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Anxiety after remembering stressful academic versus brush with death events: The moderating roles of future time perspective and personal intimacy

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Summary

This study examines: (i) whether recalling stressful autobiographical events results in anxiety, (ii) the relation of memory qualities to anxiety, and (iii) the relation of future time perspective and personal intimacy to experiencing anxiety. Participants (N = 120) completed Future Time Perspective, Personal Intimacy and State Anxiety scales. They were randomly assigned to recall a brush with death, a stressful academic deadline, or a no-stress control. Memory qualities (vividness and significance) were assessed. As expected, recalling stressful events resulted in anxiety with more personally significant events related to higher anxiety. Having a more open-ended future time perspective related to lower anxiety after recalling a stressful academic deadline, whereas greater personal intimacy predicted lower anxiety after recalling a brush with death. Findings are discussed in terms of factors that may serve to moderate the link between stressful memories and the experience of anxiety.

KEYWORDS

anxiety, death, intimacy, stressful autobiographical events, time perspective

1 | INTRODUCTION

Autobiographical memories store information about life's events across domains (Fivush, Habermas, Waters, & Zaman, 2011). Often recalled in response to cues in our everyday environment (Bluck, Alea, & Demiray, 2010; Conway, Singer, & Tagini, 2004), memories of our personal past carry information about what happened, when, and to whom. They can also be rich in emotions—including anxiety (e.g., Wenzel, Pinna, & Rubin, 2004). How people experience the anxiety that arises during recall of a stressful event has consequences for their well-being. Following the introduction of the classic Velten mood induction procedure (1968), a whole body of research was spawned on the relation between autobiographical memory and emotion (for a review, see Holland & Kensinger, 2010). Much research on stressful events has focused on traumatic memories, and their relation with emotional disorders or how certain disorders affect recall (e.g., Fitzgerald, Berntsen, & Broadbridge, 2016; Rubin, Boals, & Berntsen, 2008; Rubin, Dennis, & Beckham, 2011). Thankfully, the majority of people (i.e., not suffering from emotional disorders) do not commonly relive stressful events at the same intensity at which they were first experienced (Levine & Bluck, 1997). They still do recall such events with emotion; however, relatively little attention has been paid to internal resources that may regulate emotions elicited by recalling stressful events. Following past literature (Galatzer-Levy, Burton, & Bonanno, 2012) the present study focuses on resilience, aiming to identify factors related to experiencing lower anxiety when recalling stressful events months or even years later, in college students.

The level of anxiety that individuals feel when recalling a stressful event is associated with a host of factors (Levine & Safer, 2002). Memory qualities such as how vividly it is recalled or how significant the event seems today, for example, are related to the extent of anxiety felt at recall (e.g., Holmes & Mathews, 2005; Rubin et al., 2008). We argue that anxiety may also depend on the type of stressful event

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being remembered. Much research examines the relation of memory and emotion (for a review, see Holland & Kensinger, 2010) but research in social cognitive psychology has been somewhat content-free. That is, the assumption has been that anxiety is anxiety (or happiness is happiness), regardless of the type of event from the individuals' personal past that is spurring that anxiety now. How anxiety manifests when recalling different types of life events has been understudied (cf. Fitzgerald et al., 2016).

Given that, the present research examines recall of two categorically different types of stressful events experienced as part of our participants' lives. The stressful events were chosen for their relevance to anxiety in our college student participants. In particular, how death-related experiences are recalled and felt was of major interest. As such, one of the events was in the health domain, a threat to bodily integrity, specifically a time when one felt he or she might die. The other type of event was in the achievement domain and is a common source of stress for students, facing an academic deadline.

Recalling either of these types of stressful events was expected to result in current feelings of anxiety. The major goal was to assess how the level of anxiety elicited by different types of stressful events may be related not only to qualities of the memory (i.e., vividness, personal significance) but also to individual characteristics of the person doing the remembering (Bluck et al., 2010; Conway et al., 2004). Two individual characteristics (i.e., personal intimacy and future time perspective) were expected to correlate with lower level of anxiety at recall, dependent on the type of event. Because secure attachment styles have been linked to better well-being in general as well as better school performance and management of academic and death-related stress (e.g., Mikulincer, Florian, & Hirschberger, 2003; Moore & Leung, 2002), we expect that having a strong sense of personal intimacy (i.e., sense of belonging and closeness to significant others; Baumeister & Leary, 1995) should be related to lower anxiety, regardless of event type. In contrast, because having an open-ended future time perspective has been shown to motivate adaptive future preparations such as learning and exploration (for a review, see Carstensen, 2006; Liao & Carstensen, 2018), we suggest that holding a more open-ended future time perspective should relate to lower anxiety in relation to an academic deadline: the individual with a longer future still has time to learn and thereby later succeed in similar situations. This positive aspect of believing one has plenty of time left in life is not relevant when facing the end of life, that is, when individuals feel that time is ending.

1.1 | Recalling different types of stressful autobiographical events

Stressful events come in many forms. The current study chose stressful academic and brush with death events as they have been identified by college students as stressors (Fitzgerald et al., 2016). Health is important at all ages, and particularly so when it posits a threat to bodily integrity or, in fact, one's survival. Though illness-related life-threatening events may be more common later in the lifespan, young people experience threats to bodily integrity such as vehicle accidents, recreational accidents, and violent attacks at relatively high rates compared with other age groups (Park, Scott, Adams, Brindis, & Irwin, 2014). Young adults expect a long life ahead, such events make life's temporal finitude evident, threatening to "cut their time short" (i.e., *off-time events*; Neugarten, 1979). In a study examining recall of death-related events and other negative events in college students and older adults, for example, younger age was associated with more frequent rumination about death-related events (Mroz, Bluck, Sharma, & Liao, 2019).

The other type of stressful event recalled was an academic deadline. Stress in the achievement domain is a common experience in the lives of college students: constant daily and weekly deadlines that are crucial to academic success can act as stressors (Robotham & Julian, 2006). Many students face anxiety related to maintaining the level of college performance that is necessary to compete for future jobs or graduate and professional school admission. Taken together, heightened state anxiety after recalling stressful events as compared with a no-stress recall condition was expected.

