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From Awe to Ecological Behavior: The Mediating Role of Connectedness to Nature

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Abstract: Awe is a self-transcendent emotion that can diminish one's focus on the self and serves as an important motivator of commitment to social collectives. However, the influence of awe on ecological behavior is not clear. This study examines the relationships between people's feeling of awe, their connectedness to nature, and ecological behavior. Three experiments tested the effect of awe on ecological behaviors including mediation tests. Compared with participants in the control condition, participants in the awe condition were more inclined to behave ecologically (Study 1 and 2) and reported a higher feeling of connectedness to nature (Study 2). Moreover, the relationship between awe and ecological behavior was mediated by connectedness to nature (Study 3). These findings indicate that awe helps broaden the self-concept by including nature and increase connectedness to nature, which in turn lead to ecological behavior. They also highlight the significance of connectedness in explaining why awe increases ecological behavior.

Keywords: awe; connectedness to nature; ecological behavior; self-concept

1. Introduction

Global environmental protection agencies and governments spare no efforts to advocate eco-friendly actions and encourage individuals to behave ecologically. In this context, studying individuals' ecological behavior has become a popular topic, as it is broadly approved that endeavors to alter behaviors that are harmful to the environment can help solve environmental problems worldwide. Many scholars are engaging in research to discover ways to increase ecological behavior from varying perspectives [1,2]. However, people's relevant daily practice is not as ideal as the high awareness of ecological behavior. It seems to be easier to just claim an ecological lifestyle for people than to behave ecologically. A national survey of the Chinese ecological civilization shows that the score of actual ecological practice is much lower than ecological awareness [3]. Such a significant gap between ecological awareness and behavior implies that intrinsic mechanism underlying the ecological behavior at individual level has not been fully addressed [4].

In general, people who act ecologically often have to sacrifice their individual interests in exchange for the overall interests of public and society [5]. Due to the loss of self-interest caused by ecological behavior, individuals usually face a trade-off prior to engage in the process of ecological behavior [6]. If some appropriate means were conducted to lower individuals' emphasis on self and increase their attention to the external surroundings, ecological behavior would become more logically reasonable for individuals. The emotion of awe as one typical transcendent experience dissuades individuals from concentrating on immediate personal interest [7] and prompts a broader existential approach of life that leads to the inclination to take into account the welfare of other people, the broader

community, and nature [8,9]. Therefore, the emotion of awe may be an effective breakthrough to prompt ecological behavior.

Many environmental psychologists assert that an individual's relationship with nature is a key antecedent of ecological value, belief and behavior [10,11]. For example, connectedness to nature (CN) refers to a self-perceived close association with the natural world. The role of CN in facilitating the ecological behavior has recently been well acknowledged in literature on environmental psychology [11,12]. Although CN contributes significantly to environment conservation planning and practice [13], the antecedents of CN are still poorly understood, with research lacking conceptual sophistication and depth. Many scholars focus on external factors, such as exposure to nature, environmental education [14], which fail to present the essential reason for prompting CN. CN is considered to be a self-expression of the need to belong to the external world including nature [15,16]. Any factors that expand the self-concept to include nature may influence CN, such as the awe emotion. Individuals experiencing the awe emotion would perceive a smaller self, directing the attention from self to broader external entities [17,18]. Therefore, it is indicated that awe would contribute to ecological behavior by increasing the CN.

Guided by these arguments, the present study aims to provide evidence that: (1) awe increases the ecological behavior (Study 1 and 2); (2) awe increases CN (Study 2) and; (3) the 'awe-ecological behavior' relationship is mediated by the effect of CN (Study 3). Three experiments were conducted with participants in China.

2. Literature Review

2.1. Awe and the Connectedness to Nature

Belonging is a fundamental human need and reliable social relationships are essential to physical and psychological well-being [19]. The connection with nature functions in the same way [20]. It has been proved that the majority of people have the tendency to associate self with natural world [21]. The close association with nature could contribute significantly to prompting individuals' physical, mental, and overall wellbeing caused by exposure to nature [13], for example, Nisbet, Zelenski and Murphy demonstrated that CN contributes significantly to personal growth, self-acceptance, positive relations with others, and life satisfaction [22]. Meanwhile, nature contact and images of nature are considered to be effective means to cope with negative experiences and feelings in people's lives, mitigating stress, anxiety, and illness [23]. However, the isolation from the outdoor natural environment in modern city life is unable to meet the basic need for connecting with the natural world, which greatly undermines individuals' wellbeing. Therefore, understanding how to re-connect humans and nature is crucial to fulfilling the fundamental physical and psychological demand.

