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Awe, Group Cohesion, and Religious Self-Sacrifice

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ABSTRACT

Awe is an emotion frequently experienced in religious contexts. Research has documented the effects of awe on feelings of small self, spirituality, and sense of interconnectedness. We extend this literature by investigating the relationship between awe and religious group cohesion, which can ultimately lead to sacrifice for one's religious group. Study 1 found that U.S. adult participants ($N = 782$) who experience greater dispositional awe-proneness are more willing to self-sacrifice for their group. This relationship was explained (mediated) by greater reports of a sense of vastness and greater cohesion with one's religious group. In Study 2, U.S. community participants ($N = 187$) were randomly assigned to an awe induction condition or a neutral condition. While the manipulation successfully elicited feelings of awe and small self (both vastness and self-diminishment), it did not directly affect our other measures. We still found partial evidence for an indirect pathway from awe to vastness, group cohesion, and sacrifice for one's religious group. This research highlights an emotional component of religious group cohesion, with implications for the role of awe in self-sacrificial forms of devotion.

Introduction

"When I admire the wonders of a sunset or the beauty of the moon, my soul expands in the worship of the creator."
Mfahatma Gandhi

Many historical thinkers and modern scientists seem to agree that religious worship is intimately tied to the wondrous experience of awe (James, 1985; Keltner & Haidt, 2003; Sundararajan, 2002; Van Cappellen et al., 2021). Ancient religions found deities in the natural world, embracing supernatural explanations for the glister of starlight or ferocity of a storm. In modern times, religions have brought awe to the altar through the construction of spectacular architecture (Joye & Verpooten, 2013). In addition to eliciting a sense of captivation and esthetic beauty, research has illustrated that awe-inspiring moments may promote religious belief and devotion. In one study, researchers found that activating feelings of awe through video clips increased religiosity and belief in a creator compared to a neutral condition (Saroglou et al., 2008). Another series of studies illustrated that experiences of awe promoted supernatural agency detection by decreasing tolerance for uncertainty (Valdesolo & Graham, 2013). Awe is characterized as a self-transcendent experience, or one that diminishes the salience of the self (small self) in favor of increased connectedness with others (Yaden et al., 2017). Beyond effects on individual beliefs, we set to study, based on literature reviewed below, a potential social role of awe: Does awe lead to increased feelings of group membership? When taken to the extreme, can awe inspire devotees to sacrifice themselves for their group? The answers to these questions may enrich future understanding of religious indoctrination and extremism. Across two studies, we aim to examine how the experience of awe is related

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to religious group cohesion and willingness to self-sacrifice for the group. Specifically, we propose a conceptual model whereby awe activates feelings of small self, which increases feelings of cohesion with one's religious group, which lastly promotes self-sacrifice for one's religious group. We are interested in these relationships across all forms of religious identification, including atheists and agnostics.

Theoretical accounts define awe as an emotion elicited by a combination of "vastness" and "need for accommodation" (Keltner & Haidt, 2003). Vastness refers to stimuli that can be both physically large or perceptually grand. For instance, the Grand Canyon and an intricate piano concerto could both elicit a sense of vastness. Need for accommodation describes the process of updating our mental schemes when confronted with an experience that does not fall within the bounds of our typical understanding of the world. These features of awe enable us to absorb new information (Danvers & Shiota, 2017; Shiota et al., 2007). Together, awe has the ability to shift focus from the self to something larger. In sum, awe promotes a "small self," characterized by Piff and colleagues (Piff et al., 2015) as a combination of outward feelings of *vastness* vis-à-vis the self (expanding one's usual frame of reference) and inward feelings of *self-diminishment*. For example, a person on the edge of the Grand Canyon might feel as though the geographical wonder in front of them is remarkably large (vastness), while they are remarkably small in comparison (self-diminishment). The theory from Piff et al. argues that the presentation of a vast stimulus decreases attention toward self-oriented concerns (i.e., small self), enabling focus on larger, other-oriented concerns (Piff et al., 2015). Therefore, a consequence of feelings of small self is to enable the social effects of awe. For example, awe has been found to promote prosociality through feelings of small self (Piff et al., 2015; Prade & Saroglou, 2016; Stellar et al., 2017).

The earliest (Keltner & Haidt, 2003) and more recent (Perlin & Li, 2020) theories on awe emphasize its function in promoting social group membership. In one study, researchers found that asking participants to recall an experience of awe led them to identify more closely with the community that they identified with. This study further found that the relationship between awe and increased community engagement was mediated by decreased focus on the self (Bai et al., 2017). Another study found that inducing awe of nature led religious people to experience greater oneness with their friends (Van Cappellen & Saroglou, 2012). The present research aims to extend these findings by specifically looking at the relationship between awe and religious group cohesion, as defined by feelings of oneness between the self and one's religious group (Swann & Buhrmester, 2015). To measure group cohesion, we use a pictorial measure of feelings of unity (the Inclusion of Other in the Self Scale, Aron et al., 1992) and a self-report identity fusion questionnaire designed to predict extreme behavior on behalf of the group (Gómez et al., 2011).

We further reason that group cohesion will be related to greater willingness to sacrifice for the group. Individuals who experience high levels of identity fusion with their religion (feeling of oneness between the group and self) view their group as viscerally personal and would therefore be much more likely to engage in pro-group behavior even if it comes at personal expense (Swann et al., 2012). For example, research on militants in the Libyan revolution illustrated that combatants were more fused with their fellow militants than their own families. These powerful ties were found to explain a willingness to risk one's life for their group (Whitehouse et al., 2014). Additionally, a recent study revealed that admiration of radical Islamist groups predicted increased identity fusion and endorsement of religious self-sacrifice among a sample of imprisoned jihadists in Spain (Gómez et al., 2021). In order to assess self-sacrifice for one's religious group, we included a self-report measure of willingness to harm others for the benefit of one's group (Swann et al., 2009), a more implicit measure of monetary sacrifice for religious causes and charities (Clobert & Saroglou, 2013; Van Cappellen et al., 2016), and an iteration of the trolley dilemma to assess willingness to die in self-sacrifice for a member of one's religious group (Swann et al., 2010).

