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The COVID-19 Pandemic as an Impetus for Pro-Environmental Behaviours: The Role of Causal Attribution

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Abstract

In this paper, we examine the impact of causal attribution on pro-environmental behaviours in the context of COVID-19. Using data collected in July 2020 (N = 319 Chinese adults), we find that individuals' beliefs that the pandemic was caused by humanity's excessive intrusion into nature has a positive impact on their environmental awareness. This, in turn, triggers a positive behavioural change towards the environment. The current study unveils and empirically demonstrates the mechanism of the relationship between causal attribution of the pandemic and pro-environmental behaviour. The implication is that the pandemic presents an occasion for policymakers to consider human environmental intrusion as a causal attribution

to engage individuals in pro-environmental behaviours through the design of strategies that explicitly emphasize the relationship between environmental degradation and global-scale epidemics.

Keywords

COVID-19; Pro-environmental behaviours; Causal attribution; Environmental awareness; Negative emotions

1. Introduction

People typically feel the need to make sense of what has caused an event, in particular when this event is unexpected, negative, or significant in their lives (Weiner, 1985). Identifying the cause of an event is also the first step people take in an attempt to cope with its effects (Hulme, 2014). According to attribution theory, individuals' perception of the cause of an event and "the consequences of such perceptions" (Kelley, 1973) can influence how they respond to the event.

Some researchers argue that excessive and uncontrolled human consumption rather than nature itself has increased the risk of "zoonotic" diseases to jump from animals to human (e.g., COVID-19) (New Scientist, accessed on 3 March 2021)[1]. Despite this scientific view, individuals' beliefs of the cause of COVID-19 diverge (Freeman et al., 2020). This divergence highlights the importance of examining individuals' attributions and the impact of those attributions on their behaviours. In this study, we investigate the extent to which an individual's level of COVID-19 attribution to human intrusion into nature can increase environmental awareness and trigger negative emotions, which then lead to more pro-environmental behaviours. In so doing, we add to the literature on the impact of causal attribution of COVID-19 on individuals' behaviours, specifically in the domain of pro-

[1] https://www.newscientist.com/article/mg24933243-000-the-covid-19-pandemic-makes-plain-the-consequences-of-abusing-nature/

environmental behaviours.

1.1 Causal attribution and pro-environmental behaviour

Attribution theory has been used to explain the association between accountability for environmental problems and individuals' likelihood to engage in pro-environmental behaviours (e.g., Bockarjova & Steg, 2014; Steg & Sievers, 2000). For example, using data on Dutch drivers, Bockarjova and Steg (2014) find that drivers are more willing to switch to electric vehicles if they perceive that the environmental damage caused by conventional cars is severe and electric vehicles could decrease the damage. Drawing from survey data in the aftermath of severe floods in the UK, Ogunbode et al. (2019) find that the attribution of a disaster to human-induced environmental intrusion is a prerequisite for more pro-environmental engagement after such an event.

So, if individuals believe that humanity's excessive intrusion into nature is to blame for the pandemic, they might be more willing to adopt pro-environmental behaviours since, in so doing, they could avoid future similar disasters (i.e., pathogen spillover). In other words, for individuals who believe that COVID-19 is the outcome of human intrusion into nature, the on-going outbreak may serve as an alarm bell and a call to change their behavioural patterns. Indeed, there is evidence that public concern over the environment has increased notably since the outbreak of COVID-19[2]. Thus, we propose that there is a relationship between individuals' likelihood to attribute the cause of the pandemic to human intrusion into nature and their intention to behave pro-environmentally.

1.2 Environmental awareness and negative emotions as mediators

Disastrous events exert their influence on pro-environmental behaviours via cognitive, emotional, and other mediating variables (Mazzocchi & Montini, 2001; Västfjäll et al., 2008).

