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Report

When a small self means manageable obstacles: Spontaneous self-distancing predicts divergent effects of awe during a subsequent performance stressor

Phuong Q. Le[a], Thomas L. Saltsman[a,*], Mark D. Seery[a], Deborah E. Ward[a], Cheryl L. Kondrak[a], Veronica M. Lamarche[b]

[a] University at Buffalo, The State University of New York, Department of Psychology, Park Hall, Buffalo, NY 14260, United States
[b] University of Essex, Department of Psychology, Wivenhoe Park, Colchester, Essex CO4 3SQ, United Kingdom

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ABSTRACT

The emotion of awe occurs when one feels small relative to something vaster than the self; it leads to benefits such as care for others. However, because awe elicits the experience of a "small self," it is unclear to what extent awe positively versus negatively affects responses to subsequent stressors. If personal obstacles seem trivial in comparison to awe-inspiring stimuli, stressors should seem either manageable or unimportant, but if one's capabilities seem comparatively insignificant, stressors should seem unmanageable. We hypothesized that awe would have a generally positive effect on responses during a subsequent performance stressor, but that this would further depend on whether people tended to spontaneously take on a self-distanced versus self-immersed perspective. In the face of awe, focusing less on the self (self-distanced perspective) should make obstacles in particular seem trivial, whereas focusing more on the self (self-immersed) should lead one's capabilities to seem insignificant. Using the biopsychosocial model of challenge/threat, we found that spontaneous self-distancing significantly moderated awe's effects on responses during a subsequent performance stressor (speech task): For participants who self-distanced, the awe condition led to cardiovascular responses consistent with greater challenge than the neutral control condition (reflecting evaluating the stressor as more manageable); for participants who self-immersed, awe predicted relative threat (less manageable stressor). There was no support for awe making people care less about the stressor (as reflected in cardiovascular responses consistent with task engagement). This offers insight into how awe can have divergent effects on people's experiences during performance stressors.

From grand natural vistas to religious experience, stimuli capable of inducing awe are commonplace. Awe describes an emotional response that occurs when one is in the presence of something larger than the self that requires mental accommodation to make sense of its vastness (Keltner & Haidt, 2003). Empirical research has largely focused on understanding beneficial effects of awe, including prosocial behavior (Piff, Dietze, Feinberg, Stancato, & Keltner, 2015), sense of social connection (Bai et al., 2017; Shiota, Keltner, & Mossman, 2007), humility (Stellar et al., 2018), and life satisfaction (Rudd, Vohs, & Aaker, 2012). A key mechanism of such benefits is thought to be the experience of a "small self," in which both the self and one's concerns seem insignificant (e.g., Bai et al., 2017; Piff et al., 2015; Preston & Shin, 2017; Stellar et al., 2018). However, awe and the sense of a small self it creates could plausibly have either benefits or costs in one important and novel domain: coping with subsequent performance stressors. In the current research, we investigated when awe has positive versus negative effects in this context.

Performance stressors—such as taking a test or giving a speech—require active instrumental responses to reach valued goals. Individuals' psychological responses to such stressors should be shaped by their evaluations of their own capabilities (i.e., resources) and personal obstacles presented by the stressor (i.e., demands; Blascovich, 2008; Blascovich & Tomaka, 1996; Seery & Quinton, 2016). This is where awe potentially has opposing effects, depending on exactly what aspect of the self seems small relative to the vastness of the awe-inspiring stimulus. First, if exposure to an awe-inspiring stimulus focuses attention on the comparative insignificance of obstacles posed by a subsequent stressor, the stressor should seem relatively more manageable. Second, focus on the stressor's insignificance could alternatively lead to the stressor seeming altogether unimportant rather than easy to manage, leading individuals to not care about it. Third, if an awe-inspiring stimulus focuses attention instead on the comparative

* Corresponding author.
E-mail addresses: tlsaltsm@buffalo.edu (T.L. Saltsman), mdseery@buffalo.edu (M.D. Seery).

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insignificance of one's capabilities, the stressor should seem relatively less manageable. Thus, the effects of awe on responses to a performance stressor should depend on the extent to which awe leads individuals to focus on the insignificance of their obstacles or their capabilities. It is possible that awe typically leads to any one of these three alternatives (i.e., yielding a statistical main effect). However, we reasoned that individual differences in tendencies related to one's self-focus should moderate awe's effects by highlighting the insignificance of either one's obstacles or capabilities (i.e., yielding an interaction with awe). The construct of spontaneous self-distancing/self-immersion is an appealing candidate.