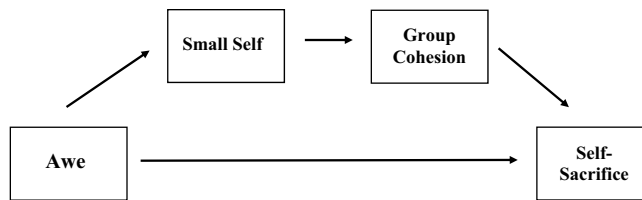


Figure 1. Proposed Mediation model illustrating the pathway between awe and self-sacrifice for the group.

Note. Regression coefficients show the indirect effect of awe on self-sacrifice (indexed by self-report willingness to sacrifice and trolley dilemma sacrifice), as mediated by vastness and group cohesion (indexed as identity fusion and inclusion of other in the self). Brackets indicate 95% confidence intervals for estimates. Confidence intervals that do not contain zero indicate evidence for mediation.

The present study

In sum, we conducted two studies to understand the relationship between awe, small self (comprised of the vastness and self-diminishment components), group cohesion, and self-sacrifice (see theoretical model in Figure 1). In Study 1, we aimed to establish correlational relationships between dispositional awe-proneness (or a person's predisposition to experience awe), small self, cohesion with one's religious group, and self-sacrifice for one's religious group. In Study 2, we extended our findings from Study 1 to establish causal effects of manipulated awe on the same variables by randomly assigning participants to either an awe or neutral condition.

Our hypotheses are as follows:

- (1) We predict that participants who experience greater awe will experience significantly higher levels of:
 - (a) Small self
 - i. Vastness vis-à-vis the self
 - ii. Self-diminishment
 - (b) Cohesion with one's religious group as measured by identity fusion and inclusion of other in the self
 - (c) Self-sacrifice in favor of one's religious group as measured by willingness to sacrifice, trolley dilemma, and money distribution game
- (2) We predict that greater awe will have a positive indirect effect on religious self-sacrifice measures as mediated by small self and group cohesion
- (3) We will test and report these effects among the entire sample but expect them to be stronger among people who currently identify as religious (excluding agnostics, atheists, spiritual but not religious, and other). We report results on religious participants only in the Online Supplemental Materials (OSM)

Materials and procedures for Study 2 were pre-registered on the Open Science Framework and can be found at <https://osf.io/uybdv/>.

Study 1

In Study 1, we examined the relationship between dispositional awe-proneness, sense of small self (including the facets of vastness vis-à-vis the self and self-diminishment), group cohesion (measured through two self-report scales), and self-sacrifice (measured through self-report, implicit, and behavioral attitude measures). We expected that people who tend to experience awe more frequently would also show greater tendencies to self-sacrifice for their religious group, as explained (mediated) by showing greater feelings of small self and cohesion with their religious group. The concept of small self

is comprised of two theoretically and empirically distinct facets: a sense of vastness vis-à-vis the self and a sense of self-diminishment, which we examined as separate measures in addition to the full scale (see details and factor analysis in Piff et al., 2015).

Method

Participants

Participants were recruited from Amazon's Mechanical Turk (MTurk) and compensated at a rate of \$3/hour. The study was advertised as an investigation of personal beliefs and emotions. We aimed to recruit 800 participants with complete surveys. A total of 862 participants completed the study, which was approved by the campus Institutional Review Board. The data from this study came from a larger project, which also included items investigating the relationship between awe and meaning. Exclusion criteria included two attention checks, which involved following instructions to leave a response blank and count how many times the letter "a" occurred in a string of letters. Participants who failed to leave the response blank after two attempts ($N = 61$) or who deviated in their count of letters by more than three ($N = 19$) were removed. Out of the total recruited sample, 782 passed both checks and were included in the final sample. All participants provided informed consent prior to the study measures. All participants were US citizens between the ages of 18 and 78, with a mean age of 38 ($SD = 12$). The sample identified as 49.6% male, 50.1% female, and 0.3% other. The sample also identified as 49% Christian, 1.5% Muslim, 1.0% Hindu, 1.3% Buddhist, 2.4% Jewish, 12.5% Agnostic, 12.3% Atheist, 10.1% spiritual but not religious, 7.7% nothing in particular, and 2.1% other or missing. The sample racial breakdown of the sample was 0.9% American Indian or Alaska Native, 5.6% Asian, 0.1% Native Hawaiian or Pacific Islander, 16.1% Black or African American, 75.3% White or Caucasian, and 1.9% Other.

Procedure

Participants completed an online survey that consisted of various questionnaires about dispositional emotions, small self, group cohesion, and self-sacrifice. The online survey also contained study measures for a separate study, as well as personality and demographic assessments. The ordering of the questionnaires was consistent for all participants.

Measures

Dispositional positive emotions. Trait positive emotions were measured with the Dispositional Positive Emotion Scale (DPES) (Shiota et al., 2006). The measure asked participants to indicate their level of agreement to various statements on a seven-point scale from *Strongly Disagree* to *Strongly Agree*. The seven emotions measured were joy (e.g., *I am an intensely cheerful person*; $\alpha = .90, M = 4.54, SD = 1.29$), contentment (e.g., *I am at peace with my life*; $\alpha = .94, M = 4.78, SD = 1.41$), pride (e.g., *I feel good about myself*; $\alpha = .86, M = 4.96, SD = 1.16$), love (e.g., *I develop strong feelings of closeness to people easily*; $\alpha = .90, M = 4.55, SD = 1.31$), compassion (e.g., *It's important to take care of people who are vulnerable*; $\alpha = .90, M = 5.41, SD = 1.08$), amusement (e.g., *I find humor in almost everything*; $\alpha = .85, M = 4.79, SD = 1.23$), and awe (e.g., *I see beauty all around me*; $\alpha = .88, M = 4.87, SD = 1.20$). The awe scale included six statements, while the other positive emotion scales each included eight statements. We computed mean scores for each positive emotion subscale.

