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## The buffering effect of awe on negative affect towards lost possessions\*

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### ABSTRACT

Although the positive emotion of awe is of growing interest, past research has not directly examined its buffering effect in negative circumstances. As awe has been theoretically linked to experiences of vastness and spirituality, the present study proposes that awe helps individuals alleviate their negative affect, in the context of possession loss. Study 1 manipulated awe and examined participants' responses in an imagined situation in which they lost a cherished possession. Study 2 manipulated awe and happiness and compared their effects on participants' response to an actual loss in the form of points obtained and deducted during a laboratory task. In Study 3, daily experiences of awe, other positive emotions, and affect in response to actual loss, were measured using event sampling. In all studies, awe predicted lower negative affect towards loss of possessions. Implications of the function of awe in coping with loss and other future directions are discussed.

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Awe; possessions; loss;  
positive emotions; negative  
affect

### Introduction

The experience of awe is associated with a sense of vastness and the need to cognitively assimilate the new experience (Keltner & Haidt, 2003). It opens our mind beyond our normal experiences, such that we feel small as compared to the greater world and are compelled to act in service of this greater reality (Shiota, Keltner, & Mossman, 2007). As a positive emotion, awe is expected to serve a functional purpose in accruing positive mental resources to tap on in times of crisis (Fredrickson, 2001). Although past research has demonstrated differential positive outcomes of awe, such as stronger spirituality and higher prosociality (Piff, Dietze, Feinberg, Stancato, & Keltner, 2015; Saroglou, Buxant, & Tilquin, 2008), there is no direct evidence on the buffering effect of awe in negative circumstances. In the current paper, we present three studies to depict the buffering effect of awe, in the context of possession loss.

According to the broaden-and-build theory of positive emotions (Fredrickson, 2001), positive emotions serves two primary adaptive functions. First, positive emotions broaden our momentary thought-action repertoires, enabling us to explore and learn new things. Second, the experiences and knowledge accrued builds up our personal resources, buffers against future threat and ameliorates the potential negative impact. In other words, positive emotions propel us to explore and gather mental

resources in times of safety, which helps to protect and sustain ourselves in times of hardship. To this end, positive emotions are a viable resource due to their effectiveness in coping with stressful life situations (Folkman, 2008; Folkman & Moskowitz, 2000), building resilience, facilitating psychological growth in difficult situations and buffering individuals against depression (Fredrickson, Tugade, Waugh, & Larkin, 2003). They also predict lower grief and fewer depressive symptoms during situations of loss such as bereavement (Ong, Bergeman, & Bisconti, 2004). Happiness, or joy, is one of the most researched positive emotions, and serves as a good exemplar of the buffering function of positive emotion. Studies have repeatedly shown the benefits of happiness in promoting well-being (Diener & Biswas-Diener, 2008). In particular, happiness can alleviate distress to loss (Lund, Utz, Caserta, & de Vries, 2008) and has been widely applied in interventions as an effective means to help people build resilience and overcome negative circumstances in which a significant loss has occurred (Cohn, Fredrickson, Brown, Mikels, & Conway, 2009; Greenberg, Warwar, & Malcolm, 2008).

While it is compelling that positive emotion can alleviate negative emotional responses, past literature has focused largely on global positive affect or common positive emotions and lacked specificity in examining the buffering effect of a more specific positive emotion such as awe. Past research has revealed some of the positive

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outcomes of being in awe such as increased generosity and prosocial behaviors (Piff et al., 2015; Prade & Saroglou, 2016), which helps individuals to gather social support as a form of resource according to the broaden-and-built theory (Fredrickson, 2001). However, the buffering effect of awe in light of negative circumstances has not been directly evidenced.

Past literature reveal attributes of awe that suggests its potential function in alleviating one's negative reactions. First, theorists have posited that awe promotes a self-transcendence state that is characterized by an awareness of something greater than the self. In particular, Keltner and Haidt (2003) propose that awe comprises in part of perceived vastness, which is the appraisal that the awe-eliciting entity is beyond one's normal experience. Hence, an elicitor that is physically large, culturally important or supernatural/divine can inspire awe and captivate one's attention to the point that the self is perceived as small or insignificant.

