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Article

Dynamics of Awe and Mindfulness in Awe Elicitation among Young Adults in Malaysia

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Abstract: Awe is an experience, similar to wonder, that expands one's thoughts and emotions, facilitates the formation of belief systems, and generates significant therapeutic benefits. Researchers continue to call for new ways to elicit significant levels of awe in a lab setting because awe via natural phenomenon is rare, and virtual reality equipment, to mimic it, is expensive. The objective of this study was to investigate how much of each of the six aspects of awe (vastness, time-alteration, connection, physical sensation & accommodation) could be experienced in a lab through 2D video and group interactive reflections in comparison with a control group. The study design focused on intensifying awe through increasing attentional resources with mindfulness and increasing awe-immersion through relevance, variety, and longer awe exposures. The methodology was composed of sixty-eight young adults who were randomly assigned to a control group or an awe-intervention group, and then experienced a mindfulness exercise, either awe-intervention activities (videos and interactive reflection) or neutral videos, and afterwards, both completed the AWE-S scale. The findings indicated a significant difference in the total awe level of the two groups ($t(66) = 3.195$, $p = 0.002$), particularly in the aspects of vastness ($p < 0.001$) and self-diminishment ($p = 0.006$). However, both the control group and the awe group experienced levels of awe above a neutral threshold, suggesting that mindfulness potentially had awe-eliciting power. This expands upon current research suggesting that mindfulness could not only be a primer to awe but might also produce aspects of awe.

Keywords: Awe; mindfulness; vastness; self-diminishment; awe-primer

Introduction

This study aimed to elicit the six aspects of awe in a lab environment through refreshed and new methods in a Malaysian context. It was designed in response to researchers calling for accessible methods of awe-elicitation (Rankin et al., 2020; Shiota, 2018) that create significant measurements of absorption and impact (Kitson et al., 2020). Awe is becoming a significant topic in social science research because it has been shown to have transformative cognitive, emotional, and social benefits (Chirico et al., 2018; Piff et al., 2015; Shiota et al., 2007; Shiota et al., 2017; Thompson, 2022). However, empirical studies investigating awe experiences within the Malaysian context remain scarce. It has been explored simply as a nature-based spirituality (Zaremohzzabieh et al., 2022), leaving a significant gap in the area of experimental awe-elicitation combined with mindfulness for therapeutic benefit in a Southeast Asian context.

Eliciting awe used to be limited to travelling to see great sights, like the view from the top of Mount Kinabalu, but now, researchers aim to stimulate awe using imagination or story-telling (Thompson, 2022; Wonder & Rollin, 1997), breath-taking videos (Rankin et al., 2020), virtual reality (Chirico et al., 2018), or connecting with daily wonders found in music, nature, or science (Chen & Mongrain, 2020; Passmore & Holder, 2017; Shiota et al., 2006; Silvia et al., 2015). While these methods have shown some effectiveness, many produce a lower

intensity of awe which does not necessarily lead to all six aspects (on the AWE-S scale) being experienced (Shiota et al., 2018). The current study is unique because it aims to elicit awe within a Malaysian context and enhance existing methods by increasing relevance, variety, and duration of awe exposures, as well as introducing a new method of interactive group reflection. More specifically, this study has a particular focus on attempting to increase one's immersion into the awe experience by increasing availability of attentional resources (through mindfulness), and by using methods that may facilitate greater awe-absorption (increasing relevance, duration, and variety of videos for engagement) and accommodation through a group interaction. The research objective was to investigate how much of each of the six aspects of awe could be elicited in a lab through 2D video and a group interactive reflection, compared to a control group.

Literature Review

Awe is an experience of inspiration, reverence, and wonder that activates the mind and emotions in transformative ways (Shiota et al., 2017). It broadens one's thoughts, expands one's sense of outward connection and diminishes one's inner sense-of-self (Keltner & Haidt, 2003; Shiota et al., 2007; Valdesolo & Graham, 2014). Foundational awe researchers Keltner & Haidt (2003) break down the experience of awe as perceiving vastness (or the comprehension of anything larger than oneself which causes one to feel small or diminished in comparison. This sudden shift in perspective often confounds the brain, as the new information does not fit into current cognitive categories forcing the brain to develop new beliefs to accommodate the new experience.