1.2 | Memory qualities: Vividness and personal significance

Across types of events, how a stressful event is represented in memory (i.e., memory qualities) can be related to the level of anxiety experienced when it is recalled. The current study targeted two qualities central in the autobiographical memory literature: vividness and personal significance (Berntsen & Rubin, 2006; D'Angiulli et al., 2013). Memory vividness reflects an episodic quality of autobiographical memory, whereas personal significance reflects appraisal of the memory by the long-term self as playing an important part in one's life (Conway & Pleydell-Pearce, 2000). These qualities should thus link closely to the emotional experience, in this case anxiety, resulting from remembering regardless of the type of event being recalled.

1.3 | Vividness

Vividness refers to the sensory aspects of recall (e.g., vision, hearing, and smell) that provide a sense of reliving during remembering (Sutin & Robins, 2007). Individuals judge memory vividness based on the detail, clarity, and richness in their representation of the remembered event. Research has documented links between vivid recall and anxiety. Recalling negative events with clearer auditory and olfactory senses is, for example, associated with greater stress symptoms (Rubin et al., 2008). Vividly imagining negative events is correlated with greater state anxiety (Holmes & Mathews, 2005). As such, if individuals have vivid memories of an anxiety-provoking experience, they may closely relive the event. Reliving such an experience should correlate with higher anxiety felt at recall.

1.4 | Personal significance

The significance of a memory involves evaluation of the extent to which the stressful event is still personally relevant and influential

today (Bluck & Habermas, 2001). Appraisals of event memories change over time (e.g., *hindsight*; Freeman, 2010). Viewing past stressful or traumatic events as currently significant to one's identity is related to greater symptoms of depression (Berntsen & Rubin, 2006; Del Palacio-Gonzalez & Berntsen, 2018; Fitzgerald et al., 2016). Judging stressful events as central to identity is also suggested as a core mechanism of post-traumatic stress disorder (Fitzgerald et al., 2016). If a past stressful event is appraised as no longer significant, it will likely be associated with lower anxiety felt when currently recalled.

1.5 | Relation of individual characteristics to experience of anxiety at recall

Although both types of stressful events may engender anxiety, threats to bodily integrity and everyday achievement deadlines are, indubitably, rather different. As such, our premise is that the individual characteristics that moderate the level of anxiety felt on remembering these events may also differ. Remembering may be guided by such individual characteristics of the self (Conway & Pleydell-Pearce, 2000), and feelings elicited by autobiographical remembering correspond to contents of the memory being recalled (Philippe, Koestner, Lecours, Beaulieu-Pelletier, & Bois, 2011). We tested the hypotheses that future time perspective (i.e., perceived a positive and open-ended future) is associated with lower anxiety particularly evoked by academic stress and that personal intimacy (i.e., sense of belonging and intimacy; Baumeister & Leary, 1995) to be related to lower anxiety regardless of the type of stressful event recalled.

1.6 | Future time perspective

Future time perspective in the current study refers to the extent to which individuals perceive their future as open ended and full of opportunities (Carstensen & Lang, 1996). Having a more positive, open-ended future time perspective has been related to greater well-being across a variety of contexts (e.g., Coudin & Lima, 2011; Demiray & Bluck, 2013). In facing achievement stressors in particular, having a greater future time perspective has been related to stronger motivation to achieve (Shell & Husman, 2001). Testing its buffering effect, researchers (Lu, Li, Fung, Rothermund, & Lang, 2018) found that perceiving one's future as more expansive and unlimited was related to less negative self-views. As such, we speculate that having a positive, open-ended future time perspective may correlate with lower anxiety felt when recalling a stressful academic deadline. Individuals can console themselves that they still have time in future to repair their poor academic performance. They can thereby feel motivated to continue pursuing their achievement goals.

In contrast, when recalling a brush with death, sensing a long future is less likely to serve as a moderator. Recalling a time when individuals thought they might die is, by definition, memory of a situation in which one felt that time was going to end. Unlike most animals, humans are able to contemplate time left in life and their own death (Corballis, 2014). That said, they largely avoid thinking about mortality, partly to avoid feeling anxiety (Pyszczynski, Greenberg, Solomon, Arndt, & Schimel, 2004). Recall of a brush with death, however, forces the individual to confront the reality that their time is finite. Even if individuals generally feel they have a long life ahead of them, bringing to mind a previous brush with death reminds them that their time will end, sometimes suddenly and unexpectedly. As such, although future time perspective may be associated with better well-being and lower anxiety in other contexts, its positive effect is unlikely to manifest when one recalls a previous brush with death. By comparing the two qualitatively different stressful events, this study thus tests the limits (Lindenberger & Baltes, 1995) of research showing that future time perspective is a correlate of well-being outcomes.

1.7 | Personal intimacy

Personal intimacy represents a basic need to belong (Baumeister & Leary, 1995) and feel communion with others (Alea & Bluck, 2003). It is an important component of well-being and can act as a buffer of anxiety regardless of the type of stressful event being recalled (in contrast to a no-stress recall). From the perspective of attachment (Bowlby, 1980), beliefs that one has secure social relationships available when in need are internal resources for well-being. For example, having secure attachment styles with romantic partners has been associated with lower levels of loneliness and stress and greater satisfaction with university life (Moore & Leung, 2002). Secure attachments with parents and peers have been linked to better academic performance in college students (Fass & Tubman, 2002). When faced with an achievement stressor, individuals can draw on their sense of social connectedness to feel encouraged about themselves and their own personal worth (i.e., I will be loved regardless of my bad exam grade). Such personal intimacy has also been suggested to protect against anxiety in the face of existential threat (e.g., Mikulincer et al., 2003; Mikulincer & Florian, 1998). As such, we hypothesized that a stronger sense of personal intimacy would be related to lower anxiety after recalling stressful events regardless of the type of event being recalled.