1. Self-distancing/self-immersion

Reflecting two ends of a continuum, self-distancing and self-immersion refer to the vantage points from which people reflect and think about their experience (Ayduk & Kross, 2010; Kross & Ayduk, 2011). When individuals self-immerse, they tend to see a situation unfold through their own eyes, as from a first-person perspective. In contrast, when individuals self-distance, they view their own experience as if they were a bystander, as from a third-person perspective. A self-distanced perspective—relative to a self-immersed perspective—can result in lower emotional distress regarding past negative events (Kross & Ayduk, 2011; Kross, Gard, Deldin, Clifton, & Ayduk, 2012). Self-distancing can also shape responses to positive emotional experiences (Gruber, Harvey, & Johnson, 2009; Verduyn, Van Mechelen, Kross, Chezzi, & Van Bever, 2012) and can lead to more positive responses to anticipated stressors (Kross et al., 2014; Streamer, Seery, Kondrak, Lamarche, & Saltsman, 2017), which suggests particular relevance for the current research question. Although the sense of "small self" engendered by awe could make one's capabilities seem insignificant in comparison, we reasoned that a self-distanced perspective should make the experience seem less personal and more removed, reducing focus on internal qualities of the self (i.e., capabilities) and instead highlighting the insignificance of one's obstacles (i.e., those posed by a subsequent stressor) relative to the awe-inspiring stimulus. Although still relevant for the self, external obstacles are more easily discernable than hidden internal qualities to any external observer, which should make such obstacles more salient when adopting a third-person perspective of the self as well. In contrast, a self-immersed perspective should keep focus personal and internal, on the insignificance of one's capabilities relative to the awe-inspiring stimulus.

Self-distanced/immersed perspective can be induced, but people differ in the extent to which they spontaneously self-distance versus self-immerse across situations (Ayduk & Kross, 2010; Grossmann & Kross, 2010; White, Kross, & Duckworth, 2015). This tendency has been assessed in previous work by asking participants to think about a past negative event (e.g., being rejected by a close other) and then report the degree to which they viewed themselves as immersed participants versus distanced observers during their reflection. Similar to induced self-distancing, spontaneous self-distancing is related to various positive and adaptive coping responses when reflecting on past experiences (Ayduk & Kross, 2010). Importantly, comparable effects for anticipated stressors have also emerged for spontaneous self-distancing (Kross & Ayduk, 2017; Penner et al., 2016). Because spontaneous self-distancing in response to one situation has successfully predicted responses to distinct situations, it suggests that the construct may have trait-like qualities that generalize across contexts, including exposure to awe-inspiring stimuli and performance stressors.

2. The biopsychosocial model of challenge/threat (BPSC/T)

The BPSC/T (Blascovich, 2008; Blascovich & Tomaka, 1996; Seery, 2011, 2013; Seery & Quinton, 2016) is particularly well suited for testing the moderated effects of awe on responses to a subsequent performance stressor, as it holds that cardiovascular measures reveal psychological experience *during* performance stressors. Unlike self-report measures, cardiovascular measures do not require self-reflection, prospection or recollection, or the interruption of stressor-focused attention, and can thereby be sensitive to effects not captured by self-report (Weisbuch, Seery, Ambady, & Blascovich, 2009; Blascovich, Mendes, & Seery, 2002). During performance stressors, the psychological state of *task engagement* occurs to the extent that the performance is evaluated as self-relevant or valuable to the performer ("caring" about the task; e.g., an opportunity to impress others or avoid embarrassment). Task engagement results in increased heart rate (HR; heart beats faster) and ventricular contractility (VC; heart contracts harder) compared to resting baseline. Correspondingly, larger increases in these cardiovascular responses reflect greater task engagement (e.g., Blascovich, Mendes, Hunter, & Salomon, 1999; Seery, Weisbuch, & Blascovich, 2009; also see Fowles, Fisher, & Tranel, 1982; Tranel, Fisher, & Fowles, 1982; for additional discussion, see Seery, 2013).

Given task engagement, the BPSC/T holds that people evaluate personal resources and situational demands and experience a continuum of psychological states anchored at *challenge* and *threat*. Challenge, the relatively positive state, occurs when people evaluate high resources and low demands (e.g., feeling invigorated or confident). Threat, the relatively negative state, occurs when people evaluate low resources and high demands (e.g., feeling anxiety and dread). These psychological states are identified by changes in cardiac output (CO; how much blood the heart pumps every minute) and total peripheral resistance (TPR; resistance to blood flow in the blood vessels). Specifically, challenge leads to dilation of arteries (low TPR), helping the heart to pump more blood (high CO) in a way that parallels aerobic exercise. In contrast, threat leads to constriction of arteries (high TPR), which hinders the heart from pumping blood (low CO), despite equivalent increases in HR and VC as during challenge.

3. Overview and hypotheses

We used a between-subjects design, measuring individual differences in spontaneous self-distancing (continuous) and manipulating exposure to an awe-inspiring stimulus via a video (awe vs. neutral). We then measured cardiovascular responses during a speech task—the performance stressor—to assess the moderated effects of awe on the psychological states of task engagement and challenge/threat.

