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From Awful to Awe-Full: Easing the Discomfort of Uncertain Waiting Periods

A Dissertation submitted in partial satisfaction
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by

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I think it is fair to say that I have a great deal of professional and personal experience with uncertainty. I study it, live with it, and laugh often at the irony of attempting to write convincingly about it. Absolute certainty is a rarity in my world, and yet I have no doubt that accepting an offer of admission from UC Riverside is one of the best decisions I have ever made. Even before I (ever so gracefully and rather unexpectedly) blurted out my intention to join the Life Events Lab in the middle of the recruitment weekend lab meeting, I was sure of my choice and I have never questioned that decision. At every point in this adventure I have been surrounded by people – staff, faculty, students, friends, and family – who truly wanted me to succeed. Although I will attempt to keep this section short lest it eclipse the dissertation itself, there are far more people who have contributed to my well-being, success, and growth in this time than I can possibly acknowledge here. Please know, fellow adventurers, that you are always with me.

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DEDICATION

This dissertation is dedicated to my beautiful son, Matias Grey, who teaches me more about uncertainty and awe in a single moment than I could hope to learn in a lifetime without him.

ABSTRACT OF THE DISSERTATION

From Awful to Awe-Full: Easing the Discomfort of Uncertain Waiting Periods

by

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Doctor of Philosophy, Graduate Program in Psychology
University of California, Riverside, August 2016
Dr. Kate Sweeny, Chairperson

Waiting for uncertain news is a common experience that many people find uncomfortable. People experience negative affect, anxiety, and rumination, and they employ a variety of strategies to manage this distress. Awe is a moral emotion we feel when we are confronted with something vast beyond our comprehension that requires a perspective shift in order to accommodate the new experience, and research has confirmed that awe increases both well-being and patience (Rudd et al., 2012), making it a good candidate for an intervention to reduce the negative affect, anxiety, and rumination typically associated with difficult waiting periods. I conducted three studies to test the effect of awe on distress during uncertain waiting periods. Study 1 (N = 89) examined the relationship between *trait awe* and discomfort and strategy selection as participants awaited feedback on what they believed was a novel intelligence test. Building on Study 1, Studies 2 and 3 examined the effect of an *awe induction*, compared to positive and neutral controls, on discomfort and strategy use in two different uncertain waiting periods: In Study 2 (N = 324), participants waited for feedback on the same

intelligence test used in Study 1, and in Study 3 (N = 399) participants waited for interpersonal feedback from peers after a group interaction. Across the three studies, I found partial support for a relationship between trait awe and distress and the use of uncertainty navigation strategies. Experiencing awe offered a consistent reduction in negative affect and anxiety during an uncertain waiting period but did not have a reliable effect on the strategies that people employ to manage their feelings of uncertainty. Instead, strategy selection was primarily driven by temporal proximity to feedback. Thus, awe emerged as a unique and reliable means of reducing distress during an uncertain waiting period, and these benefits were not contingent on a predisposition to experiencing awe daily life.

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From Awful to Awe-full: Easing the Discomfort of Uncertain Waiting Periods

Waiting for uncertain news is a common and stressful experience. People may feel uncertain as they wait to learn the outcome of a cancer screening, a job interview, a home purchase, or an academic exam. Although many examples of uncertain waiting periods come readily to mind, little is known about the best way to manage the expectations, emotions, and decisions that arise as people await the final outcome. I propose that experiencing awe, an expansive state of wonder and reverence, can help people effectively navigate a difficult waiting period by broadening their perspective and increasing patience and well-being.

Navigating Uncertain Waiting Periods

Waiting in itself can be annoying (Tom & Lucey, 1997) and uncertainty is consistently associated with anxiety (Ellsberg, 1961; Izard, 1991; Knyazev, Savostyanov, & Levin, 2005; Parsons, 1980; Penrod, 2001; Reiman, Fusselman, Fox, & Raichle, 1989), but the combination of the two appears to be particularly unpleasant. In fact, a growing body of research suggests that awaiting uncertain news is often more anxiety-provoking than receiving the bad news one fears (Boivin & Lancastle, 2010; Flory, Faintuch, & Lang, 2008; Janzen & Hadjistavropoulos, 2008).

In addition to anxiety, rumination tends to arise when awaiting uncertain news (Sweeny & Andrews, 2014). Rumination is an uncomfortable state characterized by repetitive and intrusive negative thoughts fixated on a particular source of distress and strongly associated with depression (Nolen-Hoeksema & Morrow, 1993), memory inhibition and reduced regulation of negative emotions (Davis & Levin, 2013; Hertel,

1998), worry and fearfulness (Garnefski, Rieffe, Jellesma, Teerwogt, & Kraaij, 2007) and a variety of other negative outcomes (Lyubomirsky & Nolen-Holeksema, 1995; Lyubomirsky, Tucker, Caldwell, & Berg, 1999; see Nolen-Hoeksema, Wisco, Lyubomirsky, 2008, for a review).

Uncertainty Navigation Strategies

Although some people naturally cope with uncertainty better than others, some strategies (employed consciously or otherwise) appear to provide relief during an uncertain waiting period regardless of one's dispositional tendencies toward discomfort. For example, people awaiting an outcome may derogate the desirable outcome to decrease its appeal or simply expect to experience the less desirable outcome (Pyszczynski, Greenberg, & Holt, 1985; Sweeny, Carroll, & Shepperd, 2006). They may also engage in strategies specifically aimed at managing or reducing uncertainty, such as seeking out new information, distracting themselves, or withdrawing from the situation (Penrod, 2001).

The uncertainty navigation model (Sweeny & Cavanaugh, 2012; Sweeny & Andrews, 2014; Sweeny, Reynolds, Falkenstein, Andrews, & Dooley, 2015) provides a framework with which to explore the experience of a difficult waiting period, describing specific strategies people use to manage their distress. Some of these strategies are defensive in nature, such as emotion suppression, bracing, and distancing, whereas others are more positively valenced, such as distraction, maintaining hope and optimism, and preemptive benefit-finding, and proactive coping.

Distraction and suppression. The emotion regulation strategies of distraction and suppression target the specific thoughts and feelings people have in response to uncertainty (Gross & Thompson, 2007; Sweeny & Cavanaugh, 2012). People can avoid thinking about the uncertain outcome by focusing on external distractions (e.g., engaging in unrelated hobbies) or internal distractions (e.g., purposefully thinking about unrelated topics; Nolen-Hoeksema et al., 2008). Suppression, on the other hand, focuses specifically on the unpleasant emotional experience, with the goal of effortfully controlling and limiting its intensity or expression (Gross & Levenson, 1993; Srivastava, Tamir, McGonical, John, & Gross, 2009).

Bracing, hope, and optimism. People faced with the discomfort of an uncertain waiting period may also manage their expectations for the outcome by making an effort to be optimistic and hoping for best while also bracing for the worst. Even when people have been relatively optimistic about a particular outcome and have reason to expect the best, they often significantly lower their expectations immediately before learning the outcome (Sweeny & Krizan, 2013). Hope and optimism make for a more comfortable experience (Taylor, Lichtman, & Wood, 1984; Wilson, Centerbar, Kermer, & Gilbert, 2005), and people can maintain a hopeful mindset even as specific expectations decline (Bruininks & Sweeny, 2008).

Proactive coping and preemptive benefit-finding. People experience a range of emotions when looking ahead to an anxiously anticipated outcome, imagining the best and the worst case scenarios and how they might respond to each. These preparative processes are a form of proactive coping that allow people to mitigate the effect of a

potentially negative outcome (Aspinwall & Taylor, 1997). Although it is easy to imagine being happy with one's desired outcome, research suggests that being able to find something positive in the undesired outcome (the "silver lining") is beneficial for long-term adjustment, meaning-making (Carver & Antoni, 2004, Davis, Nolen-Hoeksema, & Larson, 1998; Janoff-Bulman & Frantz, 1997), and behavioral adjustment (Littlewood, Vanable, Carey, & Blair, 2008).

Distancing. Creating psychological space or distance between oneself and the personal implications of a bad outcome is another strategy that temporarily eases the discomfort of awaiting uncertain news, as when a student awaiting finals grades feels that the exam was not a valid measure of his or her understanding in the course. Engaging in distancing reduces negative affect (Davis et al., 2012) and diminishes the potential impact of a negative outcome.

Despite the wealth of evidence supporting these common strategies as potentially effective means of coping with the experience of uncertainty, a recent study (Sweeny et al., 2015) suggests that many of these strategies are relatively ineffective (and perhaps even harmful) for reducing anxiety and rumination as people await uncertain news. This finding is bad news for people working through a difficult waiting period, but it provides researchers with an opportunity to expand our perspective on how to help people navigate such uncertainty more comfortably and ultimately more productively.

The Experience of Awe

Although the concept of awe has deep roots in religion, philosophy, literature, and art, and was incorporated into William James' discussion of religious phenomena (1902)

and a key features of Abraham Maslow's concept of peak experiences (1964), its arrival on the scene of modern psychological research is relatively recent. Psychologists describe awe as a moral, spiritual, and aesthetic emotion in which two appraisals are central: perceived vastness and a need for accommodation (Keltner & Haidt, 2003). Perceived vastness refers to one's sense of something greater than the self that can make a person feel small and even insignificant (e.g., nature, royalty, an earthquake). The need for accommodation is a concept borrowed from developmental psychology (Piaget & Inhelder, 1966, 1969) and describes the need for reorganization of mental structures that cannot comfortably assimilate a new experience that is overwhelming and even frightening but may also bring about a sense of enlightenment and newness. Five additional appraisals – threat, beauty, exceptional ability, virtue, or the supernatural – may color the experience of awe but are not considered necessary or sufficient.

The experience of awe is stimulus-focused and self-diminishing (Shiota, Keltner, & Mossman, 2007), improves mood and increases prosociality (Joye & Bolderdijk, 2015; Zhang, Piff, Iyer, Koleva, & Keltner, 2014), and boosts feelings of connectedness and humility (Chancellor, Cornick, Nelson, Blascovich, & Lyubomirsky, under review). Daily positive emotion experiences, especially awe, wonder, and amazement, have even been linked with lower levels of pro-inflammatory cytokines, suggesting that these experiences are associated with and potentially contribute to greater physical and mental health (Stellar, John-Henderson, Anderson, Gordon, McNeil, & Keltner, 2015).

However, some people are more likely to experience awe than others. People who regularly experience awe tend to be more open to new experiences and more extraverted

(Shiota, Keltner, & John, 2006) and, particularly pertinent to the proposed studies, have less need for cognitive closure (Shiota, Keltner, & Mossman, 2007). Fortunately, even people who do not naturally experience awe on a regular basis can raise their levels of awe through simple exercises. Recent research confirms that experiencing awe or writing about past awe experiences expands perceptions of time, improves decision-making, and (most relevant to the current set of studies) increases well-being and patience (Rudd, Vohs, & Aaker, 2012), making it a good candidate for an intervention to reduce the anxiety and rumination typically associated with difficult waiting periods.

Overview and Hypotheses

Given the ubiquity of uncertain waiting periods and the detrimental effects of anxiety and rumination, the goal of my dissertation research is to explore the experience of awe as a means of easing this distress.