Keltner and Haidt consider awe as a mixed emotional response to perceptually vast stimuli that requires adjusting mental structures that cannot assimilate a new experience [24]. Although various stimuli can inspire awe, from waterfalls to childbirth to senses of devastation, the prototypical awe experience mostly involves encounters with natural phenomena that are immense in size, scope, or complexity [18]. It could be deduced intuitively that awe would have a natural impact on the individual's relationship with nature. This prediction is based on the core features that underlie the awe emotion. Firstly, Shiota, Keltner and Mossman found that both dispositional awe and experimentally elicited awe are related to an emphasis on belonging to 'universal' categories of individuals' self-concepts [17]. The awe emotion tends to make people feel small and insignificant, directing attention from self-interest and concern to entities vaster than the self [18]. Specifically, nature, as one of the primary elicitors of the awe emotion, is the vast surroundings that people could touch and perceive in their daily life. Consequently, it is reasonable to conclude that awe can instigate an individual's feeling of connectedness to larger entities, like nature, by inspiring the perception of the small self.

Secondly, awe could motivate people to take in new information or enhance people's openness to novel experiences, which has been confirmed to correlate positively with CN [18,25,26]. Since the openness to novel experience could blur the permeable mental boundaries between self and others [27]. It is reasonable to expect that awe could lead to CN, which is characterized by an indistinctness of the perceived boundaries between humans and other living things [15]. The greater the awe emotion individuals experience, the higher the degree of acceptance for external surroundings, including other people, other creatures and objects in nature.

The effect of awe on the feelings of smallness and openness indicates that awe can significantly increase CN. Guided by these results and the above conceptual analysis, the present study examines how awe influences an individual's CN.

2.2. CN and Ecological Behavior

Ecological behavior refers to behavior that aims to minimize the negative effect of people's activities on nature (e.g., saving water, reducing exhaust emission) [4]. Previous studies provide related evidence that a sense of CN would influence pro-environmental attitudes and ecological behaviors [15,27–29]; for example, farmers with a higher level of CN showed more willingness to protect the local vegetation [12]. There are several theories that help to explain the relationship between CN and ecological behavior. First, literature that paves the way for our hypothesis involves the study of self-identity. A high level of CN relates to the expanding self-concept by including nature as part of the self [28,30]. Seeing the self as part of the whole life collective could result in the mergence between body and mind with nature [30]. Consequently, protecting natural environments is regarded as self-constructive, since nature is an important component of oneself [15].

The second evidence relates to the study of psychological processes involved in the mechanism of CN affecting ecological behavior [31]. One of the most significant facets of relationship is dependence [32]. The physical and emotional dependence on nature could predict pro-environmental behavior, as well as inclusion of nature in the self [32]. According to the self-expansion model, when individuals deem nature as a partner of themselves, they would incorporate nature's identity, resources and perspectives into their own [33]. Thus, the feeling of interconnectedness between the self and nature would provoke ecological behaviors due to the consideration of the benefit the natural world.

From the perspective of self-identity and dependence on nature, CN is suspected to positively affect ecological behavior. Based on this theoretical derivation, we would examine the relationship between CN and ecological behavior.

2.3. Awe, CN and Ecological Behavior

Because environmental destruction is a bigger-than-self problem, the key values of ecological behavior are the communal, self-transcendent values. These values transcend the focus on the self and prioritize the welfare of other people, the broader community, and nature [9]. The self-transcendent value would lead to intrinsic motives to protect the environment [34,35] while suppressing values that support self-interest. The emotion of awe is deemed to be one typical self-transcendent experience [36]. Hence, people experiencing awe should show intrinsic motives to care for the environment.

The resource allocation theory also provides a foundation for our prediction on the direct relationship between awe and ecological behavior. Given that attention is a limited resource, the more individuals pay attention to themselves, the less they focus on their surroundings [37]. According to the characteristics of awe, individuals who experience awe would reduce focus on self and turn attention to surroundings. Hence, the higher the degree of awe individuals experience, the more consideration they would show for nature. By contrast, the induction of a heightened sense of self-awareness would increase the possibility of self-oriented behavior that contradicts interest in society, such as conspicuous consumption [38]. Consequently, we deduce that the awe emotion directing individual's focus from the self to nature may lead to ecological behavior for the benefit of nature.

Past studies have documented the social function of awe based on a feeling of self-diminishment; for example, awe can enhance collective concern via a sense of a small self [18]. Awe has also been associated with an improved social relationship with others [39]. It is proposed that self-transcendent emotions like awe can help individuals initiate and maintain relationships with others that facilitate prosocial behavior [39]. Along this line of consideration, we infer that awe could also promote ecological behavior through increased association with nature.