1.8 | The current study: Specific aims

The major goal of the current study is to address individual characteristics that relate to experiencing anxiety after recalling different types of previously experienced stressful life events. Research has focused on trauma in relation to symptoms of psychopathology, including how events are remembered (e.g., Fitzgerald et al., 2016; Janssen, Hearne, & Takarangi, 2015; Rubin et al., 2008; for a review, see also Holmes & Bourne, 2008). Acknowledging this link between stressful events and memory phenomenology, the current study includes measures of vividness and personal significance of memories. Of particular interest, however, is the relation of future time perspective and personal intimacy to the experience of anxiety after recalling stressful events. The study has three aims with the third reflecting the major study interest.

Aim 1. To examine whether recalling stressful life events, across two event types, provokes current anxiety. Recalling events in both the brush with death and academic stress conditions was expected to provoke greater anxiety than the no-stress control condition.

Aim 2. To examine whether vividness and personal significance of the remembered event were related to level of anxiety felt at recall. Recalling memories that were more vivid and had greater personal significance was expected to be related to higher anxiety whether recalling a brush with death or an academic stress (as compared with the no-stress control condition).

Aim 3. To examine the moderating effects of future time perspective and personal intimacy on the experience of anxiety after recalling a stressful event. Having a more open-ended future time perspective was expected to be related to lower anxiety after recall. We predicted this effect would be moderated by recall condition: sensing that one has an open-ended future should be related to less anxiety after recalling an academic deadline as compared with after recalling a brush with death. Having higher personal intimacy should be related to feeling less anxiety at recall regardless of the type of stressful event recalled (as compared with the control condition).

2 | MATERIALS AND METHODS

2.1 | Participants

Participants were 120 college students (61 men; age mean [*M*] = 19.70, standard deviation [*SD*] = 1.57) recruited from the Psychology participant pool of a large Southeastern university. They received course credit for participation. Among the participants, 63.3% were Caucasian, 14.2% were Hispanic, 13.3% were Asian, 5.8% were African American, and 3.3% self-identified as other. The sample size exceeds VanVoorhis and Morgan's (2007) assertion that 30 participants per condition is adequate for yielding small to medium effect sizes for detecting group differences using analysis of variance-type analyses. The sample size also satisfied the criterion for regression-type analyses of an absolute minimum of 10 participants per predictor.

2.2 | Procedure

The study was approved by an institutional IRB. In the first session, participants provided electronic informed consent and demographic background and completed assessments of future time perspective, personal intimacy, and a baseline state anxiety in counter-balanced order. In the second session, they visited the lab and completed online: the autobiographical narrative recall task and post-recall measures of state anxiety and memory qualities. Participants were randomly assigned to one of the three conditions, balancing for gender. They recalled either a threat to bodily integrity (i.e., brush with death condition; n = 40), an achievement stress (i.e., academic stress condition; n = 40), or past leisure activities (i.e., no-stress control condition; n = 40). After completion of all measures, participants were debriefed.

In each condition, participants followed instructions provided by a trained research assistant for completing the autobiographical recall narrative task. Three minutes were given to recall a specific autobiographical memory. To ensure adequate engagement, they were instructed to produce text to fill a seven-line text box. After the recall task, after a short delay, participants in all conditions completed the Memory Quality Questionnaire and the State Anxiety Inventory.

In the brush with death condition, participants were instructed: "… we want you to briefly describe one specific type of event. We are interested in hearing about an experience where something happened that, at least for a moment, you were faced with danger and actually thought you might die." To ensure that individuals could in fact recall a brush with death experience, although they were only college student age, we recruited college students for pilot testing before beginning the main study. Using the instructions described, in which individuals only had to perceive for a moment that they might die, all participants were able to generate an event. The range of events recalled, however, was wide; some events were likely frightening at the time but did not contain much actual likelihood of death whereas others were serious life-threatening events. Examples of events participants recalled from their lives include experiences such as having or believing one had a serious illness, being in a vehicle or other accident or near accident, and violence or threat of violent physical confrontations. For example, one participant wrote: *I was walking in Paris with two friends around 2 am in a strange neighborhood trying to find an apartment. I was really apprehensive because it was dark and deserted and unknown. We were slightly lost and I started to panic when an unknown man started to follow us. We began to walk faster and come up with a plan to get help. My hands were shaking and I felt really scared. We finally found the apartment but were locked out. The man went one building beyond and waited, watching us. I had the number for the American Embassy on my cell phone, ready to call. My pepper spray was in my hand. I was thinking about all the horrifying kidnapping stories I have seen on the news and remembering my mother's warnings against being out at night. I was terrified and nervous and so were my friends. I also felt stupid for getting into such a dangerous situation. I was praying a lot for some sort of deliverance and began to cry*. Although many events were serious ones, less intense events were also reported. For example, one participant wrote: *I was volunteering at a hospital with a friend and we were in one of the elevators. It seemed to be taking a longer time than it normally did, so we were worried. The elevator would not open. I was thinking about what we were going to do. The cart we brought with us had plenty of food and water, but I didn't want to spend my afternoon in an elevator! I was nervous and scared and I wanted the doors to just open. After a few long minutes it did, but those minutes felt a lot longer than they would have normally*.

In the academic stress condition, participants were instructed: "… we want you to briefly describe one specific event from your own life in which you were faced with an upcoming academic deadline (exam, big assignment, term paper, etc.)..." In both conditions, participants followed instructions to: "Describe all the emotions that you were

feeling as this happened. Write down, as specifically as you can, what happened to you in the moments leading up to this event and what happened, and what you were thinking and feeling while you were experiencing this. Focus only on how you were feeling during the event itself, and not what happened or how you felt once the event was over." Examples of events participants recalled include experiences such as preparing for an imminent standardized test (e.g., GRE and MCAT), scrambling to write a term paper at the last minute, and working on a team project with irresponsible classmates during finals week. For example, one participant wrote: *I had to take many AP tests but I was most worried about my AP Art History test. I felt like I didn't know nearly enough and I was so busy that I couldn't study constantly so that made me feel anxious. The morning of the test I got up early and met a friend for breakfast to study, but we were both so anxious that we felt like it was useless to study at this point and that we had done all we could. I felt that either I knew it or I didn't. When I took the test at first I was happy because I was finally getting it done, but then the questions got harder and I started losing focus*.