Empirical support has been found for the self-diminishing property of awe. For instance, awe generated a sense of something larger than the self (Piff et al., 2015) and an increased association of one's self-concept to a greater category (Shiota et al., 2007). This diminishing of the self does not necessitate a weakened self-identity, but rather a perception of the self with reference to the greater reality. Hence, to the extent that awe reduces the salience of the self, it suggests the possibility of a similar disengagement from one's own troubles and a perception that one's struggles are insignificant in relation to the bigger world, thereby potentially alleviating the negative impact of loss.

Second, awe is associated with an enhanced sense of spirituality, enabling individuals to look to and depend on a higher power. Consistently, awe was found to promote experiences of religiosity, connectedness, and purpose in life (Krause & Hayward, 2015; Saroglou et al., 2008). Furthermore, participants induced with awe preferred to travel to a spiritual destination (e.g. Tibet), rather than a hedonistic destination (e.g. Haiti) (Van Cappellen & Saroglou, 2012), and more readily attributed unexplainable phenomena to supernatural agents (Valdesolo & Graham, 2014). A strong sense of spirituality and religiosity can help people overcome adversity by bolstering their resilience and acceptance of crisis in life (Carrico, Gifford, & Moos, 2007; Mosqueiro, da Rocha, & de Almeida Fleck, 2015; Tuck & Anderson, 2014), and awe may be able to elicit the same effect and buffer individuals against potential harm.

Third, awe encourages greater mindfulness of the present moment (Rudd, Vohs, & Aaker, 2012). Being in awe may indirectly perpetuate such experiences as individuals engage in positive rumination and savour the present 'awe-filled' moment, which may generate extended positive affect (Quoidbach, Berry, Hansenne, & Mikolajczak,

2010). Research has also shown that being mindful of the present moment can enhance the ability to let go of negative thoughts (Frewen, Evans, Maraj, Dozois, & Partridge, 2008), and highlight that one's negative circumstances are temporal (Bruehlman-Senecal & Ayduk, 2015; Sauer & Baer, 2010). Taken together, awe may enhance and prolong its positive experience, and ameliorate the negative impact of a subsequent unfortunate situation. In sum, a diverse range of considerations implicates the buffering role of awe in adjusting to negative circumstances, but none of the research mentioned provided direct support for this assertion.

## Current research

In the current research, we investigate the buffering role of awe in a negative circumstance of loss. An experience of loss implies a deprivation of something from the self. Given that instances of intense loss can be devastating but infrequent (etc., death of a loved one), we used specifically the context of possession loss as it may be relatively more common and better identified by most individuals.

Possessions represent a part of a person's identity (e.g. status, relationships) (Gawronski, Bodenhausen, & Becker, 2007; Kiesler & Kiesler, 2005) and provide self-affirmation and comfort (Keefer, Landau, Rothschild, & Sullivan, 2012). Conversely, the loss of a possession can result in negative affective reactions (Ferraro, Escalas, & Bettman, 2011; Shu & Peck, 2011), and predict lower mental health (Lowe, Joshi, Pietrzak, Galea, & Cerdá, 2015). Even deciding to sell away one's possessions can be a painful experience (Dewall, Chester, & White, 2015). Hence, the loss of possessions is a viable context to examine the buffering effect of positive emotions.

We conducted three studies to evidence the buffering effect of awe and examine how awe would fare in comparison to other positive emotions in an exploratory fashion. We first established the buffering effect of awe on possession loss in Study 1, where participants were induced to feel awe and rated their responses towards an imagined loss. In Study 2, we further examined the buffering effect of awe and happiness towards an actual experience of loss in the laboratory. In Study 3, event sampling was used to capture and examine the relationship between daily experiences of awe, happiness, gratitude, contentment, and serenity and affective responses towards real-life losses. Hence, Studies 1 and 2 allow us to examine the alleviation of negative affect in comparison to a neutral condition; Studies 2 and 3 allow us to gauge the effectiveness of awe as a buffer with respect to other more commonly used positive emotions. Additionally, we used different measures to index participants' negative affect towards their loss in order to capture a more varied picture of the buffering

effect of awe, namely general negativity (Studies 1 and 2) and troubled feeling towards the lost possession (Study 3). In all studies, we posit that awe buffers individuals against possession loss, indicated by less negative affect towards the loss of their possessions.