By differentiating between task engagement, challenge, and threat, the BPSC/T allowed us to test all three plausible effects of awe (described above) on responses during a subsequent performance stressor. First, if exposure to the vastness of an awe-inspiring stimulus makes the obstacles posed by the stressor seem insignificant in comparison, so as to be something still worth caring about (i.e., important) but manageable, it should lead to high task engagement, evaluations of high resources and low demands, and thus the experience of relative challenge. This would be reflected in high HR/VC (task engagement) and low TPR/high CO (challenge) during the stressor. Second, if the stressor instead seems insignificant so as to be altogether unimportant, it should lead to low task engagement, reflected in low HR/VC. Given that task engagement is a component across the challenge/threat continuum, lack of engagement should lead to little or no change in TPR/CO. Third, if an awe-inspiring stimulus makes one's capabilities seem insignificant in comparison, so that the stressor seems important but relatively less manageable, it should lead to high task engagement, evaluations of low resources and high demands, and thus the experience of relative threat. This would be reflected in high HR/VC and high TPR/low CO. Fig. 1 presents the three cardiovascular patterns.

We hypothesized that if a main effect emerged for awe, it should be most likely to take the form of the first alternative (cardiovascular responses consistent with greater challenge—lower TPR/higher CO—than in the control condition). Although tentative, this reasoning was based on conceptual parallels across previous research: (1) Awe can result in less attention to the self and less self-focused thoughts (Piff

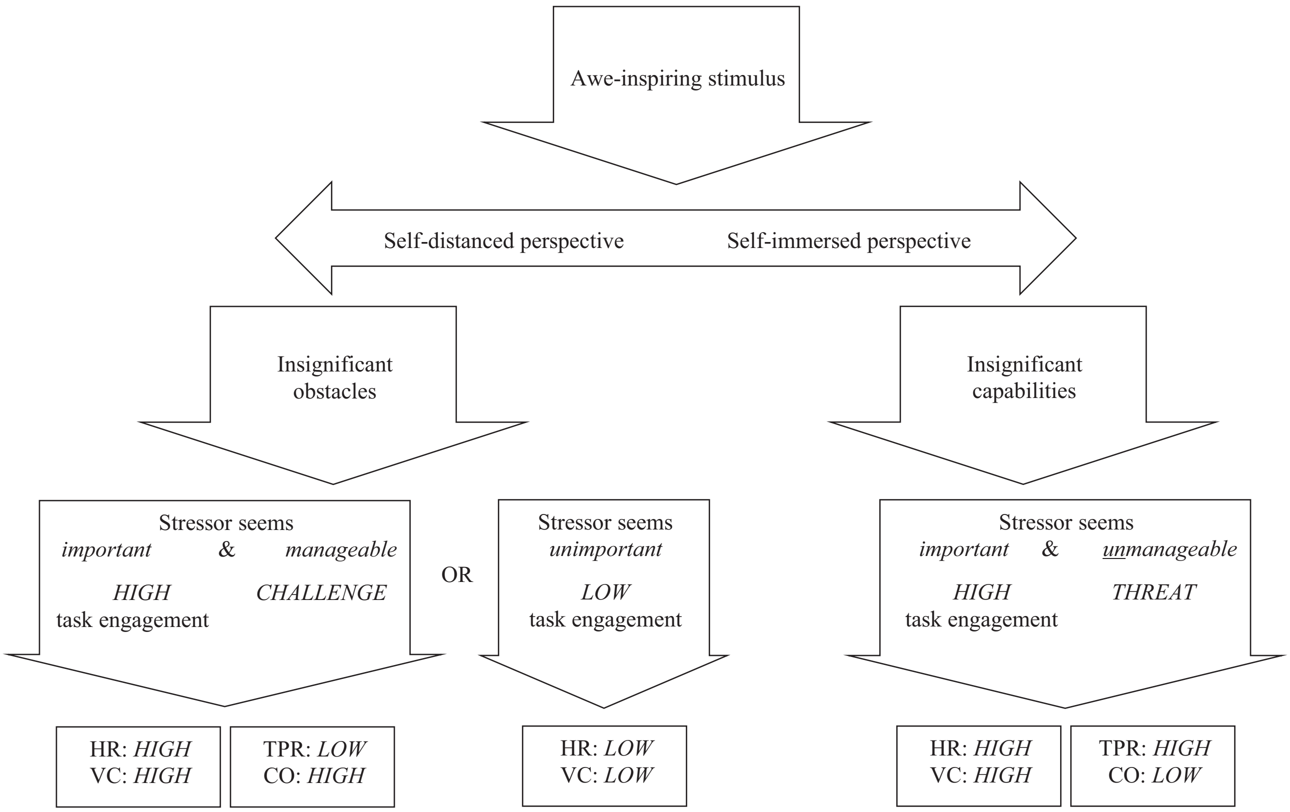

Fig. 1. Possible effects of exposure to an awe-inspiring stimulus on responses during a subsequent performance stressor; the left endpoint results in challenge, the middle endpoint results in low task engagement, and the right endpoint results in threat.