In the no-stress control condition, participants responded to a checklist of leisure activities to help them recall having engaged in such activities in their own life, thereby incorporating autobiographical recall in the control condition. Examples of leisure pursuits include attending a sporting event, outdoor activities such as hiking, and spending time relaxing with friends.

2.3 | Measures

2.3.1 | Demographics

Self-reports of demographic and background information (e.g., age, gender, ethnicity, and perceived health) were collected using a standard questionnaire. Perceived health was rated on a single 6-point scale (*1 = very good, 6 = very poor*; Maddox, 1962).

2.3.2 | State anxiety

Participants' baseline state anxiety and anxiety after the recall were measured using the State Anxiety Inventory (Marteau & Bekker, 1992), a shortened version of the original (Spielberger, 1983). Reliability in the current sample is excellent (Cronbach's α = .92). The scale includes six items (i.e., calm, tense, upset, relaxed, content, and worried). Participants respond using Likert scales ranging from 1 = *not at all* to 7 = *very much* about how they are feeling right now. Higher scores indicate greater state anxiety.

2.3.3 | Future Time Perspective

The Future Time Perspective Scale (Carstensen & Lang, 1996) was used to measure the extent to which individuals view their future as positive and open ended. Ten items (e.g., my future seems infinite to me) were rated on Likert scales ranging from 1 = *very untrue* to 7 = *very true* with high reliability (Cronbach's α = .88). Higher scores indicate a more open-ended, optimistic future view.

2.3.4 | Personal intimacy

To assess beliefs about intimacy and closeness with romantic partners, Sharabany's (1994) Personal Intimacy Scale was used (modified as per Mikulincer & Florian, 2000). Participants answered in terms of the level of personal intimacy in their ideal partnership. This approach ensures that all participants regardless of their relationship status or experience can complete this measure. The scale consists of 32 items (e.g., feel close to him/her) with excellent reliability (Cronbach's α = .89). Items were rated on Likert scales from 1 = *not at all* to 7 = *very much*.

2.3.5 | Memory qualities

The Memory Qualities Questionnaire (MQQ; Bluck, Levine, & Laulhere, 1999) was used to assess phenomenological qualities of the recalled memories. The seven items were rated on Likert scales from 1 = *not at all* to 5 = *very much*. Exploratory factor analysis (Varimax; 63.36% variance explained) resulted in extraction of two factors, Vividness and Personal Significance. Factor loadings for all items ranged from.59 to.84. Vividness (Cronbach's α = .62) included: "how vivid is the information you shared, to what extent were you reliving your life experience, how much do you actually remember it happening rather than just knowing that it happened." Personal significance (Cronbach's α = .83) included: "how personally significant is the information you shared, and how much has this event influenced who you have become as a person, how often do you think about the information you shared, how often do you talk about the information you shared." Event negativity was also assessed using a single item (i.e., how emotionally negative was the information you shared; 1 = *not at all*, 5 = *very much*). Participants in the two stress recall conditions also reported the year when the event occurred.

3 | RESULTS

Preliminary analyses are presented followed by major analyses addressing the three specific aims. Aim 1 is tested with a mixed analysis of covariance. Aims 2 and 3 are tested using hierarchical regression analyses.

3.1 | Descriptive statistics and preliminary analyses

On average, brush with death events occurred about 5 years ago (M = 4.8, SD = 4.01) and were more distant than academic stress events (M = 1.5, SD = 0.83), $F(1, 78) = 31.8$, $MSE = 8.38$, $p < .001$. Both types of stressful events were rated as more negative (Ms = 3.38, 3.28, SDs = 1.14, 1.11) than leisure activities (M = 1.68, SD = 1.00), $F(2, 117) = 30.83$, $MSE = 1.18$, $p < .001$. Vividness, personal significance, and state anxiety after recall were normally distributed across conditions with skewness and kurtosis statistics smaller than or close to 1. Across the no-stress, academic stress, and brush with death conditions, vividness ratings did not differ and were above average (Ms = 3.55, 3.58,

3.83; *SD*s = 0.71, 0.74, 0.7), $F(2,117) = 1.92$, $MSE = 0.67$, $p = .15$. Compared with leisure activities ($M = 3.58$, $SD = 0.75$), academic stress and brush with death events were rated as less personally significant, *M*s = 2.43, 2.54, *SD*s = 0.87, 0.82, $F(2, 117) = 25.3$, $MSE = 0.67$, $p < .001$. No differences were found across the no-stress, academic stress, and brush with death conditions in future time perspective, *M*s = 5.77, 5.63, 5.47; *SD*s = 0.89, 1.00, 1.06, $F(2, 117) = 0.93$, $p = .40$, or personal intimacy, *M*s = 6.07, 6.01, 5.98; *SD*s = 0.45, 0.45, 0.53), $F(2, 117) = 0.33$, $p = .72$.

Pearson's correlations were calculated between the variables of interest (i.e., vividness, personal significance, personal intimacy, and future time perspective) and the outcome variable (i.e., state anxiety after recall). Higher levels of personal intimacy and future time perspective were, as expected, associated with less anxiety after recall (*r*s = −.22., −.32, *p*s < .05, .001). Associations between the outcome variable (i.e., state anxiety after recall) and potential covariates including demographics (i.e., baseline state anxiety, gender, and perceived health) and event characteristics (i.e., age of event and event negativity) were explored. Age of the stressful event was unrelated to anxiety after recall (i.e., brush with death and academic stress: *r*s = .08, −.11, *p*s = .61, .49). Men and women ($M = 3.19, 3.64$; *SD*s = 1.64, 1.59) did not differ in state anxiety after recall, $t(118) = 1.51$, $p = .14$. Gender and age of the event were therefore not included as covariates. State anxiety at baseline, perceived health, and event negativity were correlated with state anxiety after recall (see Table 1) and were included in the major analyses.

3.2 | Aim 1: Does recalling stressful events elicit current anxiety?