I conducted three studies to test the effect of awe on distress during uncertain waiting periods. Study 1 examined the relationship between *trait awe* (i.e., the dispositional tendency to readily and frequently experience awe) and discomfort and strategy selection during an uncertain waiting period in which participants awaited feedback on what they believed was a novel intelligence test. Building on Study 1, Studies 2 and 3 examined the effect of an *awe induction* (e.g., Rudd et al., 2012), compared to positive and neutral controls, on discomfort and strategy use in two different uncertain waiting periods: In Study 2, participants were again waiting for performance feedback on the same intelligence test used in Study 1, and in Study 3 participants

believed they were awaiting interpersonal feedback about how others perceived them in a group interaction. My specific hypotheses were as follows:

Hypotheses 1a-1b (examined in Studies 1, 2, and 3): People who are higher in trait awe will report less discomfort and less reliance on the defensive strategies (distraction, suppression, distancing) outlined in the uncertainty navigation model (Sweeny & Cavanaugh, 2012; *1a*). This effect will be particular pronounced when participants are expecting immediate (vs. delayed) feedback (*1b*).

Hypotheses 2a-2c (examined in Studies 2 and 3): People who engage in an awe induction will report less discomfort and less reliance on defensive strategies compared to the control conditions (*2a*). Participants who are higher in trait awe will benefit most from the awe induction (*2b*). The benefits of awe will be particularly pronounced when participants are expecting immediate (vs. delayed) feedback (*2c*).

Study 1

Participants

Participants were 89 undergraduate students (64.0% female; M_{age} = 19.31, *SD* = 1.42) from an introductory psychology course at the University of California, Riverside (UCR), who consented to participate in the study for partial course credit. Participants were diverse in terms of race and ethnicity: 48.3% identified as Hispanic or Latino, 23.6% Asian, 13.5% non-Hispanic White, 7.9% Mixed, 4.5% non-Hispanic Black, and 2.3% identified as Middle Eastern. Participants also used a 10-point scale to indicate their subjective socio-economic status (SSES). Responses can range from 1 to 10, with the lowest numbers representing those who are worst off in terms of money, education, and

jobs, and the highest numbers representing those who are best off (M = 5.43, SD = 1.70; "SES ladder"; Adler, Epel, Castellazzo, & Ickovics, 2000).

Procedure

Participants arrived to lab for a study called "Test Your Skills" and were told they would complete sets of measures before and after a novel intelligence test. Participants were randomly assigned to one of two feedback conditions: immediate (n = 45) or delayed (n = 44). Although no participants would receive feedback on their performance, participants in the immediate condition believed they would receive feedback at the end of the session, whereas participants in the delayed condition believed they would received feedback several months in the future. After completing measures of individual differences and emotions, participants were given instructions for Raven's Matrices problems (Raven, 1941) and completed a practice item before continuing on to the novel intelligence test, which consisted of 10 Raven's Matrices problems of increasing difficulty (Georgiev, 2008). After the test, participants completed measures of emotions, uncertainty navigation strategies, and demographic information. All participants were debriefed and given credit for participation at the end of the session.

Measures

All variable means, standard deviations, and Cronbach's alphas for Study 1 are reported in Table 1.

Baseline measures.

Intolerance of uncertainty. Participants' general ability to tolerate uncertainty was measured using the short form of the Intolerance of Uncertainty Scale (Carleton,

Norton, & Asmundson, 2007), a 12-item measure rated on a 5-point scale (e.g., "Unforeseen events upset me greatly"; 1 = *not at all characteristic of me*, 5 = *entirely characteristic of me*).

Need for closure. Need for closure (Kruglanski & Webster, 1996) was measured with 16 items rated on a 6-point scale (e.g., "I don't like to be with people who are capable of unexpected actions"; 1 = *strongly disagree*, 6 = *strongly agree*).

Dispositional optimism. Dispositional optimism was assessed using the six items of the Revised Life Orientation Test with filler items excluded (LOT-R; Scheier, Carver, & Bridges, 1994). These items were assessed on a 7-point scale (e.g., "I rarely count on good things to happen to me"; 1 = *strongly disagree*, 7 = *strongly agree*).

Defensive pessimism. Defensive pessimism was measured with 12 items adapted to generalize beyond academic settings (see Norem, 2001 for original items). These items were rated on a 6-point scale (e.g., "I often start out expecting the worst, even though I know I will probably do OK"; 1 = *not true at all of me*, 7 = *very true of me*).

Dispositional positive emotions. Trait awe was assessed using the awe subscale of the Dispositional Positive Emotion Scales (DPES; Shiota, Keltner, & John, 2006), a 5-item subscale rated on a 7-point scale (e.g., "I feel wonder almost every day"; 1 = *strongly disagree*, 7 = *strongly agree*). The DPES also includes 5- to 6-item subscales of amusement (e.g., "I find humor in almost everything"), contentment (e.g., "My life is very fulfilling"), compassion (e.g., "I often notice people who need help"), joy (e.g., "I often feel bursts of joy"), love (e.g., "I love many people"), and pride (e.g., "Many people respect my authority") that were included and measured on the same 7-point scale.

Positive and negative affect. Participants completed the Affect Adjective Scale (Diener & Emmons, 1985), rating the extent to which they have experienced a set of positive and negative emotions in the past week on a 7-point scale (e.g., joyful, pleased, frustrated, unhappy; 0 = *not at all,* 7 = *extremely*).

Baseline anxiety. Participants completed a 10-item measure of anxiety that includes eight general ratings of how they have been feeling in the past three days (e.g., calm, anxious, worried) and two items specific to the study (e.g., "I am worried about how others will see me" or "I am worried about my test performance"; Sweeny & Andrews, 2014). All items will be rated on a 7-point scale (1 = *not at all,* 7 = *extremely*).

Baseline rumination. Participants completed a single item of state rumination ("I can't seem to stop thinking about my performance in the group interaction and how others will rate me" or "I can't seem to stop thinking about my performance on the intelligence test") adapted from a previous study (Sweeny & Andrews, 2014) and rated on a 7-point scale (1 = *not at all,* 7 = *extremely*).

Waiting period measures.

Task evaluations. Participants rated the intelligence test on difficulty, validity, interest, fairness, stressfulness, and education value using a 7-point scale (1 = *extremely easy*, 7 = *extremely difficult*).

Expected results. Participants indicated the score they expect to receive on the 10-item Raven's Matrices test.

Positive and negative affect. Participants again completed the Affect Adjective Scale (Diener & Emmons, 1985) they completed at baseline, this time indicating how they felt in that moment.

Waiting period anxiety and rumination. Participants again completed the 10-item measure of anxiety and the single item of state rumination they completed at baseline, indicating for each how they felt in the current moment.

Uncertainty navigation strategies. All the strategies described below were adapted from past studies (e.g., Sweeny & Andrews, 2014; Sweeny et al., under review).

Distraction. Distraction efforts were measured with a single item ("I'm trying to distract myself from thinking about my results"; 1 = *strongly disagree*, 7 = *strongly agree*).

Suppression. Suppression efforts was measured with a single item ("I've been trying to completely stop myself from thinking about my results"; 1 = *strongly disagree*, 7 = *strongly agree*).

Bracing. Participants' use of bracing as an expectation management strategy was assessed with two items ("I'm bracing for the worst when it comes to my results," "I want to make sure to keep my expectations low when it comes to my results"; 1 = *strongly disagree*, 7 = *strongly agree*).

Hope and optimism. Participants' use of a hopeful, optimistic expectation management strategy was assessed with two separate items ("I'm hoping for the best when it comes to my results," "I'm trying to be optimistic about my results"; 1 = *strongly disagree*, 7 = *strongly agree*).

Proactive coping. Proactive coping was measured with a single item ("Have you spent any time in the last few minutes thinking about how you'll cope if your [ratings are / score is] low?") If participants responded "Yes" to this question they were asked to describe those thoughts and indicate how much time they spent thinking about how to cope (1 = *very little time,* 7 = *a great deal of time*).

Preemptive benefit-finding. Preemptive benefit-finding was measured with three items ("I feel like I'll learn something from the experience if my [ratings are / score is] low"; "It might be for the best if my [ratings are / score is] low"; and "I feel like I would grow as a person if my [ratings are / score is] low"; 1 = *strongly disagree,* 7 = *strongly agree*).

Distancing. Psychological distancing was measured with five items (e.g., "This [interaction/test] is a valid measure of [personality/intelligence]"; 1 = *strongly disagree,* 7 = *strongly agree*).

Time perception. Perceptions of time were assessed with two questions ("It feels like it's taking forever to get my results back" and "It feel like I'll get my results before I know it"; 1 = *strongly disagree,* 7 = *strongly agree*).

Religiosity and spirituality. Religiosity and spirituality were each assessed with a single item on a 7-point scale ("Compared to most people you know, how [religious/spiritual] do you consider yourself to be?"; 1 = *not at all,* 7 = *extremely*).

Study 1 Results

Manipulation Check

There were no significant condition differences in evaluations of how difficult, valid, interesting, fair, stressful, or valuable participants found the intelligence test (*p*s > .11).

Primary Analyses

Hypothesis 1a: Associations with trait awe. In partial support of *Hypothesis 1a*, trait awe was associated with less negative affect at baseline, $r(89) = -.36$, $p < .001$, and during the waiting period, $r(89) = -.27$, $p = .01$, but it was not associated with anxiety or rumination at either time point (*p*s > .46). There were no associations between trait awe and most uncertainty navigation strategies (distraction, suppression, bracing, score estimates, preemptive benefit-finding, distancing; *p*s > .25), and trait awe was also not associated with Raven's Matrices scores, estimated scores, or time perception (*p*s > .13). However, trait awe was associated with a greater likelihood of engaging in proactive coping, $r_{pb}(89) = .25$, $p = .02$, and, though not significant, efforts to be hopeful, $r(89) = .17$, $p = .10$, and optimistic, $r(89) = .17$, $p = .11$. Correlations among individual difference variables are presented in Table 2 and cell means and standard deviations for dependent variables are presented in Table 3.

Hypothesis 1b: The role of anticipating feedback. To test for effects of feedback condition, trait awe, and their interaction on waiting period experiences and strategy use, all three predictors were entered into simultaneous multiple regressions with each variable of interest. None significantly predicted differences in affect, anxiety, or

rumination during the waiting period (*p*s > .24), though baseline levels of affect, anxiety, and rumination were all were highly significant predictors of their downstream counterparts when included in the model for the corresponding outcome (*p*s < .001). They also did not predict differences in time perception or in the use of distraction, suppression, bracing, preemptive benefit-finding, or distancing during the waiting period (*p*s > .16). Trait awe trended toward significance as a predictor of both hope ($p = .12$) and efforts toward optimism ($p = .11$). A logistic regression was conducted to assess the effects of feedback condition, trait awe, and their interaction on the use of proactive coping. Only trait awe predicted significantly greater use of proactive coping, Wald $\chi^2(1, N = 89) = 5.58$, $p = .02$, $\varphi = .55$.

