Awe Expands People's Perception of Time, Alters Decision Making, and Enhances Well-Being

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Abstract

When do people feel as if they are rich in time? Not often, research and daily experience suggest. However, three experiments showed that participants who felt awe, relative to other emotions, felt they had more time available (Experiments 1, 3) and were less impatient (Experiment 2). Participants who experienced awe were also more willing to volunteer their time to help others (Experiment 2), more strongly preferred experiences over material products (Experiment 3), and experienced a greater boost in life satisfaction (Experiment 3). Mediation analyses revealed that these changes in decision making and well-being were due to awe's ability to alter the subjective experience of time. Experiences of awe bring people into the present moment, which underlies awe's capacity to adjust time perception, influence decisions, and make life feel more satisfying than it would otherwise.

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Time might be the scarcest commodity for many people in modern life. A recent poll of over 1,000 Americans found nearly half (47%) felt they lacked enough time in daily life (Carroll, 2008). This feeling of having too much to do and not enough time to do it—or "time famine" (Perlow, 1999)—has been linked to undesirable side effects including trouble sleeping, stress, difficulty delaying gratification, and postponing seeing a doctor when ill (Lehto, 1998; Vuckovic, 1999; Zhang & DeVoe, 2010). In light of these findings, we asked, what could be done to shift people's perception of how much time is available?

Three experiments examined whether awe, defined as the emotion that arises when one encounters something so strikingly vast that it provokes a need to update one's mental schemas (Keltner & Haidt, 2003), can expand perceptions of time availability. Additionally, we investigated whether awe, through engendering the sense that more time is available, would alter prosocial decisions concerning time, consumption preferences, and well-being assessments. We predicted that people induced to feel awe, relative to other states, would be more willing to volunteer their time, prefer experiential goods over material ones, and experience a boost in life satisfaction.

Can the Experience of Awe Increase Perceived Time Availability?

The burgeoning research on awe depicts it as a distinct (Ekman, 1992; Shiota, Campos, & Keltner, 2003) and powerful emotion with two defining features (Keltner & Haidt, 2003; Shiota, Keltner, & Mossman, 2007). One, awe involves perceptual vastness, which is the sense one has come upon something immense in size, number, scope, complexity, ability, or social bearing (e.g., fame, authority). Two, awe stimulates a need for accommodation, meaning it alters one's understanding of the world (Keltner & Haidt, 2003). These features of awe are intertwined,

whereby events that expand one's usual frame of reference, such as natural events (e.g., thunderstorms), personal transitions (e.g., childbirth), or unfathomable structures (e.g., the Grand Canyon), stimulate new mental models.

Does awe have the potential to increase perceived time availability? Prior research and theory suggest so. Experiences involving awe, such as optimal athletic performances (Ravizza, 1977), peak experiences (Maslow, 1964), and spiritual or mystical events (Fredrickson & Anderson, 1999), often also involve a sense of timelessness (Csikszentmihalyi & Hunter, 2003). The phenomenology of awe, therefore, suggests it might expand perceptions of time.

Two psychological theories are also relevant. The first involves the extended-now theory (Vohs & Schmeichel, 2003), which suggests focusing on the present moment elongates time perception. Awe captivates people's attention on what is unfolding before them, which the extended-now theory predicts would expand the perception of time. The second is Socioemotional Selectivity Theory (SST), which posits that people are motivated to acquire new knowledge when time feels expansive (Carstensen, Isaacowitz, & Charles, 1999). Awe triggers in people a desire to make new knowledge structures (Keltner & Haidt, 2003). Thus, a speculative suggestion from SST is that awe's ability to stimulate the creation of mental schemas may be a signal that the mind perceives an expanded amount of time in response to awe.

The Consequences of Perceived Time Availability

Whether people believe they have enough time to accomplish their goals affects numerous outcomes. First, perceived time availability influences some prosocial behaviors. Classic studies on the power of the situation demonstrate that feeling time pressured hinders the tendency to help someone in distress (Darley & Batson, 1973). Insufficient time availability is also a common barrier to volunteering and engaging in community service (Strober & Weinberg,

1980), behaviors linked to greater well-being (Thoits & Hewitt, 2001). Therefore, we predicted that creating the perception that more time is available would augment people's willingness to spend time helping others.