1. The Benefits of Awe

There is robust evidence that awe plays a significant role in enhancing emotional, cognitive, and social functioning (Anderson et al., 2018; Caldwell-Harris et al., 2011; Chen & Mongrain, 2020; Chirico & Yaden, 2018; Keltner & Haidt, 2003; Piff et al., 2015; Rankin et al., 2020; Rudd et al., 2012; Shiota et al., 2007; Shneider et al., 2015; Stellar et al., 2017; Tarani, 2017; Valdesolo & Graham, 2014; Van Cappellen & Saroglou, 2012). One study found that students exposed to an awe video significantly outperformed a control group in creative thinking tasks (Chirico et al., 2018), and it has also been linked to increased memory, critical thinking, and generosity (Chirico et al., 2018; Robson, 2022; Shiota et al., 2017). This suggests that experiencing awe is not merely an emotion, but a cognitive process that leads to new brain pathways (Shiota et al., 2007). Awe also appears to expand time perception, which has been associated with increased volunteering, higher life satisfaction, and the ability to savour positive experiences (Rudd et al., 2012). Shown to reduce brooding and hopelessness (Tarani, 2017), awe supports therapeutic change (Adame & Leitner, 2009) and broadens belief systems through increasing agency detection in the universe (Valdesolo & Graham, 2014). This may provide a sense of order, purpose, and shared connection with humanity (Shiota et al., 2007; Pappas & Friedman, 2007). Physiologically, awe activates the parasympathetic nervous system, which decreases heart rate and moderates stress (Chen & Mongrain, 2020), and even brief interventions have been shown to reduce anxiety and generate positive emotion (Rankin et al., 2020).

2. Eliciting Awe in Controlled Settings

While awe can be experienced in smaller doses in the details of everyday life, through nature, or music or science (Fredrickson & Anderson, 1999; Rudd et al., 2012; Shiota et al., 2006; Schneider, 2004; Silvia et al., 2015; Wonder & Rollin, 1997), with a list of benefits so vast, awe is also sought to be stimulated artificially in a controlled environment which allows for greater consistency and the ability to assess awe-absorption levels (Valdesolo & Graham, 2014). However, eliciting awe in a controlled environment is a complex challenge in that different personalities respond to different stimuli (music vs. nature vs. science), and to harness its transformative power requires an immersive experience, which can be challenging in a lab environment. Many researchers use a beautiful photograph of nature, or a video of sweeping landscapes, but typically only once for a short duration (5 minutes for example) which may evoke only a diluted form of awe, lacking the intensity, sensitivity, or duration necessary for deeper cognitive accommodation (Chirico et al., 2018; Rankin et al., 2020; Valdesolo & Graham, 2014). Ke & Yoon (2020) have attempted to expand these traditional elicitors of awe and have identified six stimulating affinity groups: 1) beauty and transience 2) timeless and iconic 3) novelty and high complexity 4) rapid changes and unpredictable behaviour 5) connectedness and participation in a collective 6) conceptual hierarchy and presence of a higher power. These synergistic groupings emphasize the interplay of factors,

underscoring that isolated variables are rarely sufficient. For example, an experience of novelty or high complexity alone may produce interest or curiosity, but the combination of novelty and high complexity together (as in intricate feathers flapping in slow motion) may stimulate awe and wonder. Ke & Yoon (2020) also suggest that eliciting cognitive accommodation (an aspect of awe) may not require a direct challenge one's current belief systems, but can gently stretch it to consider different ways of thinking. While Ke & Yoon (2020) broaden the possibilities of awe-inducing stimuli, few studies have operationalised these synergistic elements within a single protocol. This study addresses that gap by using multiple videos, including various affinity groups. Building upon this former research, the current study incorporated multiple awe videos, instead of one, involving these synergystic elements, spanning various genres for diversity and personality preference, each primed with a relevance-prompting sentence to re-activate engagement throughout. Moreover, to bridge the gap between passive viewing and meaningful personal engagement (as per Ritter et al., 2012), a follow-up group reflection was added in the current study, extending the overall awe-exposure to a duration of 35 minutes.