Expected results and time perception. Although participants' average expected score out of a possible 10 on the Raven's Matrices "intelligence" test ($M = 6.75$, $SD = 1.72$) was lower than the average received score ($M = 7.06$, $SD = 1.87$), these scores were not significantly different ($p = .14$). Test scores differed somewhat by feedback condition, such that participants who expected immediate feedback predicted that they would received marginally lower scores on the test than those who expected delayed feedback, $\beta = -.94$, $t(85) = -1.69$, $p = .10$, suggesting that participants were bracing for bad news by lowering their outcome predictions in the face of feedback. Test scores did not differ as a function of trait awe or the interaction between feedback condition and trait awe (*p*s > .30),

Study 1 Discussion

This study provided an initial test of the hypotheses that trait awe would be associated with reduced distress and strategy use during an uncertain waiting period (*Hypothesis 1a*) and that this effect will be particular pronounced when participants are expecting immediate (vs. delayed) feedback (*Hypothesis 1b*). Trait awe and feedback condition were not associated with affect, anxiety, rumination, participant scores or score estimates, time perception, or the majority of the uncertainty navigation strategies, and there were no notable interaction effects.

However, trait awe was associated with a greater likelihood of proactive coping, and results also suggest that it may contribute to efforts to be hopeful and optimistic, though these finding should be interpreted with caution because they failed to reach statistical significance. Similarly, the trend for participants who expect more proximal feedback to estimate lower scores than they actually received suggests that the timing of feedback prompted some bracing behavior, as we would predict based on many previous studies of bracing (for review, see Sweeny & Krizan, 2013).

Although the findings from this initial study do not suggest a reliable relationship between awe and distress and strategy use during an uncertain waiting period, it may be the case that a dispositional tendency to experience awe is not beneficial in and of itself without an external cue to tap into that tendency. Thus, the following two studies test the effectiveness of an awe intervention to improve the experience of an uncertain waiting period relative to positive and neutral control conditions.

Study 2

Participants

Participants were 324 undergraduate students (67.0% female; M_{age} = 19.76, *SD* = 2.25) from an introductory psychology course at UCR who consented to participate in the study for partial course credit. Participants were diverse in terms of race and ethnicity: 34.6% identified as Hispanic or Latino, 39.8% Asian, 12.7% non-Hispanic White, 6.5% Mixed, 3.1% non-Hispanic Black, 2.2% as Middle Eastern, and 0.9% as Native Hawaiian/Pacific Islander. Participants again used the 10-point SES ladder to indicate their subjective socio-economic status (*M* = 5.47, *SD* = 1.46; Adler, Epel, Castellazzo, & Ickovics, 2000).

Procedure

Study 2 was identical to Study 1 with one key addition: After the intelligence test (but before completing the final measures), participants were randomly assigned to watch one of three videos: an awe induction (*n* = 118), a positive control (*n* = 95), or a neutral control (*n* = 111). These conditions were crossed with the feedback manipulation condition, in which half of participants anticipated feedback immediately after the session (*n* = 156) and the other half (*n* = 168) expected to receive feedback several months after the session.

Pilot testing of study materials. Paid Amazon Mechanical Turk users (*N* = 332) were randomly assigned to watch one of six pilot videos (two per condition: awe induction, positive control, and neutral control) and rate the extent to which the video made them feel each of 26 discrete emotions (e.g., interest, awe, amusement/humor,

fear/anxiety; adapted from Sherman, Haidt, & Coan, 2009; Smith, 2010) using a 6-point scale (1 = *not at all*, 6 = *extremely*). All videos were approximately five minutes long and selected because they (or similar videos) had been used successfully in previous studies. The final set of three videos were selected over their alternatives because they were the most representative of the intended emotional response as described below (full list of items with means and standard deviations listed in Table 4).

Awe induction. When asked to recall personal experiences with awe, people most frequently describe encounters with nature, followed by art or music (Shiota, Keltner, & Mossman, 2007). Participants in the awe induction condition watched a 4.5-minute high definition (HD) video that pairs beautiful shots of the Earth (e.g., sunrise, mountains, waterfalls, opening blossoms, migration, aurora borealis) with an instrumental music piece (https://www.youtube.com/watch?v=zV5zEP2QZ0Y). This prompt was intended to elicit relatively high ratings of awe, moral uplift, inspiration, optimism about humanity, the desire to be a better person, warmth in the chest, hope, admiration, and relatively low ratings of negative emotions.

Positive control. Participants watched a 4.5-minute HD video of "cute animal couples" (https://www.youtube.com/watch?v=WUrJ1oCz0oQ) intended to elicit general positive feelings. People tend to experience interest, happiness, calmness, tenderness, amusement, and entertainment when viewing when viewing "high-cuteness" compared to "low-cuteness" images, but they do not typically experience feelings of awe or other morality-based appraisals (Sherman, Haidt, & Coan, 2009) or negative emotions like sadness, shame, disgust, or anger.

Neutral control. Participants watched a 4.5-minute video clip of how padlocks are made from the television show *How It's Made* (https://www.youtube.com/watch?v=TZ62bhXRJ_k). This video was selected to be interesting but neutral (no extremely positive or negative reactions) in terms of participants' physical and emotional responses (Smith, 2010).

Measures

All Study 2 measures are identical to those described in Study 1. Baseline measures included intolerance of uncertainty, need for closure, dispositional optimism, defensive pessimism, dispositional positive emotions (awe, amusement, compassion, contentment, joy, love, and pride), affect, anxiety, and rumination. Waiting period measures included task evaluations, expected results, and measures of affect, anxiety, rumination, and uncertainty navigation strategies including distraction, suppression, bracing, hope, optimism, proactive coping, preemptive benefit-finding, and distancing, as well as time perception, religiosity, and spirituality. Means, standard deviations, and Cronbach's alphas for Study 2 are reported in Table 5.

Study 2 Results

Manipulation Checks

Emotion ratings. Participants were asked to describe the video they watched and the extent to which the video made them feel the same 26 discrete emotions (e.g., interest, awe, amusement/humor, fear/anxiety) described in the pilot study on a 6-point scale (1 = *not at all*, 6 = *extremely*) to confirm that the manipulation had the intended effect and that ratings for each video were consistent with those observed in the pilot

study. As predicted, participants in the awe condition experienced significantly greater feelings of awe and other morality-based appraisals (e.g., a desire to help others, inspiration) relative to controls; participants in the positive control had the highest ratings of amusement/humor, entertainment, and surprise relative to the other two conditions; and participants in the neutral condition consistently had the lowest ratings on both positive and negative emotions. All means and standard deviations for these variables are listed for the pilot study, Study 2, and Study 3 in Table 4, with significant differences marked by superscript.

Of note, participants in the awe condition did have significantly higher ratings than controls on several negative emotions including shame, fear/anxiety, and sadness (*p*s < .004). In qualitative descriptions of the awe induction video, participant descriptions were consistent with the predicted feelings of awe, but a number of participants also expressed concern about environmental issues (e.g., "sad because of how people are capable and willing to destroy this beautiful world for selfish purposes") and a strong desire to travel ("I feel small because I wish I had the chances [sic] and money to go travel around the world"), which may explain the negative emotional response alongside the predicted awe response.

Task ratings. Multiple regression analyses were used to determine whether task evaluations differed by condition. There was a main effect of feedback condition for several items: Participants in the immediate feedback condition found the test significantly more difficult, $F(1, 318) = 4.91$, $p = .03$, more valid, $F(1, 318) = 4.24$, $p = .04$, fairer, $F(1, 318) = 5.90$, $p = .02$, and more stressful $F(1, 318) = 6.87$, $p = .01$, than

participants in the delayed feedback condition. Additionally, participants experienced marginally less stress in the awe condition compared to controls, $F(1, 318) = 2.76$, $p = .10$, and participants in the neutral control condition found the test marginally more interesting than participants in the positive control condition, $F(1, 318) = 3.88$, $p = .05$. There were no other main effects or interaction effects on task ratings, and there were no significant differences in evaluations of how educationally valuable participants found the intelligence test (*p*s > .11).

Primary Analyses

Hypothesis 1a: Associations with trait awe. Consistent with Study 1 and with *Hypothesis 1a,* trait awe was negatively associated with negative affect at both baseline, $r(234) = -.28$, $p < .001$, and during the waiting period, $r(234) = -.31$, $p < .001$. Also consistent with *Hypothesis 1a*, trait awe was associated with anxiety at both baseline, $r(234) = -.15$, $p = .008$, and during the waiting period, $r(234) = -.15$, $p = .005$. Trait awe was not associated with rumination at either time point (*p*s > .21). Regarding strategy use during the waiting period, participants high in trait awe were significantly more likely to make an effort to be hopeful, $r(234) = .16$, $p = .005$, and optimistic, $r(234) = .31$, $p < .001$, consistent with Study 1. There was no association between trait awe and the other uncertainty navigation strategies, including distraction, suppression, bracing, preemptive benefit-finding, distancing, or proactive coping (*p*s > .15). Trait awe was marginally associated with higher Raven's Matrices scores, $r(234) = .10$, $p = .08$, but not with estimated scores ($p = .14$). Trait awe was trending with time perception, $r(234) = -.09$, $p = .11$, such that participants higher in trait awe were less likely to feel that they would

have to wait a long time for feedback. Correlations between individual difference variables for Study 2 are presented in Table 6.

Hypotheses 1b, 2a-2c: The role of trait awe, anticipating feedback, and the awe induction. For the remaining analyses, I evaluated main effects and interactions of feedback condition, video condition, and trait awe using a set of orthogonal a priori contrast codes and covariates entered into simultaneous multiple regressions as predictors of waiting period distress and strategy use. This analytic approach is analogous to factorial ANOVA and provides equivalent results in terms of explained variance and substantive interpretations but offers the advantage of allowing the inclusion of both categorical (e.g., feedback and video conditions) and continuous predictors (e.g., trait awe) in the same model, as well as testing a priori hypotheses without relying on post hoc tests (Davis, 2010).

I developed a set of orthogonal planned contrasts for the six conditions of the 2 (feedback condition: immediate or delayed) x 3 (video condition: awe induction, positive control, and neutral control) factorial design to reflect the main effects hypotheses that participants expecting immediate feedback would experience more distress and rely more heavily on uncertainty navigation strategies relative to those expected delayed feedback, and participants experiencing the awe induction would show lower levels of distress and defensive strategy use relative to control conditions (see Table 7 for contrast weights). Interaction terms reflect the product of the contrast-coded categorical variables.

Following the guideline presented by Hayes (2013), the following results are presented from a single set of regression analyses predicting waiting period experiences

(affect, anxiety, rumination), strategy use (e.g., distraction, efforts toward optimism, proactive coping), real and estimated test scores, and time perception from the following set of predictors: feedback condition (main effect), video condition contrasting the awe induction against controls (main effect), trait awe (main effect), and interactions between feedback and video condition, feedback condition and trait awe, and video condition and trait awe. The second parameter testing a main effect of video condition (contrasting positive and neutral control conditions) that completes the orthogonal set of codes for the main effect of video condition was omitted from these analyses, as were its interactions. This contrast (i.e., a comparison between control conditions) was not of primary interest in this study, and all regression coefficients for the included contrasts retain their meaning despite the omission of these terms. However, due to unequal *n*s across cells, the tradeoff for gaining degrees of freedom back in the model is the potential for a slight change in the value of the some parameters (e.g., the intercept will represent the unweighted mean of the cells means instead of the grand mean) depending on the extent of the sample size differences and the extent to which the omitted parameters have nonzero effects (Judd, McClelland, & Ryan, 2009). All cell means and standard deviations for Study 2 are presented in Table 8.

