps promote seeking close interpersonal relationships and support (Kastenbaum, 2009; Kastenbaum & Heflick, 2011). Therefore, whether gratitude, well-being, and sadness work together with self-transcendence values in the process of death awareness affecting prosocial behavior warrants future investigation.

4.3 Moderating Effect of Donation Context

As mentioned, individuals under mortality salience conditions still exhibit some prosocial behavior, but only when it satisfies their pursuit of external values such as social prestige, status, and dominance over others (Ferraro, Shiv, & Bettman, 2005; Gailliot, 2008; Jonas et al., 2002; Knight et al., 2016). This study further reveals the boundary conditions for death anxiety leading to prosocial behavior through the moderating effect of donation context, re-verifying the context-dependency of death anxiety's effect on prosocial behavior and revealing its underlying mechanism.

Reker and Wong's (1988) personal meaning system model divides meaning orientation into four levels: self-concern (i.e., hedonism and comfort), individualism (i.e., investing time and energy to realize personal potential), collectivism (i.e., commitment to larger social and political groups), and self-transcendence (i.e.,

pursuing values and goals beyond self-interest). The model assumes that increased sense of meaning is proportional to one's commitment to higher-level orientations. Therefore, meaning is fundamentally about self-transcendence. Anonymous donation may be more meaningful for individuals, so those with self-transcendence values would participate more anonymously. Kang (2022) interviewed over 12 anonymous living organ donors, finding that the essence of anonymous living organ donation experience is "confirming the value of self-existence and the meaning of life by sharing part of one's body with others as a practice of love and morality." Therefore, under death reflection, individuals with stronger self-transcendence values make more donations in anonymous contexts to achieve greater meaning.

4.4 Theoretical and Practical Implications

Most death awareness research has focused on death's negative effects, with scholars only recently attending to its positive utility and adaptability. This study measured, distinguished, and compared the effects and mechanisms of death anxiety and death reflection on prosocial behavior, proposing a "dual-path" model that provides supporting evidence for the dual-existence system model (Grant & Wade-Benzoni, 2009) and expands research on the social adaptability of death awareness, offering new directions for positive death awareness research.

Prosocial behavior is a crucial factor for harmonious social development. In the face of natural disasters and viral death cues, humans should unite and assist each other. This study reveals the relationship between death awareness and prosocial behavior to some extent. How to make individuals view death more from the perspective of death reflection is a future direction for research on the positive effects and adaptability of death awareness. Although this study found that death anxiety has negative effects on prosocial behavior, changing the specific context and form of prosocial behavior can also promote its occurrence. For example, Aknin and Dunn (2020) found that under mortality salience, individuals who signed books donated more than those who did not, because signing created a sense of self-transcendence that promoted donation behavior. Therefore, how to promote prosocial behavior in death-anxious individuals by changing the implementation method of prosocial behavior is another direction for future exploration.

4.5 Limitations and Future Directions

This study has several limitations. First, all participants were university students aged 20-30, and we did not examine the role of age in the effect of death awareness on prosocial behavior. Different age groups may have different understandings and coping styles when facing death topics. Research shows that older adults have higher death reflection than younger adults and show more kindness, intrinsic value orientation, and other-concern after death reminders (Cozzolino et al., 2009). Future research could compare death awareness differ-

ences and subsequent behavioral effects across age groups. Second, this study did not consider cultural differences in death psychology, as not all cultures exhibit fear of death. Van den Bos et al. (2012) found that Muslims did not show defensive reactions to death under mortality salience conditions. Therefore, future research could investigate death psychology across broader populations and regions to reveal cultural differences. Finally, this study used the death reflection paradigm and mortality salience paradigm to manipulate death reflection and death anxiety, respectively. Future research could enhance ecological validity by using methods such as virtual reality technology (Chirico et al., 2018) as priming materials.

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Note: Figure translations are in progress. See original paper for figures.