Small self. We used a self-report scale to measure feelings of small self (Piff et al., 2015; Study 4). Participants rated the extent to which they agreed with ten items on a seven-point Likert-type scale from *Not at all true* to *Very True*. Following Piff et al. (2015), scores were calculated for the overall scale of small self ($\alpha = .86, M = 4.56, SD = 1.27$), as well as for the two five-item subscales of vastness vis-à-vis the self (e.g., *I feel like I am in the presence of something grand*; $\alpha = .95, M = 4.70, SD = 1.79$) and self-diminishment (e.g., *I feel small relative to something more powerful than myself*; $\alpha = .88, M = 4.41, SD = 1.51$).

Group cohesion measures. After selecting religious affiliation from a list of 10 items (i.e., Christian, Muslim, Hindu, Buddhist, Jewish, Agnostic, Atheist, spiritual but not religious, nothing in particular, and other), all participants (including those who indicated Agnostic, Atheist, Spiritual, or Other as their religious affiliation) were instructed to use this affiliation as their group of reference when considering questions about their religious group. Two measures of group cohesion were chosen to capture feelings of agency on behalf of a religious group (Identity Fusion), as well as feelings of interconnectedness (Inclusion of Other in the Self Scale).

Identity fusion. We used a self-report measure of identity fusion as one method to assess group cohesion (Gómez et al., 2011). Participants were asked to complete seven questions, on a seven-point scale ranging from *Strongly Disagree* to *Strongly Agree* (e.g., *I have a deep emotional bond with my religion*; $\alpha = .97$, $M = 3.55$, $SD = 1.91$).

Inclusion of other in the self scale. As a second measure of group cohesion, participants were asked to identify a picture that most closely represented the connection they felt with their religious group (Aron et al., 1992). The measure included seven sets of circles, with increasing levels of overlap (no overlap coded as 1, nearly complete overlap coded as 7), ($M = 3.09$, $SD = 2.16$).

Self-sacrifice measures. The following measures were used to assess willingness to self-sacrifice.

Willingness to sacrifice. We used a self-report scale to measure willingness to sacrifice (Swann et al., 2009) and adapted it to target members of one's religion. Participants were asked to respond to six questions, responding on a seven-point scale ranging from *Strongly Disagree* to *Strongly Agree*, (e.g., *I would fight someone physically for threatening another member of my religion*; $\alpha = .93$, $M = 2.72$, $SD = 1.60$).

Trolley Dilemma. As another measure of self-sacrifice, we used an iteration of the Trolley Dilemma (Swann et al., 2010). Participants were asked to imagine that they could stop a boxcar from killing five members of their religious group by flipping a switch and sacrificing themselves. Participants had the option to either do nothing (coded as 0) or flip the switch and sacrifice themselves (coded as 1). Participants were additionally asked this question about strangers, rather than members of their religious group (see supplemental materials for results).

Money distribution game. As a behavioral measure of self-sacrifice, we used a money distribution game (Clobert & Saroglou, 2013; Van Cappellen et al., 2016). Participants were asked to imagine that they won 100,000 dollars in the lottery. They were instructed to itemize how they would spend the money, writing down the chosen categories and the percentage of money that would go to each category. The first author reviewed all spending categories and coded donations as religious self-sacrifice while blinded to other measures. Responses that involved donations outside of family and friends, mention of religious organizations, tithe, or charitable giving were coded as self-sacrifice. Then, for each participant, total percentage of all coded religious self-sacrifice donations was computed, ranging from zero to one hundred percent. Overall, religious and charity donations were very low ($M = 4.45\%$, $SD = 12.19\%$).

Results and discussion

We ran bivariate correlations among all study variables, which can be found in Table 1. The results for religious people alone were comparable to the full sample and can be found in Supplemental Materials.

Partially confirming our first hypothesis, the results show positive associations between dispositional awe-proneness and the small self, but this association is specifically driven by the facet of vastness and not self-diminishment. Given that vastness and self-diminishment are complementary facets of the small self and aspects of awe (Piff et al., 2015; Yaden et al., 2019), it is surprising that only one of these facets, vastness, showed such association. Results also show positive associations between dispositional awe-proneness and both measures of group cohesion (identity fusion and inclusion of other in the self), and self-sacrifice as measured

Table 1. Bivariate correlations among all study variables for dispositional awe, small self, group cohesion, and self-sacrifice.

	Dispositional awe	Small self	Self-diminishment	Vastness	Identity fusion	Inclusion of other in the Self	Willingness to Sacrifice
Dispositional awe							
Small self	.39***						
– Self-diminishment	.05	.72***					
– Vastness	.51***	.81***	.18***				
Identity fusion	.31***	.53***	.18**	.59***			
Inclusion of other in the Self	.25***	.38***	.10**	.46***	.71***		
Willingness to sacrifice	.23***	.36***	.27**	.28***	.63***	.35***	
Money distribution game ^a	.05	.06	.05	.04	.10**	.04	.10**

^aHigher scores reflect more religious and charity donation intentions of a hypothetical lottery prize.

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

This Table with exact p -values can be found in the Supplemental Materials.

through the willingness to sacrifice measure. However, there was not a significant relationship between dispositional awe-proneness and self-sacrifice as measured by the money distribution game. Multiple regression analyses revealed that dispositional awe-proneness remained a significant predictor of the vastness subscale of small self and identity fusion but not of the other variables when controlling for other positive emotions (see Supplemental Materials for results).

Next, we used binomial logistic regressions to analyze relationships between our study variables and the dichotomous outcome of the trolley dilemma toward one's religious group. Complete results are shown in Table 2; the analyses for each study variable presented in the table were run independently. In line with hypothesis 1, awe was a statistically significant, although small, predictor of responses to this trolley dilemma, $X^2(1) = 4.34$, $p = .037$. The model explained 1.3% (Nagelkerke R^2) of the variance in trolley sacrifice and correctly classified 54.8% of cases. An increase of one unit on dispositional awe-proneness increases the odds of self-sacrifice by 1.23.

Next, to test hypothesis 2, we tested for serial mediation using PROCESS v. 3 model 6, using 5,000 bootstrap samples. We repeated mediation tests for dispositional awe-proneness (predictor), each of the two small self subscales (vastness and self-diminishment, mediator 1), two group cohesion measures (mediator 2), and three self-sacrifice measures (outcome). We focus our discussion of results on the total indirect paths testing our hypothesis. Confirming our second hypothesis, the results showed consistent evidence of mediation of the relationship between dispositional awe-proneness and self-sacrifice (self-report and trolley) through vastness and group cohesion (identity fusion and inclusion of other in the self), see Figures II–V. Although there was no significant correlation between dispositional awe-proneness and the money distribution game, we still found evidence of mediation through vastness and identity

Table 2. Logistic regression predicting likelihood of self-sacrifice in the trolley dilemma for members of religious group based on variables of awe, small self, group cohesion, and religious self-sacrifice.

