OPENNESS TO EXPERIENCE AND AWE: EXAMINATION OF DISPOSITIONAL TENDENCIES, LABORATORY INDUCTION, AND DAILY LIFE EXPERIENCES

by

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ABSTRACT

Prior research has demonstrated a robust association between positive affect and the personality factor extraversion, and parallel findings consistently link negative affect and Neuroticism, but few studies have explored the personality correlates of various lower order discrete emotions. In separate samples of college and community adults, we conducted experimental induction (N = 248) and experience sampling (N = 58) studies to explore the personality correlates of awe. We hypothesized that among five-factor personality domains, openness to experience would be associated with awe most consistently and that the aesthetic component of openness would account for significant variance in these associations. Results showed that higher openness was significantly related to higher experimentally induced awe ratings as well as dispositional awe proneness, and marginally associated with awe frequency in daily life. The aesthetic component of openness was consistently associated with several awe outcomes. Interestingly, agreeableness emerged as a significant, positive predictor of awe across multiple analyses. We discuss implications of these findings, explore possible explanations for the agreeableness associations, and propose future directions for awe and openness research.

To my son Oliver, whose birth and life have reacquainted me with awe,
and to my wife, MaryAnn, whose continual patience is awe-inspiring.

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INTRODUCTION

Personality is typically defined as an individual's characteristic style of thinking, feeling, and behaving (Allport, 1937). Thus, personality factors should each be associated with particular variations in affective experience. Personality traits and many affective patterns remain stable across the life span, and both personality and affect are highly related to well-being and happiness (Costa & McCrae, 1980; Costa, McCrae, & Zonderman, 1987). Personality traits have also been shown to predict affective patterns associated with some forms of psychopathology (e.g., Watson & Naragon-Gainey, 2014). In light of these connections, linking personality traits with characteristic affects not only refines personality theory, but may lead to improved risk-factor detection, prevention, and intervention for issues related to personality, affect, or both.

The five-factor model is a widely accepted trait taxonomy of personality (Digman, 1990) with well validated measures (e.g., Costa & McCrae, 1992). The five factors are typically labeled extraversion, neuroticism, openness to experience, agreeableness, and conscientiousness. With respect to characteristic affects, extraversion and neuroticism are consistently, robustly associated with broad positive affect (PA) and negative affect (NA), respectively (Costa & McCrae, 1980; Watson & Clark, 1992). Watson and Clark's (1992) analyses of both affect and personality at a more granular level revealed additional associations. Within the broad factors, they found that the constituent lower order facets of neuroticism and extraversion varied in the strength of

their correlation with PA and NA. They also found that specific lower order positive and negative affects had unique associations with personality: higher conscientiousness was associated with higher levels of the positive affect *attentiveness*, low agreeableness was related to higher affective *hostility*, and high agreeableness was related to the positive affect *joviality* (as was extraversion).

The characteristic affective associations of openness to experience are not well understood, but it has been hypothesized that openness is related to the experience of *awe* (Keltner & Haidt, 2003; McCrae, 2007; Wild, Kuiken, & Schopflocher, 1995). Preliminary empirical evidence supports this view (Shiota, Keltner, & John, 2006). Theoretical and empirical perspectives on openness (DeYoung, 2015; DeYoung, Peterson, & Higgins, 2005; McCrae & Costa, 1997) and awe (Keltner & Haidt, 2003; Rudd, Vohs, & Aaker, 2012; Shiota, Keltner, & Mossman, 2007) suggest functional similarity since both seem to facilitate information acquisition through exploration of novel and complex stimuli.

Openness to Experience

Openness to experience eludes succinct description, but its general function is thought to be facilitation of cognitive exploration (see DeYoung, 2015 for review). McCrae and Costa (1997) state that "Openness is seen in the breadth, depth, and permeability of consciousness, and in the recurrent need to enlarge and examine experience" (p. 826). DeYoung, Peterson, and Higgins (2005) emphasize distinct motivational and cognitive components of openness (reflected in their use of the alternate label “Openness/Intellect”). Specifically, high-open individuals generally (a) take interest

in novel, diverse stimuli and experiences and (b) have a complementary capacity to incorporate, assimilate, and/or accommodate high volumes of information derived from those stimuli and experiences. McCrae and Costa (1997) have similarly proposed that experience seeking and cognitive consolidation complement one another in openness as broad experiences facilitate forming adaptive behavioral strategies.

High-open individuals tend to tolerate ambiguity and form remote and obscure cognitive associations more readily than low-open individuals (McCrae, 2007). Higher openness is associated with the tendency to seek out aesthetic experiences (e.g., art, music, literature) and to report having chills, feeling moved or touched, and experiencing absorption or transcendence in response to those stimuli (Silvia & Nusbaum, 2011). Indeed, chill response to aesthetic stimuli is one of the strongest correlates of overall openness (McCrae, 2007).