## Study 1

### Methods

#### Participants

Ninety-seven undergraduates participated for course credits. Five participants were dropped from the analysis; one guessed the purpose of the study, and four did not follow the experimental procedure. The remaining ninety-two participants (62 females; mean age = 19.90, SD = 1.38) were randomly assigned to either the awe ( $n = 42$ ), or neutral ( $n = 50$ ) condition.

#### Procedure and materials

Participants were told that the study examined everyday thinking and experiences. Upon arrival, they were seated in partitioned computer cubicles in which the entire study was administered using self-explanatory on-screen instructions. Participants were first prompted to think about a personal possession that they cherish. They were told that the possession did not necessarily have to be expensive; it just had to be important to them. They were told to describe the possession in adequate detail, such that another person would be able to picture it. They then answered some filler questions about the possession.

Next, all participants proceeded to the emotion induction section of the study. Following similar procedures in other emotion studies (Lerner, Li, & Weber, 2013; Lerner, Small, & Loewenstein, 2004), participants were asked to watch a one-minute video and write about their own experience of the same theme expressed in the video. The choice of videos and their duration were informed by previous studies on awe (Rudd et al., 2012; Van Cappellen & Saroglou, 2012). The recall procedure was also based on those used in prior emotion studies, in which participants were asked to describe their personal experience in detail, and were given prompts to facilitate recall (Griskevicius, Shiota, & Neufeld, 2010). In the awe condition, participants watched a video depicting various picturesque scenes of people exploring nature (e.g. mountains, snowy plains, forests). Then, they were asked to describe an event in their life when they saw a similar panoramic view for the first time. They were given examples such as the Grand Canyon and a view high up in the mountain. Question prompts included 'What went through your mind?' and 'How did it feel like to be feeling awe?' In the neutral condition, participants watched a video depicting people

viewing and talking about rocks. They were then asked to describe a routine everyday experience (e.g. doing the laundry or brushing teeth), and were given similar prompting questions.

Next, participants were asked to imagine that they had just lost the material possession they described earlier (Ferraro et al., 2011). They were told to imagine that possession could be misplaced, taken or destroyed. Next, they indicated on a seven-point scale ranging from 1 (*not at all*) to 7 (*very much*) regarding how *unhappy*, *upset*, and *regretful* they would feel if they really did lose the possession at that point in time. They also rated their feelings on three other seven-point scales which were anchored from 1 (*neutral*) to 7 (*extremely bad/extremely negative/extremely sad*). All six items were summed to give *negative affect* which measured their negative affect towards the imagined loss ( $\alpha = .96$ ).

Participants proceeded to complete other measures that included manipulation check, awareness check and demographic questions. For manipulation check, they rated the extent to which they were feeling awe and the extent to which the video made them feel awe on a seven point scale from 1 (*not at all*) to 7 (*extremely*). These items were summed to give *reported awe* ( $\alpha = .89$ ). Participants were later debriefed through emails.

## Results

### Manipulation checks

The distribution of reported awe was considerably normal, skewness =  $-.03$ , SE =  $.25$ ; kurtosis =  $-1.25$ , SE =  $.50$ . Participants in the awe condition ( $M = 9.95$ , SD =  $2.07$ ) reported higher levels of awe than those in the neutral condition ( $M = 4.56$ , SD =  $2.44$ ),  $F(1,90) = 127.58$ ,  $p < .001$ ,  $\mu^2 = .59$ .

### Negative affect

Negative affect was highly skewed to the left (skewness =  $-1.55$ , SE =  $.25$ ; kurtosis =  $2.51$ , SE =  $.49$ ; see Figure 1 in supplementary materials). No transformation could reduce the skewed emotion scores substantially and analytical methods that assume normality might not be appropriate. Hence, we applied Poisson regression. Poisson regression is typically employed to analyze discrete events that occur rarely and hence have distributions that are strongly skewed to the right. It can be applied to dependent variables expressed in non-zero integers such as the present data. To make them positively skewed and applicable for Poisson analysis, each score was subtracted from the largest score (i.e. 43), giving *positive affect*, which was regressed onto condition with the awe condition specified as the target condition.