	<i>B</i>	<i>SE</i>	<i>df</i>	<i>p</i>	Odds ratio	95% CI for odds ratio	
						Lower	Upper
Awe	.21	.06	1	<.001	1.23	1.09	1.39
Small Self	.32	.06	1	<.001	1.37	1.22	1.55
• Vastness	.16	.04	1	<.001	1.17	1.08	1.27
• Self-diminishment	.21	.05	1	<.001	1.23	1.12	1.26
Identity fusion	.24	.04	1	<.001	1.27	1.17	1.37
Inclusion of other in the self	.14	.03	1	<.001	1.15	1.08	1.23
Willingness to sacrifice	.26	.05	1	<.001	1.20	1.19	1.43

The logistic regression analyses for each study variable were tested and reported independently.

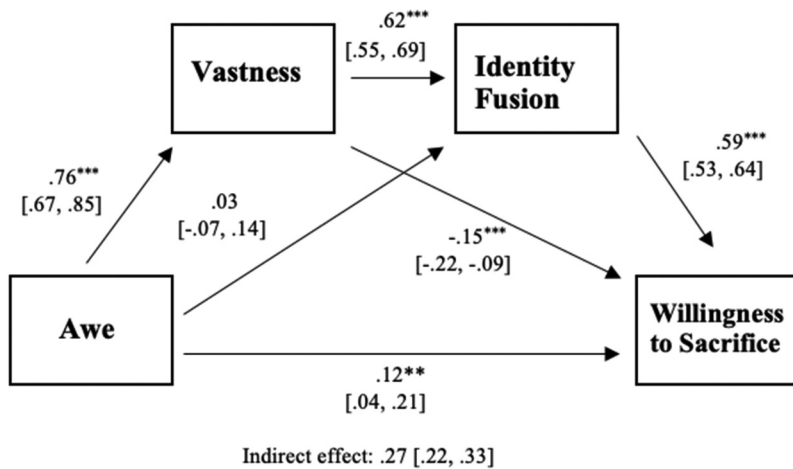


Figure II. Serial mediation models illustrate relationship between awe and willingness to sacrifice as mediated by vastness and group cohesion (measured by Identity Fusion; Study 1). $*p < .05$. $**p < .01$. $***p < .001$.

Note. Regression coefficients show the indirect effect of awe on self-sacrifice (indexed by self-report willingness to sacrifice and trolley dilemma sacrifice), as mediated by vastness and group cohesion (indexed as identity fusion and inclusion of other in the self). Brackets indicate 95% confidence intervals for estimates. Confidence intervals that do not contain zero indicate evidence for mediation.

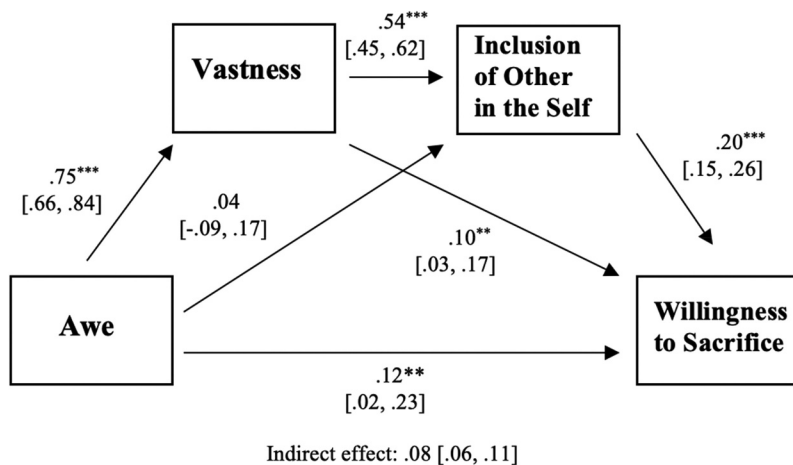


Figure III. Serial Mediation Models Illustrate Relationship between Awe and Willingness to Sacrifice as Mediated by Vastness and Group Cohesion (measured by Inclusion of Other in the Self; Study 1). $*p < .05$. $**p < .01$. $***p < .001$.

Note. Regression coefficients show the indirect effect of awe on self-sacrifice (indexed by self-report willingness to sacrifice and trolley dilemma sacrifice), as mediated by vastness and group cohesion (indexed as identity fusion and inclusion of other in the self). Brackets indicate 95% confidence intervals for estimates. Confidence intervals that do not contain zero indicate evidence for mediation.

fusion, indirect effect = $.36$, 95% CI $[.08, .59]$, but not through vastness and the inclusion of other in the self scale, indirect effect = $.05$, 95% CI $[-.10, .19]$. Mediation tests through self-diminishment instead of vastness were consistently not significant, indirect effect point estimate ranging from 0 to 0.1.

Overall, these results provide compelling evidence for a positive association between awe, the small self facet of vastness (but not self-diminishment), group cohesion, and self-sacrifice (self-report, trolley dilemma, but not monetary donation). Results also showed that our predicted mediation was supported, specifically for vastness (not through self-diminishment) and across both measures of group cohesion.

