



# Effects of death anxiety on fear of missing out

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## Abstract

Death Anxiety (DA) and Fear of Missing Out (FOMO) are two psychological phenomena that have distinct implications for individuals and their overall quality of life. The Terror Management Theory (TMT) is utilized to bridge the gap between these constructs and extends its understanding to everyday behaviors and psychopathology. The present 2-part study examined the effects of DA and Mortality Salience (MS) on FOMO, respectively. Study 1 included ( $N=220$ ; 53% females) participants aged 18 to 38 years ( $M=21.48$ ,  $SD=3.80$ ) and Study 2 included ( $N=175$ ; 53% females) participants aged 20 to 63 years ( $M=32.23$ ,  $SD=9.43$ ). Results supported the hypotheses, where (1) a strong and positive correlation exists between FOMO and DA; the strength of the correlation weakens, after self-esteem was partially out, and (2) participants in the MS condition who reported higher self-esteem, reported significantly lower levels of FOMO. Practical implications include broadening the TMT literature to advance clinical psychological practice, where new interventions that addresses the effects of FOMO and future translational research are needed to mitigate DA and its detrimental effects. Overall, this novel discovery which involves FOMO serves as a precedent for future TMT studies.

**Keywords** Death anxiety · Terror management theory · Fear of missing out · Mortality salience

## Introduction

Death Anxiety (DA) has important theoretical foundations in Terror Management Theory (TMT; Weaver et al., 2021), while Fear of Missing Out (FOMO) can be theorized as an extension of TMT. Notably, both phenomena are rooted in the fundamental fear of missed opportunities and existential concerns experienced in life (Iverach et al., 2014; Przybylski et al., 2013). Given the possible conceptual parallels between DA and FOMO, surprisingly, no studies to date examined the association between these variables and their relation to self-esteem (where self-esteem is significantly implicated in both phenomena; Abeyta et al., 2014; Gori

et al., 2023). Therefore, the present study aimed to examine: (1) the association between DA and FOMO and (2) the moderating role of self-esteem on the association between mortality salience (MS) effects and FOMO.

## Death anxiety

DA is defined as the psychological distress and fears we experience when confronted with mortality and uncertainty surrounding death (Neimeyer et al., 2003). It encompasses a cluster of attitudes marked by annoyance, discomfort, threats, uneasiness, and other unpleasant emotional states exacerbated by death-related thoughts and experiences (e.g., annihilate oneself, after-death care for the corpse, loss of loved ones, funeral rituals, and the unknown; Menzies et al., 2021). DA appears particularly relevant currently because the after-effects of the post-pandemic have exacerbated an increase in DA worldwide, where a large extent of the public's behaviors and emotional states can be attributed to fears of death that drives the instinct for self-preservation (e.g., excessive handwash and wiping down touchpoints; Menzies & Menzies, 2020).

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## Death anxiety and self-esteem

While detrimental implications are considered, a wealth of DA literature emphasizes self-esteem to be a buffer against DA (Abeyta et al., 2014; Routledge, 2012; Zhang et al., 2019). There are several explanations for this. First, a purposeful life, where higher self-esteem provides individuals with a sense of meaning and value in life. When individuals have a positive self-image and believe in their worth, they tend to feel that their lives have purpose and significance. This sense of meaning and self-worth alleviates existential concerns, such as DA (Davis et al., 1983). Second, is symbolic immortality, where self-esteem allows people to feel connected to a greater cause. When individuals possess higher self-esteem, they often see themselves as valuable and unique beings. This perception can lead to a belief that a part of them will continue to exist even after physical death, such as through their accomplishments, impact on others, or the memory of their existence. This symbolic immortality, thus, helps reduce DA by providing a sense of continuity and transcendence (Lifshin et al., 2021). Third, is psychological security, where self-esteem fosters a sense of confidence and self-assurance. When individuals have higher self-esteem, they tend to have greater faith in their abilities, strengths, and qualities. This confidence, therefore, acts as a defense mechanism against DA, as it helps individuals cope with existential threats by providing a sense of control and mastery over their lives (Bassett, 2007). Collectively, these explanations have provided important insights into self-esteem's role as a buffer against DA.

However, what occurs when self-esteem does not effectively buffer against DA? Arndt et al. (2005) argued that these unbuffered anxieties could be manifested as psychiatric disorders, which indicates a redirection of DA to more specific anxieties that individuals may exercise control on (e.g., excessive handwash in obsessive-compulsive and related disorders). Therefore, psychopathology is of relevance to DA and will be further examined.

## Death anxiety and psychopathology

To alleviate DA, driven by death-related thoughts and reminders, we engage in adaptive coping strategies such as forging intimate relationships or leaving a legacy worth remembering (Yalom, 2008). While we engage in these adaptive coping mechanisms to mitigate DA, when death-related fears are not adequately buffered, it may compel individuals to seek *extreme forms of defenses* (i.e., maladaptive coping strategies) observed in clinical psychology (Verin et al., 2021). Iverach et al. (2014) extended this notion by postulating DA as a transdiagnostic construct, where DA is thought to play a causal role in the development and maintenance of various psychiatric

disorders (e.g., anxiety disorders; Menzies & Menzies, 2023). Further, Menzies et al.'s (2019) study found that DA is strongly associated with symptom severity of 12 psychiatric disorders and predicted clinical markers of psychopathology (i.e., lifetime diagnoses), demonstrating the causal role of DA in psychopathology.