The indirect effect of awe on ecological behavior can be further illustrated by the effect of CN on ecological behavior, together with the relationship between awe and CN. These lines of study on the awe emotion, CN and ecological behavior suggest that awe could adjust the self-concept and induce the feeling of CN, which should also increase ecological behavior. We propose that CN plays an important role in the relationship between awe and ecological behavior. According to previous findings and the present conceptual analysis, we conducted three studies to test the hypotheses that the induction of awe would increase ecological behavior awe by prompting people's feelings of CN.

2.4. The Current Research

In the present research, we hypothesize that awe prompts CN and in turn increases ecological behavior. Three experiments were performed to test these hypotheses (see Table 1). We investigate whether the awe emotion can prompt ecological behavior (Study 1 and 2) and the connectedness to nature (Study 2) and examine the mediation effect of the connectedness to nature on the relationship between awe and ecological behavior (Study 3). We mainly focus on awe induced by natural scenery and powerful people, as physical vastness (e.g., natural sceneries) and social vastness (e.g., a powerful person) are considered to be two typical types of awe elicitors [24,39]. In Study 1, awe is induced by natural sceneries as well as powerful people; in Study 2, awe is induced by powerful people only; in Study 3, awe is induced by natural sceneries only. Varied manipulations of awe were adopted, including recalling report task (Study 1 and 2) and video clips (Study 3). Specifically, emotions (such as fear, pride) and exposure to nature are considered to affect environmentally related behavior [40,41]. In light of this concern, we control for other emotional states in Study 1, and induce the awe emotion by a non-natural stimulus in Study 2. We chose college students as participants in our studies. In order to exclude the interferences of other variables such as environmental education and resulting knowledge, all participants were randomly assigned to the awe condition and the control conditions to ensure the homogeneity of other external variables.

Table 1. Aims, materials and method of the three studies.

	Aim	Targeted Emotion Induction	Material		Method
			CN	Ecological Behavior	
Study 1	1. Examine the impact of awe on ecological behavior		-		
Study 2	1. Examine the impact of awe on CN and ecological behavior; 2. Exclude the influence of natural elicitors of awe on the relationship between awe and ecological behavior.	A narrative recalling task	The Connectedness to Nature Scale	The possibilities to engage in 12 ecological behaviors	Experiment
Study 3	Investigate whether CN mediated the effect of awe on ecological behavior	Watching video clips			

3. Study 1

This study investigated the impact of awe on increasing ecological behavior. We predicted that awe would increase the intentions of ecological behavior. Awe and the neutral state were experimentally

induced via a narrative recall task, which has been well validated and widely adopted by previous research. Ecological behavior was measured by the possibilities to engage in 12 ecological behaviors.

3.1. Method

146 Chinese college students in Shanghai were recruited for this experiment. Their major was business management. They received several course credits for their participation, and they ranged in age from 18 to 24 years (79 females, $M_{\text{age}} = 22.43$, $SD = 1.85$).

Randomly assigned to one of the two conditions (awe or neutral), all participants were required to recall and describe an experience related to a targeted emotion. The following materials to induce the targeted emotions were adapted from Gordon, Stellar, Anderson, McNeil, Loew and Keltner [39] and Piff, Dietze, Feinberg, Stancato and Keltner [18]. Participants assigned to recall an awe-related experience read the text content as follows.

“We often feel awe in response to vast, beautiful landscapes and natural wonders such as tall mountains, expansive vistas, or large waterfalls. We can also feel awe in response to people who cause large-scale change such as Nelson Mandela and his role in ending apartheid in South Africa. Please take a few moments to recall a time when you felt intense awe like the examples described above.”

Participants assigned to recall a neutral experience read the text as follows.

“Bring to mind an ordinary event in your daily life—an event that took place in the last week. Take a few moments to think about the ordinary event and how it makes you feel.”

After that, all participants were instructed to write at least 30 Chinese characters to describe their experience and feeling. Then, participants reported their emotional states, including anger, awe, disgust, fear, pride, sadness, and happiness, assessed by single items (1 = not at all, 7 = extremely) [18]. Moreover, participants reported the likelihood of engaging in 12 ecological behaviors assessed by the scale developed by Kaiser, Doka, Hofstetter, and Ranney (e.g., “recycling, taking shorter showers”; $\alpha = 0.85$; $M = 5.43$; $SD = 0.76$; 1 = not at all, 7 = extremely) [42]. Finally, all participants were thanked.

3.2. Results

To ascertain that the recalling task induced the targeted emotion, we contrast the ratings of awe in the awe condition with those in the neutral condition. An independent *t*-test showed that awe induction led to more awe than the control induction, $t(144) = 28.75$, $p = 0.000$, $d = 0.93$. Therefore, the awe manipulation was successful (see Table 2 and Figure 1).

Table 2. Mean scores for awe, connectedness to nature, ecological behavior (SDs in Parentheses).