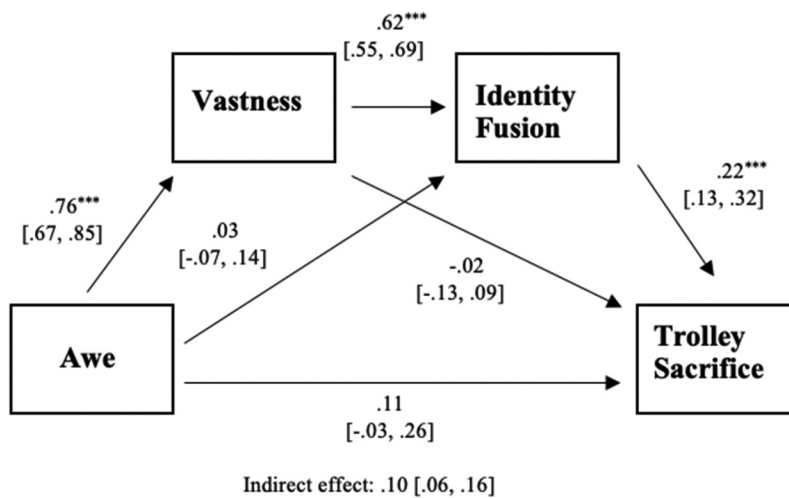


Figure IV. Serial Mediation Models Illustrate Relationship between Awe and Trolley Dilemma Sacrifice as Mediated by Vastness and Group Cohesion (measured by Identity Fusion; Study 1). * $p < .05$. ** $p < .01$. *** $p < .001$.

Note. Regression coefficients show the indirect effect of awe on self-sacrifice (indexed by self-report willingness to sacrifice and trolley dilemma sacrifice), as mediated by vastness and group cohesion (indexed as identity fusion and inclusion of other in the self). Brackets indicate 95% confidence intervals for estimates. Confidence intervals that do not contain zero indicate evidence for mediation.

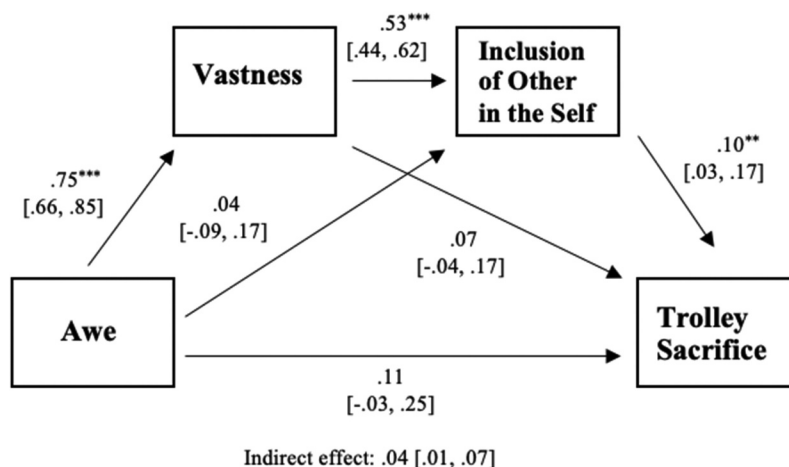


Figure V. Serial Mediation Models Illustrate Relationship between Awe and Trolley Dilemma Sacrifice as Mediated by Vastness and Group Cohesion (measured by Inclusion of Other in the Self; Study 1).

Note. Regression coefficients show the indirect effect of awe on self-sacrifice (indexed by self-report willingness to sacrifice and trolley dilemma sacrifice), as mediated by vastness and group cohesion (indexed as identity fusion and inclusion of other in the self). Brackets indicate 95% confidence intervals for estimates. Confidence intervals that do not contain zero indicate evidence for mediation.

Study 2

In Study 2, we aimed to extend the results of Study 1 by manipulating feelings of awe to establish causal effects of awe on the small self (facets of vastness and self-diminishment), group cohesion, and self-sacrifice. We used a randomized control study to do this, with one group receiving an awe-inducing video and the other receiving a neutral video. We pre-registered our hypotheses and analyses plan and indicate below deviations from such plans.

Method

Participants

Participants were recruited from the campus Research Center participant pool and compensated with a \$6 Amazon gift card. The study was advertised as an online survey investigating personal beliefs and emotions. We aimed to recruit 180 participants with complete surveys. A total of 202 participants completed this study, which was approved by the campus Institutional Review Board. The data from this study came from a larger project, which also included items investigating the relationship between awe and meaning. As we had preregistered (<https://osf.io/5vaw7/>), participants were excluded from the study if they indicated that their data was not trustworthy in a self-report measure ($N = 10$) or took a break during one of the sections ($N = 5$). No significant outliers were found in the dataset. Out of the total recruited participants, 187 were included in the final sample. All participants provided informed consent prior to the study measures. Participants ranged between the ages of 18 and 73, with a mean age of 27 ($SD = 9$). The sample identified as 33.2% male and 66.8% female. The sample also identified as 38.5% Christian, 0.5% Muslim, 5.9% Hindu, 4.3% Buddhist, 3.7% Jewish, 19.3% Agnostic, 9.1% Atheist, 9.1% spiritual but not religious, 7.5% nothing in particular, and 2.1% other. The sample was 2.1% American Indian or Alaska Native, 29.9% Asian, 0.5% Native Hawaiian or Other Pacific Islander, 9.1% Black or African, 54.5% White or Caucasian, and 3.7% Other.

Procedure

Participants were randomly assigned to one of two conditions. After watching either an awe-inducing or neutral video, participants completed various questionnaires to measure emotional states, small self, group cohesion, self-sacrifice, religious affiliation, and demographics using many of the same measures as in Study 1. The questionnaire took about 10 minutes to complete, and all measures included are listed.

Emotional manipulation. Participants were randomly assigned to either watch a panoramic video of Yosemite (awe condition) or an informational video about patio construction (neutral condition). Conditions were dummy coded 0 for neutral and 1 for awe. Both videos were approximately four minutes in length. The Yosemite video was taken from an article about awe by the Greater Good Science Center at UC Berkeley (https://ggia.berkeley.edu/practice/awe_video). The patio construction video was taken from Jennifer Stellar's Health, Emotions, and Altruism Laboratory (jenniferstellar.com/materials/).

Emotion manipulation check. The modified Differential Emotions Scale (mDES) was used to measure the positive and negative emotions elicited by the videos (Fredrickson et al., 2003). Participants were asked to respond to the extent they were experiencing 20 feelings using a trio of emotion words, including awe (e.g., *I felt awe, wonder, amazement*), during the video on a five-point scale ranging from *Not at all* to *Most of the time*. Three additional questions were added relating to reverence, beauty, and warmth. Participants' rating of awe was used as a manipulation check that our awe video did indeed increase feelings of awe compared to the neutral video.