## Treatment for death anxiety

Yalom (1980) established a comprehensive existential psychotherapy paradigm to treat death-related fears across many psychiatric disorders. These existential psychotherapies are focused on the deep-rooted existential issues an individual may possess (i.e., freedom, social isolation, purpose in life, and fear of death) and recognize that death-related fears are ever-present forms of anxiety that negatively impact the physical, psychosocial, and spiritual aspects of existence. In that vein, Vos and Vitali's (2018) meta-analytic review revealed that psychotherapeutic modalities centered on death and dying (e.g., existential CBT-based meaning-making therapies) alleviate DA and positively influence psychosocial outcomes, such as self-esteem and overall quality of life. Consistent with the transdiagnostic perspective, DA indeed cuts across psychiatric disorders and treating DA could alleviate clinical symptomatology and improve the overall quality of life (Iverach et al., 2014). Aside from psychopathological behaviors, other overt behaviors may appear unrelated to death reminders and thoughts on the surface. This begs the question, then, how might our fears of death and dying influence our everyday behaviors in ways we are not aware of?

## Terror management theory

Terror Management Theory (TMT), an influential social psychological framework, might explain the influences of death-related fears on our everyday behaviors (Greenberg et al., 1992). TMT posited that awareness of mortality drives the instinct for self-preservation in us, which results in extreme anxiety (*terror*; Greenberg et al., 1986). To alleviate this anxiety, we employ several defense strategies based on whether death-related thoughts are within or outside conscious awareness, as proposed by the *dual process model* (i.e., an extension of Pyszczynski et al., 1999). According to this, we engage in *proximal defenses*, such as denying one's vulnerability to suppress death-related thoughts, while consciously salient (i.e., immediate death-related reminders). Eventually, we engage in *distal defenses*, such as protecting our cultural worldviews and strengthening self-esteem, when these death-related thoughts are unconscious yet accessible (i.e., after some time; Burke et al., 2010; McGregor et al., 1998). Collectively, these defenses enable us to live in composure.

## Mortality salience paradigm

The MS hypothesis is widely used to demonstrate TMT predictions and reveal the impact of death-related fears on human behaviors (Burke et al., 2010). The hypothesis contends that if cultural worldviews, self-esteem, and attachment serves as buffers against death-related fears, then death-related reminders (i.e., MS) will ought to spur us to uphold our cultural worldviews, bolster self-esteem, and increase desire for intimate relationships. Studies that utilized the MS hypothesis typically have two conditions. First, participants in the experimental condition were reminded of death via death-related questions, while other MS primes (i.e., death-related pictures, words, or videos) have also been utilized. Second, participants in the control condition were primed with neutral or unpleasant scenarios that are distinct from death-related reminders (e.g., dental pain).

A wide variety of MS-employed TMT studies demonstrated that fear of death is implicated in many psychological phenomena (Koole et al., 2006). These included hostility towards others who threatened individuals' worldviews (McGregor et al., 1998), increased desire to purchase luxury items (Dar-Nimrod, 2012), engagement in risky behaviors (Ben-Ari et al., 1999), sun tanning intent (Routledge et al., 2004), and interracial conflict (Hayes et al., 2008). Recently, the extent to which these findings replicate across settings has been scrutinized by researchers (Klein et al., 2019; Saetrevik & Sjøstad, 2022). However, Chatard et al. (2020) found that TMT studies are replicable when sample sizes are sufficiently powered. Overall, Burke et al.'s (2010) meta-analysis of 277 studies demonstrated support for the MS hypothesis across settings with a low indication of publication bias.

## Mortality salience and self-esteem

Moreover, the TMT literature has well-established that self-esteem is heavily implicated in the MS hypothesis, where it is thought to buffer individuals against death-related thoughts and reminders (Florian & Mikulincer, 1998; Guan et al., 2015; Harmon-Jones et al., 1997; Schmeichel et al., 2009). Consistent with the MS hypothesis, Pyszczynski et al. (2004) demonstrated that MS primes (compared to neutral or unpleasant scenarios, such as dental pain) significantly bolstered the need for self-esteem, as noted by the desire to strive for increased self-esteem and a propensity toward self-improvement. These findings were further augmented by Burke et al.'s (2010) meta-analytic review, which demonstrated that self-esteem indeed moderates MS effects. Together, these lines of robust research revealed that self-esteem moderates responses to MS primes and decreases defensive responses and self-serving biases.

MS aside, when we revisit DA in the earlier section, we recognize that DA and FOMO are two separate phenomena rooted in the fundamental fear of missed opportunities and existential concerns experienced in life (Iverach et al., 2014; Przybylski et al., 2013). Given the conceptual parallels between the variables, FOMO could be of relevance to DA and will be further examined.