1.2.1 Environmental awareness

[2] https://www.downtoearth.org.in/news/environment/covid-19-effect-public-concerns-about-environment-have-risen-76987

Protection motivation theory (Rogers, 1975) posits that individuals who have experienced a disaster are more likely to make behavioural changes to prevent losses from similar disasters in the future (Sattler et al., 2000). The realization that a disaster has been caused by human environmental destruction can lead to awareness that the environment is fragile and environmental protection action is needed. This then should develop into an intention to engage in pro-environmental behaviours. For example, Zhang et al. (2014) find that when people are aware of the consequences of disasters, they would see the importance of environmental protection and thus be more willing to promote pro-environmental behaviours.

In the context of COVID-19, there has been speculation, from both academics and the public, that human intrusion into nature is the root cause of COVID-19. For instance, on the website of the World Economic Forum[3], experts stress that environmental problems such as deforestation and loss of wildlife habitat cause infectious diseases, and the COVID-19 pandemic is a "stark reminder of our dysfunctional relationship with nature" (Quinney, 2020). When individuals make sense of the cause of COVID-19 as such, they would feel more concerned over environmental problems, which can motivate their pro-environmental behaviours. Indeed, as Natural England's recent People and Nature Survey suggests, during COVID-19 (April-June 2020), the public concern over the environment and environmental protection significantly increased (Statistics, 2020).

1.2.2 Negative emotions

Attributing COVID-19 to human intrusion into nature can lead to negative emotions. When individuals interpret a negative outcome as one that they can control, the causal attribution may generate a sense of guilt (Weiner, 1985). This negative emotion may make people think more about their responsibility and that the event could have been avoided.

[3] https://www.weforum.org

Recent research in pro-environmental behaviours finds that, compared to natural environmental damage, individuals feel more negative emotions when they observe or experience human-induced environmental damage, and thus are more likely to practice pro-environmental behaviours (Rees et al., 2015).

Hence, we posit that attributing the pandemic to human intrusion into nature will increase individual awareness of environmental issues, trigger negative emotions towards the damage caused by the disaster, and in turn motivate pro-environmental behaviours.

1.3 Hypotheses of the present study

We develop a framework which illustrates the formulation of two hypotheses and present it below as well as in Figure 1a:

Hypotheses: The more individuals believe that the pandemic has been caused by human intrusion into nature, the more they intend to behave pro-environmentally, and the relationship is mediated by environmental awareness (H1) and negative emotions (H2).

In this study, we also account for the possibility that causal attributions (e.g., environmental attribution in this research) might follow rather than precede specific types of cognition such as awareness (e.g., environmental awareness in this research) and emotions (e.g., negative emotions) (Harvey & Weary, 1984). Therefore, we investigate the potential of reverse causality such that environmental awareness might already be present in an individual's schemata that leads to rather than is triggered by environmental attribution for COVID-19. We present a competing model which reflects that alternative in Figure 1b whereby environmental awareness and negative emotions act as antecedents to attribution. We, then, compare empirically the two competing models.

Insert Figure 1a here.

Insert Figure 1b here.

2. Method

2.1. Procedure

We collected data using an online survey in China from 26 July to 30 July 2020. We posted a link to our questionnaire on two social platforms, WeChat and Weibo, which are popular social media platforms in China (Guo & Zhang, 2020). Respondents were also encouraged to share the link to the questionnaire among their own social networks. Reminders were sent via the social media accounts a few days after posting to encourage participation. In the questionnaire, we provided respondents with a brief description of our study and the estimated duration (15–20 min). We also ensured respondents' anonymity and confidentiality. Then, participants provided informed consent and filled out the online questions.

2.2. Participants

We obtained a usable sample size of 393. Over half of the respondents (56.8%) in our sample were female. Most of the respondents were young, with 41.2% of respondents aged between 18 and 24 and 28.3% between 25 and 34. The respondents were generally well educated, with over 70% having a university degree or above (bachelor's degree = 43.4% and master's degree = 30.3%).