Openness has implications for physical and mental health outcomes through at least one important pathway—stress response and regulation. Williams et al. (2009) found that openness moderated emotional and physiological reactivity to a laboratory stressor. High-open individuals showed a slight increase in parasympathetic activity as measured by high frequency heart rate variability (HF-HRV) and less blood-pressure reactivity than low-open individuals, who showed greater increases in blood pressure and parasympathetic withdrawal. Interestingly, higher levels of openness predicted an increase in self-reported PA and the specific positive affect *attentiveness* during the stressor. Openness also moderated the association between life stress and sleep quality: Low-open individuals evidenced a significant association between stressful events and

poor sleep quality, whereas high-open individuals showed no association. Importantly, component-level analyses indicated that the aesthetic component of openness was central to both physiological reactivity and increases in positive affect, as well as moderation of the stress-sleep association, suggesting that emotional processes related to aesthetic experience may have a stress buffering effect.

This pattern of effects was corroborated in a study by Schneider, Rench, Lyon, and Riffle (2012), who also found evidence for a distinct affective response (higher positive affect and lower negative affect) in high-open individuals relative to low-open individuals responding to a stressor. This association was mediated by lower threat appraisal in high-open participants during the stressor (Schneider et al., 2012). Considering these links between openness and affective processes in stress regulation, further clarification of the state and trait-like affective correlates of openness is warranted.

Awe

Keltner and Haidt's (2003) conceptual model of awe has informed recent empirical explorations of this affective experience. Noting common themes in philosophy, religion, literature, sociology, and psychology, they describe awe as a distinctive emotional response to perceiving a stimulus that is *vast* and requires *accommodation*. Vastness may connote impressive physical size (e.g., a mountain vista or panoramic landscape), conceptual expansiveness (e.g., a grand idea or concept), forceful or powerful attributes (e.g., a thunderstorm or tornado), or some combination of these. Accommodation involves reconfiguring a cognitive set or schema when new information

cannot be assimilated into current schemata (Fiedler, 2001).

Empirical findings support awe as a distinct affective state and confirm the central features of awe-inducing stimuli. Two studies associated awe with a unique facial expression relative to other emotions, including surprise (Campos, Shiota, Keltner, Gonzaga, & Goetz, 2013; Shiota, Campos, & Keltner, 2003). Campos and colleagues (2013) found that individuals' descriptions of past awe experiences contained a unique *core relational theme* that differentiated awe from other positive emotions—specifically, individuals emphasized feeling small in relation to the environment or another person and sensing that their current worldview was being challenged. Shiota and colleagues (2007) speculated that individuals in Western societies are likely to encounter awe-inducing stimuli most frequently in the form of large or impressive natural objects or environments. They found that pictures of natural beauty elicited awe reliably in multiple studies (Shiota et al., 2007; Shiota, Neufeld, Yeung, Moser, & Perea, 2011). Others have demonstrated successful awe induction through prompted recall of natural beauty (Van Cappellen & Saroglou, 2012), using film clips of natural scenes (Valdesolo & Graham, 2014), and through in vivo exposure to natural environments (Piff, Dietze, Feinberg, Stancato, & Keltner, 2015).

Functional studies of awe suggest that it facilitates acquiring knowledge from information-rich stimuli in three ways. First, awe temporarily decreases self-focused attention and promotes stimulus-focused attention. In three experiments, manipulating awe was shown to reduce impatience and expand perceptions of available time (Rudd et al., 2012), effects which may promote careful attention to stimuli and facilitate cognitive exploration. In a college sample, participants' narrative descriptions of awe-inducing

experiences reflected diminished self-focus and increased attention to stimuli (Shiota et al., 2007). Attenuated self-focus is also central to findings from Piff and colleagues (2015), who demonstrated that dispositional awe, as well as experimentally manipulated awe, are associated with decreased self-focus and sense of entitlement. Piff and colleagues (2015) also observed evidence in support of a second function of awe: increasing a sense of interdependence with the broader environment. Experimental awe induction increased participants' generosity and ethical decision-making in hypothetical scenarios and games, as well as participants' engagement in prosocial behavior in a contrived opportunity to help. At the dispositional level, individuals who report higher awe proneness tend to identify greater numbers of universalistic—as opposed to individualistic—markers of self-concept (Shiota et al., 2007). Lastly, awe is associated with identifying patterns in and deriving meaning from experiences. Relative to general positivity, laboratory-induced awe increases self-transcendent spiritual orientation, belief in the supernatural, and tendency to perceive agency or intention in random patterns or events (Saroglou, Buxant, & Tilquin, 2008; Valdesolo & Graham, 2014; Van Cappellen & Saroglou, 2012). Importantly, the relationship between awe and increased spiritual orientation and belief was mediated by increased affective discomfort with ambiguity in the awe condition relative to the positivity condition in two separate experiments (Valdesolo & Graham, 2014).

Among positive emotions, awe may play a special role in promoting mental and physical health and/or buffering against illness. Rudd et al. (2012) found that awe induction enhanced participants' sense of well-being by expanding their perception of available time. Stellar et al. (2015) found that, among positive affects, awe is uniquely

associated with one marker of health—proinflammatory cytokines—beyond the associations observed for general PA or other specific positive affects. Participants with higher dispositional awe and those that reported experiencing more awe on the day of the study were found to have lower levels of proinflammatory cytokines, which facilitate inflammatory immune responses that are adaptive for fighting infection but can be harmful when chronically elevated. Having lower levels of proinflammatory cytokines can therefore be interpreted as a marker of better health and/or a buffer against poor health.