	Study 1		Study 2		Study 3		
	Awe (N = 75)	Neutral (N = 71)	Awe (N = 80)	Neutral (N = 78)	Awe (N = 83)	Amusement (N = 78)	Neutral (N = 77)
Anger	1.05 (0.75)	1.57 (1.41)	1.23 (0.62)	1.68 (1.55)	1.17 (0.86)	1.33 (0.79)	1.58 (1.03)
Awe	6.09(0.84) ***	2.17 (0.75)	5.92 (0.87) ***	2.77 (0.76)	5.98 (0.88) ^{b,c}	2.20 (1.00) ^a	2.66 (0.89) ^a
Disgust	1.54 (0.76)	2.18 (0.83)	1.79 (0.76) ***	2.84 (0.77)	2.09 (1.21)	1.78 (1.14)	2.58 (1.09)
Fear	2.36 (0.98)	2.74 (1.12)	2.55 (0.84)	2.56 (1.12)	2.13 (1.11)	1.93 (0.94)	2.33 (1.27)
Pride	4.77 (1.45)	4.02 (1.21)	4.32 (1.02)	4.27 (1.17)	4.89 (1.37)	4.56 (1.02)	4.13 (0.87)
Sadness	1.18 (0.66) ***	3.09 (1.37)	2.68 (1.02)	3.13 (1.26)	1.12 (0.99) ^c	1.07 (0.78) ^c	3.53 (0.85)
Happiness	5.90 (1.20) ***	4.82 (1.61)	5.92 (0.76) ***	4.32 (0.88)	5.91 (1.12) ^c	6.12 (1.03) ^c	3.24 (1.17)
Amusement	-	-	-	-	3.79 (0.94) ^b	5.51 (0.88)	3.01 (0.87) ^b

Note: For Study 1 and 2: *** $p < 0.001$. For Study 3: ^a The means are different from those in the awe condition ($p < 0.05$); ^b The means are different from those in the amusement condition ($p < 0.05$); ^c The means are different from those in the control condition ($p < 0.05$). The above emotions are assessed by single items including the text “anger”, “awe”, “disgust”, “fear”, “pride”, “sadness”, “happiness” and “amusement” separately.

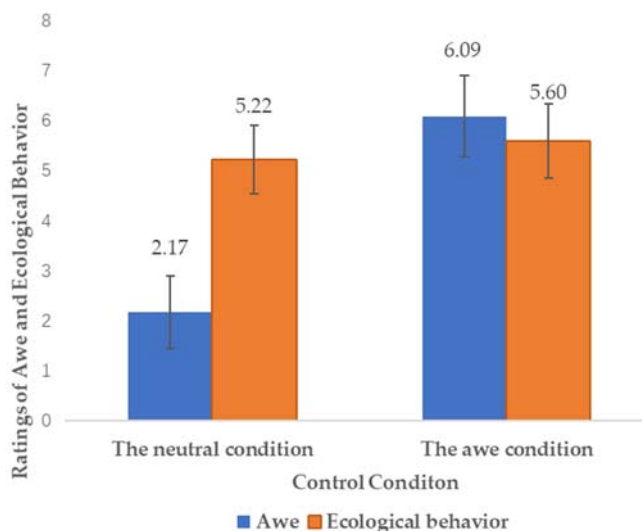


Figure 1. The means and standard deviations of awe and ecological behavior in Study 1.

We set composites for negative affects (anger, disgust, fear, sadness) and positive affects (happiness, pride). An independent t test showed that awe induction led to more positive emotion ($M = 5.34$, $SD = 0.72$) than the neutral induction ($M = 4.42$, $SD = 0.81$), $t(148) = 8.55$, $p = 0.000$, $d = 0.51$. Moreover, the awe induction led to less negative emotion ($M = 1.53$, $SD = 0.57$) than the neutral induction ($M = 2.40$, $SD = 0.79$), $t(148) = -7.63$, $p = 0.000$, $d = -0.53$ (see Table 2).

We then contrast the ratings of ecological behaviors in the awe condition with those in the neutral condition. An independent t -test yielded a significant difference across conditions. Participants in the awe condition ($M = 5.60$, $SD = 0.69$) reported greater likelihoods of engaging in ecological behaviors than did those in the neutral condition ($M = 5.22$, $SD = 0.74$), $t(144) = 3.20$, $p = 0.002$, $d = 0.26$ (See Figure 1). In order to examine the unique influence of the awe emotion on ecological behavior, we controlled for the influence of other emotions on ecological behavior. Results indicated that the influence of awe on ecological behaviors remained unchanged, $F(1, 144) = 7.425$, $p = 0.007$.