## Fear of missing out

FOMO is defined as the persistent worry that others may be having enjoyable and memorable experiences while one is absent (Przybylski et al., 2013). FOMO includes two processes. The perception of exclusion/ostracism from social experiences and unmet attachment relatedness, followed by obsessive behaviors to counter those rejections (Gupta & Sharma, 2021). FOMO manifests as a persistent disposition, an episodic mood that occurs mid-conversation, or a state of mind that allow individuals to feel a heightened negative emotional state (e.g., jealousy, social inadequacy, or ferocious fury; La-Guardia & Patrick, 2008). As the world becomes interconnected, we are exposed to a wealth of information about what others are engaged in and left to constantly wonder if our achievements are decent or whether we are headed towards the right direction in life (Rifkin et al., 2015). That social comparison bolsters the need to feel connected and form stable and enduring interpersonal relationships.

In line with the Social Comparison Theory, FOMO could be a problematic thought process, where individuals evaluate their social and personal worth against others (Przybylski et al., 2013). However, these comparisons may not always be accurate or representative of reality. To make matters worse, seeing others' exciting or envy-indulging experiences could trigger feelings of inadequacy or the fear of being left behind. This distorted thought process reinforces the perception of social exclusion and the persistent need for personal validation and positive evaluations of a flawed sense of self (Burrow & Rainone, 2017). These processes collectively amplify one's fears of missing out and anxiety levels in anticipation of a social reward (i.e., social connectedness; Billieux et al., 2014). Further, FOMO could manifest as a by-product of social relatedness and acceptance needs that develop in adolescence and persist into adulthood (Rozgonjuk et al., 2021). Due to the omnipresence of social media in today's society and the pressure to interact with others, FOMO may be more prevalent in adolescents and young adults compared to older adults (Kuss & Griffiths, 2017). Therefore, developmental differences should be considered in how FOMO is perceived and manifested in everyday life (Neumann, 2020).

## Fear of missing out and self-esteem

FOMO is inevitable, and the continuous awareness of what we may miss out on creates a distorted reality of the lives of others, manifested through rumination (e.g., dwelling on negative experiences; La-Guardia & Patrick, 2008). When detrimental consequences are considered, the extant literature have well-established that FOMO negatively affects one's self-esteem, which leads to poorer psychosocial outcomes (i.e., life satisfaction; Barry & Wong, 2020; D'Arienzo et al., 2019). Individuals who possess lower self-esteem may be more prone to FOMO experiences, where they may believe that others lead fulfilling lives and, therefore, feel inferior or excluded. It can be detrimental to their quality of life if they frequently perceive themselves as *less than* others or feel like their life lacks excitement, which can erode their self-worth and contribute to diminished self-esteem. This may result in increased anxiety and a greater fear of missing out on opportunities that could boost their self-esteem. In contrast, individuals with healthy self-esteem are more resistant to FOMO's harmful effects. They are less likely to rely their worth on social comparisons or external experiences because of a strong sense of self-worth. Collectively, these explanations have provided important insights into self-esteem's role in FOMO.

## Death anxiety, terror management theory, and fear of missing out

With that in mind, in what way could DA be related to FOMO? Consistent with the TMT literature, as people age, they become increasingly conscious of their mortality and begin to recognize that they may be *running out of time* (Bozo et al., 2009). That realization increases their anxiety about losing out on valuable experiences with loved ones. In other words, FOMO could appear as a subtle interpretation of resolving one's existential anxieties associated with mortality and is theorized to manifest the desire to maximize one's experiences, driven by the awareness of limited time in the pursuit of symbolic immortality. Therefore, one would strive to invest in activities, relationships, and experiences that provide a sense of meaning and transcendence beyond their finite existence. FOMO could, therefore, appear as an expression of this striving, as individuals fear missing out on experiences that contribute to their sense of self-esteem, social connection, and symbolic immortality. Notably, it is

plausible that individuals may utilize FOMO as a defense mechanism against DA, where FOMO-driven behaviors may serve as a way to distract them from or suppress existential anxieties associated with mortality.

## The present study

While DA and FOMO are considered two distinct phenomena, they appear to be conceptually related. There are three explanations for this. First, the impermanence and uncertainty felt, where DA stems from the uncertainty and finality of mortality, which lead individuals to grapple with the unknown aspects of afterlife (Menzies & Veale, 2022). Similarly, FOMO emerges from the fear of missing out on connections, experiences, or opportunities, highlighting the transient nature of life and the fear of not making the most of it (Hartanto et al., 2022). Thus, both concepts prompt individuals to confront the impermanence of existence and the potential regrets associated with it. Second, the existential concerns experienced, where DA stems from contemplating the meaning and purpose of life, the fear of non-existence, or the potential loss of personal identity (Upenieks, 2021). FOMO, on the other hand, reflects concerns about social validation, personal fulfillment, and the fear of not living up to societal expectations (Tandon et al., 2022). Thus, both concepts reflect the existential worries about the limited time at hand and the desire to lead a fulfilling life. Third, and most importantly, self-esteem in individuals, where low self-esteem could amplify vulnerability and fear of missing out on crucial life experiences (in FOMO; Servidio, 2021), and contribute to a heightened sense of mortality and deeper fears of death (in DA; Zhang et al., 2019). Conversely, higher self-esteem may bolster a more secure self and contented experiences in life (in FOMO) and embrace the limited time left to spend with loved ones (in DA). Given these possible conceptual parallels between DA and FOMO, surprisingly, no research to date has examined their relationship.