3. Receptivity to Awe

Part of the challenge of designing exposures of awe is differing receptivity levels. Research suggests that one's awe experience may be influenced by (but not limited to): experiential absorption level, and availability of attentional resources (Chirico & Gaggioli, 2021). Another consideration is accessibility of awe-inspiring resources. While immersive technologies like Virtual Reality (VR) have shown promise in enhancing absorption (Quesnel & Riecke, 2018), cost and limited access makes it particularly difficult for private therapeutic settings or group contexts (Chirico et al., 2017). This study desired to use a combination of easily accessible materials, such as you tube videos and guided reflections to elicit awe. Past experiments have also largely overlooked the role of individual relevance, despite the fact that studies consistently show that awe intensity increases when the stimulus aligns with an individual's values or preferences (Silvia et al., 2015; Yaden et al., 2016). Therefore, the current study included intentional diversity of video genres and personal relevance prompts preceding each awe video to enhance relevance and intentional engagement. As the participants were diverse in culture, relevant content was also stimulated by using "the overview effect" (viewing earth from space) (Yaden et al., 2016). The overview effect often stimulates a transcendent emotion, maximising the experience of vastness and self-diminishment in a way that is relevant to all of humanity.

However, even if the awe content is immersive and relevant, participants must have available attentional resources to receive the stimuli and experience awe. Due to the brain's attentional bias on self, one may struggle to free up their attention to experience the benefits of awe, especially if they struggle with intense stress, perseverative thinking or depression (Chen & Mongrain, 2020). As Yusoff et al. (2024) noted emotion regulation challenges in Malaysian adolescents, higher levels of stress and emotional variation continue into young adulthood (Mohamad et al., 2021). Therefore, a strategy to reduce variation and create a baseline of emotional readiness was pursued to facilitate a greater preparedness to experience awe. Physiological studies suggest that awe requires a loosening of the Default Mode Network (DMN) to shift focus from self-referential processing to external stimuli (Van Elk et al., 2019). Accordingly, mindfulness has been proposed as a cognitive primer that increases attentional resources and stabilies emotion (Hozel et al., 2011; Van Leeuwen et al., 2012); therefore, mindfulness may create a baseline readiness for the awe stimuli (Hozel et al., 2011; Van Leeuwen et al., 2012; Querstret et al., 2020; Segal et al., 2018). Chen & Mongrain (2021) concur that mindfulness practices encourage the intentional focusing of one's attention on the details of the present moment and may activate certain executive functions that increase absorption potential. In addition, recorded nature sounds have also been shown to stimulate attentional resources (Li et al., 2022; Ratcliffe, 2021) and therefore became a part of the strategy to be played in the background during the mindfulness practice.

4. Measuring Awe

Kitson et al. (2020) reviewed existing evaluative methods for self-transcendence and identified five main awe-related scales: the Nature of Awe Questionnaire (NAQ), Awe Experience Scale (AWE-S), Situational Awe Scale (SAS), Awe and the Small-Self (AS), and the Gratitude/Awe Scale (GrAw-7). While each scale was designed with a distinct conceptual focus, the AWE-S stands out as the most rigorously tested, demonstrating strong internal reliability ($\alpha = 0.93$) and multidimensional coverage. It assesses awe across six components using a 7-point Likert scale: altered time perception ($\alpha = 0.91$), self-diminishment ($\alpha = 0.89$), connectedness ($\alpha = 0.87$),

vastness (α = 0.85), physical sensations (α = 0.81), and need for accommodation (α = 0.80) (Yaden et al., 2018). The SAS provides an alternative that distinguishes between four dimensions: connection, oppression, chills, and diminished self. It is known for its comparative focus on threat-based versus positive awe (Sawada et al., 2023). However, the scale is less widely used and remains relatively new, with fewer replications. Therefore, for this study's aims, the AWE-S is a comprehensive and credibile option for assessing the multi-dimesionality of awe.

5. Mindfulness and Awe

Although mindfulness and awe are increasingly explored as self-transcendent states, their relationship remains underdeveloped in the literature. Some researchers, such as Yaden et al. (2017), group both with psychedelic experiences, describing them as forms of ego-dissolution or decentering. Awe-Researcher Michelle Shiota (2018) suggests that mindfulness may be inseparable from awe because it is an aspect of awe itself. Yet few studies have investigated how mindfulness might function as a primer for awe. Because awe is an experience that comes upon you, without striving or effort to obtain, experiencing awe in a lab may require a posture of openness to receive which may be difficult without intentional priming (Schneider, 2008). The research on mindfulness has strongly established its benefits on emotional regulation, attentional control, and general well-being (Khoury et al., 2015; Mrazek et al., 2019; Tang et al., 2016), offering a potential practice for establishing a baseline level of readiness for an awe-exposure, both emotionally and mentally. Chen & Mongrain (2021) suggest that the decentering capacity of mindfulness reduces self-focus which may make people more open to experiences of awe, by quieting internal chatter and activating attentional resources (Chen & Mongrain, 2021). However, while some awe studies prompt participants with taking a few deep breaths or informing them to 'pay attention to the details', no studies seemed to have explicitly primed participants with a full mindfulness practice, such as a body scan, prior to awe exposure. Informed by this gap, this experiement introduces a 5-minute mindfulness practice to relax and prepare participants for the awe-exposure. This practice was not meant to induce awe but to scaffold it, to heighten receptivity. With attentional resources primed, awe's impact may be amplified, and with emotions and thoughts equalised to a baseline, awe's influence may be measured more accurately.