Researchers have yet to demonstrate whether dispositional awe proneness and momentary experiences of awe represent distinct, overlapping, or unified constructs. Although some evidence suggests common underlying processes, other findings suggest divergent effects of dispositional awe versus momentary experience. For example, whereas momentary manipulations of awe increase affective discomfort with ambiguity, high dispositional awe proneness has been associated with *low* baseline need for cognitive closure—a broader measure that includes ambiguity intolerance (Shiota et al., 2007). Over time, awe-prone individuals may become more comfortable with revising and updating cognitive structures to accommodate new information (Valdesolo & Graham, 2014). Importantly, explorations of awe have not differentiated clearly between intensity and frequency of individuals' awe experiences. It remains an empirical question whether awe-prone individuals experience awe more profoundly, more frequently, or both.

Studies of momentary and dispositional awe suggest that awe may be uniquely related to openness, and one study offers empirical support for this hypothesis. Shiota

and colleagues (2006) found that dispositional awe proneness correlated more highly with openness than with the other personality traits of the five-factor model and that openness correlated more highly with dispositional awe proneness than with seven other positive emotion dispositions.

The Current Research

We sought to clarify associations between openness and awe across two studies: a laboratory induction study of response to an aesthetic stimulus (Study 1) and an experience sampling study of awe in daily life (Study 2). In both studies, we explored the association between awe and openness generally, as well as the specific association of the aesthetic facet of openness with awe. We also tested associations of openness and its facets with dispositional awe proneness. We expected that openness would predict ratings of awe more consistently than other personality factors, that openness would be more consistently associated with awe than with other positive emotions, and that these associations would be largely driven by the Aesthetics facet of openness.

In Study 1, we hypothesized that higher openness would be associated with higher ratings of awe following an aesthetic film clip, that higher openness would be significantly associated with higher dispositional awe proneness, and that the Aesthetics facet of openness would explain a significant amount of the variance in both outcomes. In Study 2, we predicted that higher openness would be associated with greater *frequency* and *intensity* of awe experiences in daily life. We also predicted that variation in the aesthetic aspect of openness would explain significant variance in awe ratings. Given the preliminary nature of these hypotheses, we did not make specific predictions about the

associations of other personality factors with awe. We did expect that openness would be the most consistent personality predictor of awe experiences.

STUDY 1

Method

Participants. Two hundred seventy-seven adults between 18 and 44 participated in Study 1 (mean age = 23; *SD* = 5.01; 63% female). Most participants (88%) reported their ethnicity as non-Hispanic, 9% identified as Hispanic, and 3% did not report ethnicity. Most of the sample (81%) identified as White, 8% identified as Asian, 2% as Black or African American, 2% as Native Hawaiian or Pacific Islander, 1% as American Indian or Alaska Native, and 6% did not report race. Participants were recruited through the Psychology Department participant pool at the University of Utah (*n* = 263) and fliers posted around campus and the surrounding community (*n* = 13). Students recruited through the participant pool received 3 hours of research participation credit. Those who responded to a flier were entered in a drawing for a gift card to an electronics store. The only inclusion criterion was that participants be over the age of 18. Participants were excluded who had a history of seizures or other neurological issues that could be affected by 3D technology.

Measures. Personality was measured using the NEO Personality Inventory-Revised and NEO-Five-Factor Inventory (NEO-PI-R and NEO-FFI; Costa & McCrae, 1992)**.** Both the NEO-FFI and the NEO-PI-R have demonstrated high internal consistency and convergent and discriminant validity. Participants completed all 48 Openness to Experience items from the full NEO-PI-R so that associations could be

examined at the facet level. Neuroticism, extraversion, agreeableness, and conscientious were assessed using the NEO-Five-Factor Inventory (NEO-FFI; Costa & McCrae, 1992).

Emotion ratings were obtained with a modified version of the Differential Emotions Scale (DES; Izard, Dougherty, Bloxom, & Kotsch, 1974; McHugo, Smith, & Lanzetta, 1982; Schaefer, Nils, Sanchez, & Philippot, 2010)**.** The version of the DES we used was modified first by McHugo et al. (1982), then by Schaefer et al. (2010), and has been used in multiple subsequent studies of discrete emotions (e.g., Schaefer et al., 2003; Schaefer & Philippot, 2005). The scale consists of 15 items, each describing an emotion state using one to three adjectives (e.g., “interested, concentrated, alert,” “moved”). Respondents are instructed to rate the extent to which they have experienced each emotion state during the time period specified on a 7-point scale (1 = “I did not feel this emotion at all” and 7 = “I felt this emotion very intensely”). An additional affect item (“a sense of awe”) and two binary response items related to awe (“Did you feel a shiver or chill down your spine?” and “Did you feel goosebumps?”) were appended to this scale. In addition to item-level analyses, we calculated positive and negative affective composites (PA; NA) per Schaefer et al. (2010). Cronbach’s alpha was .8 for both PA (5 items) and NA (7 items) composites derived from baseline affect ratings. Alphas for PA and NA in response to the aesthetic film clip were .89 and .74, respectively.