2.3. Measures

We used measures adapted from existing scales in the literature, which are presented below. Sample items for the measures are shown in brackets. All items were measured using 7-point Likert scales anchored from strongly disagree (1) to strongly agree (7).

2.3.1 Causal attribution (Belief)

Three items assessed causal attribution (hereafter, Belief), operationalized as belief in human-induced environmental degradation as the cause of the pandemic (e.g., "I believe environmental problems is one of the main reasons for the coronavirus outbreak"). The items were adapted from Ogunbode et al. (2019), which were originally designed for subjective

attribution of the cause of floods to climate change.

Our measurement of the causal attribution allows us to directly tap into these beliefs without necessarily measuring the various perceptions of the event and its causes. This is because there is evidence that the base rate of individuals who attribute the current COVID-19 pandemic to human intrusion into nature is already as high as 30-40% (Freeman et al., 2020).

2.3.2 Environmental awareness (Aware)

Six items assessed environmental awareness (hereafter, Aware), adapted from Schlegelmilch et al. (1996) (e.g., "The environment is one of the most important issues facing society today").

2.3.3 Negative emotions (Emotion)

Items for measuring negative emotions triggered by reading COVID-19-related news (hereafter, Emotion) were adapted from Kim and Niederdeppe (2013), which originally measured individuals' emotional responses triggered by the H1N1 pandemic in 2009 (e.g., "I feel anxious when I read pandemic related news").

2.3.4 Pro-environmental behaviour (PEB)

Items for pro-environmental behaviour (hereafter, PEB) were adapted from Kaiser and Wilson (2000) (e.g., "I will take my own bags when I go grocery shopping").

2.3.5 Demographics

We controlled for the respondent's age, gender and level of education as these demographic variables might be related to pro-environmental behaviours (White et al., 2019).

We also control for resilience (Connor & Davidson, 2003) because, in the COVID-19 context, resilient individuals tend to see the significance in the role of pro-environmental behaviours in preventing similar pandemic outbreaks in the future. Due to their higher ability to bounce back from setbacks, these individuals are more likely to adopt pro-environmental

behaviours as an adaptive response to the pandemic compared to those who are less resilient. For example, in the domain of pro-environmental behaviour, Manyena et al. (2011) found that resilience is positively related to a willingness for behavioural changes in order to avoid disaster reoccurring.

3. Results

3.1 Checking data quality

Our initial data collection (N = 398) was done through social media. For respondents from such channels, inattentive and careless responding could be a major concern, which may potentially lead to low quality data (DeSimone & Harms, 2018). To mitigate that possibility, we conducted quality data checks focusing on items of key constructs in our model. We calculated the longstring index (i.e., the maximum number of steady responses provided by a respondent consecutively) and the Mahalanobis distance as indicators of attention quality (DeSimone et al., 2015) using the R package careless (Yentes, 2021). Based on these checks, 79 cases were removed, and the sample size for the empirical analyses presented below was 319.

3.2 Measurement model

We performed a confirmatory factor analysis (CFA) to assess the appropriateness of the constructs used in our model framework, using the R package lavaan (Rosseel, 2012). Our results showed that the CFA model had an adequate fit to the data ($\chi 2$ = 411.304, df = 254, RMSEA = 0.044, SRMR = 0.047, CFI = 0.965, TLI = 0.958, AIC = 19738.102). Note that, fitting the CFA model to the original data before it was cleaned using the LQD checking techniques explained in the previous version produced relatively similar model fit indices ($\chi 2$ = 498.688, df = 254, RMSEA = 0.049, SRMR = 0.046, CFI = 0.955, TLI = 0.947, AIC = 26492. 858). Nevertheless, because the clean data produced a lower AIC value than that of the original data, thus better results, we conducted subsequent analysis using the clean data.