Second, time perception affects choices people make about how to live life. For instance, feeling that one lacks time is associated with markers of unhealthy diets, such as eating fewer family meals at home (Neumark-Sztainer et al., 2003) and consuming fast food (Darian & Cohen, 1995). Furthermore, not having enough time is an oft-cited reason for not engaging in leisure experiences (Mannell & Zuzanek, 1991). Time perception may also influence decisions to acquire experiences as opposed to material goods (Van Boven & Gilovich, 2003), a preference pattern associated with enhanced well-being (Zhong & Mitchell, 2010). Indeed, one quality of experiential products is that they, by their nature, require the experiencer devote time to savor the attendant feelings and sensations (Quoidbach et al., 2010). Thus, we predicted that inducing a sense of ample time availability would lead people to choose experiences over material goods.

Third, one's sense of the amount of time available is often an indicator of health and well-being. Feeling that time is constricted is associated with a heightened risk of hypertension (Yan et al., 2003) and ailments such as headaches, stomach pain, and poor sleep quality (Kivimäki, Kalimo, & Julkunen, 1996; Spence, Helmreich, & Pred, 1987). Mental health also suffers to the extent time feels compressed. For instance, people who report feeling "always" rushed have lower life satisfaction than do others (Robinson & Godbey, 1997), and feeling one has little time available has been linked to depression symptoms (Roxburgh, 2004). Consequently, we predicted that altering perceptions of time, through eliciting awe, would lead people to experience boosts in momentary life satisfaction.

An Overview of Experiments

Experiment 1 examined whether awe would alter time perception by manipulating whether people were induced to feel awe or happiness. Experiment 2 examined whether feeling awe, relative to happiness, would alter an indicator of time perception (i.e., impatience) and, in turn, willingness to donate time. Experiment 3 tested whether awe, compared to a neutral state, would influence participants' choice of experiential (versus material) goods and momentary life satisfaction, two outcomes posited to follow from awe's ability to expand perceptions of time.

Experiment 1

Experiment 1 tested the hypothesis that feeling awe can expand people's perception of time. We chose happiness as the comparison condition because both emotions are positively-valenced and can broaden one's perspective (Frederickson, 2001), but differ in whether perceptual vastness and need for accommodation are experienced (Shiota et al., 2007).

Because awe is often elicited during events such as exposure to music or nature (Shiota et al., 2007), and since these events commonly occur when people are under minimal time pressure, it is possible that an expanded perception of time might be a prerequisite for experiencing awe and not a consequence thereof. To address this alternative, all participants were initially primed to perceive time as constricted, before receiving a novel awe versus happiness emotion manipulation.

Method

Participants

Sixty-three students (39 women) participated for $20.

Procedure

As a cover story, participants were told they would be participating in several unrelated studies. They were first given a sentence unscramble task (Srull & Wyer, 1979). Twelve word-

sets each listed five words (e.g., "not available enough time much"), four of which participants used to create a meaningful phrase. Half of the unscrambled word-sets pertained to non-time topics, whereas the others pertained to the idea of constricted time. A pre-test (N = 30) confirmed that completing the constricted time unscramble task (M = 5.33, SD = 1.53), versus a control unscramble task (with all non-time-related word-sets; M = 4.13, SD = 1.22), resulted in higher ratings on a two-item perceived time constriction index ("I am pressed for time," "Time is constricted"; 1 = *strongly disagree/not at all*, 7 = *strongly agree/very much*; α = .88), $F(1, 28)$ = 5.65, p = .03, η_p^2 = .17.

In the second survey, participants were randomly assigned to watch either an awe-eliciting or happiness-eliciting 60-second commercial for an LCD television. The awe-eliciting commercial depicted people in city streets and parks encountering and interacting with vast, mentally overwhelming, and seemingly realistic images, such as waterfalls, whales, and astronauts in space. The happiness-eliciting commercial depicted people in city streets and parks encountering and interacting with rainbow confetti falling through the air and a parade of smiling, joyful people, waving flags while wearing brightly-colored outfits and face paint. Participants then completed filler questions about television brands.