Dispositional awe proneness was measured using two items previously used by Shiota and colleagues (2006): "I often feel awe," and "I feel wonder almost every day." Two additional items reflecting dispositional response to aesthetic stimuli were also included: "I often feel a sense of awe in response to art, nature, or music," and "I sometimes feel a connection to something greater than myself in response to art, nature,

or music." All items were rated on a 1 (“Strongly Disagree”) to 5 (“Strongly Agree”) scale. Cronbach's alpha for the dispositional awe items was .80, supporting the analysis of the items as a composite. We therefore summed and averaged the four dispositional awe items to create a composite dispositional awe score.

Procedure. Study procedures were completed in a comfortable, sound attenuated room. After providing informed consent, the participant completed a baseline affect rating indicating how intensely he or she had experienced each state on the DES during the preceding 24 hours. An experimenter attached physiological electrodes to the participant, dimmed the room lights, and instructed the participant to sit quietly during a 5-minute resting baseline. The participant then viewed three emotional film clips, each followed immediately by emotion ratings on the DES. The DES was displayed on the same screen as the film stimuli and participants used a computer mouse and keyboard to respond. Each subsequent film clip was preceded by a 90-second recovery/baseline period. During each baseline, large plain text was displayed on the screen to instruct participants to sit quietly but remain awake. Each study participant viewed an aesthetic film clip consisting of a panning out vista scene of the Grand Canyon (taken from the film *Grand Canyon Adventure: River at Risk*). Each participant also viewed two additional film clips, each selected randomly from a set of four. The additional film clips and their target emotions were *The Polar Express* (thrill/excitement), *Despicable Me* (amusement), *My Bloody Valentine* (fear), and *Tangled* (sadness). Examination of awe response to alternate clips allowed for confirmation of awe induction in the aesthetic film clip. Film clips were played from a Samsung BD-6900 Blu-ray 3D player and displayed on a Samsung UNC55C7000 55-inch 3D television. The viewing room was 112.5 inches by 104 inches

and participants were seated approximately 6 feet from the display.

Results

Preliminary analyses. Of the original sample, 14 participants were screened out and excluded from analyses via validity checks embedded in the self-report measures or due to noncompliance with the study protocol. Due to equipment malfunctions, 15 additional participants either did not see the film stimuli or did not complete self-report personality measures and were therefore excluded from analyses. The final sample of 248 participants had a mean age of 22.88 (*SD* = 4.93), and consisted of 98 males (39.5%) and 150 females (60.5%). All variables of interest were inspected to ensure assumptions of regression were met. No data transformations were conducted prior to analyses. Descriptive statistics for Study 1 variables are found in Table 1.

Manipulation check. We tested the effectiveness of the aesthetic film clip as an awe-inducing stimulus by using *t*-tests to compare change in awe ratings from baseline for all film clips. Only the aesthetic clip significantly increased ratings of awe from baseline. Table 2 summarizes these analyses.

Hypothesis tests related to NEO personality factors. To test associations between personality and affect, we first calculated bivariate correlations of NEO factors with baseline affect (i.e., participant-estimated ratings of prior 24-hour period). For affect ratings in response to film clips, we calculated partial correlations of each factor with affect ratings for each film clip (i.e., controlling for the appropriate baseline affect). In these analyses, we explored ratings of awe and composite NA and PA. Factor-level correlations for Study 1 are presented in Table 3.

Table 1.
Study 1 Descriptive Statistics

	N [a]	Possible Range	Observed Range	Mean (*SD*)
NEO Factors				
Neuroticism	248	0-48	1-43	18.56(8.62)
Extraversion	248	0-48	8-45	31.91(6.14)
Openness to Experience	248	0-192	74-178	125.61(18.78)
Agreeableness	248	0-48	16-46	34.67(5.68)
Conscientiousness	248	0-48	13-47	33.83(6.25)
NEO Openness Facets				
Fantasy	248	0-40	3-32	19.65(5.43)
Aesthetics	248	0-40	6-32	20.42(6.25)
Feelings	248	0-40	11-32	23.78(4.57)
Actions	248	0-40	8-28	17.57(3.13)
Ideas	248	0-40	8-32	22.09(5.47)
Values	248	0-40	12-28	22.10(3.56)
Dispositional Awe Composite	247	0-5	1.5-5	3.55(.87)
Awe Ratings				
Baseline	247	1-7	1-7	2.91(1.57)
Grand Canyon (awe)	122	1-7	1-7	4.44(1.91)
Polar Express (excitement)	125	1-7	1-7	2.71(1.79)
Despicable Me (amusement)	121	1-7	1-7	2.04(1.48)
My Bloody Valentine (fear)	119	1-7	1-6	1.58(1.16)
Tangled (sadness)	247	1-7	1-7	2.55(1.68)
PA Composite				
Baseline	247	5-35	5-34	23.23(5.19)
Grand Canyon (awe)	247	5-35	5-35	20.13(7.06)
Polar Express (excitement)	122	5-35	5-29	16.86(5.95)
Despicable Me (amusement)	125	5-35	6-35	21.54(5.99)
My Bloody Valentine (fear)	121	5-35	5-30	8.79(4.54)
Tangled (sadness)	119	5-35	5-32	16.03(6.05)
NA Composite				
Baseline	247	8-56	9-47	21.40(6.30)
Grand Canyon (awe)	247	8-56	8-26	12.37(2.66)
Polar Express (excitement)	122	8-56	9-30	17.9(4.25)
Despicable Me (amusement)	125	8-56	9-25	13.15(2.58)
My Bloody Valentine (fear)	121	8-56	10-42	24.56(7.63)
Tangled (sadness)	119	8-56	10-42	18.47(6.32)

Note: [a] Sample sizes differed across film clips due to the design of the study.