Table 1 shows the assessment of our measures in detail, including the standardized factor loadings, composite reliability and the average variance extracted for each construct. The results showed that our constructs exhibited strong internal validity, indicated by loadings exceeding the threshold of 0.5 (Bagozzi & Yi, 2012), and the composite reliability of all constructs surpassing the threshold of 0.70 (Fornell & Larcker, 1981). We also examined the convergent validity of each construct by assessing the average variance extracted (AVE), which indicated that all constructs had a higher AVE than the benchmark of 0.5. We examined the discriminant validity of each construct by assessing the square root of the AVE, which indicated that the AVE of each construct was greater than all corresponding correlations (Fornell & Larcker, 1981) (see Table 2). In addition, we also calculated the Heterotrait-monotrait (HTMT) ratio to assess discriminant validity (Henseler et al., 2015) using the R function HTMT in lavaan. All HTMT values in this study were below the threshold value 0.85, indicating that discriminant validity was achieved.

Insert Table 1 here.

Insert Table 2 here.

3.3 Common method variance

As is typical in a cross-sectional study, common method variance (CMV) presents a threat to research that uses survey data (e.g., inducing spurious covariance among items, and affecting construct validity and reliability). We conducted an assessment of the potential effects of CMV by using the unmeasured latent factor technique. Thus, our model consisted of constructs as seen in the CFA model above and the CMV latent method factor. The results revealed that the new model ($\chi 2$ = 371.591, df = 248, RMSEA = 0.039, SRMR = 0.050, CFI = 0.972, TLI = 0.967, AIC = 19710.388) did not largely improve the goodness of fit of the original CFA model. Hence, we concluded that CMV was not a serious threat to our data.

3.4 Main relationships

Using the R package lavaan (Rosseel, 2012), we implemented structural equation modelling to test the main relationships in the model. Our SEM model produced fit indices, showing that the model fit the data well ($\chi 2$ = 571.749, df = 323, RMSEA = 0.049, SRMR = 0.071, CFI = 0.946, TLI = 0.937). As shown in Figure 2, Belief was positively related to Aware (b = 0.242; p < 0.001); however, the relationship between Belief and Emotion was not significant (b = 0.151; p > 0.05). Aware was positively related to PEB (b = 0.652; p < 0.001) and Emotion was also positively related to PEB (b = 0.133; p < 0.05). Regarding the effect of control variables, we found that resilience had a positive and significant impact on PEB (b = 0.325; p < 0.01). The effects of gender and age on PEB were not significant, while the effect of education on PEB was positive and significant (b = 0.148; p < 0.01).

Insert Figure 2a here.

We present the results of the SEM competing model in Figure 2b. The SEM model produced poor fit indices in comparison with those of the original model, which showed that the competing model did fit the data well ($\chi 2$ = 637.968, df = 237, RMSEA = 0.068, SRMR = 0.167, CFI = 0.915, TLI = 0.901, AIC = 19758. 192). Inspecting the path coefficients, the path from Emotion to Belief, and the path from Belief to PEB were not significant. Looking at the AIC value, the competing model had a greater AIC value compared to the original model (AIC = 19710.368), showing that the original model was better than the competing model. These results provided a greater confidence to support the original model.

3.5 Mediation effect

We also tested for the mediation effects of Aware and Emotion on the relationship between Belief and PEB. We considered two mediation paths: Belief to Aware to PEB and Belief to Emotion to PEB. We used bootstrapping techniques generating 5000 bootstrap samples to calculate the parameter estimates and the standard errors of the mediation effects. We present our results in Table 3, which shows the standardized estimates of the mediation

indirect effects and their standard errors, p-values associated with the estimates, and the lower limit and upper limit of the bias-corrected confidence intervals.

The results suggested that (1) Aware mediated the effect of Belief on PEB (b = 0.158, CI: 0.035, 0.174, and (2) Emotion did not mediate the effect of Aware on PEB (b = 0.020, CI: -002, 0.035). The total effect of Belief on PEB was positive and significant with a moderate strength (b = 0. 178, CI: 0.040, 0.195). Together, these results showed that beliefs about the cause of the pandemic related to environmental degradation had a positive and significant role in affecting individuals' pro-environmental behaviours only through the cognitive process of awareness, supporting Hypothesis 1.