Waiting period distress. Analysis of participants' affect during the waiting period, controlling for baseline affect (baseline affect: $\beta = .48$, SE = .05, $p < .001$), revealed that participants in the awe condition experienced significantly less negative affect than those in the control conditions, $\beta = .31$, SE = .06, $p < .001$. There was also a significant effect of trait awe on negative affect, $\beta = -.20$, SE = .05, $p < .001$, such that participants who

were higher in trait awe tended to experience less negative affect. There were no significant effects of feedback condition or interaction effects (*p*s > .23). Overall, the set of predictors explained 38.3% of the variance in waiting period affect (R^2 = .383, p < .001).

Analysis of participants' anxiety during the waiting period, controlling for baseline anxiety (baseline anxiety: β = .52, SE = .04, p <.001), revealed that participants in the awe condition experienced significantly less anxiety than those in the control conditions, β = .28, SE = .06, p = .004. There was also a main effect of feedback condition, such that participants who expected immediate feedback were significantly more anxious than participants who expected delayed feedback, β = .25, SE = .09, p = .005. There was also a marginal effect of trait awe on anxiety, β = -.10, SE = .05, p = .06, such that participants who were higher in trait awe tended to be somewhat less anxious during the waiting period. There were no significant interaction effects (*p*s > .34). Overall, the set of predictors explained 35.0% of the variance in waiting period affect (R^2 = .350, p < .001).

Analysis of participants' rumination during the waiting period, controlling for baseline rumination (baseline rumination: β = .56, SE = .05, p < .001), revealed only a main effect of feedback condition, such that participants who expected immediate feedback ruminated significantly more than participants who expected delayed feedback, β = .51, SE = .13, p < .001. There was no effect of video condition or trait awe, and no significant interaction effects (*p*s > .13). Overall, the set of predictors explained 38.3% of the variance in waiting period rumination (R^2 = .383, p < .001).

Uncertainty navigation strategies. Analysis of participants' use of distraction during the waiting period revealed a significant main effect of feedback condition, such that participants expecting immediate feedback used more distraction than those expecting delayed feedback, $\beta = .49$, SE = .17, $p = .005$. There were no effects of video condition, trait awe, or interactions (ps > .38). Overall, the set of predictors explained only 2.9% of the variance in the use of distraction during the waiting period ($R^2 = .029$, $p = .16$).

This pattern of results was the same for the use of suppression, with participants who expected immediate feedback engaging in significantly more suppression than participants who expected delayed feedback, $\beta = .47$, SE = .16, $p = .003$. There were no effects of video condition, trait awe, or interactions (ps > .16). Overall, the set of predictors explained only 3.7% of the variance in the use of suppression during the waiting period ($R^2 = .037$, $p = .06$).

Analyses of the use of bracing during the waiting period again revealed only a main effect of feedback condition, with participants expecting immediate feedback engaging in significantly more bracing than those expecting delayed feedback, $\beta = .46$, SE = .18, $p = .009$. There were no effects of video condition, trait awe, or interactions (ps > .21). Overall, the set of predictors explained only 2.8% of the variance in the use of bracing during the waiting period ($R^2 = .028$, $p = .06$).

Analysis of participants' efforts to be hopeful during the waiting period revealed a trending main effect of video condition, such that participants who were in the awe condition were relatively more likely to be hopeful compared to controls, $\beta = -.18$, SE =

.11, p = .11. There was also a main effect of trait awe, such that participants who were higher in trait awe tended to be significantly more hopeful during the waiting period, β = .28, SE = .10, p = .005. There was no main effect of feedback condition or interactions (ps > .19). Overall, the set of predictors explained 4.0% of the variance in hope during the waiting period (R^2 = .040, p = .04).

Analysis of participants' efforts to be optimistic during the waiting period revealed a marginal main effect of feedback condition and a significant main effect of trait awe. Participants who expected immediate feedback made significantly less effort to be optimistic than those expecting delayed feedback, β = .29, SE = .15, p < .001, and participants who were higher in trait awe made a significantly greater effort to be optimistic during the waiting period, β = .51, SE = .09, p < .001. There was no main effect of video condition or interactions (ps > .27). Overall, the set of predictors explained 11.1% of the variance in efforts to be optimistic during the waiting period (R^2 = .111, p < .001).

Analysis of participants' efforts to engage in preemptive benefit-finding revealed no main effects of feedback condition, video condition, or trait awe, and no significant interaction effects. The only marginal effect was an interaction between trait awe and video condition, such that trait awe was marginally predictive of preemptive benefit-finding for participants in the control conditions but not for participants in the awe condition, β = .21, SE = .11, p = .07.

Analysis of participants' distancing revealed no main effects of feedback condition, video conditions, or trait awe, and no interaction effects (ps > .16).

A logistic regression was conducted to assess the effects of feedback condition, video condition, and trait awe on the use of proactive coping and to assess whether the conditions interacted to predict use of this strategy. There was a main effect of feedback condition, indicating that participants expecting immediate feedback were more likely to engage in proactive coping than participants expecting delayed feedback, Wald $\chi^2(1, N = 324) = 5.58$, $p = .02$, $\varphi = .13$. There was also a marginal main effect of video condition, such that participants in the awe condition were somewhat more likely to use proactive coping than participants in the control conditions, Wald $\chi^2(1, N = 324) = 2.99$, $p = .08$, $\varphi = .10$. There was no effect of trait awe or interaction effects (ps > .45).

Expected results and time perception. On average, participants' expected score out of a possible 10 on the Raven's Matrices "intelligence" test ($M = 6.92$, $SD = 1.77$) was significantly lower than the average received score ($M = 7.46$, $SD = 1.68$), $t(323) = 5.44$, $p < .001$, indicating unrealistic pessimism. However, expected scores varied as a function of feedback condition, such that participants expecting immediate feedback predicted significantly lower scores than those who expected delayed feedback, $\beta = -.53$, SE = .20, $p = .008$. There was also a marginal positive effect of trait awe on estimated scores, $\beta = .20$, SE = .12, $p = .09$. There was no effect of video condition or interaction effects on expected scores.

There were no main effects of feedback or video conditions or interaction effects on time perception during the waiting period (ps > .13). However, trait awe had a trending negative effect, such that participants higher in trait awe felt that the feedback was further away than people who were lower in trait awe, $\beta = -.12$, SE = .07, $p = .10$.

Study 2 Discussion

People who are predisposed to experience awe in their everyday lives tend to experience less negative affect and somewhat less anxiety during an uncertain waiting period, and they are generally more likely to put effort into being hopeful and optimistic in times of uncertainty, in addition to providing higher performance estimates. However, it is not necessary to have this trait in order to benefit from an experience of awe. People who had an experience of awe – even from a brief video viewed in a lab setting – reported less negative affect and anxiety during an uncertain waiting period compared to people who watched positive or neutral videos. The benefits of experiencing awe appear to be most relevant to markers of distress (namely negative affect and anxiety) as opposed to strategy selection when awaiting uncertain news. Although people who experienced awe appear more likely to engage in proactive coping and be hopeful and optimistic, differences in strategy selection appear to be almost entirely driven by the timing of anticipated feedback. When feedback was imminent, people were more anxious and ruminative and more likely to engage in a variety of strategies to manage their distress. People distracted themselves, suppressed their feelings, braced for the worst and provided lower performance estimates, and began proactively coping for the possibility that they would get unpleasant feedback. To further investigate these relationships, I conducted a partial replication of Study 2 by changing the task for which participants would be awaiting feedback.

Study 3

Participants

Participants were 399 undergraduate students (66.0% female; M_{age} = 19.03, *SD* = 1.28) from an introductory psychology course at UCR who consented to participate in the study for partial course credit. Participants were diverse in terms of race and ethnicity: 38.1% identified as Hispanic or Latino, 36.8% Asian, 8.7% non-Hispanic White, 7.8% Mixed, 4.0% non-Hispanic Black, 3.5% as Middle Eastern, and 0.8% as Native Hawaiian/Pacific Islander. As in Studies 1 and 2, participants used the 10-point SES ladder to indicate their subjective socio-economic status (*M* = 5.61, *SD* = 1.55; Adler, Epel, Castellazzo, & Ickovics, 2000).

Procedure

Study 3 followed the same basic design as Study 2, but instead of taking an intelligence test, participants were brought into the lab in groups of three to take part in what they presumed to be a study about personality and first impressions. If a third student was unavailable for the session, a research assistant stepped in as a confederate (21.6% of sessions). Participants were told they would complete sets of personality and emotion measures before and after a brief peer interaction and that they would be evaluating (and evaluated by) each of the other group members. They were told that they would see the results of these evaluations, and as in the previous studies participants were randomly assigned (by group) to expect either immediate (*n* = 192) or delayed feedback (*n* = 207). The peer interaction was unscripted and lasted for five minutes. Each person was assigned a letter and instructed to refer to the other group member by letter instead of

name when taking notes. Participants were told they could talk about anything that arose naturally in conversation such as hobbies, hometowns, or year in school, but were asked to avoid talking about the current study or any other studies.

After the peer interaction, participants were randomly assigned to watch one of three videos (also presented in Study 2): an awe induction (n = 136), a positive control (n = 129), or a neutral control (n = 134), after which they completed video evaluations, peer evaluations, and the final set of study measures before being debriefed.

Measures

The majority of Study 3 measures are described in Study 1. Key differences include a brief measure of personality added to baseline and revised task evaluations and expected results, reflecting the change to a group interaction task (described below). Means, standard deviations, and Cronbach's alphas for Study 3 are reported in Table 9.

Baseline measures included intolerance of uncertainty, need for closure, dispositional optimism, defensive pessimism, dispositional positive emotions (awe, amusement, compassion, contentment, joy, love, and pride), affect, anxiety, and rumination. Waiting period measures included task evaluations, expected results, and measures of affect, anxiety, rumination, and uncertainty navigation strategies including distraction, suppression, bracing, hope, optimism, proactive coping, preemptive benefit-finding, and distancing, as well as time perception, religiosity, and spirituality.

Big Five personality traits. Participants in Study 3 completed the Ten Item Personality Inventory (TIPI; Gosling, Rentfrow, & Swann, 2003), which consists of ten pairs of words (two pairs per construct, one reverse-scored) assessing openness,

conscientiousness, extraversion, agreeableness, and neuroticism on a 7-point scale (e.g. "extraverted, enthusiastic"; 1 = *disagree strongly*, 7 = *agree strongly*).

Task evaluations. In Study 3, participants rated each of the other group members on how attractive, likeable, trustworthy, competitive, aggressive, interesting, funny/humorous, intelligent, and selfish each person was using a 7-point scale (1 = *not at all*, 7 = *extremely*).

Expected results. In Study 3, participants completed the same trait scales they used to describe their peers, this time indicating the average ratings they expected to receive from the other participants.

Study 3 Results

Manipulation Check

As in Study 2, participants were asked to describe the video they watched and the extent to which the video made them feel the same 26 discrete emotions (e.g., interest, awe, amusement/humor, fear/anxiety) on a 6-point scale (1 = *not at all*, 6 = *extremely*) to confirm that the manipulation had the intended effect and that ratings for each video were consistent with those observed in the pilot study. As predicted, participants in the awe condition experienced significantly greater feelings of awe and other morality-based appraisals (e.g., a desired to help others, inspiration) relative to controls; participants in the positive control condition had the highest ratings of amusement/humor, entertainment, and surprise; and participants in the neutral condition consistently had the lowest ratings on both positive and negative items. All means and standard deviations for these variables are listed for the pilot, Study 2 and Study 3 in Table 4, with significant

differences marked by superscript. As in Study 2, participants in the awe condition had significantly higher ratings than controls on several negative emotions including shame, fear/anxiety, and sadness. Again, qualitative descriptions of the video suggest that this may be explained by concern over environmental issues and a strong desire to travel.