6. Effective Mindfulness Interventions

When designing mindfulness interventions, one must consider the type of attention one aims to stimulate. For example, focused-attention meditation (FAM) primarily fosters sustained attention on one thing, in contrast to open-monitoring meditation (OMM) which may enhance divergent thinking (Lutz et al., 2008) an attribute more closely aligned with the impact of awe. OMM interventions such as body scans or observing thoughts or emotions, may be brief in nature but still have an immediate positive effect, impacting one's cognition in a different capacity (Chi et al., 2018; Khoury et al., 2015; Virgili, 2015). One study suggested that meditation practice as brief as ten minutes each day could improve the efficiency of allocating cognitive resources and increase attentional control as observed by electrophysiological markers (Moore et al., 2020), showing the potential of these practices for cognitive impact. A meta-analysis on single-session and multi-session mindfulness practices (up to two weeks) reported that even brief interventions have a small but significant effect on reducing negative affect ($g=0.21$. $p<.001$) (Schumer et al., 2018). These findings support the feasibility of using short mindfulness practices as primers in experimental settings.

Another factor in the effectiveness of mindfulness practice may be the level of intentional engagement by the individual. One experiment motivated participation by offering course credits, and the results indicated no significant attentional improvements after mindfulness practices, suggesting the importance of internal engagement (Wimmer et al., 2020). A systematic review of mindfulness research suggests that educating participants about mindfulness practices encouraged an attitude of acceptance of one's experience, which may increase engagement and efficacy (Stein & Witkiewitz, 2020). In the present study, the mindfulness practice was explained and intentionally framed as a way to relax in preparation for the following experience, not as a standalone exercise. This framing was designed to promote a receptive mindset while creating a baseline for emotional readiness. The approach balances practicality (requiring no prior experience or training) with theoretical grounding suited for experimental designs requiring an immersive state.

Methodology

This experiment collected quantitative data from 68 young adults located in Penang Malaysia. The required effect size was determined based on a comparable study design by Ritter et al. (2012), who conducted two experimental studies investigating divergent thinking using both video and group-based manipulations. They reported a between-subjects effect size of approximately $d = 0.35$ for cognitive flexibility outcomes. Given that the present study employed a repeated-measures (pre-post) within-subjects design, this effect size was converted to the appropriate paired-samples t-test metric (dz) using the formula $dz = d \times \sqrt{2}$ (Lakens, 2013), resulting in $dz \approx 0.495$. Using G*Power 3.1, an a priori power analysis ($\alpha = .05$, $1-\beta = .80$, two-tailed) indicated that a minimum sample size of 34 participants would be sufficient to detect this effect. The final sample ($N = 68$) therefore doubled the minimum requirement, providing additional statistical power and precision. Participants signed up anonymously via an online calendar, blind to allocation to the awe group ($n_1 = 35$) or the control group ($n_2 = 33$). Sessions were scheduled using a rotating awe/control pattern to approximate random assignment. Due to occasional dropouts and the minimum size required for awe interventions (≥ 4), group allocation was quasi-random and based on availability to ensure balanced group sizes.

Inclusion requirements included an age range of 20-34 years, fluency in English (grade B or higher) and signed consent. Demographically, females comprised the majority in both the awe group (27/35) and the control group (23/33). Most participants were aged 20–24 years (awe: 26/35; control: 27/33), and the majority had at least some tertiary education (awe: 30/35; control: 31/33). English proficiency was comparable across groups, with 30/35 of the awe group and 29/33 of the control group reporting "expert" or "very competent" levels. Both groups demonstrated similar distributions of personality traits and racial diversity, with no major imbalances observed. As Zhao et al., (2024) highlighted the prevalence of depression in undergraduate students, in order to reduce the likelihood of impaired access to attentional resources (Chen & Mongrain, 2020), participants with diagnosed mental health disorders or dependency on a counsellor were excluded. Financial compensation was offered to cover possible travel expenses to and from the lab (with no loss of benefit for discontinued participation).