Small self. We used the same measure as Study 1 for small self ($\alpha = .91$, $M = 3.81$, $SD = 1.41$), including subscales of vastness ($\alpha = .93$, $M = 3.95$, $SD = 1.73$), and self-diminishment ($\alpha = .84$, $M = 3.68$, $SD = 1.44$). In this case, participants were asked to consider how they were feeling "right now," when responding to the items and to answer again on a seven-point Likert-type scale from *Not at all true* to *Very True*.

Group cohesion measures. After selecting their religious affiliation from a list of 10 affiliations (same as in Study 1), participants were told to use this affiliation as their group of reference for the remaining questions.

Identity fusion. We used the same self-report measure as Study 1 for identity fusion ($\alpha = .94$, $M = 3.07$, $SD = 1.55$).

Inclusion of other in the self scale. We used the same measure as in Study 1 as a graphical representation of group cohesion ($M = 2.85$, $SD = 1.73$).

Willingness to sacrifice measures. The following measures were used to assess willingness to self-sacrifice.

Willingness to sacrifice. We used the same measure as in Study 1 for self-report willingness to sacrifice ($\alpha = .87$, $M = 2.25$, $SD = 1.14$).

Trolley Dilemma. We used the same iteration of the trolley dilemma as in Study 1.

Money distribution game. We used the same lottery donation measure and coding procedure as in Study 1 for a behavioral measure of willingness to sacrifice. Religious and charity donations ranged from zero to one hundred percent and donations were again very low in this study, ($M = 6.17\%$, $SD = 11.55\%$).

Results and discussion

Independent samples *t*-tests were used to determine if there were statistically significant differences between conditions on all dependent variables. To correct for multiple testing, using a Bonferroni correction leads to a new threshold for statistical significance of 0.0125 (although not preregistered, we chose to adopt this more stringent criteria). Complete results can be found in Table 3. Participants who watched the awe video reported significantly greater awe than those who watched the neutral video, indicating we successfully manipulated awe. We further found that there was a significant difference on measures of small self between participants in the awe and neutral condition. We found that this difference was present for the subscale of vastness, but not for self-diminishment. Taken together, these results suggest that our manipulation was successful at inducing some component of awe (vastness) and self-reported awe.

However, not supporting our hypotheses, there was no direct effect of conditions on measures of group cohesion or religious self-sacrifice. Participants in the awe condition experienced similar levels of identity fusion as those in the neutral condition (awe: $M = 3.10$, $SD = 1.59$; neutral: $M = 3.04$, $SD = 1.53$), $t(185) = 0.278$, $p = .783$, $d = .04$. The same null results were found for the measure of inclusion of other in the self (awe: $M = 2.93$, $SD = 1.81$; neutral: $M = 2.78$, $SD = 1.67$), $t(185) = 0.618$, $p = .537$, $d = .09$. We failed to find significant differences for self-reported willingness to self-sacrifice (awe: $M = 2.31$, $SD = 1.11$; neutral: $M = 2.19$, $SD = 1.17$), $t(185) = 0.712$, $p = .477$, $d = .10$, and lottery donations (awe: $M = 6.48$, $SD = 13.12$; neutral: $M = 5.86$, $SD = 9.83$), $t(167) = 0.346$, $p = .729$, $d = .05$. Null results were also found for the Trolley dilemma (awe: $M = 1.47$, $SD = 0.50$; neutral: $M = 1.48$, $SD = 0.50$), $t(184) = -0.186$, $p = .853$, $d = -.03$. Results for religious individuals alone, which we had hypothesized to be stronger than among the entire sample, were comparable and can be found in Supplementary Materials.

Table 3. Independent samples *t*-test results comparing awe and neutral conditions among all study variables for dispositional awe, small self, group cohesion, and self-sacrifice.

Study variable	Awe		Neutral		<i>t</i> (185)	<i>p</i>	Cohen's <i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Awe	3.93	1.09	2.10	1.14	11.20	<.001	1.64
Small self	4.25	1.20	3.41	1.40	4.22	<.001	.62
-Vastness	4.60	1.59	3.36	1.65	5.19	<.001	.76
-Self-diminishment	3.91	1.38	3.47	1.47	2.10	.037	.31
Identity fusion	3.10	1.59	3.04	1.53	0.278	.783	.04
Inclusion of other in the self	2.93	1.81	2.78	1.67	0.618	.537	.09
Willingness to sacrifice	2.31	1.11	2.19	1.17	0.712	.477	.10
Money Distribution game	6.48	13.12	5.86	9.83	$t(167) = 0.346$.729	.05
Trolley Dilemma	1.47	0.50	1.48	0.50	$t(184) = -0.186$.853	-.03

Although we did not find significant total effects of conditions on group cohesion and self-sacrifice, we still proceeded to test our theoretical mediation model. This decision was supported by 1) the fact that significant mediation, or an indirect pathway, can still be present even in the absence of significant total effects because there can be many different positive and negative indirect pathways in addition to the ones measured here that end up canceling each other producing a nonsignificant total effect (Hayes, 2009; Rucker et al., 2011) and 2) recent research specifically on awe showing such indirect paths in the absence of direct paths and suggesting that awe's effects are complex and may have competing effects on the ultimate outcome (Rivera et al., 2020). We note that in our preregistration document we listed mediation analyses under our analysis plan but we failed to provide details for such mediation under the hypotheses, which was an oversight. We again tested for serial mediation using PROCESS v. 3 model 6, using 5,000 bootstrap samples. We repeated mediation tests for conditions (predictor), self-report awe (mediator 1), each of our two small self subscales (vastness or self-diminishment, mediator 2), two group cohesion measures (mediator 3), and three self-sacrifice measures (outcome). The mediation model of condition, awe, vastness, identity fusion, and self-report willingness to sacrifice was significant, see Figure VI. However, the same model with inclusion of other in the self as the measure of group cohesion had a nonsignificant indirect effect (indirect effect = .01, 95% CI [-.02, .06]). Similarly, the mediation model of condition, awe, vastness, identity fusion, and trolley dilemma sacrifice was significant, see Figure VII, while the same model with inclusion of other in the self was not significant (indirect effect = .06, 95% CI [0, .2]). Together, we replicate findings from Study 1 except when group cohesion is measured through the inclusion of other in the self scale. As in Study 1, the same models testing money donation task as the outcome were not significant for the measure of identity fusion (indirect effect = .19, 95% CI [-.44, .89]) and inclusion of other in the self (indirect effect = .19, 95% CI [-.18, .83]). As in Study 1 too, all mediation models testing self-diminishment as mediator instead of vastness were not significant, indirect effect point estimates range from -.03 to .05. Additional models for nonsignificant results can be found in Figures S4-S13 of the Supplemental Materials.