Primary Analyses

Hypothesis 1a: Associations with trait awe. Overall, trait awe was negatively associated with negative affect at baseline, $r(399) = -.28$, $p < .001$, and during the waiting period, $r(399) = -.24$, $p < .0001$, and with anxiety at both baseline, $r(399) = -.13$, $p = .008$, and during the waiting period, $r(399) = -.10$, $p = .04$. Trait awe was not associated with rumination at either time point (ps > .86). In terms of strategy use during the waiting period, participants high in trait awe were significantly more likely to make an effort to be optimistic, $r(399) = .16$, $p = .001$, and to engage in preemptive benefit-finding, $r(399) = .21$, $p < .001$, and marginally more likely to express hope, $r(399) = .09$, $p = .08$. There was no association between trait awe and the other uncertainty navigation strategies, including distraction, suppression, bracing, distancing, and proactive coping (ps > .17), or with time perception, $r(399) = -.07$, $p = .16$. Correlations among individual difference variables are presented in Table 10 and cell means and standard deviations for dependent variables are presented in Table 11.

Hypotheses 1b, 2a-2c: The role of trait awe, anticipating feedback, and the awe induction. As described in Study 2, planned orthogonal contrasts for the 2 (feedback condition: immediate or delayed) x 3 (video condition: awe induction, positive control, and neutral control) factorial design were entered into simultaneous multiple regressions

predicting waiting period experiences (controlling for baseline variability) and uncertainty navigation strategies to test the main effects of feedback condition, video condition (awe vs. control conditions only), and trait awe, as well as interactions.

Waiting period distress. Analysis of participants' negative affect during the waiting period, controlling for baseline negative affect (baseline affect: $\beta = .54$, SE = .04, $p < .001$), revealed that participants in the awe condition experienced significantly less negative affect than those in the control conditions, $\beta = .15$, SE = .05, $p = .001$. There were no significant effects of feedback condition, trait awe, or interactions (ps > .12). Overall, the set of predictors explained 42.8% of the variance in waiting period affect ($R^2 = .428$, $p < .001$).

Analysis of participants' anxiety during the waiting period, controlling for baseline anxiety (baseline anxiety: $\beta = .56$, SE = .04, $p < .001$), revealed that participants in the awe condition experienced significantly less anxiety than those in the control conditions, $\beta = .14$, SE = .06, $p = .01$. There were no significant effects of feedback condition, trait awe, or interactions on waiting period anxiety (ps > .16). Overall, the set of predictors explained 38.6% of the variance in waiting period anxiety ($R^2 = .386$, $p < .001$).

Analysis of participants' rumination during the waiting period, controlling for baseline rumination (baseline rumination: $\beta = .58$, SE = .04, $p < .001$), revealed a main effect of feedback condition, such that participants who expected immediate feedback ruminated significantly more than participants who expected delayed feedback, $\beta = .30$, SE = .13, $p = .02$, and a marginal interaction between feedback and video conditions,

such that the relationship between feedback condition and rumination was marginally stronger for participants in the awe condition than for controls, β = -.29, SE = .18, p = .10. There were no main effects of video condition or trait awe and no other significant interaction effects (ps > .45). Overall, the set of predictors explained 38.3% of the variance in waiting period rumination (R^2 = .383, p < .001).

Uncertainty navigation strategies. Analysis of participants' use of distraction during the waiting period revealed a significant main effect of feedback condition, such that participants expecting immediate feedback used more distraction than those expecting delayed feedback, β = .67, SE = .16, p < .001. There were no effects of video condition, trait awe, or interactions (ps > .66). Overall, the set of predictors explained 4.6% of the variance in the use of distraction during the waiting period (R^2 = .046, p = .005).

This pattern of results was the same for the use of suppression, with participants who expected immediate feedback engaging in significantly more suppression than participants who expected delayed feedback, β = .57, SE = .15, p < .001. There were no effects of video condition, trait awe, or interactions (ps > .27). Overall, the set of predictors explained 4.6% of the variance in the use of suppression during the waiting period (R^2 = .046, p = .005).

Analysis of the use of bracing during the waiting period again revealed only a main effect of feedback condition, with participants expecting immediate feedback engaging in significantly more bracing than those expecting delayed feedback, β = .69, SE = .16, p < .001. There were no effects of video condition, trait awe, or interactions (ps

> .28). Overall, the set of predictors explained 5.2% of the variance in the use of bracing during the waiting period (R^2 = .052, p = .002).

Analysis of participants' efforts to be hopeful during the waiting period revealed a surprising main effect of feedback condition, with participants who expected immediate feedback expressing significantly *more* hope than those expected delayed feedback, β = .51, SE = .17, p =.003. There was also a marginal main effect of trait awe, such that participants who were higher in trait awe tended to be more hopeful during the waiting period, β = .17, SE = .10, p =.09. There was no main effects of video condition or interactions (ps > .14). Overall, the set of predictors explained 4.1% of the variance in the use of hopefulness during the waiting period (R^2 = .041, p = .01).

Analysis of participants' efforts to be optimistic during the waiting period revealed a main effect of trait awe, such that participants who were higher in trait awe made significantly greater efforts to be optimistic during the waiting period, β = .31, SE = .10, p =.002. There were no significant effects of the feedback condition, video condition, or interactions (ps > .11). Overall, the set of predictors explained 3.8% of the variance in efforts to be optimistic during the waiting period (R^2 = .038, p = .02).

For preemptive benefit-finding, there was a main effect of feedback condition and a main effect of trait awe. Participants who expected immediate feedback engaged in significantly more preemptive benefit-finding than those who expected delayed feedback, β = .28, SE = .12, p =.02, and participants who were higher in trait awe were significantly more likely to engage in benefit-finding, β = .28, SE = .12, p =.02. There was no main effect of video condition and no interactions (ps > .60). Overall, the set of predictors

explained 5.6% of the variance in preemptive benefit-finding during the waiting period (R^2 = .056, p = .001).

There were no main effects of feedback condition, video condition, or trait awe or interaction effects on the use of distancing during the waiting period (ps > .15).

A logistic regression was conducted to assess the effects of feedback condition, video condition, and trait awe and their interactions on the use of proactive coping. There was a main effect of feedback condition, such that participants expecting immediate feedback were more likely to engage in proactive coping than participants expecting delayed feedback, Wald $\chi^2(1, N = 399) = 6.03$, p = .01, φ = .12. There was also a significant interaction between feedback condition and trait awe, such that those who were higher in trait awe were particularly likely to engage in proactive coping if they were in the immediate feedback condition, Wald $\chi^2(1, N = 399) = 5.28$, p = .02, φ = .12. There was no effect of video condition or other interactions (ps > .52).

Expected results and time perception. Participants expected significantly less favorable personality ratings from their group partners than they themselves provided to their group partners on how attractive, $t(398) = 11.44$, $p < .001$, likeable, $t(398) = 15.83$, $p < .001$, interesting, $t(398) = 10.80$, $p < .001$, funny, $t(398) = 6.64$, $p < .001$, intelligent, $t(398) = 14.09$, $p < .001$, selfish, $t(398) = -5.07$, $p < .001$, aggressive, $t(398) = -4.21$, $p < .001$, and competitive (marginal), $t(398) = 1.85$, $p = .065$, they were during the group interaction, indicating a type of comparative pessimism.

When these estimated scores were combined to reflect an overall impression (M = 4.12, SD = .58), there was a marginal effect of video condition, such that participants

who experienced the awe induction predicted more favorable ratings than did participants in the control conditions, β = .07, SE = .04, p = .09. There was also a main effect of trait awe, such that trait awe predicted higher estimated ratings, β =.15, SE = .03, p < .001, and an interaction between feedback condition and trait awe, suggesting that the effect of trait awe on estimated ratings was weaker for participants who expected feedback than for those who expected delayed feedback, β = -.14, SE = .03, p = .04. There was no main effect of feedback condition or interaction effects on expected scores.

There were no main effects of feedback condition, video condition, trait awe, or interaction effects on time perception during the waiting period (ps > .21).

Study 3 Discussion

The pattern of results in Study 3 was very similar to that of Study 2, with several notable differences. Although the pattern of correlations suggested that trait awe was again associated with less negative affect and anxiety during the waiting period, these effects did not persist in subsequent analyses. People who were predisposed to experience awe were again more likely to put effort into being hopeful and optimistic, and in this setting they were also more likely to provide higher outcome predictions and engage in preemptive benefit-finding during the waiting period, suggesting that trait awe may contribute to the use of more positively-oriented uncertainty navigation strategies. But regardless of one's predisposition to feeling awe, experiencing an awe induction resulted in less negative affect and anxiety during the uncertain waiting periods (compared to controls). As in Study 2, strategy use during the waiting period was most consistently predicted by the timing of anticipated feedback, with people who expected immediate

feedback ruminating more and employing a broad variety of strategies to manage their discomfort. As in Study, 2, people tried to distract themselves, suppress their feelings, and brace for bad news and were more likely to engage in proactive coping when anticipating immediate feedback, but in Study 3 people expecting immediate feedback were also more likely to express hope and look for benefits in a possible failure.

General Discussion

Uncertainty is an inevitable part of life, and it can be a source of significant discomfort and distress. In three studies, I investigated the role of awe during an uncertain waiting period. I expected that people who are predisposed to experiencing awe would report less distress during the waiting period and would rely less on defensive strategies such as distraction, suppression, and distancing (*1a*). Across the three studies, I found partial support for a relationship between trait awe and distress (specifically negative affect and anxiety) but no relationship between trait awe and the use of defensive strategies. The strategies most consistently associated with trait awe were related to expectation management and included various combinations of hopefulness, efforts toward optimism, and higher estimates of task performance. I also predicted that these relationships with trait awe would be particularly pronounced for participants who were expecting immediate (vs. delayed) feedback (*1b*) but found virtually no support for this hypothesis. The timing of anticipated feedback moderated only one trait awe parameter in one study (performance estimates in Study 3).

Instead, I found strong support for the effect of feedback timing on both distress and strategy selection. Specifically, when people believe they will receive performance

feedback in the immediate future (compared to months down the road), they tend to ruminate more and sometimes feel more anxious. In terms of strategy selection, they consistently engage in more distraction and suppression (both defensive strategies) and are more likely engage in proactive coping. People also engaged in some preemptive benefit-finding and consistently made use of expectation management strategies including bracing, hopefulness, and efforts to be optimistic, though the specific strategies used and the magnitude of effects varied across studies.