Table 2. *Study 1 t-tests of Awe Induction*

	Mean Awe Rating(*SD*)		***t*-test**
	Past 24 hours[a]	Postclip	
Grand Canyon	2.91(1.58)	4.47(1.90)	11.96***
Polar Express	2.66(1.48)	2.75(1.80)	0.50
Despicable Me	3.06(1.58)	2.01(1.45)	-7.02***
My Bloody Valentine	2.96(1.59)	1.58(1.16)	-9.75***
Tangled	2.95(1.62)	2.54(1.69)	-2.44*

Note: [a] Baseline affect ratings were collected before any stimuli were presented. Hence, differences in baseline awe ratings represent differences due to random error in group composition.
* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

Table 3. *Correlations of NEO Factors, Affect Ratings in Study 1.*

	NEO Factors				
	O	N	E	A	C
Awe					
Baseline	.19**	-.11	.15*	.03	.04
Grand Canyon (awe) [a]	.20**	-.03	.10	.18**	-.03
Polar Express (excitement) [a]	.13	-.07	.04	.21**	.11
Despicable Me (amusement [a]	-.13	.01	.03	.05	.01
My Bloody Valentine (fear) [a]	.05	.12	-.07	.01	-.09
Tangled (sadness) [a]	.13	.10	.05	.02	-.01
Positive affect					
Baseline	.20**	-.30***	.41***	.21**	.16*
Grand Canyon (awe) [a]	.20**	.09	.07	.04	.03
Polar Express (excitement) [a]	.09	-.09	.17	.19*	.04
Despicable Me (amusement [a]	.06	.06	.19*	.25**	.08
My Bloody Valentine (fear) [a]	.03	.07	.02	-.01	-.03
Tangled (sadness) [a]	-.11	-.11	.22*	.21*	.12
Negative Affect					
Baseline	.01	.29***	-.13*	-.13*	-.13*
Grand Canyon (awe) [a]	.14*	-.01	.02	.08	.01
Polar Express (excitement) [a]	.15	.05	.30***	.09	.15
Despicable Me (amusement [a]	.03	-.03	.15	.13	.08
My Bloody Valentine (fear) [a]	.11	.02	.16	.23*	.05
Tangled (sadness) [a]	.12	.14	.01	.09	-.08
Dispositional Awe	.62**	.04	.19**	.13*	-.01

Note: O = Openness, N = Neuroticism, E = Extraversion, A = Agreeableness, C = Conscientiousness.
[a] Partial correlation controlling for appropriate baseline affect rating.
* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

Openness was positively associated with baseline awe and PA, as well as with awe, PA, and NA responses to the aesthetic clip—the stimulus of primary interest. Extraversion showed significant positive correlations with baseline awe, PA, and NA, but it was not significantly associated with awe response to any film clips (whereas there were multiple significant correlations between Extraversion and PA/NA for other clips). Agreeableness was significantly, positively associated with awe ratings for the aesthetic clip and the excitement clip but not with baseline awe. Multiple PA/NA associations with other film clips were significant for Agreeableness.

We conducted several follow-up regressions to clarify relationships between the personality factors and affect variables. Since Openness and Agreeableness were each associated with baseline composite PA in addition to awe ratings for the aesthetic clip, we sought to differentiate awe prediction from associations with PA generally.[1] We calculated separate regressions with Openness and Agreeableness each in turn predicting awe ratings for the aesthetic clip while controlling for baseline PA in addition to baseline awe. Both personality factors continued to predict awe even when controlling for baseline PA (Openness, $B = .02$, $\beta = .18$, $p = .004$; Agreeableness, $B = .04$, $\beta = .15$, $p = .02$).

To explore the independent influences of Openness and Agreeableness on awe ratings, we performed a regression with baseline awe, Agreeableness, and Openness predicting awe ratings for the aesthetic clip. Both Openness ($B = .02$, $\beta = .18$, $p = .003$.)

[1] The composite PA variable in Study 1 did not include awe. Nevertheless, given that the evidence favors a conceptualization of awe as one of several discrete positive emotions (see, e.g., Campos et al., 2013; Shiota et al., 2014), we felt it was important to ensure that the association between awe and personality was not accounted for by associations with broad band PA.

and Agreeableness (B = .05, β = .16, p = .007) retained significant associations with awe.

Hypothesis tests of Openness facets. We also tested associations between the facets of Openness and ratings of awe, PA, and NA using bivariate and partial correlations (facet-level correlations are reported in Table 4). Aesthetics—the facet we hypothesized would most consistently predict awe ratings—showed significant positive correlations with baseline awe and PA, as well as awe, PA, and NA in response to the aesthetic film clip (but no other film clips). The Feelings facet was positively associated with baseline awe and PA, awe in response to the sadness clip, and NA and PA for multiple other clips. The Actions facet was associated positively with awe, PA, and NA in response to the aesthetic clip but was also associated with PA in response to the excitement clip. The Ideas facet was associated with awe at baseline and NA in response to the aesthetic clip.