The model was significant,  $\alpha^2(1) = 10.11, p = .001$ . The awe condition ( $M = 9.45, SD = 9.90$ ) was higher than the neutral condition ( $M = 7.51, SD = 6.29$ ) in positive affect,  $b = .23, SE = .07, 95\% CI [.09, .37]$ . The incident odds ratio,  $\text{Exp}(b)$ , which indicates the degree to which the target condition was expected to differ from other condition(s), was 1.26, 95% CI [1.09, 1.45]. This means that the awe condition is expected to be higher (i.e. lower) than the neutral condition in positive (negative) affect by .26 unit (1.26–1.00) on average.

## Discussion

Consistent with predictions, participants induced to feel awe reported less negative affect towards an imagined loss of a possession as compared to those in the neutral condition. Participants' negative affect was highly skewed, possibly due to limitations in the participants' ability to imagine the loss.

## Study 2

Study 2 examined real loss through a reaction time task in which participants were made to lose a significant number of points, a form of possession (Sen & Johnson, 1997), as it is unclear whether the participants' responses in Study 1 reflect what they would actually feel if a possession loss did occur.

Study 2 also examined how the effect of awe would fare as compared to another positive emotion, happiness. Happiness promotes well-being (Diener & Biswas-Diener, 2008) and has been shown to alleviate distress (Lund et al., 2008). We expect induced happiness to reduce reported negative affect (relative to the neutral state) in response to the actual loss of points in the reaction time task. We investigate whether awe would have a comparable or different buffering effect as happiness.

## Methods

### Participants

One hundred and twenty-one undergraduates participated for course credits. Three participants were dropped for not following experimental procedure. The remaining 118 participants (83 females; mean age = 20.97,  $SD = 1.66$ ) were assigned to the awe ( $n = 42$ ), neutral ( $n = 41$ ), or happy ( $n = 35$ ) condition.

### Procedure and materials

Participants were seated in partitioned cubicles and received all instructions through the computer. They started off on a task which promised a \$20 cash voucher if they could accumulate a certain number of points over

successive blocks (the experimenter was conspicuously seated in the room with a stack of cash vouchers). In this task, a cross was first shown in the center of the screen and participants had to tap a button whenever a black circle appeared in place of the cross at random intervals of time. Participants were told that the number of points earned depended on how quick their response was as compared to the average computed from participants of the previous semester, which was stated as 200ms. The faster (vs. slower) they were compared to the average, the more points they would earn (lose). Those who accumulated 100 points would receive the cash voucher after the study.

Each block comprised 10 trials and participants could earn a total of 60 points per block. They were told that their scores were computed by a new algorithm and their scores for each block and total score for all attempted blocks would be shown after each block. Participants started with the first block, in which they were preset to gain 45 points. They then answered filler questions, allegedly to provide feedback to the developer of the task, which also focused their attention on their score.

Before proceeding to the second block, participants underwent the same emotional induction procedure from Study 1. As a cover story, they were told that a break would ensure better performance. Participants in the awe and neutral conditions received the same materials as Study 1. Participants in the happy condition viewed a colorful parade with people celebrating on the streets (Rudd et al., 2012) and described an event in their life when something good happened to them, and were given examples like a birthday celebration or receiving a present. Similar question prompts were given.

Participants were preset to lose several points in the second block. Their cumulative score after the second block was 18 points, indicating a reduction of 27 points from block 1 to 2, and hence were not eligible for the cash voucher. They then answered the same filler questions.

Next, participants completed the same manipulation checks in Study 1, summed to form *reported awe* ( $\alpha = .82$ ). They rated their current emotion on the following items on seven-point scales that ranged from 1 (not at all) to 7 (extremely): *sad, anxious, worried, angry, annoyed, frustrated, guilty, fear*; and *joy, calm, peace, amazed, excited, relax* (reversed scored). They also rated their current feelings on three seven-point items (reversed-scored) anchored from 1 to 7: *very bad to very good, very sad to very happy, very negative to very positive*. The initial objective for using a greater variety of items than Study 1 was to explore whether the results would replicate with different affect variables. All items formed a highly internally consistent scale ( $\alpha = .85$ ) and were summed to give *negative affect* ( $\alpha = .85$ ). After completing other unrelated measures,



participants were debriefed. No participants guessed the hypothesis correctly.