In Studies 2 and 3, I investigated the effect of an awe induction to test the hypothesis that people who have a momentary experience of awe (regardless of their trait awe) would report less discomfort and rely less on defensive strategies compared to positive and neutral control conditions during an uncertain waiting period (*2a*). In both studies, I found strong support for this hypothesis in terms of waiting period distress (reduced negative affect and anxiety), but almost no support in terms of strategy selection during the waiting period. Thus, experiencing awe offers a reduction in negative affect and anxiety during an uncertain waiting period but does not have a reliable effect on the strategies that people employ to manage their feelings of uncertainty. I also expected that participants who were higher in trait awe would benefit more from the awe induction (*2b*) and that it would provide more protective features for participants expecting immediate (vs. delayed) feedback (*2c*). Across the three studies, there was no consistent evidence for either of these hypotheses.

The lack of awe effects regarding strategy selection was somewhat surprising given recent findings that an awe induction may contribute to improved decision making

(Rudd et al., 2012). However, because the context and experience of an uncertain waiting period is quite unique, it may be that the observed improvements in decision making are limited to domains and situations that confer a sense of clarity and certainty.

Similarly, based on previous findings that experiences involving awe involve a sense of timelessness (Csikszentmyhalyi & Hunter, 2003), and experiencing an awe induction increases one's sense of patience and expands perceptions of time as one pursues a particular goal (Rudd et al., 2012), I expected that participants in my studies might also experience an altered sense of time perception when awaiting uncertain feedback. Although this was not the case, uncertain waiting periods like those in this study are notably different from the previous situations. Unlike people who feel pressed for time when they have a task to complete, people who are awaiting uncertain feedback do not wish to spend more time waiting, particularly when they no longer have control over the outcome. In fact, people go well out of their way to cut short feelings of uncertainty even when they would benefit from it (Wilson et al., 2004). Thus, the motivation to shorten the waiting time in this context may negate the typical (and typically desirable) expanse of time associated with awe.

This research expands our understanding of how people can manage uncertainty productively and improve the experience of an uncertain waiting period, providing empirical evidence for a strategy that effectively reduced the discomfort associated with uncertain waiting periods, a goal that has proved elusive. Finally, because the concept of awe is relatively new to psychological research, this research expands our understanding

of awe by making a notable contribution to the field and opening new avenues for study in the field of positive psychology.

Limitations

The current set of studies is the first to investigate the role of awe in uncertain waiting periods. However, several limitations suggest future directions for research on this topic. First, although Study 1 provided an initial test of the role of awe in uncertain waiting periods, it was somewhat limited by the relatively small sample size. Second, all three studies were conducted with undergraduates at UCR, which limits generalizability. Third, because this is the first set of studies to bring together work on waiting periods and awe, the results must be interpreted with caution until further studies replicating and extending these findings provide evidence for their generalizability. Fourth, in all three studies, Cronbach's alpha was quite low for our measures of time perception and distancing (ranging from -.19 to .55), indicating that the measures and thus their associated results are likely unreliable.

Future Directions

The goal of these studies was to explore the experience of awe as a means of easing the distress typically associated with uncertain waiting periods. In addition to making an uncertain waiting period easier, "waiting well" can also mean that people wait in a way that facilitates an adaptive response to the news, good or bad, when it arrives (Sweeny, Reynolds, Falkenstein, Andrews, & Dooley, 2015). Unfortunately, most of the strategies that reduce distress during the wait create a situation in which people do not respond well to the ultimate outcome; People do not receive a boost from good news and

may be hit particularly hard by bad news. Experiencing awe shifts people's focus from the self to the "bigger picture," increasing feelings of connectedness, prosociality, and humility, making it a good candidate for an intervention that improves the experience of waiting without sacrificing adjustment after the fact.

The experience of awe may also function differently with different types of uncertain waiting periods, including those with prolonged or unknown timelines to resolution or those in which people may have some measures of control (or perception of control) over the outcome. Research suggests that experiencing awe can increase agency detection via decreased tolerance for uncertainty (Valdesolo & Graham, 2013), which may fundamentally shift the experience of otherwise low-agency waiting periods rather than simply and directly mitigating distress. Further work can compare the effect of awe in waiting periods that confer relatively little or relatively more control over one's outcomes.

Future research should also address questions about dosage (e.g., frequency, strength, and effectiveness of awe inductions) and applications (e.g., domains, severity and certainty of outcome). A recent study suggested that more frequent experiences of awe, even small ones found in daily life, predict positive outcomes weeks later (Gordon & Keltner, in preparation). With attention and intention, awe can be found in daily life; an all-consuming experience is not necessary for one to reap these benefits, and it may be the case that a practice designed to focus one attention and intention on such experiences (e.g., mindfulness) would enhance these benefits.

Finally, the historical and cultural contexts that have shaped our understanding of awe in psychological research and other domains are a rich source of information for further investigating and understanding awe in terms of its relationship to related constructs (e.g., religiosity, spirituality, other moral emotions), potential applications (e.g., decision-making), and tailored interventions to improve well-being in the course of daily life.

Conclusion

Although one's proximity to feedback may drive the strategies people use to manage uncertainty, awe emerged as a unique and reliable means of reducing distress, specifically negative affect and anxiety, during an uncertain waiting period. Moreover, the benefits of a contrived moment of awe were not contingent on a predisposition to experiencing awe in one's daily life. In sum, awe shows promise as a simple and effective means of easing the discomfort commonly associated with awaiting uncertain news.

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Tables

Table 1

Means, standard deviations, and Cronbach's alphas (α) for Study 1 measures

Variable	*M (SD)*	α
Intolerance of uncertainty	3.55 (1.13)	.90
Need for closure	3.86 (0.73)	.84
Dispositional optimism	4.58 (1.06)	.81
Defensive pessimism	4.79 (1.08)	.84
Trait awe (DPES)	5.10 (1.00)	.81
Negative Affect		
Baseline	3.32 (0.93)	.83
Waiting period	3.02 (0.92)	.84
Anxiety		
Baseline	3.58 (1.05)	.86
Waiting period	2.74 (1.27)	.91
Rumination		
Baseline	2.48 (1.56)	--
Waiting period	2.51 (1.76)	--
Test results	7.06 (1.87)	--
Expected results	6.75 (1.72)	--

Table 1, cont.

Means, standard deviations, and Cronbach's alphas (α) for Study 1 measures

Variable	*M (SD)*	α
Uncertainty Navigation Strategies		
Distraction	2.36 (1.55)	--
Suppression	2.40 (1.47)	.92
Bracing	3.66 (1.80)	.84
Hope	4.82 (1.58)	--
Efforts toward optimism	4.42 (1.62)	--
Preemptive benefit-finding	3.15 (1.31)	.84
Distancing	4.45 (0.83)	.48
Proactive coping (% Yes)	19.10%	--
If yes, time spent coping	2.88 (1.76)	--
Time perception (feels distant)	3.39 (1.15)	.08

Table 2

Correlations between individual difference variables and demographics in Study 1

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Intolerance of uncertainty													
2. Need for closure	.69**												
3. Dispositional optimism	-.50**	-.38**											
4. Defensive pessimism	.66**	.55**	-.38**										
5. Awe	-.29**	-.23*	.53**	-.21†									
6. Joy	-.34**	-.26*	.65**	-.27	.67**								
7. Contentment	-.44**	-.31**	.74**	-.34	.59**	.82**							
8. Pride	-.39**	-.21*	.75**	-.31	.67**	.74**	.76**						
9. Love	-.23*	-.14	.46**	-.15	.34**	.63**	.61**	.51**					
10. Compassion	-.09	-.04	.26*	-.01	.51**	.60**	.43**	.46**	.53**				
11. Amusement	-.18†	-.22*	.14	-.05	.22*	.36**	.29**	.19†	.40**	.29**			
12. Religiosity	.15	.27**	.08	.13	.04	.16	.12	.13	.16	.33**	.002		
13. Spirituality	.06	.29**	.19†	.03	.22*	.25*	.11	.24*	.11	.35**	-.002	.69**	
14. SSES	.23*	.23*	-.29**	.07	-.22*	-.29**	-.34**	-.37**	-.20†	-.05	-.18†	.11	.13

Note. $N = 89$; †$p < .10$, *$p < .05$, **$p < .01$.

Table 3

Cell means and standard deviations for Study 1 dependent variables

Variable	Immediate Feedback (n = 45)	Delayed Feedback (n = 44)
Waiting negative affect	3.05 (0.87)	2.98 (0.98)
Waiting anxiety	2.88 (1.39)	2.61 (1.13)
Waiting rumination	2.80 (1.97)	2.20 (1.47)
Test results	6.91 (2.24)	7.20 (1.41)
Expected results	6.51 (1.94)	7.00 (1.45)
Uncertainty Navigation Strategies		
Distraction[F]	2.69 (1.53)	2.02 (1.50)
Suppression	2.64 (1.54)	2.16 (1.36)
Bracing	3.97 (1.84)	3.35 (1.71)
Hope	4.78 (1.48)	4.86 (1.69)
Efforts toward optimism	4.40 (1.57)	4.43 (1.68)
Preemptive benefit-finding	3.19 (1.09)	3.11 (1.51)
Distancing	4.49 (0.85)	4.40 (0.82)
Proactive coping (% Yes)	20.0%	18.2%
If yes, time spent coping	3.13 (1.46)	2.67 (2.06)
Time perception (feels distant)	3.42 (1.25)	3.35 (1.04)

Note. [F]Significant effect of feedback condition.

Table 4

Means and standard deviations for video ratings in pilot study, Study 2, and Study 3

	Pilot			Study 2			Study 3		
	Awe	Positive	Neutral	Awe	Positive	Neutral	Awe	Positive	Neutral
Interest[2A,3A]	4.77	4.70	4.45	4.81	4.29	3.75	4.53	4.34	3.57
	(1.32)	(1.37)	(1.54)	(1.42)	(1.69)	(1.84)	(1.70)	(1.68)	(1.67)
Warmth[2A,3A]	4.69	4.79	2.35	4.86	4.71	2.12	4.40	4.72	2.26
	(1.39)	(1.20)	(1.54)	(1.30)	(1.47)	(1.51)	(1.70)	(1.64)	(1.62)
A desire to	3.47	3.57	2.34	3.53	3.03	1.83	3.65	2.96	2.34
help others[2A,3A]	(1.73)	(1.78)	(1.76)	(1.82)	(1.79)	(1.27)	(1.90)	(1.88)	(1.60)
Sympathy/	3.73	3.60	1.81	4.20	3.83	1.85	3.91	3.98	2.02
compassion[2A,3A]	(1.72)	(1.69)	(1.35)	(1.76)	(1.79)	(1.45)	(1.75)	(1.79)	(1.50)
Hope[2A,3A]	4.27	4.06	2.26	4.43	3.70	1.99	4.40	3.77	2.06
	(1.58)	(1.69)	(1.54)	(1.61)	(1.78)	(1.54)	(1.64)	(1.72)	(1.53)

Note. [2]Study 2; [3]Study 3; [A]Significant difference between awe and control conditions; [M]Marginal effect.

Table 4, cont.