Testing associations with dispositional awe proneness. Bivariate correlations of dispositional awe proneness with NEO factors revealed significant positive associations with Openness, Extraversion, and Agreeableness (see Table 4). Both Openness and Extraversion remained significant predictors in a simultaneous regression of Openness and Extraversion predicting dispositional awe (Openness, B = .03, β = .60, p < .001; Extraversion, B = .02, β = .14, p = .01). All facets of Openness except for Values were significantly, positively associated with dispositional awe in bivariate correlations (Table 4).

Table 4. *Correlations of Openness Facets, Affect Ratings in Study 1*

	Facets of Openness to Experience					
	1	**2**	**3**	**4**	**5**	**6**
Awe						
Baseline	.12	.24***	.16*	.06	.14*	-.05
Grand Canyon (awe)	.11	.20**	.09	.20**	.11	.06
Polar Express (excitement)	.12	.06	.06	.15	.12	.01
Despicable Me (amusement)	-.01	-.13	-.12	.08	-.13	-.16
My Bloody Valentine (fear)	.11	.02	-.04	.05	.01	.05
Tangled (sadness)	.19	.11	.24**	.03	-.04	.01
Positive Affect Composite						
Baseline	.13*	.17**	.28***	.12	.07	-.01
Grand Canyon (awe)	.04	.25***	.19**	.17**	.04	.09
Polar Express (excitement)	.07	.04	.08	.11	.02	.08
Despicable Me (amusement)	.01	.10	.20*	.08	-.14	.02
My Bloody Valentine (fear)	.16	-.06	.02	.06	-.03	.01
Tangled (sadness)	-.22*	-.05	.07	-.08	-.12	.01
Negative Affect Composite						
Baseline	.05	-.03	.01	-.01	.06	-.12
Grand Canyon (awe)	.04	.15*	.07	.14*	.15*	-.01
Polar Express (excitement)	.18*	.05	.20*	.26**	-.08	.05
Despicable Me (amusement)	-.03	.06	.09	.15	-.01	-.15
My Bloody Valentine (fear)	.08	.14	.20	.16	-.10	.01
Tangled (sadness)	.07	.14	.20*	.09	-.06	.01
Dispositional Awe	.40***	.60***	.49***	.39***	.39***	.01

Note: 1 = Fantasy, 2 = Aesthetics, 3 = Feelings, 4 = Actions, 5 = Ideas, 6 = Values
* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

Study 1 Discussion

Study 1 results support the hypothesis that openness to experience is the most consistent and specific five-factor personality correlate of awe experiences. Openness was the only NEO factor to be associated with awe ratings at baseline and during the awe-targeting film clip but not associated with awe, PA, or NA during nontarget film clips. Unexpectedly, NEO Agreeableness was associated with awe ratings during the target clip; however, the pattern of associations was not as specific as for Openness—

higher Agreeableness was also associated with higher ratings of awe during the excitement film clip, higher PA during the excitement, amusement, and sadness clips, and greater NA during the fear clip.

Nevertheless, a possible association between agreeableness and awe warrants further consideration, and one limitation of Study 1 may be relevant. Although the film clip used to elicit awe focused on an aesthetically rich natural scene, the film segment included the voice of a narrator, video of people experiencing the nature scene, and background music featuring prominent vocals. Inclusion of these human elements may have increased the influence of agreeableness in predicting awe responses, especially given the known association between agreeableness and greater collectivist tendencies (e.g., Koole, Jager, van den Berg, Vlek, & Hofstee, 2001). In future experimental inductions of awe, researchers ought to test whether certain features of awe-inducing stimuli (e.g., the presence or absence of people) influence the strength of awe responses, and/or the associations between personality variables and awe responses.

An additional possible limitation of Study 1 is a somewhat idiosyncratic measure of baseline affect. Instead of instructing participants to rate their current emotions just prior to viewing the stimuli, we instructed participants to rate the extent to which they had experienced each emotion during the preceding 24 hours. Because of this, each participant's baseline affect ratings may have differed more of less from his or her emotional experience at the time of rating. Whereas controlling for baseline affect is often understood as a way of isolating changes that are due to the presentation of a stimulus, in this case, the interpretation is less clear. This may be partially responsible for the surprising pattern of ratings for PA and NA composites—composite ratings of PA

were higher at baseline than during any of the film clips, and only the fear-inducing clip had higher NA ratings than baseline NA. This in turn may explain certain surprising associations among personality and affect variables, such as NEO Extraversion predicting greater NA during the excitement-targeting film clip.

STUDY 2

Method

Participants. Participants were recruited from undergraduate psychology courses and the greater Salt Lake City community, and included 79 healthy adults (32% male; mean age = 27 years, *SD* = 6.5). Most participants (91%) were Caucasian, with 5% Asian Pacific and 4% Other. Participants were excluded if not 20-45 years old; primary language not English; had symptoms indicative of clinical insomnia; had visual impairments that could interfere with reading or computerized tasks; were pregnant; currently used tobacco; had history of brain trauma, seizures, brain tumor, stroke or aneurysm, brain surgery, heart surgery, Multiple Sclerosis, major orthopedic surgery, hypertension, pulmonary disorder, or renal failure; or currently using cardiovascular, neuroleptic, or hypnotic medications (e.g., beta blockers).