Upon arrival at the lab (a room with eight chairs, a central table, and a projector) participants were instructed on the goal to relax and bring their attention to the present moment (Stein & Witkiewitz, 2020), while listening to instrumental music over the sounds of water in a stream in order to increase attentional resources (Li et al., 2022; Ratcliffe, 2021; Chen & Mongrain, 2021). They were then led through a mindfulness exercise which focused on breathing and awareness of their body and surroundings (Appendix B). Afterwards, participants watched 2D videos (Appendix D). Videos were used instead of Virtual Reality equipment with the goal of evaluating applicable methods of eliciting awe in a laboratory setting, as expense and accessibility are issues with VR, especially in a group setting. VR also typically only offers a single stimulus (e.g. a forest scene) where this experiment focused on increasing personal connection through videos that covered a range of genres (e.g. nature, art, science). The awe group watched four awe-inspiring videos (for an extended duration of 15 minutes) that each began with a relevance-enhancing prompt on the screen to encourage engagement (see Table 1). The diversity of short videos and prompts were designed to appeal to different types of awe-preference and to encourage sustained engagement (Quesnel & Riecke, 2018; Silvia et al., 2015). The videos contained content based on Ke & Yoon's research (2020) and included the overview effect (Yaden et al., 2016). After the videos, the participants in the awe-group engaged in a 20-minute group reflection to deepen the experience through interaction and social implications (Desmet & Roger, 2015). The group reflection also offered increased personal relevance and a variety of awe stimulus. During this reflection (Appendix C), participants were guided through consideration of the complexity of their body's make up, such as unique fingerprints, their place in the broader universe, and rhetorical question prompts to inspire cognitive accommodation (e.g. "Notice how this makes you feel towards yourself? How does that make you feel toward one another? How does that make you feel toward humanity as a whole?"). Meanwhile, participants in the control group watched two neutral videos (a historical documentary and a short story about primary school children taking a test) for a consistent duration of the combined activities in the awe group. As the final step, participants in both groups completed the AWE-S assessment and were given a list of local counselling resources and optional debriefing should they desire to process their experience.

Table 1. Relevance prompts before videos

Video Content	Relevance Prompt
Timelapse of seeds growing from seed to foliage	*Imagine your life as a seed, can you see the similarities?*
Ink colours moving through water	*Are the things that surround your life chaotic or beautiful?*
The earth from outer space with individuals superimposed	*What's your place in the big picture?*
Slow motion of birds wings and the intricacy of nature	*Our planet is intricate. What does this mean about you?*

The Findings

1. Statistical Difference in the Intensity of Awe

The answers on the Likert 7-point scale of the AWE-S were summed to give each participant a total "awe score". Although the developers of the AWE-S did not determine a specific score as to whether or not awe occurred (Yaden et al., 2018), it may be implied that the higher the score, the stronger the agreement that awe was experienced, and the lesser the score the stronger the disagreement that awe was experienced. A two-sample t-test was conducted (assuming equal variances as the F-test suggested the groups had similar variability $p = 0.357$) to compare the mean scores of the awe group ($M_{Awe} = 152.1$, SD = 21.4) and the control group ($M_{Control} = 136.7$, SD = 18.2). The *t*-test revealed a significant difference in the intensity of awe experienced between the groups, $t(66) = 3.195$, $p = 0.002$, Cohen's d = 0.80 indicating large effect, with the awe group experiencing awe at a higher intensity than the control group.

2. Statistical Significance of Vastness and Self-Diminishment

In order to compare the intensity of each of the six aspects of awe (which were each represented by five questions on the AWE-S scale), a neutral threshold score (20) was identified (if all 5 questions were answered '4- neutral'). Figure 1 illustrates how far above the neutral threshold each aspect of awe was experienced, per group, according to mean score. It also shows the standard deviation lines for variability, with the longer lines indicating a greater range of experiences, and shorter lines showing less variability.