General discussion

Is the self-transcendent emotion of awe implicated in religious group cohesion and ultimately supporting self-sacrifice for the group? Guided by theoretical accounts of awe, we attempted to answer this question across two studies. We hypothesized that the emotion of awe increases self-sacrifice for

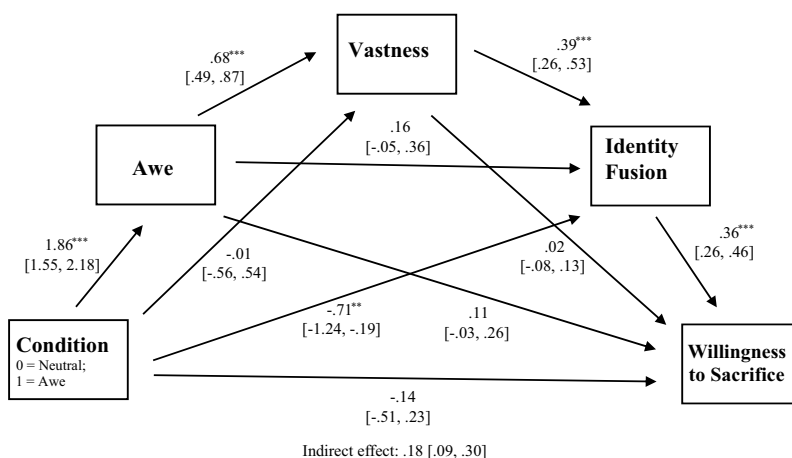


Figure VI. Serial Mediation Models Illustrate Effect of Conditions on Willingness to Sacrifice as Mediated by Awe, Vastness, and Group Cohesion (measured by Identity Fusion; Study 2). * $p < .05$. ** $p < .01$. *** $p < .001$.

Note. Regression coefficients show the indirect effect of condition and self-sacrifice (indexed by self-report willingness to sacrifice and trolley dilemma sacrifice), as mediated by awe, vastness, and group cohesion (indexed as identity fusion and inclusion of other in the self). Brackets indicate 95% confidence intervals for estimates. Confidence intervals that do not contain zero indicate evidence for mediation.

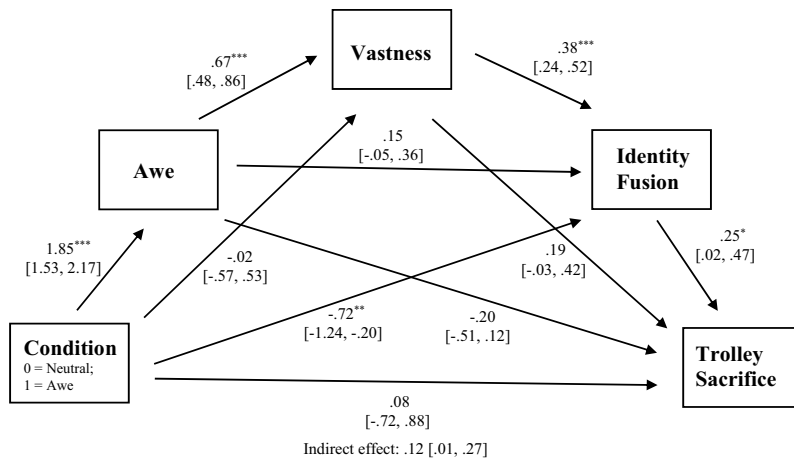


Figure VII. Serial Mediation Models Illustrate Effect of Condition on Trolley Dilemma Sacrifice as Mediated by Awe, Vastness, and Group Cohesion (measured by Identity Fusion, Study 2). $*p < .05$. $**p < .01$. $***p < .001$.

Note. Regression coefficients show the indirect effect of condition and self-sacrifice (indexed by self-report willingness to sacrifice and trolley dilemma sacrifice), as mediated by awe, vastness, and group cohesion (indexed as identity fusion and inclusion of other in the self). Brackets indicate 95% confidence intervals for estimates. Confidence intervals that do not contain zero indicate evidence for mediation.

one's religious group (regardless of what particular group one identifies with) through feelings of the small self and group cohesion. In correlational Study 1, we assessed these relationships at the dispositional level. Largely confirming hypothesis 1, we found that individuals who experience greater dispositional awe-proneness (or tendency to feel awe) are more highly fused with their religious groups (as indexed by two separate measures) and are more willing to self-sacrifice as measured by a self-report scale and an iteration of the trolley dilemma (although this particular effect was small). Awe was also related to the small self, but a closer look at the two subscales composing this measure revealed that awe was related to greater sense of vastness vis-à-vis the self, but not self-diminishment. Further, supporting hypothesis 2, we found that the association between awe and self-sacrifice is partially explained by perceptions of vastness (*i.e.*, *I feel the presence of something greater than myself*) and group cohesion.

In Study 2, we experimentally manipulated awe to determine the presence of a causal relationship between awe and our measures of interest. Inducing awe, compared to a neutral condition, did indeed increase self-reported awe and feelings of vastness but did not change self-diminishment, group cohesion, and self-sacrifice measures. Although we did not find a direct effect of our conditions on group cohesion and self-sacrifice, we did find an indirect effect of our conditions on self-sacrifice through feelings of awe, vastness, and group cohesion as measured by identity fusion (but not when measured as inclusion of other in the self). The presence of a significant indirect pathway in the absence of a total effect suggests that awe may ultimately increase both self-sacrifice (through the path described here) and decrease self-sacrifice (through a path that remains to be identified).