## Results

### Manipulation checks

The distribution of reported awe was considerably normal, skewness =  $-.07$ , SE =  $.23$ ; kurtosis =  $-1.02$ , SE =  $.44$ . There was a main effect of condition,  $F(2,115) = 46.31$ ,  $p < .001$ ,  $\mu^2 = .45$ . Tukey HSD test revealed higher reported awe in the awe condition ( $M = 9.17$ ,  $SD = 1.97$ ) than the happy ( $M = 7.83$ ,  $SD = 2.95$ ),  $p = .036$  and neutral conditions ( $M = 4.37$ ,  $SD = 2.07$ ),  $p < .001$ . Reported awe was also higher in the happy condition than in the neutral condition,  $p < .001$ , which suggests that some of the experiences recalled in the happy condition evoked a slight degree of awe and supports findings that positive emotions tend to co-occur (Vansteelandt, Mechelen, & Nezelek, 2005).

### Negative affect

Unlike Study 1, the distribution for negative affect was highly normal (skewness =  $-.03$ , SE =  $.22$ ; kurtosis =  $.04$ , SE =  $.44$ ; Figure 1 in supplementary materials). A one-way ANOVA was therefore applied, which revealed a significant effect of condition,  $F(2,115) = 5.68$ ,  $p = .004$ ,  $\mu^2 = .09$ . Participants in the awe condition ( $M = 50.55$ ,  $SD = 13.26$ ),  $p = .023$ , and happy condition ( $M = 49.00$ ,  $SD = 12.82$ ),  $p = .007$ , reported less negative affect towards the loss of their points than those in the neutral condition ( $M = 58.05$ ,  $SD = 12.13$ ). The awe and happy conditions did not differ,  $p = .86$ .

## Discussion

Study 2 replicated and extended Study 1 by showing that awe reduced negative affect experienced in an actual loss situation. The effect of induced awe and induced happiness was comparable, suggesting that awe is as effective as happiness in reducing negative affect associated with possession loss. Whether this effect is unique to situations of possession loss remains unclear, due to the lack of a no-loss comparison condition.

## Study 3

Although participants were subjected to an actual loss in Study 2, the use of points as a form of material possessions may arguably be quite unrealistic. Hence, Study 3 was conducted using event sampling to improve ecological validity. This method includes observations when no possession is lost, which can show if awe alleviates negative feelings only when a possession is lost.

Study 3 extended the comparison of awe to other positive emotions. Gratitude and contentment are strongly

related to well-being and enable people to feel satisfied with their situations in life (Ryff & Singer, 2008; Wood, Froh, & Geraghty, 2010). Serenity is associated with inner peace and tranquility (Floody, 2014), and has been used to ease anxiety (Wolfradt, Oemler, Braun, & Klement, 2014). These positive emotions, like happiness, might also help individuals alleviate negative reactions, and serves a gauge of the buffering effect of awe on loss.

## Methods

### Participants

One hundred and thirty-three undergraduates signed up for course credits. Participants were told that course credits would only be given only if they completed the measures at least twice. One hundred and fourteen participants fulfilled this criterion and hence formed the current sample. Amongst those who completed the demographics survey sent out after the last measure, there were 88 females and 19 males (mean age = 19.80,  $SD = 1.40$ ). Seven participants did not respond to the demographics questionnaire but they have provided sufficient data for analyses.

### Procedure and materials

Participants completed online measures six times (i.e. observations), one observation per day, within the span of one week. Each observation was taken between 10am and 8 pm (the undergraduate participants were less likely to be sleeping in these hours), and the timings were determined by an online randomizer that selected hourly timings within a specified range. All observations were spaced at least 12 h apart. In each observation, participants received a text message on their cell-phone via an automatic messaging service at the specified timing. The participants were instructed to complete the measures on the online platform *surveygizmo* within 3 h. The 3 h period was to give adequate time for the participants to respond, given that they participated in the midst of their daily routines, which included lectures and social activities. Participants were told they could complete the survey at any location. All participants owned a smartphone and could complete the survey within 3hrs. Their phone number was obtained during sign-up.