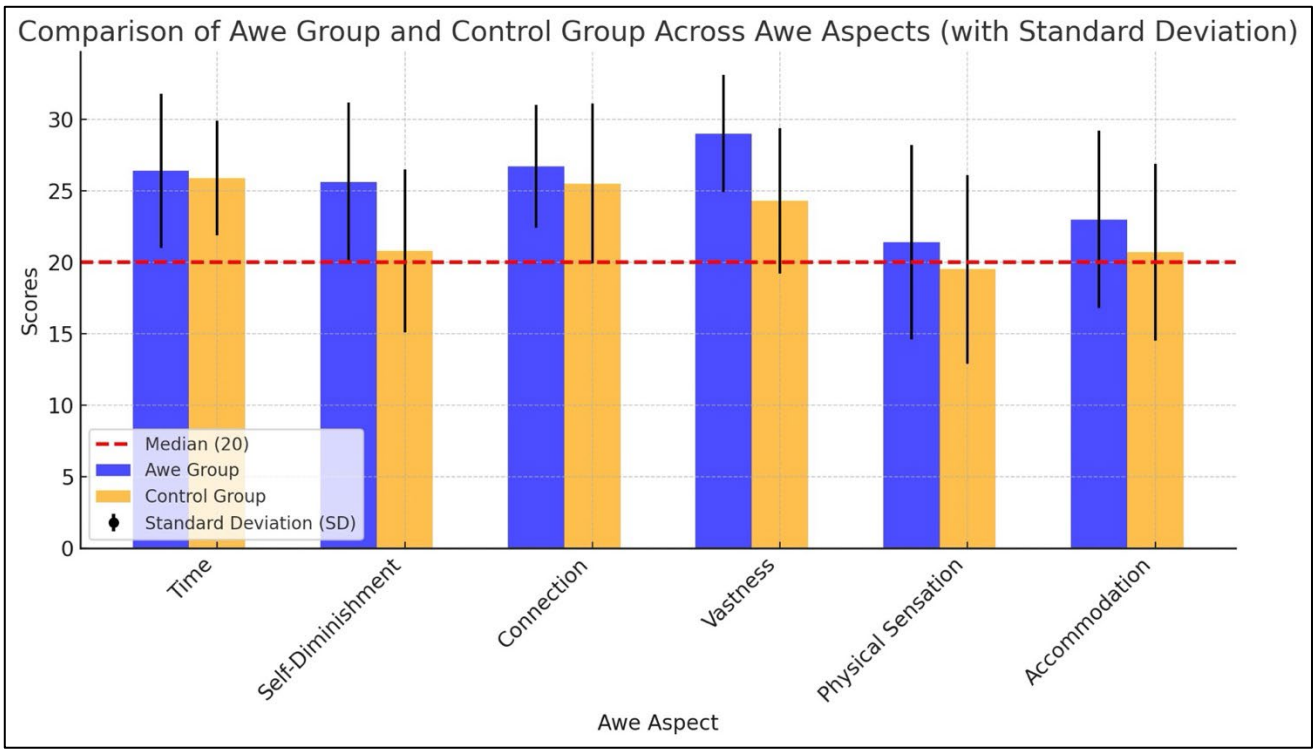

Figure 1. Comparison of mean awe aspects with standard deviation between the awe and control group

When considering the findings, all aspects of awe in the awe group scored higher than the control group. The highest mean awe score for the awe group was the experience of Vastness (M_{Awe} = 29.0, SD=4.1) which when compared to the control group ($M_{Control}$ = 24.3, SD = 5.1), $t(66) = 4.2$, p = <0.001, Cohen's d = 1.02, indicates a very large effect. Interestingly, all scores in both groups lie above (or very near) the neutral threshold, suggesting that both groups experienced a level of awe to varying levels of intensity. The three highest aspects in the control group (Connection, Time, and Vastness) have standard deviation lines that indicate the answers all fell, almost completely, above the neutral threshold, suggesting agreement that a level of awe occurred in these areas. Overall, the lowest awe-experience scores for both groups, were in the areas of physical sensation (M_{Awe} = 21.4, SD = 6.9; $M_{Control}$ = 19.5, SD = 6.9) and accommodation (M_{Awe} = 23, SD = 6.3; $M_{Control}$ = 20.7, SD = 6.3), with the control group also scoring very low in self-diminishment ($M_{Control}$ = 20.8 , SD = 5.8) compared to the awe group (M_{Awe} = 25.6, SD = 5.6), with a large effect size (Cohen's d = 0.85).

Independent t-tests (assuming equal variances) were conducted between the awe and control groups for each of the aspects of awe. A Bonferroni Correction was applied to reduce risk of a Type 1 error in multiple comparisons (α=0.0083). Table 2 results show that after the correction, Vastness (p = < 0.001) and Self-Diminishment (p = 0.006) were the two areas that remained statistically significant, with Vastness maintaining particularly strong effect below p < 0.001.