Insert Table 3 here.

4. Discussion

4.1 Theoretical and practical implications

Our results indicate that a potential shift towards more environmentally responsible behaviours post-COVID-19 is contingent upon individuals' beliefs that the pandemic is a result of humanity's excessive intrusion into nature. The current research adds to the body of work on the impact of causal attributions on human behaviours in relation to disasters (e.g., Rao & Greve, 2018). We show that if individuals attribute a disaster (such as COVID-19) to human intrusion into nature, they are more likely to adopt pro-environmental behaviours. This finding also implies, alternatively, that if individuals are less likely to relate to this causal attribution, they would be less likely to adopt pro-environmental behaviours.

A related and more specific contribution of this study is that we empirically illustrate and test the underlying mechanism where causal attribution influences pro-environmental behaviours through cognitive (i.e., environmental awareness) and emotional processes (i.e., negative emotions). We do not find evidence to support the proposition that the effect of causal attribution on pro-environment behaviour occurs through negative emotions. That is,

the causal attribution does not trigger negative emotions which would shift an individual's behaviour to become more pro-environmental. However, we find that causal attribution affects pro-environment behaviour by raising an individual's level of environmental awareness. As an individual's belief that the pandemic was due to human intrusion into nature increases, they become more aware of the actions that they ought to be taking to protect the environment and, consequently, decide to act and engages in pro-environment behaviours. Our findings overall propose—as a policy implication—that the current pandemic represents an occasion for policymakers to consider the role of perceived human environmental intrusion in fostering pro-environmental behaviours and thus develop post-pandemic, pro-environmental strategies that enhance people's awareness of the relationship between environmental degradation and global-scale epidemics.

4.2 Limitations and future research avenues

Some limitations of our research are acknowledged here. As our study is cross-sectional in nature, it might be useful to explore whether the effect of causal attribution on pro-environmental behaviour would be sustainable post-pandemic via a longitudinal study. Another avenue for further research is to consider the possibility of using supplementary data using open-ended questions for a comparative assessment of individuals' perception of the cause of the pandemic versus other attributional factors[4].

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[4] We thank an anonymous reviewer for this suggestion.