The final survey contained filler items about personal beliefs, embedded in which were four key items. Participants rated their agreement (1 = *strongly disagree/not at all*, 7 = *strongly agree/very much*) with the items "I have lots of time in which I can get things done," "Time is slipping away" (reverse-scored), "Time is expanded," and "Time is boundless." We averaged these items to create a perceived time availability index (α = .86). Last, participants reported their current feelings (angry, awe, sad, happy, calm, bored, excited, afraid; 1 = *not at all*, 7 = *very much*).

Results and Discussion

Manipulation check. Emotion reports confirmed that awe condition participants (M = 6.06, SD = 0.91) experienced stronger feelings of awe during the experiment than did happiness condition participants (M = 3.84, SD = 1.88), $F(1, 61) = 35.97$, $p < .01$, $\eta_p^2 = .37$. In turn, happiness condition participants (M = 5.61, SD = 0.88) experienced stronger feelings of happiness than did awe condition participants (M = 4.84, SD = 1.53), $F(1, 61) = 5.95$, $p = .02$, $\eta_p^2 = .09$. Ratings of other emotions did not significantly differ between conditions, Fs < 3.52, *ns*.

Time perception. To test the hypothesis that awe expands time perceptions, we conducted an analysis of variance (ANOVA) on the perceived time availability index, which revealed the predicted effect of emotion condition, $F(1, 61) = 7.44$, $p = .01$, $\eta_p^2 = .11$. Awe condition participants (M = 3.38, SD = 1.49) perceived time as more plentiful than did happiness condition participants (M = 2.44, SD = 1.20). Correlational analyses supported this effect by showing, across conditions, stronger feelings of awe were associated with greater perceived time availability, $r = .36$, $p < .01$.

Discussion. These findings showed that awe, relative to happiness, led to the perception that time is more plentiful and expansive. Experiment 1 also demonstrated that these time-expansion effects were not characteristic of all positive emotions (e.g., happiness). Importantly, the predicted effects emerged even after priming participants with the idea of time being constricted, which helps assuage concerns of a natural confound between a lack of time pressure and experiencing awe.

Experiment 2

Experiment 1 showed that awe is capable of making time seem more plentiful than when experiencing another positively-valenced emotion, happiness. For convergent validity,

Experiment 2 used a different measure of perceived time availability. The perception one has too many things to do given the time available can elicit impatience (Lang & Markowitz, 1986) and impatient behavior (Darley & Batson, 1973). Therefore, we predicted that participants who experienced awe would feel less impatient than others because impatience arises in response to the amount of time one feels is available.

Experiment 2 also assessed whether awe can alter prosocial decisions that exact a temporal cost. We tested the hypothesis that awe, by altering time perception, would increase people's willingness to volunteer their time. To test the specificity of our account, we also examined whether awe alters people's willingness to behave prosocially in a manner not involving time. To do so, we tested awe's effects on monetary donations. Because our theory centered on awe's ability to alter perceptions of time, not prosociality in general, we expected that awe would not affect willingness to donate money.

A final objective was to analyze the events participants listed as awe-eliciting and examine their relationship to time perception. We predicted that the feeling of awe, not the circumstances that elicited it, is what shifts participants' perception of how much time is at their disposal.

Method

Participants

Eighty-six students (53 women) participated for $20.

Procedure

As a cover story, participants were told they would participate in several unrelated studies. In the first survey, participants wrote narratives about a randomly assigned personal experience. Participants in the awe condition read that awe is: "a response to things perceived as

vast and overwhelming that alters the way you understand the world," and wrote about an experience that made them feel awe. Participants in the happiness condition read that happiness is feeling "contentment or joy," and wrote about an experience that made them feel happy.