et al., 2015; Shiota et al., 2007), which bears similarity to a self-distanced perspective; and (2) an induced self-distanced perspective can result in cardiovascular responses consistent with greater challenge during a subsequent performance stressor than a self-immersed perspective, without diminishing task engagement (Streamer et al., 2017). However, we further hypothesized that an interaction between condition and spontaneous self-distancing would emerge. Specifically, a spontaneous self-distanced perspective should predict experiencing the awe condition as less personal and more removed than a spontaneous self-immersed perspective, leading to greater focus on external factors discernable by an outside observer than on hidden internal qualities; specifically, greater focus on the relative insignificance of one's obstacles (i.e., from the upcoming stressor) rather than on the relative insignificance of one's capabilities. This could result in either greater challenge or lower task engagement than both high self-distancing in the control condition and low self-distancing (self-immersion) in the awe condition. However, given that Streamer et al. (2017) found differences in challenge/threat but not task engagement, we expected to find cardiovascular responses consistent with greater challenge (lower TPR/higher CO) rather than lower task engagement (lower HR/VC) for participants high in spontaneous self-distancing in the awe condition, relative to others.

4. Method

4.1. Participants

One hundred and eighty-two (81 women) introductory psychology students participated in the study for partial course credit (91 in each condition). In a typical challenge/threat study, approximately 10–15% of the sample may be lost due to cardiovascular recording problems. Beyond the analyzed sample of 182 participants, 16 additional participants were excluded from analyses for the following reasons: 7 due to missing or unusable blood pressure readings, 4 due to unusable impedance cardiography data, 2 due to unusable electrocardiography data, and 3 due to computer/equipment malfunction. Our original sample size determination was based on exceeding 0.80 power to detect an effect size of $\eta_p^2 = 0.05$ (required $N = 152$ after cardiovascular data loss); available lab resources allowed for oversampling. The final sample size should have provided adequate power (> 0.80) to detect an effect size of approximately $\eta_p^2 = 0.043$. Results were not analyzed until data collection was complete.

4.2. Measures

4.2.1. Cardiovascular measures

Cardiovascular measures were recorded noninvasively, following accepted guidelines (Sherwood et al., 1990). Equipment was manufactured and/or distributed by Biopac Systems, Inc. (Goleta, CA): NICO100C impedance cardiography (ICG) noninvasive cardiac output module, ECG100C electrocardiogram (ECG) amplifier, and NIBP100A/B noninvasive blood pressure module. ICG signals were detected with a tetrapolar aluminum/mylar tape electrode system, recording basal transthoracic impedance (Z0) and the first derivative of impedance change (dZ/dt), sampled at 1 kHz. ECG signals were detected using a Standard Lead II electrode configuration (additional spot electrodes on the right arm and left leg, with ground provided by the ICG system), sampled at 1 kHz. The blood pressure monitor was wrist-mounted, collecting continual readings—every 10–15 s—from the radial artery of participants' nondominant arm. In combination, ICG and ECG recordings allowed computation of HR, VC (for presentational purposes, pre-ejection period reactivity × −1), and CO; the addition of blood pressure monitoring allowed computation of TPR (mean arterial pressure × 80 / CO; Sherwood et al., 1990). Recorded measurements of cardiovascular function were stored on a computer and analyzed off-line with Biopac Acqknowledge 3.9.2 for Macintosh software, using techniques from previously published challenge/threat research with the same equipment configuration (e.g., Lupien, Seery, & Almonte, 2012; Seery, Leo, Lupien, Kondrak, & Almonte, 2013; Shimizu, Seery, Weisbuch, & Lupien, 2011; also see Seery, Kondrak, Streamer, Saltsman, & Lamarche, 2016), including ensemble averaging in 60 s intervals (Kelsey & Guethlein, 1990). The approach was comparable to techniques used in other challenge/threat work (e.g., de Wit, Scheepers, & Jehn, 2012; Moore, Vine, Wilson, & Freeman, 2012, 2014; Turner et al., 2013; Turner, Jones, Sheffield, & Cross, 2012). Scoring of cardiovascular data was performed blind to condition and other participant data.

4.2.2. Spontaneous self-distancing

As in Ayduk and Kross (2010), participants were prompted to recall a recent upsetting experience in which they were rejected by a close other. Immediately afterwards, they were asked to indicate the extent to which they saw the event occurring through their own eyes or as an outside observer. Participants responded to the item using a 7-point Likert-type scale ranging from 1 (mainly immersed participant) to 7 (mainly distanced observer). Evidence suggests that measuring the construct in this way yields trait-like qualities (Kross & Ayduk, 2017). See Table 1 for correlations and descriptive statistics.

4.2.3. Awe and small-self manipulation checks

Embedded among other emotion items, participants reported the extent to which they were currently experiencing feelings of awe (1 item) and a small self (10 items; $\alpha = 0.91$) post-manipulation. Participants responded to the single awe item using a 7-point Likert-type scale ranging from 1 (not at all) to 7 (extremely), and the small-self measure using a 7-point Likert-type scale ranging from 1 (not at all true) to 7 (very true). Items assessing the small self included “I feel small or insignificant” and “I feel insignificant in the grand scheme of things.” Both manipulation check measures are common in studies that use videos to induce awe (Piff et al., 2015; Prade & Saroglou, 2016; Valdesolo & Graham, 2014).