A mixed analysis of covariance (perceived health and event negativity as covariates) tested differences in state anxiety by the between-groups variable, recall condition by the within-group variable, time of administration (baseline, post-recall). The main effects of recall condition, $F(2, 115) = 1.67$, $MSE = 1.53$, $p = .35$, and time of administration, $F(1, 115) = 0.1$, $MSE = 1.09$, $p = .32$, were not significant. Relevant to Aim 1, as expected, interactions between time of administration and recall condition were found, $F(2, 115) = 3.95$, $MSE = 1.09$, $p < .05$, $\eta_p 2 = .08$. This interaction effect was plotted in Figure 1. A follow-up one-way analysis of variance found that participants in the two stress recall conditions scored higher on anxiety after recall than those who recalled leisure activities, $F(2, 117) = 28.84$, $MSE = 1.8$, $p < .001$. That is, state anxiety after recall was higher for the brush with death, $M = 3.89$; $SD = 1.52$, and academic stress, $M = 4.23$; $SD = 1.33$ than for the no-stress control conditions, $M = 2.43$, $SD = 1.16$. Paired *t*-tests found that state anxiety was higher after recall than at baseline for the brush with death $t(39) = 4.37$, $p < .001$, and academic stress conditions, $t(39) = 7.08$, $p < .001$, but that there was no change in state anxiety in the no-stress control condition after recall, $t(39) = 1.67$, $p = .10$. Note that these differences were not due to baseline anxiety, which did not differ across recall conditions, $F(2, 117) = .227$, $p = .80$. Mean scores for baseline state anxiety for the brush with death, academic stress, and no-stress control conditions were 2.57, 2.58, and 2.42 (*SD*s = 1.20, 1.28, 1.10), respectively.

3.3 | Aim 2: Do memory qualities predict state anxiety at recall?

A hierarchical regression was run to examine whether vividness and personal significance predict state anxiety after recall and across conditions. Baseline state anxiety, perceived health, and event negativity were included as control variables. The two aspects of memory qualities, vividness and personal significance and recall conditions along with control variables were first included as predictors in Step 1. Brush with death condition was the reference group in dummy coding to allow direct comparison of the two types of stressful events. Step 2 further tested the interaction effects that vividness and personal significance may strengthen the association between remembering stressful autobiographical events and anxiety after recall with the inclusion of the interaction terms of recall conditions by memory qualities. Variables for creating interaction terms were centered to avoid issues of collinearity.

The final model accounted for 62.3% of the variance in state anxiety after recall, $F(11, 108) = 16.23$, $p < .001$. The interaction terms

TABLE 1 Correlations among variables of interest

	1	2	3	4	5	6	7	8
1. State anxiety after recall	–							
2. State anxiety baseline	.23*	–						
3. Perceived health	-.33**	-.17	–					
4. Event negativity	.64***	.12	-.09	–				
5. Vividness	.16	.09	-.11	.09	–			
6. Personal significance	-.11	-.02	.05	-.18	.21*	–		
7. Personal intimacy	-.22*	-.03	.18	-.01	.04	.01	–	
8. Future time perspective	-.32***	-.51***	.26**	-.25**	.03	-.05	.24**	–
M	3.41	2.53	5.15	2.77	3.65	2.85	6.02	5.62
SD	1.63	1.63	0.78	1.33	0.72	0.96	0.47	0.98

*$p < .05$.**$p < .01$.***$p < .001$.

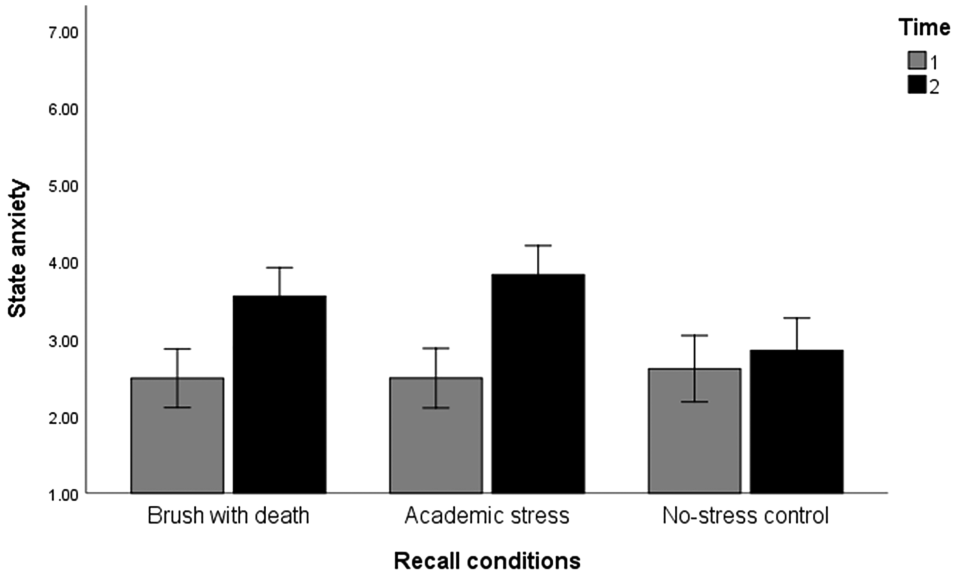

FIGURE 1 Recalling brush with death and academic stress events elicits anxiety. Covariates include perceived health and event negativity. Lighter bars indicate baseline state anxiety (Time 1). Darker bars indicate state anxiety after recall (Time 2). Bars indicate standard error

accounted for 5% of the variance, $\Delta F(4, 108) = 3.88$, $p < .01$. Table 2 summarizes the results. For control variables, better perceived health and the no-stress condition (vs. brush with death condition) predicted lower state anxiety after recall, $ts(109) = -3.37, -3.12$, $p < .001$. Event negativity predicted greater state anxiety after recall, $t(109) = 5.32$, $p < .001$. Addressing Aim 2, memory vividness showed no effect, $t(109) = .39$, $p = .70$ (see Step 1 in Table 2). In Step 2, no interaction effects of vividness and recall conditions on post-recall state anxiety were found, $ts(109) = -.64, -.93$, $ps = .52, .36$. For personal significance, a main effect on state anxiety after recall was found, $t(109) = 2.13$, $p < .05$. In Step 2, the main effect of personal significance was, as expected, moderated by recall condition (i.e., no-stress condition vs. brush with death condition), $t(109) = -3.55$, $p < .01$, which contributed to explaining additional 5% of the variance in state anxiety after recall. To follow-up this interaction effect, partial correlations based on the results of the final model were conducted, controlling for baseline state anxiety, perceived health, and event negativity. As expected, personal significance was associated with greater state anxiety after recall in both stress recall conditions; brush with death condition, $r(35) = .42$, $p < .05$, academic stress condition, $r(35) = .40$, $p < .05$. A non-significant negative association was found in the no-stress control condition, $r(35) = -.31$, $p = .06$.