As part of the second survey, participants answered filler items, then reported their feelings of impatience (1 = *not at all*, 7 = *extremely*). In a final survey, four items assessed their likelihood of and willingness to volunteer time and donate money to "support a worthy cause" and "help a charity" (1 = *not at all*, 7 = *very*). Responses to the time and money donation items were averaged separately ($\alpha_{\text{donate time}} = .94$; $\alpha_{\text{donate money}} = .94$) to create two willingness-to-give indices. Last, participants reported current feelings of excitement, awe, pride, and happiness (1 = *not at all*, 7 = *very much*).

Results and Discussion

Manipulation checks. Emotion reports confirmed that awe condition participants (M = 4.24, SD = 2.06) experienced stronger feelings of awe during the experiment than did happiness condition participants (M = 2.93, SD = 1.74), $F(1, 84) = 10.12$, $p < .01$, $\eta_p^2 = .12$. And, happiness condition participants (M = 4.95, SD = 1.26) experienced stronger feelings of happiness than did awe condition participants (M = 4.12, SD = 1.45), $F(1, 84) = 8.17$, $p < .01$, $\eta_p^2 = .09$. Ratings of other emotions did not differ between conditions, Fs < 1.75, *ns*.

Impatience. An ANOVA tested the hypothesis that awe reduces impatience. As predicted, awe condition participants (M = 3.90, SD = 1.57) reported feeling less impatient than did happiness condition participants (M = 4.64, SD = 1.48), $F(1, 84) = 4.93$, $p = .03$, $\eta_p^2 = .06$.

To determine whether awe-eliciting events were relatively lacking in time pressure and whether the type of recalled event influenced temporal perception, two judges coded the events described in participants' narratives. They rated the time pressure associated with the event (1 =

none at all, 9 = *an extreme amount*; the intraclass correlation coefficient for inter-rater reliability was $r = .92$) and whether various types of events were described (no = 0, yes = 1; using a non-mutually exclusive system developed by Shiota et al., 2007). The event categories included: being in nature, exposure to art or music, personal accomplishments, others' accomplishments, and social interactions. Ninety-eight percent of participants described an experience that fit into one or more categories (inter-rater reliability for all category ratings: κs > .90, *p*s < .01).

Were awe-eliciting experiences merely situations characterized by less time pressure than happiness-eliciting experiences? An ANOVA on time pressure ratings suggests otherwise: There were no significant differences in the time pressure associated with awe narratives ($M = 1.21$, $SD = 0.68$) versus happiness narratives ($M = 1.18$, $SD = 0.66$), $F(1, 84) = 0.05$.

We then assessed whether certain types of emotion-eliciting experiences were differentially related to measures of time perception within and across the awe and happiness conditions. Correlational analyses between ratings of impatience and each of the five event categories revealed no significant correlations within the awe condition (*r*s < |.12|, *p*s > .43), indicating the type of awe experience recalled was not a correlate of time perception. Similar null effects were found within the happiness condition (*r*s < |.17|, *p*s > .27) and across both conditions (*r*s < |.16|, *p*s > .14). In short, the effect of condition on time perception seemed not to be driven by the types of events recalled by participants in the awe versus happiness conditions.

Willingness to donate time and money. To test whether awe alters prosocial decisions involving time, an ANOVA was conducted on the willingness-to-give-time index. Results revealed the predicted effect of condition, $F(1, 84) = 6.16$, $p = .02$, $\eta_p^2 = .07$. Awe condition participants ($M = 5.43$, $SD = 1.23$) reported greater willingness to volunteer their time than did

happiness condition participants (M = 4.77, SD = 1.22). To assess whether awe affected non-time forms of prosociality, we conducted an ANOVA on the willingness-to-give-money index. In support of our time expansion account, awe condition participants (M = 4.71, SD = 1.35) were no more willing to donate money than were happiness condition participants (M = 4.63, SD = 1.12), $F < 1$, *ns*.