Similarly, while the evidence for self-esteem's role in buffering against MS effects and FOMO appears obvious, no study to date examined the moderating role of self-esteem on the relationship between MS effects and FOMO. Therefore, the present 2-part study aims to examine the effects of DA on FOMO in a university sample (study 1) and extends it to the general public (study 2). Specifically, it was hypothesized that:

**H1** A strong and positive correlation exists between DA and FOMO (H1a) and this correlation weakens, after adjusting the effects of self-esteem (H1b).

**H2** Participants in the MS condition who report higher self-esteem would report lower levels of FOMO.

## Study 1 method

### Participants

Participants ( $N=220$ ; 53% females) who were readily available from local universities in Singapore and Australia aged 18 to 38 years ( $M=21.48$ ,  $SD=3.80$ ) were recruited through convenience and snowball sampling techniques. Inclusion criteria included: English language proficiency and 18-years-old and above with no psychiatric diagnoses. Likewise, applicable to Study 2.

### Measures

#### Death anxiety beliefs and behaviors Scale (DABBS)

The DABBS is an 18-item clinical instrument developed to assess DA across three subscales: Affect (4 items), Beliefs (7 items), Behaviors (7 items; Menzies et al., 2022). Participants were asked to indicate how much they agree with each statement, frequency of troubled death-related thoughts, and frequency of avoiding death-related activities in the present moment. Responses are made on a 5-point Likert scale ranging from 1 = *Strongly Disagree* to 5 = *Strongly Agree* (Affect subscale), 1 = *Never have the Thought* to 5 = *Always have the Thought* (Beliefs subscale), and 1 = *Never Avoid* to 5 = *Always Avoid* (Behaviors subscale). Appropriate item scores in each subscale were summed collectively to derive total scores (ranging between 18 and 90), where higher scores indicate higher levels of DA. Further, the three-factor structure of the instrument has been well supported by exploratory and confirmatory factor analyses (Menzies et al., 2022). The DABBS demonstrates equivalent, if not superior, performance on psychometric properties compared to well-established scales such as the *Death Anxiety Questionnaire* (Zuccala et al., 2022). Cronbach's alpha in the present study is 0.95.

#### Fear of missing out Scale (FOMOS)

The FOMOS is a 10-item instrument developed to assess individuals' FOMO via their everyday perceived experiences (Przybylski et al., 2013). Participants were asked to indicate how accurately they can relate to their daily

experiences rather than what they believe their experiences should be in the present moment. Responses are on a 5-point Likert scale ranging from 1 = *Not at all True of me* to 5 = *Extremely True of me*. Appropriate item scores were summed and averaged to derive individual composite scores (ranging between 1 and 5), where higher scores indicate higher levels of FOMO. The single-factor structure of the instrument has been well supported by principle components and confirmatory factor analyses (Przybylski et al., 2013). The FOMOS demonstrated excellent psychometric properties (Riordan et al., 2020). Cronbach's alphas in the present studies are: Study 1 = 0.95, Study 2 = 0.97. Likewise, the instrument is applicable to Study 2.

#### Rosenberg Self-Esteem Scale (RSES)

The RSES is a 10-item instrument developed to assess global self-esteem that reflects positive and negative perceived feelings about the self (Rosenberg, 1965). Participants were asked to indicate an appropriate response to each item in the present moment. Responses are on a 4-point Likert scale ranging from 1 = *Strongly Disagree* to 4 = *Strongly Agree*. Items 2, 5, 6, 8, and 9 were reverse scored because they were negatively worded. Appropriate item scores were summed collectively to derive total scores (ranging between 10 and 40), where higher scores indicate higher self-esteem. The single-factor structure of the instrument has been well supported by item response theory analyses (Gray-Little et al., 1997). The RSES is used extensively and validated cross-culturally with excellent psychometric properties demonstrated (Robins et al., 2001; Schmitt & Allik, 2005). Cronbach's alphas in the present studies are: Study 1 = 0.88, Study 2 = 0.93. Likewise, the instrument is applicable to Study 2.

### Procedure

The true nature of the study was concealed, where participants were told that the study aimed to examine how individuals' personality traits predict their self-esteem and mental health outcomes. Participants recruited via the research participation program of the university were eligible to receive two course credits for participation in the study. They were presented with an information sheet and an informed consent form at the start of the study. Participants completed the study via Qualtrics, optimized for smartphone and web use, where the series of self-administered questionnaires embedded were randomized (items within each scale) to eliminate any order effects (Meade & Craig, 2012). First, participants indicated their age and gender for the demographic questions. Second, participants completed a personality inventory to corroborate the study's cover narrative.