TABLE 2 Summary of Hierarchical Regression Analysis for Recall Conditions and Memory Qualities Predicting State Anxiety after Recall

Outcome: State anxiety after recall	Step 1			Step 2		
	B	*SE*	β	B	*SE*	β
Baseline state anxiety	0.17	0.09	.12	0.18	0.09	.13*
Perceived health	−0.45	0.13	−.22**	−0.43	0.13	−.21**
Event negativity	0.51	0.10	.42***	0.47	0.09	.38***
No-stress (vs. brush with death)	−1.08	0.35	−.32**	−0.71	0.36	−.21*
Academic stress (vs. brush with death)	0.33	0.25	.10	0.34	0.26	.10
Vividness (V)	0.02	0.05	.03	0.05	0.05	.07
Personal significance (PS)	0.07	0.03	.17*	0.06	0.03	.15
V*No-stress (vs. brush with death)				−0.08	0.12	−.05
V*Academic stress (vs. brush with death)				−0.11	0.12	−.07
PS*No-stress (vs. brush with death)				−0.28	0.08	−.28**
PS* Academic stress (vs. brush with death)				−0.05	0.07	−.06
Total R^2	.57			.62		
ΔF	21.1***			3.88*		

Note. No-stress (vs. brush with death): No-stress condition = 1, brush with death condition = 0; Academic stress (vs. brush with death): Academic stress condition = 1, brush with death condition = 0.

*$p \leq .05$.**$p < .01$.***$p < .001$.

3.4 | Aim 3: Do future time perspective and personal intimacy differentially relate to lower state anxiety after recall?

We expected that two individual characteristics, future time perspective and personal intimacy, would have differential effects on state anxiety after recall depending on recall condition. Although personal intimacy was expected to correlate with lower anxiety felt after recalling both types of stressful events, having a more open-ended future time perspective was expected to weaken the association between recalling an academic deadline and state anxiety after recall more so than after a brush with death. A hierarchical regression was conducted: In Step 1, control variables including baseline anxiety, perceived health, event negativity, and personal significance (i.e., the memory quality found to be a predictor as per Aim 2 results), dummy-coded variables for the three recall conditions (brush with death as reference group), and the individual characteristics of future time perspective and personal intimacy were entered. In Step 2, the interaction terms of recall conditions and individual characteristics were entered. Variables for creating interaction terms were centered to avoid issues of collinearity. The final model accounts for 63% of variance in post-recall state anxiety, $F(12, 107) = 15.37$, $p < .001$, with 4% of the variance from the interaction terms, $\Delta F(4, 108) = 2.83$, $p < .05$. Table 3 summarizes the results. Baseline state anxiety did not predict state anxiety after recall, $t(109) = 1.45$, $p = .15$ (Step 1 and Step 2, respectively). In the final model (Step 2), perceived health, event negativity, and inclusion in the no-stress control condition (vs. brush with death) were related to state anxiety after recall $ts(109) = -3.4, 5.14, -3.27$, $ps < .01, .001$. Findings of our main variables of interest were reported as follows.

3.4.1 | Future time perspective

Although having a more open-ended positive future time perspective had no main effect in Step 1, $t(109) = -0.51$, $p = 0.61$, an expected interaction effect on state anxiety after recall emerged in Step 2. Relations between future time perspective and state anxiety after recall differed between the no-stress control condition and brush with death condition, as well as between the academic stress condition and brush with death condition, $ts(109) = -2.17, -2.55$, $ps < .05$. Partial correlations that controlled for perceived health, event negativity, and intimacy based on the results of the final model, were conducted to follow up the interaction effects. As plotted in Figure 2, having a more open and positive future time perspective was associated with lower state anxiety after recall in the academic stress condition, $r(35) = -.44$, $p < .01$, but had no effect on state anxiety after recalling a brush with death, $r(35) = .23$, $p = .16$. No significant association was found in the no-stress control condition, $r(35) = -.29$, $p = .08$.

3.4.2 | Personal intimacy

Personal intimacy was expected to be related to overall lower levels of state anxiety after recall, regardless of recall condition. A main effect of personal intimacy was found in Step 1, $t(109) = -2.39$, $p < .05$, but was further moderated by recall conditions in Step 2: no-stress control condition versus brush with death, $t(109) = 1.97$, $p = .05$, and academic stress versus brush with death, $t(109) = 2.19$, $p < .05$. Partial correlations controlling for perceived health, event negativity, and future time perspective were conducted to decompose the interaction effects. As expected, greater personal intimacy was associated with

TABLE 3 Summary of hierarchical regression analysis for recall conditions, personal intimacy and future time perspective predicting state anxiety after recall

Outcome: State anxiety after recall	Step 1			Step 2		
	B	*SE*	β	B	*SE*	β
Baseline state anxiety	0.14	0.10	0.10	0.14	0.10	0.10
Perceived health	−0.39	0.13	−0.19**	−0.44	0.13	−0.21**
Event negativity	0.52	0.10	0.42***	0.49	0.10	0.40***
Personal significance	0.07	0.03	0.17**	0.06	0.03	0.14
No-stress (vs. brush with death)	−1.05	0.33	−0.31**	−1.05	0.32	−0.31**
Academic stress (vs. brush with death)	0.34	0.24	0.10	0.32	0.24	0.09
Personal intimacy (PI)	−0.53	0.22	−0.15*	−0.43	0.22	−0.12*
Future time perspective (FTP)	−0.07	0.13	−0.04	−0.10	0.12	−0.06
PI*No-stress (vs. brush with death)				1.03	0.53	0.14*
PI*Academic stress (vs. brush with death)				1.11	0.51	0.15*
FTP*No-stress (vs. brush with death)				−0.56	0.26	−0.15*
FTP* Academic stress (vs. brush with death)				−0.61	0.24	−0.17*
Total R^2	.59			.63		
ΔF	20.31***			2.83*		

Note. No-stress (vs. brush with death): No-stress condition = 1, brush with death condition = 0; Academic stress (vs. brush with death): Academic stress condition = 1, brush with death condition = 0.