Participants completed the same measures in all six observations. They were instructed to answer the questions with respect to their current feelings, thoughts, and circumstances. The current study was part of a larger study that examined appraisals and emotions. Of relevance to the present study were items that asked participants to rate the extent to which they were feeling *awe*, *happy*, *content*, *grateful*, and *serene* currently (on a scale from 1 [*not at all*] to 7 [*extremely*]). They were also asked whether they had lost a possession within the past 12 h on a *yes/no*

option. Setting the observations at least 12 h apart ensured that no loss experience was double-counted. Participants who indicated that they had lost a possession in the past 12 h were then prompted to indicate how troubled they currently felt about that possession on a scale from 1 (*not at all*) to 7 (*extremely*). If no loss was indicated, participants were prompted to rate the next item. As participants were asked to respond in their daily routines, single-item measures were used, similar to other event-sampling studies (Vansteelandt et al., 2005; Zelenski & Larsen, 2000).

After the sixth observation, participants completed a demographic questionnaire and were debriefed through email.

## Results

### Descriptive statistics

Although not a main focus of this research, we examined descriptively the frequency of actual awe experiences and possession loss across the sampling period (see Figure 2 in supplementary materials), which research has given only scant attention to. A total of 569 observations were recorded (114 participants, 2–6 completed observations per participants). Participants' emotion ratings from 2 to 7 were taken as an indication of the emotional experience. Out of the 569 observations, 57.29% (326) contained experiences of awe, 80.49% (458) happiness, 85.41% (486) contentment, 80.49% (458) gratitude and 79.96% (455) serenity. The lower frequency of awe experiences could be because elicitors of awe (e.g. a scenic mountain) are less common than elicitors of the other emotions (e.g. good grades for happiness and contentment, helped received for gratitude, a relaxing moment for serenity).

There were only 26 reported cases of lost possessions from 21 participants. Of these 26 cases, 3 cases were reported by the same participant, 2 cases were reported by 3 participants, and one case was reported by the remaining participants. The low frequency of loss experiences is not surprising, showing that people generally do not lose their possessions in their daily lives. However, this low frequency presented statistical challenges.

### Main analyses

One approach was to examine the correlations among the variables in the 26 cases of possession loss. As the awe scores were also positively skewed within these 26 cases (skewness = 2.06, SE = .46; kurtosis = 4.13, SE = .89), non-parametric Spearman's Rho correlational analysis was conducted. Troubledness correlated negatively with awe as predicted,  $\rho = -.45$ ,  $p = .02$ . For consistency, the same analysis was applied on the other variables even though their distribution was considerably normal (skewness < .73, SE = .46; kurtosis < 1.06, SE = .88). Troubledness was

negatively related to happiness,  $\rho = -.42$ ,  $p = .03$ , but did not correlate with contentment,  $\rho = -.33$ ,  $p = .10$ ; gratitude,  $\rho = -.07$ ,  $p = .72$ , and serenity,  $\rho = -.25$ ,  $p = .22$ . These analyses are under-powered. Hence, the effect sizes should be also considered, which in the current case were moderate in magnitude (Cohen, 1988).

However, there are obvious limitations in the preceding analyses. First, the small sample necessarily limits reliability of the results. Second, the analysis did not control for non-independence in the data of four participants who reported multiple cases of possession loss. Finally, the independent predictive power of awe against happiness, gratitude, contentment, and serenity was not tested because entering all predictors simultaneously would overload the model (given the already small sample).

A second analysis was conducted using Hierarchical Linear Modeling (HLM; Bryk & Raudenbush, 1992). The objective was to examine within-participant relationships between troubledness, awe, and other positive emotions as a function of possession loss. This analysis allowed the use of all 569 data-points, controlled for non-independence, and enabled the independent predictive power of all five emotions to be tested. Also, HLM controls for the effects of missing data. Given that troubledness was highly positively skewed across all 569 data points (see Figure 2 in supplementary materials), Poisson HLM regression (with constant exposure) was applied. The model comprised regressing troubledness onto the five emotions (mean-centered), loss (loss and no-loss were coded as 1 and 0, respectively), and all five cross-product interaction terms.

However, the assumptions and limitations of this analysis must be noted. First, a troubledness score of 1 was assigned to cases in which no loss was reported. This allowed all data-points to be analyzed, providing high statistical power, but assumed that reported lack of troubled feelings when a possession was lost is conceptually similar to no ratings of troubledness when no possession was lost. Second, there were a total of 11 predictors, making the model somewhat large. Third, preliminary analyses with random effects specified revealed singularity problems that were likely due to correlations among the predictors. The output recommended removing one or more of the random effects. As there was no non-arbitrary basis for deciding which random effect of which predictor to drop, we ran the analyses dropping all random effects except for that of the intercept. Hence, the results must be interpreted as fixed model effects. An advantage of fixed model analysis is higher statistical power, but it provides no indication regarding the extent to which the findings vary beyond the current sample. Hence, the Spearman correlational analyses, which are not constrained by these limitations, were reported.