Awe's effects are certainly complex (see this research on the complex effects of awe on meaning, Rivera et al., 2020) and warrant more research. Study 2 provides some evidence in favor of our theoretical model, but this evidence is not as strong as we had predicted. Overall, we did not find significant findings for our third measure of self-sacrifice, which consisted of the percent of earnings donated in an imaginary lottery win. Responses that involved donations outside of family and friends, mention of religious organizations, tithe, or charitable giving were coded as self-sacrifice by the first author. One weakness of this measure is that it was coded only by one person, the first author, which can introduce bias. The bigger problem might be that this measure works better for participants who are religious. However, even among religious participants only, we did not find much evidence that

awe relates to this particular measure (note that awe has been shown to particularly increase donation of time rather than money (Rudd et al., 2012)). We will now discuss the implications of these findings within the context of the current literature.

Interestingly, research on awe typically underscores the importance of self-diminishment, rather than vastness, in the construct of small self. The small self is theorized to be the driving force in the relationship between awe and prosocial behavior (Piff et al., 2015), as well as awe and humility (Stellar et al., 2018). In particular, Piff and colleagues found that self-diminishment mediated the effect of awe on prosocial tendencies, as measured through resource distribution games (Piff et al., 2015; Study 4). However, Studies 1 and 2 found that vastness, but not self-diminishment, mediated the relationship between awe, group cohesion, and self-sacrifice. These findings suggest that vastness and self-diminishment may promote meaningfully different social effects, with vastness being more related to feeling one with a group and self-diminishment with prosociality. One paper has proposed that prosocial effects of awe may be explained through multiple steps of self-transformation and a quiet ego, rather than directly through the self-diminishment and vastness components of the small self (Perlin & Li, 2020). Future research studies could benefit from an investigation into the unique causes and consequences of both components of small self, and alternatives to this model, which may further our understanding of the relationship between awe and social behavior (Perlin & Li, 2020). For this to be possible, it would be useful to establish more substantial measures for both constructs, which are currently only measured as subscales of the small self (Piff et al., 2015).

With regard to the lack of differences following conditions on group cohesion and self-sacrifice in Study 2, we offered above that awe may be complex and not show a direct effect on these constructs because awe may have opposing effects through different pathways on these constructs. While this is possible, we still list three other possible explanations for this lack of direct effect. The first possibility is that our awe manipulation was not strong enough to meaningfully increase feelings of awe. Most naturalistic awe experiences are far more profound than the lab setting, occurring on mountain tops or between the arches of grand cathedrals. A video simply might not be a strong enough elicitor of awe to inspire the same responses. Novel research approaches using virtual reality (Chirico et al., 2018), naturalistic settings (Anderson et al., 2018), and psychedelics (Yaden et al., 2017) have yielded encouraging results and may overcome these limitations. Although our manipulation check indicated that the Yosemite video elicited awe, it might not have been the best measure to capture whether our video fully created an awe experience. Future studies should consider using a scale designed specifically to measure awe (Krenzer, 2018; Yaden et al., 2019), which may be a more valid indicator of awe than the one item awe question on the modified Differential Emotions Scale (Fredrickson et al., 2003).

Additionally, we did find that the measures that immediately followed the video, self-reports of awe and small self, were the ones that had significant differences between conditions. Order effects may be an issue with the effect of awe fading by the time participants considered group cohesion and self-sacrifice. In future studies, stronger awe manipulations might address this potential limitation by stimulating longer emotional reactions. Finally, our self-sacrifice and identity fusion measures might be too stable to be affected by an emotion induction. While some research has indicated that responses to the trolley dilemma can be changed through experimental manipulations and priming (Swann et al., 2014), other research has failed to impact decisions on the classic Trolley dilemma following emotional manipulations (Valdesolo & Desteno, 2006). Future studies might consider employing additional measures of self-sacrifice that may be more responsive to emotional manipulation. Specifically, studies could use measures that involve real sacrifice (as opposed to hypothetical), such as a cold pressor task or asking if participants would be willing to donate their compensation to charity.

Additional research may also consider using religious stimuli for the awe manipulation to provide further insights into the manifestations of awe within religious contexts. For example, participants could be shown videos of either an expansive and beautiful religious building (such as the Sagrada Familia) or a commonplace religious building. A similar experiment could also be conducted

immediately following religious service involving varying degrees of naturally experienced awe. Attendees could report their levels of awe, group cohesion, and the amount of tithe offered during service as an indicator of self-sacrifice.

The results of Study 1 indicate that there is a significant positive relationship between awe, vastness, religious group cohesion, and religious self-sacrifice. The emotion of awe can be pervasive in the atmosphere, content, and language of religious services. Our findings suggest that these emotional experiences may underlie feelings of connectedness and sacrificial behavior for the group. In many cases, the consequences of self-sacrifice can be positive. For example, a religious adherent may be motivated to donate a portion of savings to a struggling family in their congregation after a particularly awe-inspiring choir performance. However, the effects of awe on group cohesion and self-sacrifice may also have grim consequences, potentially illustrating a dark side of awe. The findings of this study, in tandem with the prior literature, suggest that awe has the potential to increase group identification through feelings of vastness. When this process is so extreme that an individual completely loses themselves for a group, they might be more likely to engage in forms of religious extremism. The findings of this study could inform our understanding of how sensational and idolized outreach materials may promote radicalization through feelings of awe, increased group membership, and support of self-sacrifice. All these potential implications go beyond the findings of the present research but we hope these findings provide some basis for future research testing more radical and potentially dark outcomes of awe in a religious context.

For many people, the experience of awe has the power to ignite and reaffirm religious faith. In the current study, we illustrate that people who experience greater awe in their daily lives feel an enriched sense of connection with their religious group, likely as a result of perceptions of worldly vastness. In turn, those who experience such connections are willing to sacrifice more of themselves for their group. Future work should build upon these initial findings to further establish the causality of these relationships, leading us to a deeper understanding of the ways that awe promotes religious identification and devotion.

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No potential conflict of interest was reported by the author(s).

Data availability statement

The data described in this article are openly available at <https://osf.io/uybdv/>.

Open Scholarship



This article has earned the Center for Open Science badges for Open Data, Open Materials and Preregistered. The data and materials are openly accessible at <https://osf.io/uybdv/>.

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