*$p \leq .05$.**$p < .01$.***$p < .001$.

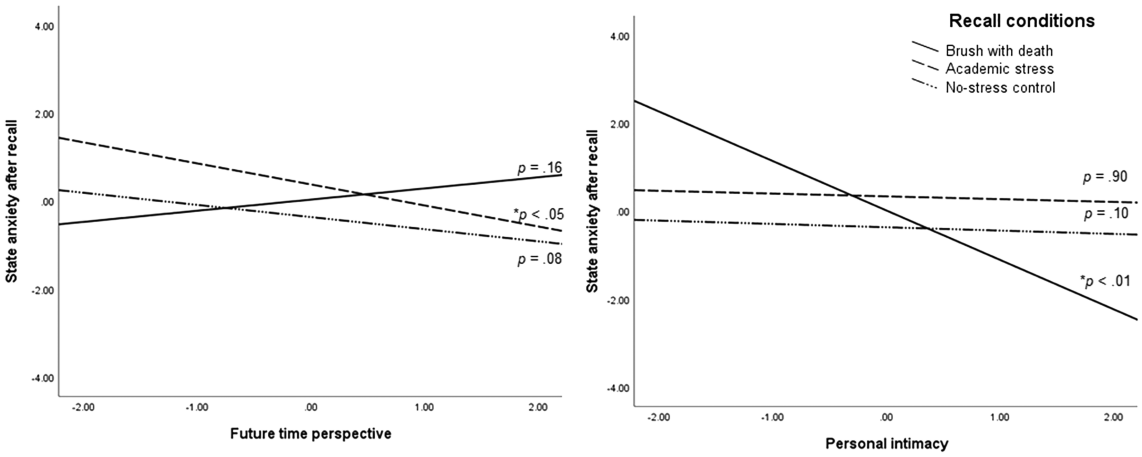

FIGURE 2 Associations between Future Time Perspective (Left Panel) and Personal Intimacy (Right Panel) and State Anxiety after recall by recall condition. Partial correlations were plotted based on Aim 3 analyses

lower levels of state anxiety after recall in the brush with death condition, $r(35) = -.46$, $p < .01$, but not in the no-stress control condition, $r(35) = .00$, $p = 1.00$. Contrary to our expectation, personal intimacy was not related to anxiety after recall in the academic stress condition, $r(35) = -.02$, $p = .90$ (see Figure 2).

4 | DISCUSSION

In this study, individuals recalled stressful events from their own lives, but of rather different types. As expected, remembering either a brush with death or a stressful academic deadline led to current feelings of state anxiety (Aim 1), which was positively correlated with the evaluation that the remembered experience was still personally significant (Aim 2). As expected, as per the major interest of the study (Aim 3), individual characteristics were differentially correlated with the anxiety elicited by different types of events being recalled, even beyond the effect of personal significance. Specifically, seeing one's future as more open ended and fuller opportunities was related to feeling less state anxiety after recalling a stressful academic deadline. This moderating effect, however, was not evident in recalling a brush with death. Instead, feeling a stronger sense of personal intimacy was correlated with lower anxiety experienced after recalling a brush with death.

4.1 | Remembering stressful events: Just thinking about it makes me anxious

Humans recall a wide range of life's experiences and events. Mental life includes the recall of life's experiences whether through directed reminiscing or as cued by our environment (Bluck et al., 2010). Sometimes these memories are of challenging, stressful events that are highly emotional (e.g., Wenzel et al., 2004). Our findings show that recall of stressful autobiographical events elicits anxiety, even though the stress-provoking environmental circumstance is in the past. Recalling either a brush with death or an academic deadline resulted in increased feelings of current anxiety, whereas the comparison condition, thinking about leisure activities, did not. Although straightforward, the findings derived from this experiment again demonstrate the close memory-emotion link (Holland & Kensinger, 2010). This reminds us of the power and richness of memory in carrying forward not only information but also feelings from our personal past into our current daily lives. It appears to be typical for individuals to feel some anxiety when thinking about stressful past events. Our study findings further contribute to a better understanding of factors related to variations in the level of anxiety experienced.

At first, surprising the level of anxiety felt from recalling the two types of stressful events did not significantly differ. Note that this result was not due to differences in memory qualities. The two types of events did not differ in personal significance or vividness. Although brush with death events happened longer ago than academic deadlines, age of the event was unrelated to anxiety felt after recall. Our findings are consistent with Fitzgerald et al. (2016) who found no difference between death-related and achievement-related events on symptoms of post-traumatic stress disorder. One might reasonably expect that remembering an academic deadline would not elicit as much anxiety as remembering a time one almost died! Although college students might refer to an exam that "almost killed me" in the vernacular, recalling a literally life-threatening event seems a tad more serious. Note, however, that this was a between-participants design. We surmise that if each participant had recalled both types of stressful event, relatively higher state anxiety would have been reported in regards to recalling a brush with death.

That said, although negative emotions such as anxiety generally fade over time (Walker & Skowronski, 2009), our findings show that recalling even stressful events such as an academic deadline can still create current anxiety. This may serve to direct individuals' motivations in similar situations that arise in their lives (Kuwabara & Pillemer, 2010). In line with that, the experience of anxiety was related to how personally significant the event feels today. Personal significance can be considered a form of *autobiographical reasoning* (Habermas & Bluck, 2000): the individual bridges their past and present through retrospective appraisal at recall (Conway et al., 2004). Consistent with a

functional perspective to autobiographical memory (Bluck, 2003; Neisser, 1978), past stressors that still feel relevant today carry greater anxiety than events that no longer feel connected to our lives.