4.3. Procedure

Participants completed the study individually. After consenting to participate in the study, participants completed the spontaneous self-distancing measure (Ayduk & Kross, 2010) followed by a series of exploratory questionnaires.[1] We administered the key spontaneous self-distancing measure first (1) to ensure that responses to it would not be affected by the act of completing other measures, and (2) because completing other subsequent measures should have helped distract participants from continuing to reflect on their past rejection and any resulting self-distancing. Following completion of these questionnaires, the experimenter attached the physiological sensors and participants then sat quietly for a 5-min resting baseline period, during which their cardiovascular responses were recorded.

4.3.1. Manipulation

Participants heard audio-recorded instructions stating that the study's researchers were interested in physiological responses during various types of tasks (a typical and effective cover story used in the lab), and that the first task would be to watch a video about nature. Instructions emphasized that participants should not try to remember specifics about the video, but should simply watch it. Participants were randomly assigned to watch one of two 5-min videos designed to induce either (1) the emotion of awe, or (2) a neutral state. The awe-inducing video contained footage from BBC's Planet Earth series, which presents grand, sweeping views of nature and is used frequently to induce awe (Gordon et al., 2017; Piff et al., 2015; Valdesolo & Graham, 2014; Valdesolo, Park, & Gottlieb, 2016). In contrast, the neutral video showed interactions between small sea creatures in a documentary style. This neutral video was designed to share the same theme as the awe video (i.e., nature) while excluding awe-inspiring components; it has also been used in previous awe research (Valdesolo et al., 2016). The awe and small-self manipulation check items were administered immediately after the video ended.

4.3.2. Speech task

Participants next heard audio-recorded instructions asking them to present a 2-min speech about a current setback or obstacle, and how they could approach or address this problem. As per previous BPSC/T research, we designed this speech task to create a performance stressor (e.g., Blascovich, Seery, Mugridge, Norris, & Weisbuch, 2004). First, the audio instructions emphasized that participants' performance would be evaluated by the research team, heightening the self-relevance of the goal to perform well (e.g., impressing the researchers or avoiding embarrassment). Second, the speech topic was chosen to relate directly to a stressor; previous research suggests that speech topic can be important in shaping challenge/threat responses above and beyond the act of giving a speech itself (Blascovich et al., 2004; Weisbuch-Remington, Mendes, Seery, & Blascovich, 2005). This topic required individuals to evaluate and resolve ongoing obstacles, which should be particularly relevant for the current research question. After the speech task, participants reported demographic information before being debriefed about the study.

5. Results

5.1. Analytical strategy

As is standard in challenge/threat research (e.g., Lupien et al., 2012; Seery et al., 2013), cardiovascular reactivity values were calculated by subtracting the value of the last baseline minute from each of the 2 min from the speech (see Llabre, Spitzer, Saab, Ironson, & Schneiderman, 1991, for psychometric justification for the use of change scores in psychophysiology). Reactivity values were then averaged across the two speech minutes. This approach should increase reliability of the measures because more data are included when using 2 min of the speech rather than one. Cardiovascular reactivity values that exceeded 3.3 *SD* from the grand mean ($p = .001$ in a normal distribution) were identified as extreme values (Tabachnick & Fidell, 1996) and were winsorized by recoding them to be 1% higher than the next-highest nonextreme value. This preserved the rank order of values in the distribution while decreasing the influence of extreme scores. A total of 7 values were changed using this procedure for the speech task (1 for HR,

[1] We report all measures, manipulations, and exclusions. Exploratory questionnaires were presented in the following order, after the measure of spontaneous self-distancing: a second emotion scenario (anger-inducing fight among friends) and self-distancing measure previously used for middle and high school students (White et al., 2015); short version of the Dispositional Positive Emotions Scale (Shiota, Keltner, & John, 2006); Rosenberg Self-Esteem Scale (Rosenberg, 1965); short version of the revised Need for Closure Scale (Roets & Van Hiel, 2011); short version of the Five Facet Mindfulness Questionnaire (Bohlmeijer, ten Klooster, Fledderus, Veehof, & Baer, 2011); and the Aesthetic Experiences Scale (Silvia & Nusbaum, 2011). These additional measures were selected because of their potential exploratory relevance for awe or coping with stressors and will not be considered further. The measure of spontaneous self-distancing reported in the text was assessed first because it was the key measure for our hypotheses. Unlike this measure, which is the established standard in previous work (e.g., Ayduk & Kross, 2010), the second emotion scenario and accompanying questions have—to our knowledge—only been used once in a sample of adolescents, but not adults. There is no precedent we are aware of for assessing two reflection prompts back-to-back, and it is not clear how completing the first might influence responses to the second (e.g., prompt a different distancing/immersion perspective by considering both endpoints of the scale). We thus did not include the second emotion reflection in analyses (substituting this measure in the reported interaction yielded a similar pattern, albeit not significant, $p = .26$).