A few findings should be noted (see Table 1). First, not surprisingly, loss positively predicted troubledness. Each experience of loss was associated with a 2.64 unit (3.62–1.00) increase in troubledness. Second, awe on its own did not predict troubledness, which is consistent with the hypothesis that awe should predict lower negative effect only when a possession is lost. Interestingly, serenity positively predicted troubledness, such that for each unit increase in serenity, there was .02 unit increase in troubledness; the reason for this unexpected finding is not clear. Third, most importantly, the interaction term between awe and loss predicted troubledness. Consistent with our hypothesis, the result indicates that for each unit increase in awe, the relationship between loss and troubledness dropped by .16 units. Finally, none of the other emotions interacted with loss to predict troubledness with the exception of gratitude, which indicated that for every 1 unit increase in gratitude, the relationship between loss and troubledness increased by .16 units.

To ascertain the reliability of these results, we tested a reduced model that avoided some of the said limitations. First, all nonsignificant predictors were dropped. Second, all random effects were specified; this time, the model ran to convergence. As shown in Table 1, serenity and the interaction between gratitude and loss no longer predicted troubledness. Loss and the interaction between awe and loss continued to predict troubledness in the same directions (as described above) that are consistent with predictions.

## Discussion

Study 3 demonstrates that awe is associated with lower negative affect in real-life possession loss. However, the association between happiness and lower negative affect first found in Study 2 did not quite replicate – the Spearman correlation analysis on the 25 loss cases conceptually replicated the relationship but the HLM analysis on all data-points did not. In contrast, the hypothesized

relationship between awe and lower loss-driven negative affect was replicated across all three studies and across different analytical methods in Study 3. Further, gratitude interacted with loss to predict troubledness in the full HLM model but this relationship was not found in the reduced model. One reason could be suppressor effects from other predictors in the full model. Troubledness did not vary with contentment and serenity as a function of possession loss.

## General discussion

The present research is the first to directly evidence the buffering effect of awe in a negative circumstance of possession loss, and compare its buffering utility to a range of other positive emotions. Consistent with predictions, induced awe led to less negative affect towards imagined loss of personal possession (Study 1) and after a loss of earned points with monetary value in a laboratory task (Study 2). Naturalistic reported awe also predicted less troubled feelings towards an actual possession loss in real life in an experience sampling study (Study 3). Furthermore, the buffering effect of awe was comparable to happiness (Study 2), and was uniquely predictive of lower negative affect during possession loss, independently of happiness, gratitude, contentment and serenity (Study 3). Our findings support the adaptive role of positive emotions in coping with negative events (Fredrickson, 2013; Tugade & Fredrickson, 2004), and show that awe builds a form of resilience against loss. Also, most research on the consequence of awe focuses on the person's orientation to larger, external factors such as the social environment, the physical world and spiritual realities (Piff et al., 2015; Shiota et al., 2007; Van Cappellen & Saroglou, 2012). The present research also sheds light on how a person might react, when feeling awe, to more mundane occurrences such as losing material possessions, which opens up more avenues for the practical use of awe experiences in everyday lives.

As our research focus was on validating the buffering effect of awe, we did not offer predictions as to how awe

**Table 1.** HLM Poisson analysis predicting troubledness from awe and other positive emotions as a function of loss.

	<i>b</i>	SE	Exp( <i>b</i> )	95% CI, Exp( <i>b</i> )	<i>b</i>	SE	Exp( <i>b</i> )	95% CI, Exp( <i>b</i> )
	Full model				Reduced model			
Awe	.01	.01	1.01	.99, 1.02				
Happiness	.00	.01	1.00	.99, 1.01				
Gratitude	.00	.010	1.00	.99, 1.01				
Contentment	.00	.00	1.00	.98, 1.02				
Serenity	.02*	.01	1.02	1.00, 1.03	.00	.01	1.00	.99, 1.01
Loss	1.29***	.11	3.64	2.92, 4.54	1.26***	.11	3.53	2.83, 4.42
Awe × Loss	−.17*	.08	.84	.72, .99	−.19*	.08	.83	.70, .98
Happiness × Loss	−.05	.05	.95	.86, 1.05				
Gratitude × Loss	.15**	.06	1.16	1.04, 1.29	.07	.07	1.07	.93, 1.23
Contentment × Loss	.00	.06	1.00	.89, 1.12				
Serenity × Loss	−.11	.07	.90	.79, 1.02				