Table 2. P-values for significance of differences in awe aspects between two groups

Subscale	*t*-Statistic	Degrees of Freedom	P-Value	Adjusted P-value
Accommodation	1.52	66	0.13	0.78
Physical Sensation	1.15	66	0.25	1.5
Vastness	4.2	66	< 0.001	< 0.001
Connection	0.93	66	0.36	2.16
Self-Diminishment	3.44	66	0.001	0.006
Time	0.44	66	0.66	3.96

Note. The P-value was determined based on the alpha being 0.05. The Adjusted P-Value column is based on the Bonferroni Correction. The alpha level = 0.05 / 6 = 0.0083

Discussion

The research objective was to investigate how much of each of the six aspects of awe could be elicited in a lab through 2D video and a group interactive reflection, compared to a control group. The findings brought an element of surprise, as it was not expected for the participants in the control group to indicate they had experienced aspects of awe (scores above the neutral threshold in the AWE-S). This suggests that something in the control group also had awe-eliciting power. It is noted, that when interpreting these results, one must use caution considering the limited sample size, and small deviations from the neutral threshold on the AWE-S.

1. Mindfulness May Elicit Certain Aspects of Awe.

Upon reflection of research, it was observed that both groups began with an awe-priming mindfulness exercise, which could have stimulated some of the awe experience. Research presents mixed opinions on the role of mindfulness practice when it comes to awe. Chen and Mongrain (2021) have suggested that mindfulness interventions may be effective primers to promote absorption of transcendent experiences such as awe, because they increase attentional resources in the brain. Hence, this practice was implemented in both groups, to isolate the effect of the awe interventions (2D video and interactive reflection) from the mindfulness exercise. However, our findings suggest that certain aspects of awe may also be produced by mindfulness. This both aligns with and extends the work of Chen and Mongrain (2021), who proposed mindfulness as a potential awe primer, because it may prime attention by producing elements of awe (time-alteration etc.). When we consider what research states about mindfulness, it is primarily credited for the ability to decenter a person from oneself as one observes the self from the outside (Norman, 2017; Parmentier et al., 2019). This decentering may be related to a sense of vastness and altered time. According to Tabibnia (2020), awe also reduces activity in the default mode network in the brain (DMN) allowing for a sense of transcending self (like decentering) which may explain some of the overlap.

Leading awe-researcher Michelle Shiota (2018) also credits awe with a decentering capability and affirms the overlap of the two experiences stating that awe creates a temporary form of mindfulness, as it consumes attention, separating one from previous thought and emotion (d'Ardenne, 2019). Thompson (2022) also identified similarities but suggests that awe is a type of mindfulness technique. There seems to be an overlap in what each experience produces; thus, future researchers may want to consider the immersive nature of certain mindfulness primers when desiring to elicit and measure awe distinctly from the impact of mindfulness. Perhaps briefer durations, without the support of music or nature sounds, or practices other than the body scan technique may be able to create an emotional baseline without producing significant levels of time-alteration, vastness, or connection (which were the highest mean scores in the control group). These scores may clarify expanded potential for mindfulness, moving beyond its common use as a technique for decentering or attention inducing, highlighting its transcendent ability to elicit a sense of vastness, time alteration and even connection which may contribute to Flow Theory on achieving altered states (Nakamura, & Csikszentmihalyi, 2009). This leaves one with the question, if mindfulness elicited aspects of awe in both groups, did the awe-experiences of video watching and interactive reflection also have an impact?

2. Awe Activities Elicited Significantly More Self-Diminishment and Vastness.

Overall, the participants in the awe group reported significantly higher total-awe mean scores compared to participants in the control group, inferring that 2D video and interactive reflection did hold awe-eliciting power in addition to the contributions of mindfulness. Self-diminishment remained statistically significant between the awe and control group, suggesting that the awe stimulations effectively elicited this aspect of awe. Self-diminishment had a mean score very close to the neutral threshold in the control group implying that mindfulness may not produce this quality, or at least at a much lower intensity. This is in line with Shiota et al.'s (2007) and Piff et al.'s (2015) assertion that awe has a unique capacity to diminish self-focus, highlighting a potential differentiator between the two experiences.