Table 1
Correlations and descriptive statistics.

Measure	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Challenge/threat index	–								
2. TPR reactivity	−0.90***	–							
3. CO reactivity	0.90***	−0.61***	–						
4. Task engagement index	0.27***	−0.03	0.46***	–					
5. HR reactivity	0.08	0.13	0.27***	0.87***	–				
6. VC reactivity	0.40***	−0.18*	0.54***	0.87***	0.52***	–			
7. Self-distancing	0.05	−0.10	0.00	−0.10	−0.14	−0.04	–		
8. Awe (self-reported)	−0.03	0.05	−0.02	0.13	0.17*	0.07	−0.10	–	
9. Small self	−0.08	0.10	−0.05	0.05	0.10	−0.01	−0.17*	0.52***	–
M	0.00	172.15	−0.18	0.00	11.34	4.82	2.55	4.09	3.95
SD	1.00	186.97	1.70	1.00	7.87	9.93	1.03	1.85	1.30

Note. TPR = total peripheral resistance, CO = cardiac output, HR = heart rate, VC = ventricular contractility.
* $p < .05$. ** $p < .01$. *** $p < .001$.

1 for VC, 1 for CO, and 4 for TPR).

Changes in TPR and CO should reflect the same underlying physiological activation and both are consistent with relative differences in challenge/threat, so we combined TPR and CO into a single index, analogous to calculating a total score for multiple scale items (e.g., Blascovich et al., 2004; de Wit et al., 2012; Moore et al., 2012; Seery et al., 2009; Vine, Freeman, Moore, Chandra-Ramanan, & Wilson, 2013). This approach allowed us to maximize reliability of the cardiovascular measures, simplify analyses by conducting a single test of challenge/threat reactivity, and assess the relative pattern of challenge/threat across CO and TPR within participants (e.g., differentiating between participants with high CO and low TPR from those with high CO and moderate TPR, consistent with differences in relative challenge). We first converted participants' TPR and CO reactivity values ($r = -0.61$) into z-scores. Because relative challenge is marked by low TPR/high CO and relative threat is marked by high TPR/low CO (Blascovich, 2008; Blascovich & Tomaka, 1996; Seery, 2011, 2013), we then subtracted TPR from CO (i.e., TPR was reverse scored), so that higher values indicated relative challenge and lower values indicated relative threat. We then standardized the resultant index for ease of interpretation ($M = 0$, $SD = 1$). Differences on this index are relative, and the zero point represents the sample mean rather than a demarcation point between challenge versus threat, consistent with challenge/threat existing on a bipolar continuum. For tests of differences in task engagement, HR and VC were similarly combined into a single index ($r = 0.52$): z-scores for HR and VC were summed, such that higher values reflected greater task engagement (i.e., greater self-relevance and subjective importance of the task; "caring" more).

Because task engagement is a prerequisite across the challenge/threat continuum, we confirmed that participants exhibited task engagement during the speech task using one-sample *t*-tests. Consistent with task engagement, participants as a whole exhibited significant increases in HR and VC from baseline to the speech task (reactivity values were significantly greater than zero): HR $M = 11.34$, $t(181) = 19.44$, $p < .001$; VC $M = 4.82$, $t(181) = 6.54$, $p < .001$. The existence of task engagement justified further analyses of challenge/threat reactivity during the speech.

We tested hypothesized effects using standard multiple regression, reporting partial eta squared (η_p^2) as a measure of effect size. As described in Steiger (2004), 90% confidence intervals (CIs) rather than 95% CIs reflect alpha = 0.05 for η_p^2 and correspond to *p* values, given that η_p^2 cannot be negative. Additionally, we followed significant interactions by testing simple effects of self-distancing within the awe and neutral conditions, as well as simple effects of condition at 1 *SD* above/below the mean of self-distancing (self-distanced vs. self-immersed).

5.2. Manipulation checks

Consistent with previous awe research, manipulation check items (i.e., state awe and small self) indicated that the video was effective in inducing awe. Compared to those in the neutral condition, participants in the awe condition reported feeling significantly more awe, $t(180) = -4.54$, $b = -1.19$, $p < .001$, $\eta_p^2 = 0.10$, 90% CI = 0.04–0.18, as well as significantly higher feelings of a small self, $t(180) = -4.36$, $b = -0.80$, $p < .001$, $\eta_p^2 = 0.10$, 90% CI = 0.04–0.17.

5.3. Task engagement

We tested the possibility that awe induction could lead a subsequent stressor to seem comparatively insignificant and thus unimportant, leading to cardiovascular responses consistent with low task engagement (see the middle endpoint in Fig. 1); this was not supported. The awe manipulation had no significant effect on the task engagement index during the speech task, $t(180) = 0.40$, $b = 0.06$, $p = .688$, $\eta_p^2 = 0.001$, 90% CI = 0–0.02. Furthermore, awe condition and spontaneous self-distancing did not interact to predict task engagement, $t(178) = -0.17$, $b = -0.03$, $p = .865$, $\eta_p^2 = 0.000$, 90% CI = 0–0.01.