3.3. Discussion

Study 1 served as experimental evidence for the hypothesis that awe prompted ecological behavior. Controlling for the influence of other emotions, the awe emotion still significantly increased ecological behavior. The results were consistent with prior research that the awe emotion helped enhance collective concern instead of self-interest. However, natural scenery, as a typical elicitor of the awe emotion, was considered to have a significant influence on ecological behavior as well [15,30]. Consequently, we conducted the next study to further ascertain the effect of awe on ecological behavior by eliciting the awe emotion with non-natural stimuli.

4. Study 2

In Study 2, we still adopted the method of a recall report task to elicit the targeted emotions (awe or neutral). Specifically, in order to exclude the influence of natural elicitors, participants were requested to recall and write about something about a great person to induce the awe emotion. Following that, participants reported their emotional state, CN and how ecologically they would behave. We predicted that awe induced by non-natural sceneries would increase CN and ecological behaviors.

4.1. Method

158 Chinese college students from a university in Shanghai participated in this experiment. They received several course credits for their participation. Their ages ranged from 17 to 25 years (81 men; $M_{\text{age}} = 23.38$; $SD = 2.10$).

Randomly assigned to the awe or neutral condition, all participants were required to recall and describe some experience related to a targeted emotion. The following material to induce emotions was adapted from Gordon, Stellar, Anderson, McNeil, Loew and Keltner [39] and Piff, Dietze, Feinberg, Stancato and Keltner [18]. Participants assigned to recall an awe-related experience read the text as follows:

“Often we feel awe in response to people who cause large-scale change such as Nelson Mandela and his role in ending apartheid in South Africa. Take a few moments to think about a great person and how he (or she) makes you feel.”

The neutral state was induced by the following text:

“Bring to mind an ordinary event in your daily life—an event that took place in the last week. Take a few moments to think about the ordinary event and how it makes you feel.”

After reading the text above, all participants were required to write no less than 30 Chinese characters to describe their experience and feeling. Then, they reported their emotional states, including anger, awe, disgust, fear, pride, sadness, and happiness, which were measured by single items (1 = not at all, 7 = extremely) [18]. Moreover, participants reported CN assessed by the scale developed by Mayer and Frantz [15], which has been well validated (e.g., “I often feel a sense of oneness with the natural world around me”; 1 = strongly disagree; 7 = strongly agree). Finally, participants reported their likelihood of behaving ecologically (e.g., “recycling, taking shorter showers”; 1 = not at all, 7 = extremely), which was identical to the measure of ecological behavior used in Study 1 [42].

4.2. Results

We first test whether the manipulation stimulates the target emotion. As shown in Table 2, the results of an independent *t*-test analysis showed that the awe induction increased awe relative to the neutral induction, $t(156) = 60.50$, $p = 0.000$, $d = 0.98$. Therefore, the manipulation was successful (See Table 2 and Figure 2).

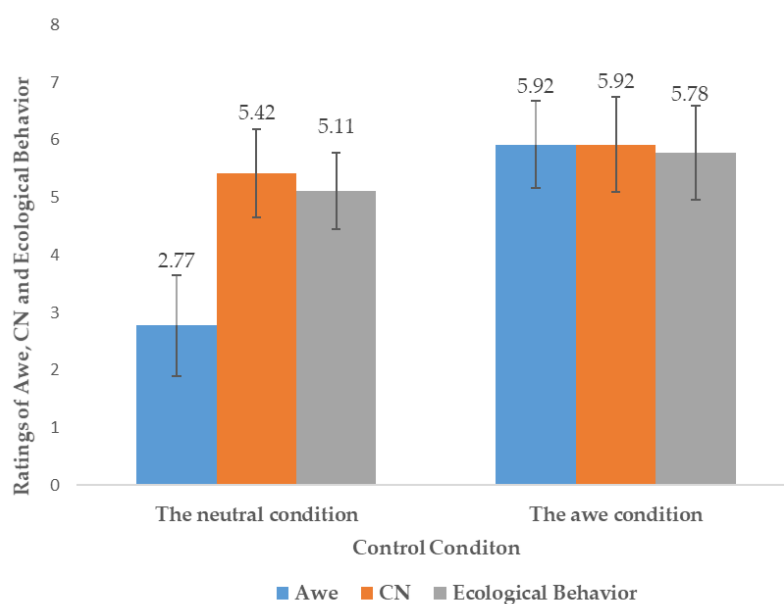


Figure 2. The means and standard deviations of awe, CN and ecological behavior in Study 2.