Means and standard deviations for video ratings in pilot study, Study 2, and Study 3

	Pilot			Study 2			Study 3		
	Awe	Positive	Neutral	Awe	Positive	Neutral	Awe	Positive	Neutral
Admiration[2A,3A]	4.37	4.09	3.50	5.00	3.95	3.10	4.57	3.92	3.15
	(1.67)	(1.71)	(1.75)	(1.33)	(1.72)	(1.94)	(1.68)	(1.79)	(1.80)
Tenderness[2A,3A]	4.21	4.47	2.04	4.50	4.05	1.61	4.19	4.02	1.97
	(1.64)	(1.65)	(1.62)	(1.55)	(1.81)	(1.19)	(1.76)	(1.81)	(1.47)
Inspiration[2A,3A]	4.60	3.98	2.96	4.58	3.55	2.60	4.54	3.51	2.68
	(1.67)	(1.85)	(1.85)	(1.54)	(1.79)	(1.76)	(1.66)	(1.88)	(1.71)
Awe[2A,3A]	4.87	4.30	3.72	4.92	4.19	3.02	4.53	4.22	3.02
	(1.50)	(1.74)	(1.72)	(1.41)	(1.79)	(1.90)	(1.72)	(1.77)	(1.80)
Morally	4.34	4.30	2.32	4.65	3.61	1.89	4.56	3.88	1.78
uplifted[2A,3A]	(1.69)	(1.61)	(1.66)	(1.33)	(1.63)	(1.27)	(1.45)	(1.53)	(1.17)

Note. [2]Study 2; [3]Study 3; [A]Significant difference between awe and control conditions; [M]Marginal effect.

Table 4, cont.

Means and standard deviations for video ratings in pilot study, Study 2, and Study 3

	Pilot			Study 2			Study 3		
	Awe	Positive	Neutral	Awe	Positive	Neutral	Awe	Positive	Neutral
Calmness[2A,3A]	4.68	4.62	3.79	5.26	4.53	3.89	4.99	4.68	3.37
	(1.40)	(1.39)	(1.69)	(1.06)	(1.44)	(1.69)	(1.34)	(1.23)	(1.58)
Pride[2A,3A]	3.85	3.57	2.34	2.79	2.70	1.77	3.68	2.53	1.67
	(1.80)	(1.78)	(1.62)	(1.66)	(1.56)	(1.15)	(1.70)	(1.46)	(1.10)
Happiness/	4.66	4.87	2.68	5.05	4.56	2.27	4.83	4.92	2.20
joy[2A,3A]	(1.51)	(1.45)	(1.70)	(1.04)	(1.31)	(1.45)	(1.38)	(1.19)	(1.35)
Optimistic about	3.77	3.55	2.27	4.09	3.55	2.26	4.43	3.87	2.23
humanity[2A,3A]	(1.81)	(1.87)	(1.56)	(1.65)	(1.65)	(1.54)	(1.62)	(1.74)	(1.42)
Moved[2A,3A]	4.37	3.87	2.19	4.72	3.45	1.78	4.72	3.76	1.85
	(1.58)	(1.84)	(1.63)	(1.35)	(1.65)	(1.15)	(1.39)	(1.57)	(1.25)

Note. [2]Study 2; [3]Study 3; [A]Significant difference between awe and control conditions; [M]Marginal effect.

Table 4, cont.

Means and standard deviations for video ratings in pilot study, Study 2, and Study 3

	Pilot			Study 2			Study 3		
	Awe	Positive	Neutral	Awe	Positive	Neutral	Awe	Positive	Neutral
A desire to be a	3.55	3.38	2.13	3.98	3.11	1.80	4.25	3.34	1.88
better	(1.79)	(1.71)	(1.67)	(1.63)	(1.50)	(1.25)	(1.55)	(1.61)	(1.29)
A warm feeling	4.06	4.26	2.06	4.79	4.04	1.62	4.71	4.53	1.70
in your	(1.68)	(1.73)	(1.55)	(1.36)	(1.60)	(1.10)	(1.39)	(1.49)	(1.21)
Excitement[2A,3A]	3.79	3.83	2.68	4.32	3.69	2.31	4.22	3.93	2.25
	(1.66)	(1.82)	(1.83)	(1.33)	(1.55)	(1.37)	(1.47)	(1.50)	(1.47)
Shame[2A,3A]	1.44	1.06	1.23	1.49	1.25	1.17	1.63	1.22	1.30
	(1.06)	(.25)	(.85)	(1.07)	(.86)	(.48)	(1.23)	(.71)	(.78)
Fear/anxiety[2A,3A]	1.53	1.04	1.32	1.52	1.22	1.20	1.66	1.32	1.36
	(1.07)	(.21)	(.83)	(1.11)	(.81)	(.50)	(1.22)	(.89)	(.82)

Note. [2]Study 2; [3]Study 3; [A]Significant difference between awe and control conditions; [M]Marginal effect.

Table 4, cont.

Means and standard deviations for video ratings in pilot study, Study 2, and Study 3

	Pilot			Study 2			Study 3		
	Awe	Positive	Neutral	Awe	Positive	Neutral	Awe	Positive	Neutral
Sadness[2A,3A]	1.71	1.11	1.19	2.33	1.84	1.49	2.43	1.79	1.88
	(1.11)	(.48)	(.65)	(1.65)	(1.35)	(1.07)	(1.76)	(1.39)	(1.45)
Amusement/hu	2.55	4.89	2.51	3.47	4.63	2.69	3.56	4.81	3.05
mor[3MA]	(1.54)	(1.42)	(1.66)	(1.82)	(1.60)	(1.82)	(1.92)	(1.52)	(1.86)
Entertainment[2M	3.87	4.85	3.87	4.36	4.65	3.51	4.23	4.85	3.23
A]	(1.69)	(1.44)	(1.74)	(1.39)	(1.33)	(1.58)	(1.52)	(1.27)	(1.60)
Surprise	2.77	3.47	2.75	3.16	3.52	2.67	3.24	3.63	2.59
	(1.69)	(1.64)	(1.81)	(1.76)	(1.62)	(1.49)	(1.67)	(1.67)	(1.60)
Disgust	1.11	1.07	1.19	1.61	1.71	1.53	2.01	1.96	1.92
	(.58)	(.25)	(.73)	(1.23)	(1.25)	(1.10)	(1.49)	(1.52)	(1.48)

Note. [2]Study 2; [3]Study 3; [A]Significant difference between awe and control conditions; [M]Marginal effect.

Table 4, cont.

Means and standard deviations for video ratings in pilot study, Study 2, and Study 3

	Pilot			Study 2			Study 3		
	Awe	Positive	Neutral	Awe	Positive	Neutral	Awe	Positive	Neutral
Anger	1.11	1.06	1.22	1.70	1.67	1.54	2.07	1.79	1.98
	(.58)	(.25)	(.77)	(1.25)	(1.22)	(1.13)	(1.56)	(1.39)	(1.53)

Note. [2]Study 2; [3]Study 3; [A]Significant difference between awe and control conditions; [M]Marginal effect.

Table 5

Means, standard deviations, and Cronbach's alphas (α) for Study 2 measures

Variable	*M (SD)*	α
Intolerance of uncertainty	3.60 (1.05)	.88
Need for closure	3.82 (0.61)	.79
Dispositional optimism	4.52 (0.98)	.79
Defensive pessimism	4.92 (0.96)	.83
Trait awe (DPES)	4.98 (0.83)	.74
Negative Affect		
Baseline	3.16 (0.90)	.84
Waiting period	2.63 (0.90)	.83
Anxiety		
Baseline	3.51 (1.00)	.84
Waiting period	2.49 (0.96)	.85
Rumination		
Baseline	2.44 (1.39)	--
Waiting period	2.22 (1.41)	--
Test results	7.46 (1.68)	--
Expected results	6.92 (1.77)	--

Table 5, cont.

Means, standard deviations, and Cronbach's alphas (α) for Study 2 measures

Variable	*M (SD)*	α
Uncertainty Navigation Strategies		
Distraction	2.65 (1.58)	--
Suppression	2.67 (1.44)	.92
Bracing	3.65 (1.58)	.79
Hope	5.00 (1.47)	--
Efforts toward optimism	4.74 (1.40)	--
Preemptive benefit-finding	3.24 (1.18)	.79
Distancing	4.39 (0.84)	.55
Proactive coping (% Yes)	12.65%	--
If yes, time spent coping	1.90 (1.41)	--
Time perception (feels distant)	3.54 (1.09)	.26

Table 6

Correlations between individual difference variables and demographics in Study 2

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Intolerance of uncertainty													
2. Need for closure	.70**												
3. Dispositional optimism	-.33**	-.26**											
4. Defensive pessimism	.47**	.41**	-.27**										
5. Awe	-.20**	-.21*	.39**	.03									
6. Joy	-.23**	-.18**	.60**	-.11†	.61**								
7. Contentment	-.34**	-.26**	.59**	-.20**	.59**	.79**							
8. Pride	-.30**	-.17**	.55**	-.18**	.55**	.67**	.68**						
9. Love	-.11†	-.11†	.33**	-.02	.43**	.58**	.54**	.39**					
10. Compassion	-.05	-.06	.24**	.09	.44**	.42**	.42**	.44**	.42**				
11. Amusement	-.03	-.03	.12*	.09	.38*	.48**	.35**	.31**	.36**	.26**			
12. Religiosity	.002	-.05	.20**	-.05	.12*	.21**	.17**	.14	.18**	.12*	0.005		
13. Spirituality	.08	.14*	.25**	-.01	.24**	.26**	.20**	.25**	.16**	.17**	.08	.65**	
14. SSES	.05	.08*	.02	.09	.05	.07	.05	.03	.06	.01	.06	.02	.02

Note. $N = 324$; †$p < .10$, *$p < .05$, **$p < .01$.

Table 7

Planned orthogonal contrast coding for Studies 2 and 3

Condition/Interaction	Immediate Feedback			Delayed Feedback		
	Awe	Positive	Neutral	Awe	Positive	Neutral
	.5	.5	.5	-.5	-.5	-.5
Awe vs. Controls (AvPN)	1	-.5	-.5	1	-.5	-.5
Positive vs. Neutral (PvN)	0	.5	-.5	0	.5	-.5
Feedback x AvPN	.5	-.25	-.25	-.5	.25	.25
Feedback x PvN	0	.25	-.25	0	-.25	.25

Table 8

Cell means and standard deviations for Study 2 dependent variables

Variable	Immediate Feedback			Delayed Feedback		
	Awe (n = 58)	Positive (n = 45)	Neutral (n = 53)	Awe (n = 60)	Positive (n = 50)	Neutral (n = 58)
Waiting negative affect[A]	2.32 (0.85)	2.44 (0.94)	3.00 (0.74)	2.35 (0.75)	2.53 (0.95)	3.14 (0.84)
Waiting anxiety[A,F]	2.42 (0.94)	2.55 (1.19)	2.86 (0.98)	2.16 (0.77)	2.40 (0.91)	2.59 (0.90)
Waiting rumination[F,M]	2.52 (1.37)	2.31 (1.46)	2.94 (1.66)	2.08 (1.28)	1.72 (1.07)	1.78 (1.24)
Test results[A,MFA]	7.34 (2.08)	7.22 (1.51)	7.49 (1.60)	7.60 (1.68)	7.48 (1.88)	6.76 (1.90)
Expected results[F]	6.83 (1.75)	6.31 (1.64)	6.77 (1.90)	7.22 (1.73)	7.55 (1.23)	7.45 (1.57)

Note. [A]Significant difference between awe induction and controls; [F]Significant effect of feedback condition; [FA]Interaction between feedback condition and awe vs. control conditions; [M]Marginal effect.

Table 8, cont.