4.2 | Anxiety: Remembering an academic stress versus a brush with death

The major focus was to examine whether individual characteristics was associated with lower anxiety when recalling stressful events. We argued that the stress from different types of events is experientially different for individuals in everyday life. Future time perspective and personal intimacy were both expected to correlate with lower anxiety experienced after recalling an academic deadline. For remembering a brush with death, however, only personal intimacy was expected to act as a moderator. Our findings largely support this view.

4.2.1 | Brush with death: Love is all there is

Life-threatening events may provoke existential anxiety at the time they occur and when recalled later (Becker, 1973). Recalling a time when one's life was at risk evokes a sense of one's own mortality, which can result in reevaluation of life's meaning, increasing its preciousness (Khanna & Greyson, 2015). It forces at least implicit consideration of the end of time (Corballis, 2014), the end of one's individual lifetime. As such, although prior research documented a positive association between having a more open-ended future time perspective and psychological well-being in a variety of situations (e.g., Coudin & Lima, 2011), we found no evidence that future time perspective was related to lower anxiety on recall of a death-related event. Individuals have a complex relationship with time. Much of life is spent with clock and calendar time as salient organizers. Thinking about time's finitude, however, is often avoided (Wong, in press). That is, chronological time and what we term *psychological time* are somewhat asynchronous. Particularly, young adults have little awareness of their own time ending (Strough et al., 2016). Recall of an autobiographical memory of a brush with death, however, grounds the abstract notion of eventual mortality in our lived experience—resulting in some anxiety.

Higher personal intimacy was found to correlate with less anxiety after recalling a brush with death. We speculate on two reasons for this. The research on the existential function of intimacy (for a review, see Mikulincer et al., 2003; Mikulincer & Florian, 1998) has documented that having a secure base in our relations with others (Bowlby, 1980) may reduce anxiety about death. For example, Mikulincer and Florian (2000) found that under a mortality-salience condition (i.e., in contrast to a no-terror control), secure individuals presented a stronger desire for intimacy and a tendency to create symbolic shields (e.g., leaving legacies). These patterns were not found in insecurely attached individuals. Feeling intimately connected with others may allow individuals to maintain the sense that they will be remembered well by others, creating a symbolic shield from anxiety. This sense of immortality through other's memories may soften the sting of recalling a time when one almost died. That is, thinking about our close social bonds may satisfy prosocial concerns for living on through generativity (McAdams & de St. Aubin, 1992), being remembered by loved ones after death (Mroz & Bluck, 2018) or leaving a personal legacy (Hunter & Rowles, 2005). These are potential factors that warrant future consideration in research on anxiety related to memories for life-threatening situations.

4.2.2 | Academic deadline: Time is on my side

The anxiety experienced after recalling a stressful academic deadline was associated with having a more open-ended future time perspective. We speculate on two ways this might occur. As mentioned earlier, holding an open-ended sense of one's future in most situations (i.e., albeit not death-related ones) allows the belief that there is time to repair failures or do better in future. Anxiety or distress can occur when people realize that they have not mastered a desired goal and that time for doing so has run out (Erikson, 1979; Wrosch, Scheier, Miller, Schulz, & Carver, 2003). In addition, future time perspective not only involves feeling that there is a lot of time ahead but also involves feeling optimistic about the time and opportunities ahead (Lu et al., 2018). As such, even if one is not explicitly considering being able to repair specific damage done (e.g., perform better on future exams or assignments), a general feeling of optimism about one's future may put a given stressful deadline in greater perspective. The individual may be able to contextualize the remembered event, thinking "my future is rosy so I don't sweat the small stuff from my past."

We had expected that higher levels of personal intimacy would be related to lower anxiety at recall for both stressful events, but it was not. We provide no evidence that having a stronger sense of personal intimacy is related to the extent of anxiety felt after recalling a stressful academic deadline. It may be that social support from parents or peers is most important to university adjustment (Friedlander, Reid, Shupak, & Cribbie, 2007; Rayle & Chung, 2007). This is in line with research suggesting support from parents, but not romantic partners is related to better college performance (Cutrona, Cole, Colangelo, Assouline, & Russell, 1994). It is also possible that individuals compartmentalize the communion and agency domains (Bakan, 1966; McAdams, Hoffman, Mansfield, & Day, 1996). That is, remembering one's poor academic performance creates anxiety related to career and is less related to positive feelings in the social-communion domain. In short, being loved won't get you into medical school. Instead, feeling some anxiety when recalling past achievement stress may help to guide better future performance (Owens, Stevenson, Hadwin, & Norgate, 2014).

5 | LIMITATIONS

This study has limitations. We used a between-participants design: individuals recalled one of the two stressful events or were in the no-stress recall condition. Although most predictions were upheld, a within-participants design would have offered an even stronger approach. We adopted a between-subject design because we considered that having participants recall both types of stressful events could cause

interference between the felt anxiety across events. Future research in which each participant recalls one stressful event and the no-stress control (i.e., between-within design) could minimize individual differences that are not adequately controlled in a between-participants design. To ensure generalizability, future research should also replicate this finding including samples with a wider age range. In addition, multi-measurement of intimacy could be useful. Specifically in studying college students, parent or peer support may be the type of social bonding that is correlated with lower stress arising from recall of academic deadlines. Intimacy in particular relationships may be crucial for buffering anxiety in different situations (Cutrona et al., 1994).

6 | CONCLUSION

Autobiographical memory involves individuals remembering their own unique life events. This study shows that the personal significance of a memory as well as individuals' sense of future time perspective and their sense of connectedness (i.e., personal intimacy) are associated with *how individuals feel* when they look back on stressful experiences. Having an open-ended sense of future time perspective appears to be associated with feeling less state anxiety after recall of some types of stressful memories (i.e., academic deadlines). Sometimes, however, time is not enough: when faced with what might be considered the ultimate stressor—the threat of death—simply sensing one has lots of time left in the future does not act as a buffer. Individuals may turn instead to love (i.e., personal intimacy). The present study highlights potential resources that may be related to experiencing less stress when recalling the difficult events that inevitably occur in a life.

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