Appendix

Fig. 1a Conceptual model

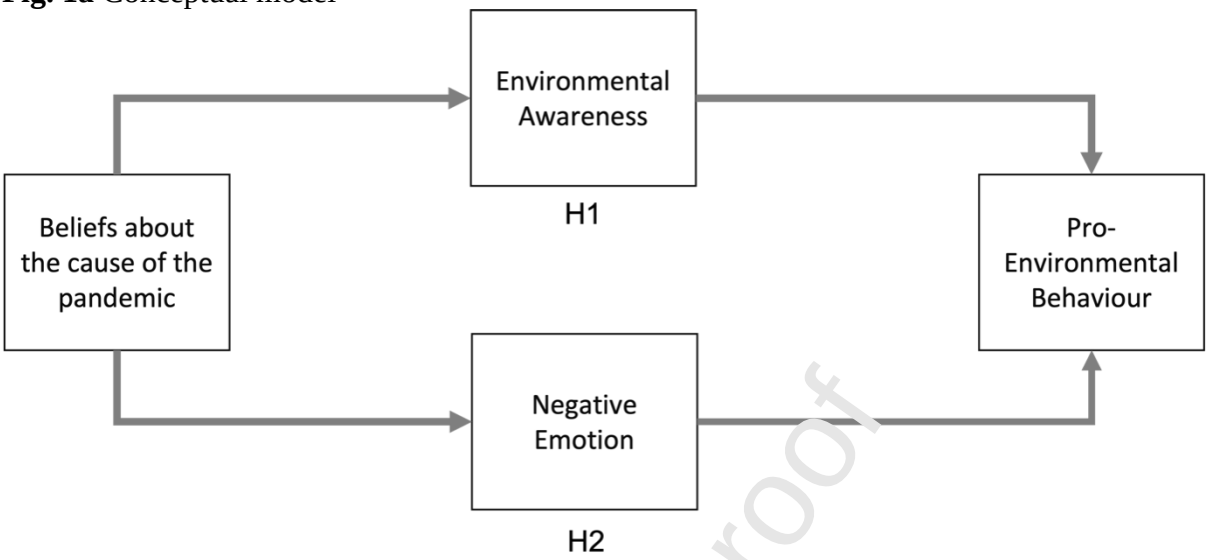

Fig. 1b Competing model

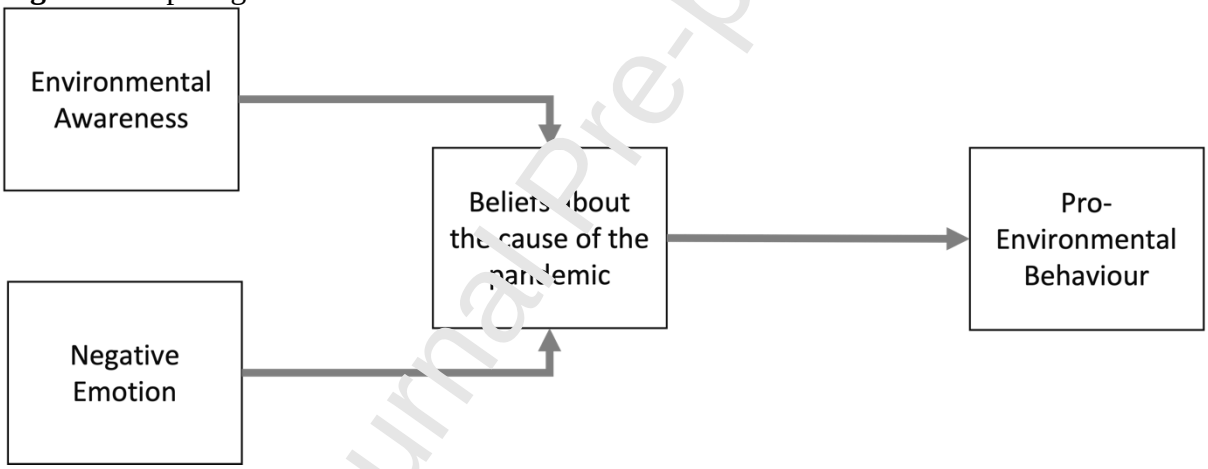

Fig. 2a Results (standardized path coefficients)