Third, participants completed either the DABBS or FOMOS first, followed by the RSES. At the end of the study, participants were probed for suspicion and debriefed about the true purpose of the study. This procedure was approved by the university's Human Research Ethics Committee. Ethical considerations were applicable to Study 2. Supplementary materials can be found on Open Science Framework ([https://osf.io/hg5q6/?view\\_only=091ca134dec94018a747c5600b4c3093](https://osf.io/hg5q6/?view_only=091ca134dec94018a747c5600b4c3093)).

## Study 1 results

The results were analyzed via a bivariate Pearson's product-moment correlation coefficient and partial correlation coefficient, alongside missing values analysis, and assumptions testing using the IBM Statistical Package for the Social Sciences (SPSS) Version 29.0 with an alpha level = 0.05. The descriptive statistics are presented in Table 1.

A bivariate Pearson's product-moment correlation coefficient was used to determine the size and direction of the statistical linear relationship between DA and FOMO. The bivariate correlation between these two variables was strong and positive,  $r(218) = 0.81, p < .001$ . Notably, a large effect size of  $r^2 = 0.66$  was revealed. Following that, a partial correlation was used to determine the statistical linear relationship between DA and FOMO, after adjusting for self-esteem. The partial correlation was statistically significant,  $r(217) = 0.70, p < .001$ . A large effect size of  $r^2 = 0.49$  was revealed, after adjusting for self-esteem.

## Study 1 discussion

This is the first study to examine the relationship between DA and FOMO. The results provided support for the hypothesis that a strong and positive correlation exists between DA and FOMO (H1a). This significant result was consistent with what was theorized, where both variables appeared to be conceptually related in terms of (1) impermanence and uncertainty, (2) existential concerns, and (3) self-esteem. Consequently, a large effect size was observed.

Similarly, the results provided support for the hypothesis that the strength of the correlation weakens between DA and FOMO after adjusting the effects of self-esteem (H1b). This significant result was consistent with what was theorized, where self-esteem could serve as a potential moderator between DA and FOMO. Further, this finding was

**Table 1** The Means and Standard Deviations of Death Anxiety, Fear of Missing Out, and Self-Esteem Scores

Variables	<i>M</i>	<i>SD</i>
Death Anxiety	56.52	18.33
Fear of Missing Out	2.97	1.14
Self-Esteem	24.93	5.43

consistent with the literature which highlighted the significant relationships between self-esteem, and DA and FOMO, respectively where higher self-esteem resulted in alleviated DA and lower levels of FOMO experienced (Abeyta et al., 2014; Du et al., 2013; Buglass et al., 2017; Santos et al., 2023).

While both hypotheses were supported, it is important to note that we cannot draw inferences about the potential causal role DA may have on FOMO or the potential moderating role of self-esteem between these variables because the first part of this 2-part study was correlational in nature, and correlation does not imply causation (Guttman, 1977). Further, the DA literature tends to assess DA directly and employ correlational study designs (i.e., as with this study). In contrast, the TMT literature does not assess DA. Rather, it employs experimental study designs, where in the MS paradigm, death-related thoughts and reminders are often primed to assess one of TMT's buffers (e.g., defense of cultural worldviews). Therefore, the second part of this 2-part study sought to establish first-hand experimental evidence of MS effects on FOMO, moderated by self-esteem (TMT's buffer) for abovementioned reasons.

## Study 2 Method

### Participants

Participants ( $N = 177$ ) from the general public were recruited through convenience and snowball sampling techniques. Two participants were excluded because they did not respond to the Mortality Attitudes Personality Survey. The final sample comprised of 175 (53% females) participants aged 20 to 63 years ( $M = 31.23, SD = 9.01$ ). Eighty-one participants (59% or 48 females) aged 20 to 53 years ( $M_{age} = 30.07, SD = 8.39$ ) completed the study in MS condition, while 94 participants (49% or 46 females) aged 20 to 63 years ( $M_{age} = 32.23, SD = 9.43$ ) completed the study in dental pain condition.

### Measures

#### Mortality attitudes personality survey (MAPS)

The MAPS is a classic 2-item task developed to manipulate MS (Rosenblatt et al., 1989). The items were presented as a *Projective Life Attitudes Assessment*, a novel method to determine an individual's personality through qualitative content analysis (data attained was not analyzed, rather, served as a priming instrument). The two items include: (1) Please briefly describe the emotions on the thought of [your own death OR your own death and the death of all the people in your country (MS) OR

dental pain (control) arousal in you] and (2) indicate as specific as you can, what you think will occur to you as you [physically die and once you are physically dead OR the people in your country as all of you physically die and once all of you are physically dead (MS) OR dental pain (control) felt at the dentist's office]. The MAPS is widely used in 79.8% of 277 MS studies, demonstrated in a meta-analysis by Burke et al. (2010). Further, Quirin et al. (2012) yielded significant differences in neural responses as participants completed the MAPS, indicating the distinctiveness of death-related and dental pain-related thoughts.