5.4. Challenge/threat

We next tested the possibilities that awe induction could lead one's obstacles to seem comparatively insignificant, leading to cardiovascular responses consistent with relative challenge during a subsequent stressor (see the left endpoint in Fig. 1), or that it could lead one's capabilities to seem comparatively insignificant, leading to cardiovascular responses consistent with relative threat (see the right endpoint in Fig. 1). We hypothesized both a main effect of awe induction and moderation by spontaneous self-distancing. Failing to support the main effect hypothesis, there was no significant effect of condition on challenge/threat response during the speech, $t(180) = -0.16$, $b = -0.02$, $p = .871$, $\eta_p^2 = 0.000$, 90% CI = 0–0.01.

However, supporting our moderation hypothesis that a self-distanced perspective in the awe condition would predict greater challenge than other combinations, there was a significant interaction between condition and spontaneous self-distancing on the challenge/threat index during the speech, $t(178) = -2.85$, $b = -0.42$, $p = .005$, $\eta_p^2 = 0.044$, 90% CI = 0.01–0.10 (CO: $p = .012$, TPR $p = .011$); see Fig. 2. This pattern is consistent with a self-distanced perspective leading to focus on the comparative insignificance of one's obstacles rather than one's capabilities after awe induction, thereby making the performance stressor seem manageable and resulting in relative challenge. Specifically, within the awe condition, higher self-distancing predicted significantly greater challenge during the speech, $t(178) = 2.48$, $b = 0.25$, $p = .014$, $\eta_p^2 = 0.033$, 90% CI = 0.003–0.09 (CO $p = .084$, TPR $p = .008$); self-distancing did not significantly predict challenge/threat in the neutral condition, $t(178) = -1.60$, $b = -0.17$, $p = .112$, $\eta_p^2 = 0.014$, 90% CI = 0–0.06 (CO $p = .067$, TPR

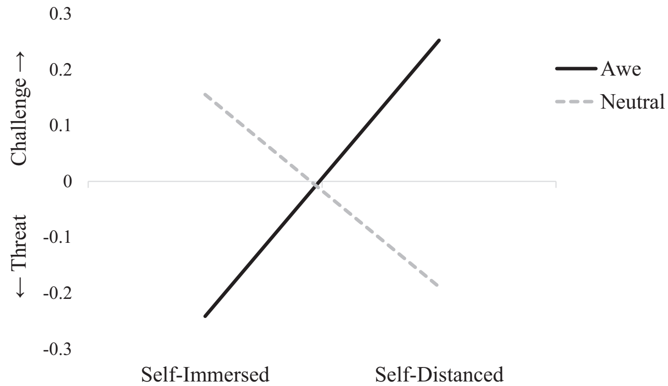

Fig. 2. Relationship between spontaneous self-distancing and awe condition on challenge/threat cardiovascular responses. "Self-Immersed" and "Self-Distanced" reflect values ± 1 *SD* from the mean of spontaneous self-distancing.

$p = .314$). Testing simple effects of condition within self-distanced and self-immersed perspectives revealed a significant effect of awe induction on challenge/threat responses for participants who self-distanced, $t(178) = -2.13$, $b = -0.44$, $p = .035$, $\eta_p^2 = 0.024$, 90% CI = 0.001–0.07 (CO $p = .046$, TPR $p = .074$), such that they exhibited significantly greater challenge during the speech in the awe condition compared to the neutral condition. A marginally significant effect of condition in the opposite direction emerged for participants who self-immersed, $t(178) = 1.92$, $b = 0.40$, $p = .057$, $\eta_p^2 = 0.020$, 90% CI = 0–0.07 (CO $p = .115$, TPR $p = .066$), such that they exhibited greater threat in the awe condition compared to the neutral condition (consistent with greater focus on the comparative insignificance of one's capabilities after awe induction, making the performance stressor seem less manageable). Importantly, the same overall pattern of results emerged when task engagement was included as a covariate in the model, suggesting that the observed differences are specific to challenge/threat and not due to magnitude of cardiovascular reactivity more generally.

We additionally conducted a repeated-measures analysis using a single mixed model to confirm that findings for challenge/threat diverged from those for task engagement. We tested the three-way interaction between spontaneous self-distancing, awe condition, and dependent variable (task engagement vs. challenge/threat index; the within-subjects factor). This interaction was significant, $z = -2.20$, $p = .028$, providing further evidence for divergence across measures. Consistent with the separate regressions, a simple two-way interaction between self-distancing and condition emerged for the challenge/threat index, $z = -2.74$, $p = .006$, but not the task engagement index, $z = -0.16$, $p = .816$; simple effects for challenge/threat were substantively identical to those reported above.