Levels of vastness were also significantly different between the two groups. The fact that the standard deviation range in the control group lay almost fully above the neutral threshold, suggests that there was united agreement that vastness occurred, likely through the mindfulness practice. However, the awe group still scored significantly higher in this aspect, which infers that the awe activities were successful in intensifying vastness beyond the vastness potentially produced by the mindfulness practice. This partially aligns with Silvia et al. (2015), who emphasized that immersive stimuli are particularly effective in eliciting vastness, which, in this study, may be true of both mindfulness and awe. However, our results suggest that even non-immersive 2D video, when paired with personal relevance, an extended duration, and reflection, may amplify the vastness produced compared to mindfulness.

3. Awe Activities Did Not Elicit Significantly more Connection, and Time-Alteration.

Connection and time-alteration both had mean scores and standard deviation ranges above the neutral threshold for both groups, suggesting that mindfulness potentially elicited these experiences. The awe group's mean score was slightly higher in each, so the awe activities may have elicited slightly stronger experiences, but further study with a larger sample size would be required to verify any conclusion taken from such slight differences.

4. Physical Sensations and Accommodation Were a Challenge to Elicit.

Physical sensation and accommodation were the lowest scoring categories in both the awe group and the control group, suggesting that these experiences may be more difficult to elicit in a lab environment using these methods. This is supported by researchers who propose that stimulating these aspects may require highly novel or overwhelming stimuli, which is difficult to produce in a lab setting (Shiota et al., 2007; Silvia et al., 2015). One of the limitations of this study was the small sample size, as a greater number of participants would have allowed for more groups. A group without any mindfulness exercise, or another with only awe-videos and no interactive reflection, and other with only the interactive reflection would have produced more data in which to better identify the specific elements most successful at stimulating awe. As online videos were used, there is also the potential that participants may have seen the clips before which may have reduced impact. Social desirability is also a risk when completing questionnaires in a group setting. Even though efforts were made to reduce biased answers (by explicitly stating *"please do not answer according to what you think I (the facilitator) might desire, I want you*

to answer honestly about what you did or did not experience" participants may have had an internal desire, or subconscious expectation to answer the AWE-S favorably.

Another limitation was the suitability of the measurement scale used, particularly related to accommodation. Items of accommodation in the AWE-S include phrases such as: "*I felt challenged to understand the experience*"; "*I felt it hard to comprehend the experience in full*." But the experience of accommodation does not necessarily involve conscious difficulty. This is in line with Keltner & Haidt's reflection (2003) that accommodation is simply a shift in mindset based on the stimuli and may be gradual and reflective in nature as opposed to a sudden confrontative change. For example, to prompt accommodation in this study, after the interactive reflection, participants were asked if their perspective on self or others changed. It is possible that even if their schema *had* shifted, they may not answer, "*I felt challenged to understand the experience*," but rather, "*I view things differently now than I did before this experience*," which may have resulted in higher and more accurate accommodation scores. Perhaps the AWE-S is better suited for life-changing bewildering awe-experiences, where using an awe-scale specific to smaller awe interventions that allows for swift schema changes would have produced a more accurate representation of smaller, yet still significant, cognitive accommodations.

Conclusion

Eliciting awe is both a privilege given its profound impact on human emotion and cognition, and a challenge, particularly in controlled settings. This study demonstrated that two core features of awe, such as vastness and self-diminishment, can be successfully evoked in a lab environment through 2D video combined with interactive group reflection. The effects were more intense than those elicited through brief mindfulness exercises. This study contributes to the theoretical understanding of awe by highlighting the nuanced relationship between awe and mindfulness, bringing caution against assuming clear distinctions between their effects. Even brief mindfulness practices, like breath awareness or body scans, may evoke elements of awe including altered time perception, connection, and vastness (Hölzel et al., 2011; Van Leeuwen et al., 2012; Querstret et al., 2020; Segal et al., 2018).

These findings suggest a need for clearer conceptual boundaries when using mindfulness as a control or primer in awe research. Furthermore, the study identifies components that may intensify awe, enriching the growing body of literature on eliciting awe for therapeutic purposes. From a practical standpoint, methodologically, this research introduces innovative techniques for awe induction, such as pairing research-based diverse video content with priming questions to enhance personal relevance and using guided group reflection to deepen engagement. These methods offer a feasible alternative to immersive VR technology, making awe-inspiring interventions more accessible in counselling and educational contexts. Exposing a client to vastness and self-diminishment may promote self-transcendence, humility, or renewed perspective, which may lead to mental and emotional well-being. This study also offers new awe-inspiring videos for academic consideration. Due to the many therapeutic benefits of awe, accessible interventions must continue to be discovered and applied for the well-being of the coming generations, and this novel study takes us a step forward in both theory and practice.

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