Procedure. Following informed consent and eligibility screening, participants completed a computerized self-report battery in the lab. Starting at least 1 day later, participants completed 2 consecutive days of affect ratings acquired through portable electronic device. Participants then returned laboratory equipment and were debriefed. Participants were reimbursed for study participation; undergraduate students received 5 research credits and $50 and community participants received $100.

Measures. Personality was measured using the NEO Personality Inventory-Revised (NEO-PI-R; Costa & McCrae, 1992)**.** The NEO-PI-R is a well validated measure

of five-factor model personality traits with high internal consistency and convergent and discriminant validity. The NEO-PI-R consists of 240 likert-style items rated on a 5-point scale from "Strongly Disagree" to "Strongly Agree." Six facets of each factor are also assessed. The six assessed facets of Openness to Experience are Fantasy, Aesthetics, Feelings, Actions, Ideas, and Values.

The frequency and intensity of various affective states were assessed via an experience sampling diary on preprogrammed PalmPilots. A total of 21 affective descriptors were presented using the stem question “On a scale from 1 to 5, how _____ do you feel right now?” (1 = "not at all,” 5 ="very much"). Participants were prompted approximately once per hour between 8am and 9pm (i.e., 14 times per day). Item order was randomized to reduce careless or overlearned responding. Participants were encouraged to respond to as many prompts as possible but were also given the option to skip a prompt if unable to respond. Affect items were grouped according to their putative valences and arousals per Russell’s (1980) affective circumplex. Composite scales included negative valence/high arousal (i.e., stressed, tense, angry, worried, upset, nervous); negative valence/low arousal (i.e., sad, lethargic, bored, depressed, distractible, fatigued), positive valence/high arousal (i.e., excited, elated, in awe, sense of wonder), and positive valence/low arousal (i.e., relaxed, calm, serene, contented, happy) as well as total positive affect (PA) and negative affect (NA). Cronbach’s alpha’s for the composite scales were .90 for high arousal/positive valence, .83 for low arousal/positive valence, .96 for high arousal/negative valence, .89 for low arousal/negative valence, .87 for total PA, and .95 for total NA. We calculated a separate PA composite that did not include awe since we were interested in associations of personality factors with awe and PA

differentially. Cronbach's alpha for this composite was .85.

Results

Sample characteristics. We conducted analyses only on participants who responded to the awe item on at least three prompts across both days of sampling (final *N* = 55; 36 female; *M* age = 27.3, *SD* = 6.24; 91% White/Caucasian, 7% Asian, 2% did not report race). Descriptive statistics for all Study 2 variables are provided in Table 5.

Hypothesis tests. We tested associations between NEO factors and awe frequency and intensity in daily life using bivariate correlations (reported in Table 6). Contrary to our hypothesis, Openness was not significantly associated with the average intensity of reported awe (mean awe rating across all prompts), whereas higher Agreeableness was associated with greater reported awe intensity. To test correlations between Openness and awe frequency in daily life, we calculated a dichotomous version of each awe rating in which scores of 1 ("not at all") were recoded as zero and all scores greater than 1 were recoded as 1. Because participants completed different numbers of prompts, we divided each participant's count for reported awe by the total number of prompts he or she responded to. Correlations of this adjusted frequency variable with NEO factors showed that higher Openness was significantly related to greater frequency of experiencing awe, as was Agreeableness. In a follow-up regression with Openness and Agreeableness entered simultaneously, the Openness association dropped to marginal significance (B = .01, β = .22, p = .10) whereas the Agreeableness association remained significant (B = .006, β = .30, p = .02).

We also calculated correlations of each facet of Openness with both awe intensity

Table 5. *Study 2 Descriptive Statistics*

NEO Factors	*N*	Possible Range	Observed Range	Mean (*SD*)
Neuroticism				
Extraversion	55	0-192	33-143	77.55(21.23)
Openness to Experience	55	0-192	62-159	118.85(20.47)
Agreeableness	55	0-192	77-154	77.55(21.23)
Conscientiousness	55	0-192	69-171	119.35(18.42)
	55	0-192	75-158	122.89(20.62)
NEO Openness Facets				
Fantasy				
Aesthetics	55	0-40	9-29	18.05(4.74)
Feelings	55	0-40	4-27	18.36(5.94)
Actions	55	0-40	12-31	21.53(3.7)
Ideas	55	0-40	9-27	16.75(3.89)
Values	55	0-40	12-31	22.44(5.14)
	55	0-40	16-30	22.89(3.41)
Affect Ratings				
Awe				
Positive/Low Arousal	55	1-5	1-4.56	1.70(.84)
Positive/High Arousal	55	1-5	1.73-3.93	3.00(.53)
PA Total	55	1-5	1-3.69	1.85(.65)
Negative/Low Arousal	55	1-5	1.30-2.50	2.43(.49)
Negative/High Arousal	54	1-5	1.14-4.5	1.85(.62)
NA Total	54	1-5	1-4.69	1.70(.70)

Table 6. *Correlations of NEO Factors, Affect Ratings in Study 2*

	NEO Factors				
	O	N	E	A	C
Awe Intensity	.19	-.08	.19	.35**	.03
Awe Frequency	.27*	-.09	.20	.34*	-.07

Note: O = Openness, N = Neuroticism, E = Extraversion, A = Agreeableness, C = Conscientiousness.