Last, to test the process by which awe (versus happiness) influences willingness to donate time, we conducted a mediation analysis with impatience as the mediator (Baron & Kenny, 1986). Condition (happiness = 0, awe = 1) was a significant predictor of impatience, $b = -.73$, $p = .03$, and the willingness-to-give-time index, $b = .66$, $p = .02$. Impatience was negatively correlated with the willingness-to-donate-time index, $r = -.33$, $p < .01$. In support of mediation, impatience remained significant, $b = -.34$, $p < .01$, whereas condition became non-significant, $b = .41$, $p = .10$, Sobel $z = 1.97$, $p = .05$, when condition and impatience ratings were simultaneous predictors of the willingness-to-give-time index.

Discussion. Experiment 2 showed that the temporal consequences of awe are evident in reduced impatience and increased willingness to volunteer one's time—a prosocial benefit of awe. Awe did not, however, make people more generous in general, as it had no measurable impact on willingness to donate money. Furthermore, meditational analyses demonstrated that awe's effect on willingness to give time to help others was driven by reduced impatience.

Experiment 3

Experiments 1 and 2 showed that awe, relative to happiness, engenders a perception that time is plentiful, curbs impatience, and inspires a desire to volunteer time. These outcomes have been related to well-being (Roxburgh, 2004; Robinson & Godbey, 1997), suggesting life satisfaction itself might be affected by awe. Experiment 3 tested this hypothesis and also

examined the prediction that awe, via influencing perceived time availability, would alter decision making. Although experiences deliver more psychological benefits, they are temporally costlier than material possessions (Cooper-Martin, 1991; Van Boven & Gilovich, 2003). Because of awe's ability to expand perceptions of time, we predicted that feeling awe would cause participants to choose more experiential (versus material) goods. For convergent validity, this experiment used a different comparison condition and procedure for eliciting awe.

Method

Participants

One-hundred-and-five members of a nationwide panel (60 women) participated for $10.

Procedure

As a cover story, participants were told they would be completing several unrelated surveys. Participants were first instructed to read a short story and try to feel as the character in the story would have felt (Griskevicius, Shiota, & Neufeld, 2010). Randomly assigned, participants in the awe condition read a story about ascending the Eiffel Tower and seeing Paris from on high. Participants in the neutral condition read about ascending an unnamed tower and seeing a plain landscape from on high. To guard against demand effects, the word "awe" did not appear in either story.

After filler items, the second survey included a perceived time availability index (1 = *strongly disagree/not at all*, 7 = *strongly agree/very much*; "I have lots of time in which I can get things done," "Time is slipping away" (reverse-scored), "Time is expanded," and "Time is boundless"; $\alpha = .76$) and a measure of momentary life satisfaction ("All things considered, how satisfied are you with your life as a whole, right now?"; 1 = *not at all satisfied with life*, 7 = *extremely satisfied with life*; cf. Kahneman et al., 2006). Participants also made hypothetical

choices between experiential and material goods (said to be equivalent in price). Participants chose between a watch and Broadway show tickets, a $10 gas card and a $10 movie theater pass, a jacket and a restaurant dinner, a scientific calculator and a professional massage, and a $50 backpack and a $50 iTunes card. Last, participants reported current feelings of calmness, anxiety, relaxation, worry, awe, sadness, boredom, and fear (1 = *not at all*, 7 = *very much*).

Results and Discussion

Manipulation checks. Emotion ratings confirmed that awe condition participants (M = 2.98, SD = 2.01) experienced stronger feelings of awe than did neutral condition participants (M = 2.25, SD = 1.40), $F(1, 103) = 4.65$, $p = .03$, $\eta_p^2 = .04$. Ratings of other emotions did not differ between conditions, Fs < 1.95, *ns*.

Time perception. Testing whether awe expands time perceptions, an ANOVA on the perceived time availability index revealed the predicted condition effect, $F(1, 103) = 8.45$, $p < .01$, $\eta_p^2 = .08$. Awe condition participants (M = 3.83, SD = 1.38) perceived time as more plentiful than did neutral condition participants (M = 3.09, SD = 1.22).