We then contrast the ratings of CN and ecological behavior in the awe condition with that in the neutral condition. An independent *t*-test showed that the awe induction increased ratings of CN ($M = 5.92$, $SD = 0.77$) relative to the neutral induction ($M = 5.42$, $SD = 0.83$), $t(156) = 3.73$, $p = 0.000$, $d = 0.29$ (See Figure 2). Moreover, participants in the awe condition has increased likelihoods of behaving ecologically ($M = 5.78$, $SD = 0.66$) compared with those in the neutral condition ($M = 5.11$, $SD = 0.82$) (See Figure 2), $t(156) = 5.63$, $p = 0.000$, $d = 0.41$. Therefore, the induction of awe led to more CN and ecological behavior than the induction of neutral state.

4.3. Discussion

Awe could be induced by anything perceived as possessing vastness, including the natural world [24]. However, nature was confirmed to be a key antecedent of ecological behavior. In order to exclude the impact of nature, awe was manipulated by non-natural stimuli in Study 2. Results indicated that the influence of awe on ecological behavior was still significant. Therefore, Study 2 provided additional evidence that awe could enhance CN and ecological behavior, even controlling for the influence of natural factors. The following study was conducted to further confirm the mediation effect of CN on the relationship between the awe emotion and the ecological behavior.

5. Study 3

This study investigated whether CN mediated the effect of awe on ecological behavior. We adopt another method, watching videos, to induce targeted emotional states including awe, amusement and a neutral state. Amusement was chosen as a comparison with awe for the following reasons. First, amusement had been used to compare with the influence of awe in previous research [18]. Then, the two emotions were both in positive valence and induced by “an incongruity between one’s expectations and experience” [18]. Finally, the two emotions could both be elicited by nature-related stimuli, which helps confirm the unique effects of awe on ecological behavior, excluding the influence of natural factors [18].

5.1. Method

238 Chinese college students in a university in Shanghai were recruited for the study. In addition, they were rewarded with several course credits. Their age ranged from 17 to 25 years (118 men; $M_{\text{age}} = 22.14$; $SD = 1.76$).

Randomly assigned to the awe, amusement or neutral condition, all participants were required to watch a video to manipulate the targeted emotion. The three video materials were all clips of about 5 min, and had been adopted in previous research by Piff, Dietze, Feinberg, Stancato and Keltner [18]. The video inducing awe is about grand natural sceneries; the video inducing amusement is about cute animals in the natural environment; the video inducing neutral state is about a man describing the construction of a kitchen countertop; after watching the videos, participants reported their emotional states, including anger, awe, disgust, fear, pride, sadness, happiness and amusement, which were measured by single items (1 = not at all, 7 = extremely) [18]. Then, participants reported CN and their likelihoods of engaging in ecological behaviors assessed by same scales employed in Study 2. Finally, all participants were thanked.

5.2. Results

We first tested whether the manipulation stimulated the targeted emotion. A one-way ANOVA analysis showed that the ratings of awe in the awe condition were higher than those in the control conditions, $F(2, 267) = 222.44$, $p < 0.001$ (see Table 2 and Figure 3). The amusement induction increased amusement relative to the awe and neutral inductions, $F(2, 267) = 212.38$, $p < 0.001$ (see Table 2).

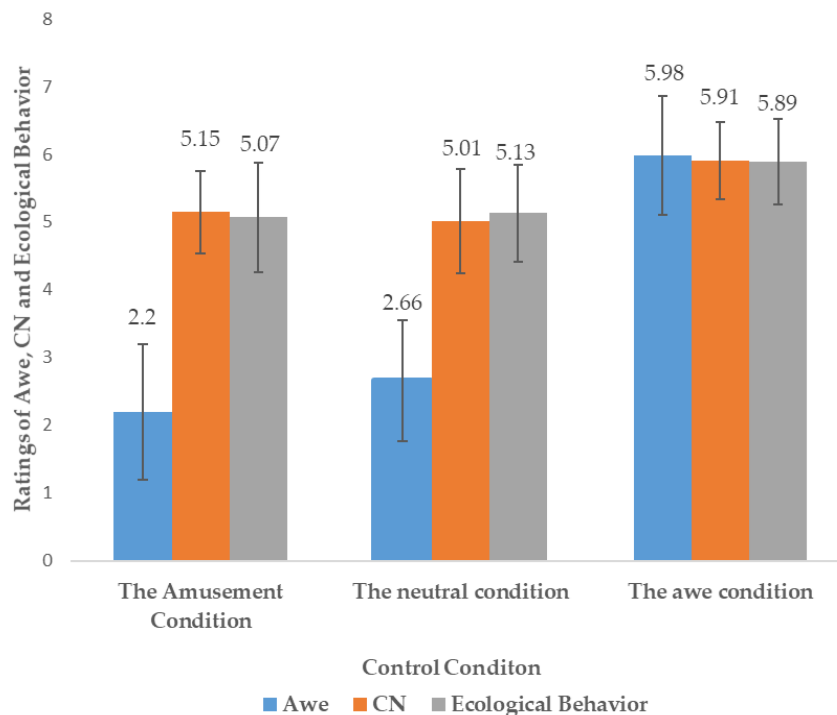


Figure 3. The means and standard deviations of awe, CN and ecological behavior in Study 3.