Cell means and standard deviations for Study 2 dependent variables

Variable	Immediate Feedback			Delayed Feedback		
Uncertainty Navigation Strategies	Awe (n = 58)	Positive (n = 45)	Neutral (n = 53)	Awe (n = 60)	Positive (n = 50)	Neutral (n = 58)
Distraction[F]	2.83 (1.65)	2.71 (1.55)	3.13 (1.63)	2.50 (1.42)	2.66 (1.66)	2.12 (1.35)
Suppression[F]	2.87 (1.49)	2.61 (1.37)	3.20 (1.56)	2.47 (1.27)	2.61 (1.46)	2.31 (1.37)
Bracing[F]	3.79 (1.49)	3.98 (1.69)	3.88 (1.67)	3.44 (1.46)	3.57 (1.66)	3.30 (1.54)
Hope	5.31 (1.26)	4.91 (1.56)	5.11 (1.41)	5.02 (1.52)	4.84 (1.62)	4.78 (1.48)
Efforts toward optimism[F]	5.07 (1.30)	4.87 (1.32)	4.79 (1.18)	4.58 (1.38)	4.40 (1.64)	4.71 (1.52)
Preemptive benefit-finding	3.42 (1.20)	3.41 (1.17)	3.21 (1.14)	3.08 (1.15)	3.19 (1.24)	3.16 (1.22)

Note. [A]Significant difference between awe induction and controls; [F]Significant effect of feedback condition; [FA]Interaction between feedback condition and awe vs. control conditions; [M]Marginal effect.

Table 8, cont.

Cell means and standard deviations for Study 2 dependent variables

Variable	Immediate Feedback			Delayed Feedback		
Uncertainty	Awe	Positive	Neutral	Awe	Positive	Neutral
Navigation	(*n* = 58)	(*n* = 45)	(*n* = 53)	(*n* = 60)	(*n* = 50)	(*n* = 58)
Strategies						
Distancing	4.52	4.36	4.20	4.43	4.44	4.38
	(0.87)	(0.69)	(0.79)	(0.88)	(0.95)	(0.84)
Proactive coping (% Yes)[F]	44.8%	51.1%	41.5%	48.3%	30%	24%
If yes, time spent coping	1.92	1.74	2.18	1.90	1.93	1.64
	(1.32)	(1.42)	(1.53)	(1.50)	(1.58)	(1.15)
Time perception (feels distant)	3.44	3.59	3.64	3.56	3.69	3.35
	(1.06)	(1.07)	(1.04)	(1.17)	(1.17)	(1.07)

Note. [A]Significant difference between awe induction and controls; [F]Significant effect of feedback condition; [FA]Interaction between feedback condition and awe vs. control conditions; [M]Marginal effect.

Table 9

Means, standard deviations, and Cronbach's alphas (α) for Study 3 measures

Variable	*M (SD)*	α
Intolerance of uncertainty	3.67 (1.05)	.87
Need for closure	3.78 (0.62)	.78
Dispositional optimism	4.35 (1.04)	.79
Defensive pessimism	5.02 (1.03)	.84
Trait awe (DPES)	5.10 (0.85)	.75
Big Five (TIPI)		
Openness	5.10 (1.15)	.32
Conscientiousness	5.14 (1.24)	.47
Extraversion	4.10 (1.48)	.63
Agreeableness	4.85 (1.01)	.16
Neuroticism	3.63 (1.34)	.54
Negative Affect		
Baseline	3.15 (0.96)	.86
Waiting period	2.52 (0.84)	.83
Anxiety		
Baseline	3.53 (1.06)	.85
Waiting period	2.48 (0.99)	.86

Table 9, cont.

Means, standard deviations, and Cronbach's alphas (α) for Study 3 measures

Variable	*M (SD)*	α
Rumination		
Baseline	2.94 (1.58)	--
Waiting period	2.46 (1.58)	--
Average (positive) scores?	4.55 (0.52)	.74
Expected (positive scores?	4.12 (0.58)	.68
Uncertainty Navigation Strategies		
Distraction	2.36 (1.59)	--
Suppression	2.55 (1.51)	.93
Bracing	3.29 (1.64)	.82
Hope	4.20 (1.74)	--
Efforts toward optimism	4.26 (1.65)	--
Preemptive benefit-finding	3.65 (1.24)	.78
Distancing	4.07 (0.78)	.21
Proactive coping (% Yes)	14.04%	--
If yes, time spent coping	2.71 (1.41)	--
Time perception (feels distant)	3.57 (1.03)	-.19

Table 10

Correlations between individual difference variables and demographics in Study 3

	1	2	3	4	5	6	7	8	9	10
1. Intol. of uncert.										
2. Need for clos.	.62**									
3. Disp.opt.	-.37**	-.27**								
4. Def. pessimism	.53**	.42**	-.38**							
5. Awe	-0.07	-.14**	.30**	0.07						
6. Joy	-.15**	-.20**	.59**	-0.06	.64**					
7. Contentment	-.25**	-.21**	.60**	-.18**	.53**	.79**				
8. Pride	-.27**	-.21**	.50**	-.13*	.49**	.72**	.74**			
9. Love	-.16**	-.17**	.37**	-.12*	.44**	.59**	.55**	.44**		
10. Compassion	-0.002	-0.06	.28**	.13*	.54**	.58**	.45**	.47**	.46**	
11. Amusement	-0.07	-.11*	.21**	0.08	.42**	.46**	.37**	.36**	.39**	.34**

Note. $N = 399$; †$p < .10$, *$p < .05$, **$p < .01$.

Table 10, cont.

Correlations between individual difference variables and demographics in Study 3

	1	2	3	4	5	6	7	8	9	10
12. Openness	-.28**	-.28**	.24**	-.17**	.41**	.30**	.22**	.27**	.16**	.32**
13. Conscient.	-0.001	-0.04	.14**	0.07	.20**	.30**	.33**	.43**	0.07	.31**
14. Extraversion	-.28**	-.22**	.28**	-.16**	.22**	.37**	.34**	.40**	.25**	.23**
15. Agreeableness	-.09†	-.11*	.15**	-0.07	.21**	.25**	.22**	.11*	.30**	.33**
16. Neuroticism	.45**	.34**	-.49**	.34**	-.23**	-.39**	-.55**	-.44**	-.28**	-.14**
17. Religiosity	-0.07	-0.08	.12*	0.006	.19**	.26**	.27**	.25**	.20**	.29**
18. Spirituality	-0.07	-.10*	.15**	-0.02	.27**	.26**	.24**	.22**	.20**	.28**
19. SSES	-0.08	-0.04	.12*	0.007	0.05	.13**	.17**	.13**	.14**	0.04

Note. $N = 399$; †$p < .10$, *$p < .05$, **$p < .01$.

Table 10, cont.

Correlations between individual difference variables and demographics in Study 3

	11	12	13	14	15	16	17	18
12. Openness	.15**							
13. Conscient.	0.08	.15**						
14. Extraversion	.19**	.28**	.11*					
15. Agreeableness	.12*	.17**	.09†	-0.04				
16. Neuroticism	-.17**	-.16**	-.21**	-.19**	-.18**			
17. Religiosity	-0.04	0.06	.24**	0.03	.14**	-.18**		
18. Spirituality	0.08	.13**	.10*	.09†	.10*	-0.08	.67**	
19. SSES	.12*	-0.03	.10*	.14**	0.08	-0.14	-0.02	-0.05

Note. $N = 399$; †$p < .10$, *$p < .05$, **$p < .01$.

Table 11

Cell means and standard deviations for Study 3 dependent variables.

Variable	Immediate Feedback			Delayed Feedback		
	Awe (n = 69)	Positive (n = 66)	Neutral (n = 57)	Awe (n = 67)	Positive (n = 68)	Neutral (n = 72)
Waiting negative affect[A]	2.46 (0.77)	2.30 (0.67)	2.81 (0.68)	2.32 (0.89)	2.40 (0.97)	2.86 (0.82)
Waiting anxiety[A]	2.55 (1.01)	2.47 (0.87)	2.59 (0.90)	2.18 (1.01)	2.56 (1.08)	2.56 (1.00)
Waiting rumination[F,MFA]	2.73 (1.76)	2.70 (1.62)	2.39 (1.46)	2.22 (1.40)	2.28 (1.60)	2.46 (1.58)
Average ratings given	4.55 (0.47)	4.60 (0.49)	4.51 (0.45)	4.52 (0.56)	4.61 (0.50)	4.50 (0.61)
Average expected ratings	4.00 (0.61)	4.12 (0.56)	4.10 (0.45)	4.10 (0.50)	4.16 (0.67)	4.21 (0.61)

Note. [A]Significant difference between awe induction and controls; [F]Significant effect of feedback condition; [FA]Interaction between feedback condition and awe vs. control conditions; [M]Marginal effect.

Table 11, cont.

Cell means and standard deviations for Study 3 dependent variables.

Variable	Immediate Feedback			Delayed Feedback		
Uncertainty Navigation Strategies	Awe (n = 69)	Positive (n = 66)	Neutral (n = 57)	Awe (n = 67)	Positive (n = 68)	Neutral (n = 72)
Distraction[F]	2.73	2.92	2.42	1.94	2.15	2.03
	(1.71)	(1.75)	(1.71)	(1.19)	(1.68)	(1.22)
Suppression[F]	3.03	2.94	2.53	2.24	2.25	2.33
	(1.64)	(1.60)	(1.39)	(1.350	(1.53)	(1.35)
Bracing[F]	3.88	3.84	3.17	2.96	2.96	2.97
	(1.72)	(1.75)	(1.43)	(1.54)	(1.57)	(1.55)
Hope[F]	4.12	4.82	4.46	3.97	3.94	3.96
	(1.69)	(1.61)	(1.65)	(1.78)	(1.81)	(1.76)
Efforts toward optimism	4.23	4.61	4.35	4.05	4.44	3.96
	(1.60)	(1.55)	(1.64)	(1.58)	(1.77)	(1.73)
Preemptive benefit-finding[F]	3.77	3.85	3.75	3.58	3.63	3.35
	(1.13)	(1.07)	(1.26)	(1.39)	(1.37)	(1.17)
Distancing	4.12	4.01	4.09	4.07	3.97	4.15
	(0.65)	(0.80)	(0.84)	(0.83)	(0.89)	(0.70)

Note. [A]Significant difference between awe induction and controls; [F]Significant effect of feedback condition; [FA]Interaction between feedback condition and awe vs. control conditions; [M]Marginal effect.

Table 11, cont.

Cell means and standard deviations for Study 3 dependent variables.

Variable	Immediate Feedback			Delayed Feedback		
Uncertainty Navigation Strategies	Awe (n = 69)	Positive (n = 66)	Neutral (n = 57)	Awe (n = 67)	Positive (n = 68)	Neutral (n = 72)
Proactive coping (% Yes)[F]	18.8%	18.2%	19.3%	9.0%	7.4%	12.5%
If yes, time spent coping	3.46 (1.45)	2.42 (1.24)	2.91 (1.58)	1.83 (0.98)	2.60 (1.52)	2.44 (1.33)
Time perception (feels distant)	3.63 (1.10)	3.70 (1.20)	3.46 (0.85)	3.38 (0.77)	3.54 (1.26)	3.69 (0.87)

Note. [A]Significant difference between awe induction and controls; [F]Significant effect of feedback condition; [FA]Interaction between feedback condition and awe vs. control conditions; [M]Marginal effect.