## Procedure

Participants were recruited via social media platforms (i.e., Facebook, LinkedIn, and Instagram) and Survey-Circle, a platform widely used for survey studies. There were no incentives awarded. Notably, participants from both studies were recruited from different sources to prevent biased study outcomes. Participants completed the study online on Qualtrics, optimized for smartphone and web use, where they were randomly assigned to the MS or dental pain condition via the randomization feature on Qualtrics. The study included demographic questions that asked to indicate age and gender. Further, the MAPS, FOMOS, and RSES were embedded within Qualtrics and randomized (items within FOMOS and RSES) to eliminate any order effects (Meade & Craig, 2012). The true nature of the study was concealed, where participants were told that the study aimed to examine how individuals' personality traits predict their attitudes towards others. First, participants indicated their age and gender for the demographic questions. Second, participants completed a personality inventory to support the study's cover narrative. Third, participants in the MS condition completed the death-related thought items, while participants in the dental pain condition completed the dental pain-related thought items, followed by the RSES. At the end of the study, participants were probed for suspicion and debriefed about the true purpose of the study.

## Study 2 results

A moderation analysis ( $\alpha=0.05$ ) was conducted by PROCESS macro-Version 4.2 using model 1 of Hayes (2018) to establish the moderating effect of self-esteem between MS effects and FOMO, alongside missing values analysis, and assumptions testing using the IBM SPSS Version 29.0 with an alpha level=0.05. The descriptive statistics and moderation model coefficients are presented in Tables 2 and 3, respectively.

**Table 2** The Means (Standard Deviations) of Fear of Missing Out and Self-Esteem Scores in Mortality Salience and Dental Pain Conditions, Respectively

Variables	Mortality Salience	Dental Pain
Fear of Missing Out	3.85 (0.72)	1.51 (0.39)
Self-Esteem	21.79 (4.77)	31.09 (4.54)

**Table 3** Unstandardized Regression Coefficients (95% Confidence Intervals) and Standard Errors for Model Predicting Fear of Missing Out

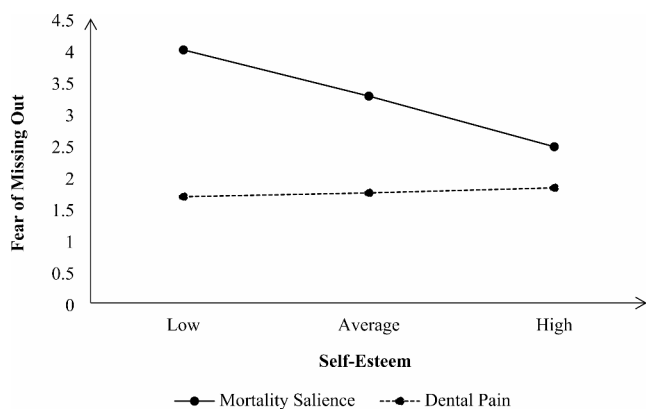
Variable	<i>b</i> [LLCI, ULCI]	<i>SE</i>
Constant	2.41[2.31, 2.51] ***	0.05
Mortality Salience	1.80[1.59, 2.00] ***	0.10
Self-Esteem	-0.05[-0.07, -0.04] ***	0.01
Mortality Salience * Self-Esteem	-0.08[-0.11, -0.05] ***	0.02

*Note.* *b*=unstandardized regression weight. CI=Confidence Interval. LL and UL represents the lower and upper limits of the 95% confidence interval, respectively. *SE*=standard error. \*\*\*  $p < .001$

Overall, the model accounted for significant proportion of the variance in FOMO,  $F(3, 171)=380.52$ ,  $p < .001$ ,  $R^2=0.87$ . Further, the interaction term on its own accounted for a significant proportion of the variance in FOMO,  $F(1, 171)=26.42$ ,  $p < .001$ ,  $\Delta R^2=0.02$ , suggesting that the hypothesis of moderation was supported. Further, a pick-a-point technique was used to probe the relationship between MS effects and FOMO at low, moderate, and high levels of self-esteem (i.e., moderator; 16th, 50th, and 84th percentile, respectively). The relationship between MS effects and FOMO was significant and negative among participants with low self-esteem,  $\theta_{X \rightarrow Y} | (W = -7.78)=2.42$ , 95% CI [2.11, 2.71],  $p < .001$ . Similarly, the relationship between MS effects and FOMO was significant and negative among participants with moderate self-esteem,  $\theta_{X \rightarrow Y} | (W=1.21)=1.70$ , 95% CI [1.49, 1.90],  $p < .001$ , and participants with high self-esteem,  $\theta_{X \rightarrow Y} | (W=6.22)=1.30$ , 95% CI [1.01, 1.59],  $p < .001$ . Overall, MS effects resulted in lower FOMO scores for participants with higher self-esteem, as illustrated in Fig. 1.