6. Discussion

Using the BPSC/T model, we tested three plausible effects of awe on responses during a subsequent performance stressor: (1) the vastness of an awe-inspiring stimulus leads the obstacles presented by the stressor to seem comparatively insignificant, and therefore manageable; (2) this comparison instead leads the stressor to seem insignificant so as to be unimportant (i.e., not worth caring about); and (3) an awe-inspiring stimulus leads one's capabilities to seem comparatively insignificant, and therefore the stressor unmanageable. We further tested the extent to which spontaneous self-distancing/self-immersion moderated the effects of induced awe, reasoning that a more self-distanced perspective should heighten the likelihood of the first over the third possibility by making the experience of awe seem less personal and more removed from internal aspects of the self.

Cardiovascular responses consistent with task engagement yielded no significant effects—moderated or not—thereby failing to support the second possibility, that exposure to an awe-inspiring stimulus makes a subsequent performance stressor seem less important in comparison. Cardiovascular responses consistent with challenge/threat yielded no main effect of awe induction, failing to support a tentative hypothesis for a non-moderated version of the first possibility. However, the hypothesized moderation by spontaneous self-distancing did emerge for challenge/threat, supporting that both the first and third possibilities can occur, depending on self-distancing. This suggests that a self-distanced perspective makes one's obstacles (i.e., those posed by the subsequent stressor) seem insignificant in comparison to the vastness of the awe-inspiring stimulus, leading the stressor to seem manageable (i.e., evaluating high resources/low demands) and resulting in the experience of relative challenge during the stressor. Findings also suggest that—in contrast—a self-immersed perspective makes one's capabilities seem comparatively insignificant, leading the stressor to seem unmanageable (i.e., low resources/high demands) and resulting in relative threat. With the use of theory-based psychophysiological measures, the current work thus offers novel evidence regarding the consequences of awe in the face of coping with performance stressors.

Although results are consistent with these hypothesized mechanisms, other explanations are possible. For instance, spontaneous self-distancing could affect the experience of awe itself, such as if people who self-immerse (relative to those who self-distance): (1) are more negatively affected (e.g., their mood) by the act of reflecting on a past rejection in the self-distancing measure, which later interferes with the experience of awe; (2) are otherwise more preoccupied with the self in general, interfering with the experience of awe; or (3) are able to feel awe more intensely because they are less removed from emotional experience. However, we did not find evidence for such alternatives, as spontaneous self-distancing did not significantly interact with condition ($p = .45$) to predict reported feelings of awe. Pre-manipulation differences as a function of self-distancing (e.g., in affect) were not assessed and so cannot be ruled out, but self-distancing was not significantly related to baseline values of any of the four physiological measures ($ps > 0.25$), which were recorded after self-report measures but before the manipulation. In sum, evidence does not support that self-distancing predicted experiencing more or less intense feelings of awe than self-immersion, but instead that self-distancing predicted experiencing awe differently than self-immersion.

Past work suggests generalization of spontaneous self-distancing across contexts, in that responses to one situation (i.e., the reflection used to measure self-distancing) predict responses to distinct situations (Kross & Ayduk, 2017). However, our study does not test the extent of this generalization. It is possible that the measure could perform differently if used with a different reflection scenario. Similarly, our study cannot rule out the influence of unmeasured third variables and cannot establish causality regarding self-distancing; manipulating rather than measuring self-distanced/immersed perspectives could address such issues (Kross et al., 2014; Streamer et al., 2017).

Because the current study used a neutral rather than positively valenced control condition, our findings could reflect differences in positive emotional responses more generally, rather than awe in particular. Drawing from the broaden-and-build theory of positive emotions (Fredrickson, 2001), it is possible that individuals who self-distanced, relative to those who self-immersed, experienced stronger positive reactions to the awe video, and that these positive reactions led to greater challenge during the speech task. However, theoretically, this argument is inconsistent with past work examining self-distancing. Rather than strengthening positive emotions, a self-distanced perspective has been found to *weaken* the intensity and duration of positive emotional experiences (Gruber et al., 2009; Verduyn et al., 2012). If our results were driven by positive emotions broadly, higher self-immersion in the awe condition should have predicted greater challenge, not the observed threat. Nonetheless, future work could use additional control conditions to investigate this issue, including positively valenced stimuli and negatively valenced, fear-based awe (Gordon et al., 2017). Ultimately, we did not directly test the proposed mechanisms underlying our current findings. To more conclusively test our interpretation, future research could incorporate measures of focus on one's capabilities versus obstacles.

Taken together, the current work offers novel insight into the experience and consequences of awe. Specifically, our findings suggest that even positively valenced awe has divergent effects on responses during subsequent performance stressors, depending on one's tendency to adopt a self-distanced versus self-immersed perspective. This has plausible implications outside the laboratory, in that when people face stressors, it is common for them to turn to coping strategies that potentially entail awe induction, whether interacting with grand natural vistas on a relaxing hike or seeking religious or spiritual experiences (e.g., Harrison, Koenig, Hays, Eme-Akwari, & Pargament, 2001). To maximally benefit from awe when facing subsequent stressors, we may need to take a step back from ourselves before we take it all in.

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