We examined whether the awe emotion significantly increased CN compared with the control condition. Results of a one-way ANOVA with post hoc analysis indicated that there were significant condition differences. The ratings of CN in the awe condition ($M = 5.91, SD = 0.57$) were higher than those in the amusement ($M = 5.15, SD = 0.61$) and neutral conditions ($M = 5.01, SD = 0.77$) (See Table 3 and Figure 3). Therefore, the awe induction led to more CN relative to the other two emotional inductions.

Table 3. Between-group differences in CN and ecological behavior.

	ANOVA	Post-Hoc Statistics [95% CI Mean Difference]		
		Awe-Neutral Condition	Awe-Amusement Condition	Amusement-Neutral Condition
CN	$F(2,235) = 11.87; p = 0.000$	$p = 0.000; [0.23, 0.76]$	$p = 0.000; [0.29, 0.76]$	$p = 0.829; [-0.25, 0.31]$
Ecological Behavior	$F(2,235) = 24.37; p = 0.000$	$p = 0.000; [0.44, 0.90]$	$p = 0.000; [0.42, 0.83]$	$p = 0.686; [-0.29, 0.19]$

We then tested whether the awe emotion significantly increased ecological behavior relative to the control emotion. A one-way ANOVA with post hoc analysis showed that there were significant condition differences. The awe emotion led to increased ecological behavior ($M = 5.89, SD = 0.63$), compared with amusement ($M = 5.07, SD = 0.81$) and neutral states ($M = 5.13, SD = 0.72$) (See Table 3 and Figure 3). Therefore, the awe induction enhanced ecological behavior relative to the amusement or neutral induction.

In addition, we examined the correlation between CN and ecological behavior. The results indicated that CN was positively associated with ecological behavior, $r = 0.73; p = 0.000$.

Finally, a bootstrap mediation analysis, recommended by Preacher and Hayes [43,44], was conducted to ascertain the mediating effect of CN on the relationship between awe and ecological behavior. The condition was coded as 1 (awe), 0 (neutral) or -1 (amusement). As shown in Figure 4, with 5000 bootstrap iterations, the indirect influence of awe on ecological behavior via CN was

significant, 95% CI [0.04, 0.50]. Moreover, the results indicated that the direct influence of the awe condition (in contrast to the control condition) on ecological behavior became nonsignificant when CN was included in the model, 95% CI [−0.02, 0.40] (see Figure 4). All the findings indicated that CN fully mediated the influence of awe on the promotion of ecological behavior.

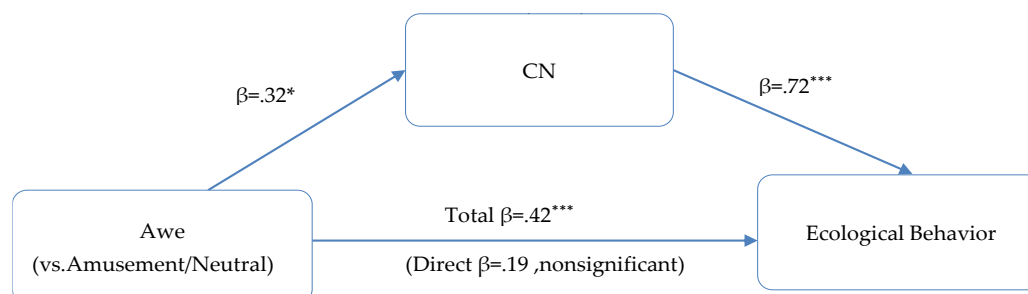


Figure 4. The mediating role of connectedness to nature in Study 3. Note: Unstandardized coefficients are shown. * $p < 0.05$; *** $p < 0.001$.

5.3. Discussion

These results further supported that CN mediated the effect of awe on ecological behaviors. Compared with people in the control context, participants in the awe condition reported more CN and showed more possibilities to behave ecologically. The results were consistent with the previous prediction that CN accounted for the effect of awe on ecological behavior.

6. General Direction

People have a strong instinctive demand for CN named biophilia [45]. CN is beneficial for human beings, as well as for environmental protection [46]. However, with the development of technologies and increased urbanization, accompanied by the isolation from outdoor natural environmental stimuli in civic life, this essential type of connectedness seems to have been undermined. This dilemma inspires us to investigate whether people would increase CN following awe, a specific self-transcendent positive emotion that involves the inclusion of other entities in one's self-concept, and whether increased CN following awe promotes ecological behaviors.