## Study 2 discussion

This is the first experimental study to establish the moderating role of self-esteem on the relationship between MS effects and FOMO. The results provided support for the hypothesis that participants in the MS condition who reported higher self-esteem would report lower levels of FOMO (H2). This significant result was consistent with the MS hypothesis, where participants demonstrated the desire to strive for increased self-esteem and the propensity toward self-improvement following reminders of death (Pyszczynski et al., 2004). These findings were further augmented by Burke et al.'s (2010) meta-analytic review, which demonstrated that self-esteem indeed moderates MS effects on



**Fig. 1** The Relationship between Mortality Salience Effects and Fear of Missing Out by Level of Self-Esteem

a variety of self-esteem-related dependent variables (i.e., specifically, FOMO in this context). These consistencies in findings could be explained, where participants with higher self-esteem possess a stronger sense of resilience and coping mechanisms. Therefore, it would allow them to better regulate their emotions and cope with existential concerns associated with mortality. Consequently, they might be more likely to prioritize their wellbeing and value their personal experiences, which reduces their susceptibility to FOMO. Overall, higher self-esteem serves as a protective buffer, shielding individuals from MS effects on FOMO. Hence, explaining the significant results.

## General discussion

The present 2-part study is the first to examine the relationship between DA and FOMO and establish the moderating effects of self-esteem on the relationship between MS effects and FOMO. Taken together, the significant results will be discussed in this section. The present findings indicated DA and FOMO to be conceptually parallel, where yielding a large effect suggested a robust and substantial relationship between these variables. This could be explained by three similarities. First, would be existential concerns, where participants who experienced FOMO might feel a heightened sense of mortality and urgency to seize every opportunity due to the fear of wasting time or missing out on fulfilling experiences (Elhai et al., 2018; Menzies et al., 2020). Consequently, these elevated FOMO levels could amplify DA. Second, the feeling of uncertainty and impermanence, where FOMO is fueled by the fear of uncertainty and the transient nature of experiences. Similarly, DA revolves around the uncertainty and inevitability of death. The perception of missed opportunities could reinforce the notion that life is fleeting, and this awareness might heighten DA (Upenieks, 2021). Third, and most importantly is self-esteem, where TMT posits self-esteem as a buffer against

existential anxiety (Pyszczynski et al., 2015). When individuals possess high self-esteem, they tend to have a more positive perception of themselves and their self-worth. This positive perception could help in counteracting the fear of death and missing out on opportunities, as it provides a sense of significance, value, and purpose in life. Consequently, when DA and FOMO trigger existential concerns, individuals with higher self-esteem could better cope with these anxieties. To further substantiate this notion, the correlation between DA and FOMO weakened when self-esteem was partially out, suggesting its relative importance in explaining the relationship between both variables. Therefore, explaining the significant results.

Further, the present findings provided support for self-esteem as a moderator between MS effects on FOMO. This indicates that individuals with different levels of self-esteem may respond differently to MS primes in relation to their FOMO. Specifically, participants in the MS condition with high self-esteem may have a more positive self-image and a stronger sense of self-worth, which could buffer the impact of MS effects on their FOMO. In other words, their higher self-esteem might help them cope better with the existential concerns associated with mortality (terror), making them less susceptible to experiencing excessive FOMO (Pyszczynski et al., 2015). In contrast, participants in the MS condition with low self-esteem may have a weaker self-concept and less confidence in themselves. As a result, their lower self-esteem might make them more vulnerable to MS effects, leading to heightened FOMO. Therefore, they may be more prone to comparing themselves to others, feeling inadequate, and experiencing a stronger FOMO on what others are doing or achieving in life (Santos et al., 2023; Servidio et al., 2021).

More importantly, the main effects were quantified by a 2-way interaction effect between MS and FOMO, as illustrated in Fig. 1. In the MS condition, participants who reported higher self-esteem reported lower levels of FOMO, and participants who reported lower self-esteem reported higher levels of FOMO. Whereas, in the dental condition, participants who reported, regardless of high or low self-esteem, had very similar FOMO scores. This finding supported the TMT's notion which highlighted that MS primes as compared to other neutral or unpleasant scenarios (e.g., dental pain) significantly bolsters the need for self-esteem when reminded of their mortality, as observed in this study (Pyszczynski et al., 2004). The findings can be further explained by the pursuit for symbolic immortality that could have bolstered self-esteem among participants in the MS condition (Pyszczynski et al., 2015). TMT suggests that individuals strive for symbolic immortality by connecting to cultural values, beliefs, and group affiliations (Greenberg et al., 1992). In this context, participants in the MS condition



with higher self-esteem may actively engage in activities that align with their personal values and aspirations. By doing so, they enhance their self-esteem and reaffirm their sense of significance and worth. This process of bolstering self-esteem can provide a buffer against FOMO, as they derive a sense of meaning and purpose from their alignment with cultural standards. Moreover, these individuals may be more self-assured and confident in their own pursuits. In the face of mortality salience, they may prioritize their own personal fulfillment and goals rather than being driven by FOMO on what others are doing. Their higher self-esteem, therefore, allows them to maintain a sense of direction and focus, reducing the extent to which they experience FOMO. Taken together, these findings highlighted the importance of a novel contribution by including FOMO to explain its relation with MS effects and self-esteem.