Experiential versus material product choices. To test whether awe influences decision making, we calculated the percentage of experiential products chosen by each participant (cf. (Van Boven & Gilovich, 2003). As predicted, an ANOVA revealed that awe condition (M = 65.66%, SD = 25.83) versus neutral condition participants (M = 54.23%, SD = 26.37) favored more experiential products, $F(1, 103) = 5.03$, $p = .03$, $\eta_p^2 = .05$.

To test how awe influences decisions to choose experiential (versus material) goods, we conducted a mediation analysis with perceived time availability as the mediator (Baron & Kenny, 1986). As reported, condition (neutral = 0, awe = 1) predicted perceived time availability, $b = .74$, $p < .01$, and percentage of experiential products selected, $b = 11.43$, $p = .03$.

Perceived time availability and percentage of experiential products chosen were positively correlated, $r = .30$, $p < .01$. When condition and perceived time availability were included as simultaneous predictors of experiential choices, perceived time availability remained a significant predictor, $b = 5.08$, $p = .01$, whereas condition became non-significant, $b = 7.67$, $p = .14$, Sobel $z = 1.96$, $p = .05$, indicating mediation.

Life satisfaction. Testing the hypothesis that awe would affect momentary life satisfaction ratings, an ANOVA revealed the predicted condition effect, $F(1, 103) = 6.97$, $p = .01$, $\eta_p^2 = .06$. Awe condition participants ($M = 5.42$, $SD = 1.28$) reported greater momentary life satisfaction than did neutral condition participants ($M = 4.65$, $SD = 1.66$).

Last, we conducted a second mediation analysis to explain life satisfaction ratings as a function of awe's ability to increase perceived time availability. As reported, condition (neutral = 0, awe = 1) predicted perceived time availability, $b = .74$, $p < .01$, and life satisfaction, $b = .76$, $p = .01$. Perceived time availability was positively correlated with life satisfaction, $r = .34$, $p < .01$. When condition and perceived time availability were simultaneously included in the model, perceived time availability remained a significant predictor of life satisfaction, $b = .33$, $p < .01$, whereas condition became non-significant, $b = .52$, $p = .08$, Sobel $z = 2.11$, $p = .03$, indicating mediation.

Discussion. Experiment 3 provided further evidence that awe expands perceptions of time. Eliciting a feeling of awe, versus a neutral state, increased perceived time availability, which in turn led participants to more strongly prefer experiential over material goods and view their lives as more satisfying. Experiment 3 also found evidence of mediation: Greater perceived time availability mediated awe's effect on momentary life satisfaction and participants' choice of experiential (over material) products.

General Discussion

People increasingly report feeling time starved, which exacts a toll on health and well-being (Menzies, 2005). Drawing on research showing that being in the present moment elongates time perception (Vohs & Schmeichel, 2003), we predicted and found that experiencing awe, relative to other states, caused people to perceive they have more time available (Experiments 1, 3) and lessened impatience (Experiment 2). Furthermore, by altering time perception, feeling awe (versus comparison states) led participants to more strongly desire to spend time helping others (Experiment 2) and partake in experiential goods over material ones (Experiments 3). A small dose of awe even gave participants a momentary boost in life satisfaction (Experiment 3). Thus, these results also have implications for how people spend their time, and underscore the importance and promise of cultivating awe in everyday life.

That awe influences time perception suggests it could also amplify the savoring of pleasurable moments (Quoidbach et al., 2010) or reduce aggressive and distracted driving (Nationwide Mutual Insurance Company, 2008). Furthermore, awe's complexity suggests it might have multifaceted effects that are not wholly positive. For instance, being stuck in the present moment can cause people to fail at self-regulation (Vohs & Schmeichel, 2003), which hints at a potential downside of awe. We also await research that continues to examine how experiences of awe produce changes in people's perception and behaviors, and how such effects are distinct from those of other discrete positive emotions.

In summary, awe offset the feeling that time is limited, which increased willingness to volunteer time, accentuated preferences for experiential goods, and lifted satisfaction with life. Our studies also demonstrated that awe can be elicited by a walk down memory lane, brief story,

or even a 60-second commercial. Therefore, awe-eliciting experiences might offer one effective solution to the feelings of time starvation that plague so many people in modern life.

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