The results of the three experiments revealed that individuals experiencing the awe emotion increased their likelihoods of behaving ecologically (Study 1 and 2) and prompted CN (Study 2). CN played a mediating role in the influence of awe on ecological behavior (Study 3). Overall, all results support the hypothesis that awe increased ecological behavior due to CN induced by awe.

The findings of this paper are consistent with previous related studies on the social function of the awe emotion [18,47]. In these investigations, awe is confirmed to increase prosociality and collective engagement [18], promotes integration into social groups [48], and decreases aggression [47]. The paper extends this function to ecological behavior. Although both prosocial behavior and ecological behavior are relevant to the broadening of self-concept, the prosocial behavior is distinct from the ecological behavior. Prosocial behavior is relevant to connectedness to other human beings, embracing others in the self-concept, while our findings prove that ecological behavior involves connectedness to nature; the inclusion of the whole of nature into the self. The latter would be concerned with a broader scope of self-concept. These researchers unanimously explained the relationship between awe and various selfless behavior in terms of people's sense of small self. This paper further showed that awe could also bring out increased desires for CN, which in turn prompted pro-environment behaviors.

7. Implications

Our paper contributes to the previous theory and management practice in the following three aspects. First, the discussion on the antecedents of ecological behavior almost all focus on extrinsic

factors in previous research [9,49], rarely addressing the intrinsic mechanisms that underlie ecological behavior [5]. Ecological behavior refers to the sacrifice of the short-term interests of the individual in exchange for the overall interests of the public and society [5]. Although the rational cognition for the cost-benefit tradeoff seems to be the main reason for the gap between ecological awareness and practical behavior, emotional variables are confirmed to exert a more significant influence in environmental related behavior than cognitive variables [9,49]. We further verify the key influence of a specific intrinsic emotion—awe—on ecological behavior. Therefore, this study broadens the research on the antecedents of ecological behavior. As compared with extrinsic factors (e.g., demographic variables, ecological awareness) discussed in previous research, the awe emotion could be easily manipulated and affected, so the findings present a new direction to prompt ecological behavior in daily life. For public managers, in addition to publish targeted regulations and policies to protect environment, flexible methods combined with the awe emotion can be adopted, such as charitable activities, propaganda, and carrying forward outstanding environmental personalities.

Second, the self-transcendent value undermines the focus on the self and prioritizes the welfare of external existence [5]. Specifically, this value leads to intrinsic motives to protect the environment [34,35], while suppressing values that support self-interest. The emotion of awe is deemed to be one typical self-transcendent experience [36]. Hence, people experiencing awe should show intrinsic motives to care for the environment. However, the majority of related studies just confirm repeatedly that awe can inspire the small self, as well as being concerned with social psychological and behavioral results, such as increased social value orientation, collective engagement and decreased aggression. The discussion on the effect of awe on the relationship between the self and the natural world is rarely mentioned. Our study extends the research on awe and further confirms that awe has a natural impact on the individual's CN, resulting in a lack of distinctness of the perceived boundaries between humans and the natural world. These findings not only deepen the mechanisms of awe on the self, but also provide a new insight for comprehending individuals' association with the natural world.

Third, the present findings further corroborate that awe could also advance pro-environment actions via CN. If there is no close connection between people and nature, it is hard for people to conduct ecological practice voluntarily in daily life because ecological behavior must be done at the cost of economy, convenience, and comfort [5]. Our study contributes to the mechanisms of the effect of awe on ecological behavior by showing CN to be an indicator of broad self-concept, effectively explaining the influence of awe on ecological behavior. Based on these results, public managers could effectively guide ecological behavior by means of activities that promote the feeling of harmony and connection between people and nature.

8. Limitations

Similar to the majority of the related studies, the two types of awe we focus on in the present research play identical roles as dependent variables. Consequently, analysis of the differences between the two types of awe has been neglected, and needs further investigation. Therefore, future studies should extend our findings concerning the different impacts of various types of awe on ecological behavior. In addition, this article only chose college students as the sample, excluding other social respondents; the limitations of sample selection may make the conclusions of this article narrower.

9. Conclusions

CN is an intrinsic orientation in people's minds and a vital feature for environmental protection. However, to date, only few studies have addressed diverse ways to enhance CN and ecological behavior. The investigation conducted in this study indicates that awe, although often scarce and fleeting, serves a vital ecological function. When people feel awe, the feeling of CN increases, which in turn prompts the inclination of ecological behavior.

The present research also carries theoretical and practical implications for the crucial role of the awe emotion in one's coping with nature and the environment. With increasing deterioration of the global environment, it is critical for scholars, industries and governments to take effective action to enhance people's pro-environmental concerns and ecological behaviors, the findings would provide another way to fulfill their need.

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