[a] Correlations are controlling for appropriate baseline affect rating.

* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

(mean rating) and frequency. None of the facets of Openness correlated significantly with awe intensity; however, the Aesthetics and Ideas facets were significantly, positively associated with awe frequency. Facet-level associations for Agreeableness with awe showed that the Trust and Altruism facets of Agreeableness were significantly correlated with awe intensity and Trust, Altruism, and Tender-mindedness were significantly correlated with awe frequency. All facet-level correlations from Study 2 are reported in Table 7.

Study 2 Discussion

Results from Study 2 provide modest support for our hypotheses and are consistent with findings from Study 1. Although the relationship between NEO Openness and awe intensity was not significant, greater Openness was significantly associated with more frequent reports of awe. Although the association between Openness and awe frequency was only marginally significant when including Agreeableness in the model, this may have been due to the modest sample size of Study 2. Regardless, these results do reinforce the need to evaluate the role of agreeableness in awe experiences, as NEO Agreeableness was the most consistent predictor of awe intensity and frequency in daily life.

Facet-level analyses supported one of our hypotheses, as the Aesthetics facet was not significantly related to awe intensity but was one of two facets (along with Ideas) which correlated significantly with awe frequency. Associations of Agreeableness facets with awe intensity and frequency may provide meaningful clues to guide further study: Altruism with awe intensity and Altruism and Tender-mindedness with both awe intensity

Table 7. *Correlations of Openness, Agreeableness Facets, Affect Ratings in Study 2*

	Openness Facets					
	O1	**O2**	**O3**	**O4**	**O5**	**O6**
Awe intensity (mean)	-.02	.19	.14	.17	.26	-.06
Awe frequency	.07	.27*	.11	.17	.32*	-.01

	Agreeableness Facets					
	A1	**A2**	**A3**	**A4**	**A5**	**A6**
Awe intensity (mean)	.34*	.16	.41**	.17	.20	.20
Awe frequency	.34**	.18	.32*	.16	.15	.29*

Note: O1 = Fantasy, O2 = Aesthetics, O3 = Feelings, O4 = Actions, O5 = Ideas, O6 = Values; A1 = Trust, A2 = Straightforwardness, A3 = Altruism, A4 = Compliance, A5 = Modesty, A6 = Tender-Mindedness.
* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

and frequency provide face-valid links to some known correlates of awe (e.g., increasing prosocial behavior, diminishing self-focus, increasing universal identifications). Further follow up in a larger sample may clarify lower order associations between openness, agreeableness, and awe.

GENERAL DISCUSSION

Across two studies in different research paradigms, we found qualified support for the hypothesis that openness to experience is uniquely associated with the affective experience of awe. These findings are in line with other empirical work (Shiota et al., 2006) and theoretical conceptualizations (Keltner & Haidt, 2003) connecting openness with awe. We also found evidence that the aesthetic component of openness plays a key role in such associations, highlighting the need to understand how aesthetic experiences and appreciation shape a person's affective responding and health.

Interestingly, agreeableness also emerged as a significant predictor of awe in multiple analyses. This is unexpected given the interpersonal nature of agreeableness and the purportedly asocial nature and effects of awe (e.g., Shiota et al., 2007). Multiple possibilities could account for this pattern of results. It is possible that highly agreeable people are more prone to acquiesce to perceived demands in study design. Future research should explore the role of social desirability and acquiescence in these associations. Another possibility is that awe is not as strictly asocial as early research suggested. Indeed, Keltner and Haidt (2003) suggested that the prototypical experience of awe was experiencing reverence for a powerful other, an idea for which Schurtz et al. (2012) found support. Recent findings also link awe with increased prosocial intentions (Rudd et al., 2012) and behavior (Piff et al., 2015). As noted in the discussion for Study 1, the presence or absence of certain elements in awe-inducing stimuli may differentially

affect personality-awe associations. Moreover, additional study is warranted to specify whether there are various types of awe-eliciting stimuli and if they vary in their effectiveness across populations and contexts.

Further exploration of both openness and agreeableness at the component level will likely reveal important information about the experience of awe and its personality correlates. Importantly, Zhang and colleagues (2014) found evidence that highly agreeable people are more perceptive of beauty in nature. Given the overlap of this effect with the aesthetics component of openness, the presentation of a nature-based awe stimulus may have influenced the outcomes in Study 1. Lastly, additional study of awe and personality in daily life with a larger sample will yield greater confidence in the pattern of results.

Results from the two studies reported here represent an important first step in documenting the consistent personality correlates of awe—a unique and important positive emotion. Findings suggest that openness is indeed the most consistent personality correlate of awe, highlighting the need for replication and deeper exploration of this relationship and its implications. These findings also revealed an unexpected secondary correlate of awe—agreeableness. Follow-up research to understand the nature of this association has important implications for the study of awe and other positive emotions as well as personality theory.

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