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



compares with other positive emotions, and thus examined them in an exploratory fashion. We suggest that the unique property in awe in reducing loss-driven negative affect specific to the context of our studies, may be due to the association between awe and diminished focus on the self (Piff et al., 2015; Shiota et al., 2007). The value of personal possessions is dependent on its association with the self (Ferraro et al., 2011). To the extent that awe diminishes the perceived importance of the self, it may help buffer against the distress resulting from losing a possession. Hence, awe may be unique in reducing the impact of negative situations that specifically implicate self-identity. In contrast, research has not demonstrated a strong relationship between happiness, contentment, gratitude, and serenity and reduced self-focus. Hence, whether these positive emotions could buffer against such situations of possession loss have been unknown and our research suggests some could not. Further, although research has found that positive emotions can enhance coping with stress (Seligman, Steen, Park, & Peterson, 2005), it is not particularly clear whether the various positive emotions would exact similar or different effects on different types of stressors. The current finding advocates the need for systematic examination on the differentiated effects individual positive emotions have on specific types of negative events.

Some limitations should be mentioned, along with other future directions. First, the awe examined in Studies 1 and 2 were specifically elicited by nature, and it is unknown if other forms of awe (etc. cognitive, religious) may have differing effects on loss. The effect of awe on other forms of self-related loss may be of future interest as well, as it is not clear how awe may influence responses to intense personal loss, such as the death of a loved one. Awe might also insulate the person from the negative impact of these forms of loss, considering that coping with them requires a greater dependency on a higher power and acceptance of the situation (Prigerson & Maciejewski, 2008; Walsh, King, Jones, Tookman, & Blizard, 2002) and awe has been found to enhance such dependency (Valdesolo & Graham, 2014).

Second, while we demonstrate that awe and happiness (Studies 1 and 2) alleviates negative affect compared to an emotionally neutral condition, this reduction can be due to a direct intervention on participants' reaction towards possession loss, or a global rise in positive affect. For the former, the negative affect arising from possession loss is dampened; participants do not feel as negatively towards the loss as those from the neutral condition. For the latter, the prior experience of awe or happiness generates positivity regardless if a loss has occurred. We encourage future research to include a no-loss comparison condition to address this limitation. Having a no-loss condition may explicate the alleviation of negative affect; whether the

reduction in negative affect during loss is similar to no loss (global positivity), less during loss (nullifying effect) or more during loss (functional effect).

Last, the time window of Study 3 could have been larger to increase the probability of capturing awe and loss experiences, both of which, as expected and found in this research, are rare. The low natural co-occurrence of awe experiences and possession loss may limit the external validity of our findings. Future research may examine other more common forms of self-related loss such as failure (e.g. academic, financial) or distress such as daily stressors. In addition, as induced awe has buffering effects in Studies 1 and 2, there is benefit in intentionally seeking awe experiences (e.g. short weekend trips to the countryside), especially when such experiences seldom come by on its own.

Relatedly, the temporality of awe experiences in relation to loss experiences influences its practical usage in alleviating distress. While awe has a buffering effect when experienced before a loss, awe may also have restorative effects when experienced after a loss. The current findings support the former, and we encourage individuals to engage in awe experiences in good times to build up resources in case of future loss or hardship. However, additional research is required to explore if the induction of awe after loss alleviates negative affect, especially for individuals who are currently experiencing the loss. Research in this direction can open further avenues for awe in therapeutic interventions, such as the aftermath of natural disasters or bereavement.

In conclusion, we evidenced the buffering effect of awe and show that it has practical utility for everyday occurrences, such as the loss of personal artefacts. The potential therapeutic function in awe has been rather ignored and more research is needed to further understand how awe enhances coping with various negative circumstances and building resilience.

## Disclosure statement

No potential conflict of interest was reported by the authors.

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