### Limitations

Limitations of the present study should be noted. Samples in both studies had a relatively young pool of individuals. As a benchmark, the United Nations defined *youth*, as individuals aged between 15 and 24 (United Nations, n.d.). The participant demographics, therefore, consisted of individuals mainly from the younger generation, suggesting that FOMO may not be adequately captured among those from the older generation. Additionally, there was no other appropriately validated FOMO scale to assess the population under study.

### Recommendation(s)

The FOMOS consisted of 10 items, where six of it appear to revolve around the topic on friends. For example, *it bothers me when I miss an opportunity to meet up with friends*. Therefore, we need to consider that there appear to be developmental differences in how individuals experience FOMO (Barry & Wong, 2020). FOMO could be more prevalent in adolescents and young adults compared to older adults in the current era of social media and peer pressure to interact with others (Kuss & Griffiths, 2017). Thus, FOMOS might not accurately reflect the unique FOMO experiences older individuals bring to bear. Hence, it is recommended that a FOMO scale be developed and validated (or revise the current version to fit) among the older generation to accurately capture their FOMO experiences.

### Implications and future directions

With the limitations and recommendation(s) in mind, the strength of the present study is bolstered in its novelty in attempting to conduct a comprehensive study that include both correlational and experimental designs. Therefore, it

provides an integrated perspective to inform future studies on the underlying mechanisms of DA and FOMO individuals employ to cope with their mortality awareness. Further, the study utilizes the DABBS, a recently developed and validated measure to comprehensively capture the elements of affect, beliefs, and behaviors in DA. Notably, the DABBS demonstrated equivalent, if not superior, performance on psychometric properties compared to well-established scales (Zuccala et al., 2022). This enables the measure to accurately differentiate individuals currently in psychotherapy services with high DA levels, further establishing its relevance to clinical settings.

Hence, this study seeks to empower clinicians to make an informed choice to consider DA aspects in psychotherapy because the current psychological treatment standards do not address the underlying death-related fears. As a result, there appears to be a *revolving door* observed in clinical psychology, where an individual receives treatment for a particular disorder, only to return in the future with a different disorder, particularly anxiety-related disorders (which are heavily implicated in DA and FOMO effects; Iverach et al., 2014). Therefore, this study sheds light on the existential perspectives clinicians should consider in clinical practice. In that vein, understanding the underlying FOMO and DA mechanisms of death-related fears could provide clinicians with the relevant insights to incorporate existential psychotherapies into existing psychological treatment frameworks. While these treatments have been suggested to tackle DA, clinicians should keep in mind the protective factors that an individual possesses (i.e., self-esteem). As demonstrated in the present study, self-esteem moderates MS effects on FOMO is evident that self-esteem indeed buffers against the fears of death and could be incorporated into therapy elements for better clinical and psychosocial outcomes. These findings are consistent with previous research in the TMT field (Menziez & Veale, 2022; Tandon et al., 2022; Servidio, 2021; Zhang et al., 2019).

Novelty, clinical and methodology aspects aside, there are further implications arising from this study. First, TMT should be considered to understand the underlying FOMO mechanisms in tandem with the fears of death and dying. Although the primary context from which DA and FOMO emerges may be different, they eventually converged together and appear to demonstrate a large effect size as demonstrated in this study. This indicates the importance of considering the extent to which the detrimental effect of FOMO is influenced by death-related fears. This is important because it would mean that TMT has yet to consider the perspectives that FOMO brings to bear, particularly in the context of the MS hypothesis, where self-esteem moderated the relationship between MS effects and FOMO. Second, the present study posited the effects of DA on FOMO. It will be worthwhile to understand FOMO and its correlates in

tandem with DA. In turn, this could provide unique insights into the development of FOMO-driven treatment plans that complement well with DA, such as FOMO education to reduce FOMO effects. Together, the present study could further the understanding of the detrimental effects of FOMO, particularly in the context of DA and other psychopathological conditions. With these implications in mind, future studies could consider evaluating MS effects on FOMO as a form of distal defense, as the present study only tested the MS effects on FOMO as a proximal defense. Overall, these fresh perspectives could serve as an extension to broaden the TMT literature aside from what has already been known.

## Conclusion

The present study is the first to examine the associations between DA and FOMO. It revealed that the effects of MS resulted in higher self-esteem and lower levels of FOMO, providing support for the MS hypothesis. This novel discovery which involves FOMO serves as a precedent for future TMT studies to consider including the possible effects FOMO may have on existential anxiety associated with mortality. Clearly, there is a pressing need to consider FOMO and its implications to further understand the role of TMT in our everyday behaviours, and therefore, this study calls for a possible revision in the TMT literature to be considered.

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**P. K. H. C:** Conceptualization; methodology; supervision; visualization; writing – reviewing and editing.

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**Data Availability** The data sets generated during and/or analysed during the current study are available at ([https://osf.io/hg5q6/?view\\_only=091ca134dec94018a747c5600b4c3093](https://osf.io/hg5q6/?view_only=091ca134dec94018a747c5600b4c3093)).

## Declarations

**Conflict of interest** All authors declare no conflict of interest.

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