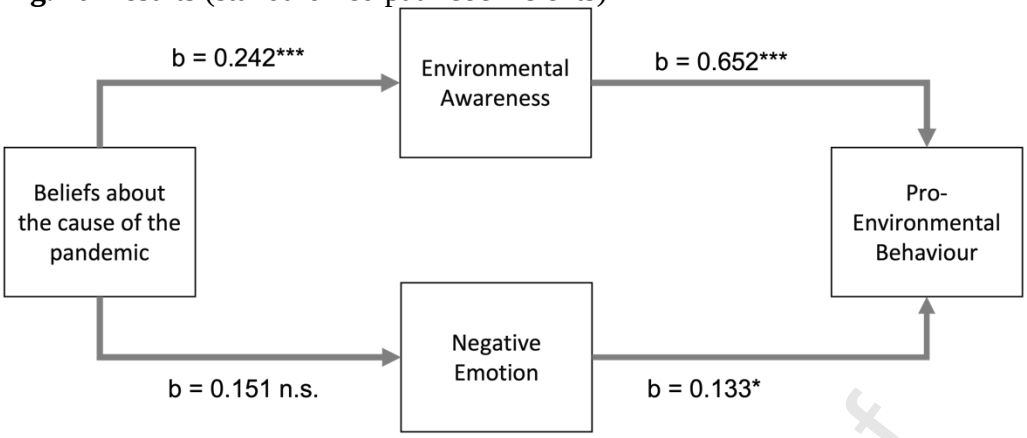

Fig. 2b Results of a competing model

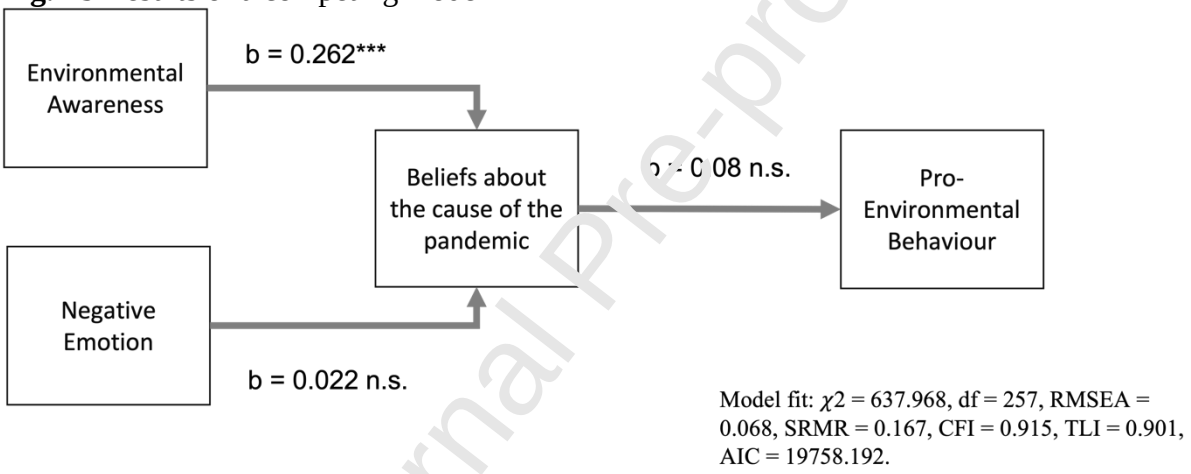

Table. 1 Measurement items

Construct/items	Loadings
Causal Attribution (CR = 0.853; AVE = 0. 659)	
I believe the environmental problems is one of the main reasons of corona virus outbreak	0.692
I believe the corona virus outbreak may be linked to environmental revenge	0.748
I believe if the environment will be better, the corona virus outbreak would not happen.	0.765
Aware (CR = 0.856; AVE = 0. 560)	
The environment is one of the most important issues facing society today	0.806
We should pay a considerable amount of money to preserve our environment	0.713
Strict global measures must be taken immediately to halt environmental decline	0.794
Unless each of us recognizes the need to protect the environment, future generations will suffer the consequences	0.689
The benefits of protecting the environment do not justify the expense involved	0.823
Personally, I can help to slow down the environmental deterioration	0.717
PEB (CR = 0.905; AVE = 0. 540)	

I will pay much higher prices in order to protect the environment	0.755
I will buy paper and plastic products that are made from recycled materials	0.797
I will buy environmentally friendly household chemicals, such as detergent and cleaning solutions	0.601
I will do rubbish classification	0.629
I will take my own bags when I go to grocery shopping	0.765
I will use less water, electricity, and other resources	0.812
I will use less water, electricity, and other resources	0.729
I will take public transportation to school, to work or to nearby area	0.82
I will sometimes financially contribute to environmental organizations.	0.705
Emotion (CR = 0.715; AVE = 0. 529)	
I feel anxious when I read the pandemic-related news	0.692
I feel anxious, when the situation is getting worse	0.748
I feel scared that the number of deaths and infections during the pandemic is increasing	0.765
Resilience (CR = 0.832; AVE = 0. 560)	
Can achieve goals despite obstacles	0.75
Can stay focused under pressure	0.859
Thinks of self as strong person	0.699
Can handle unpleasant feelings	0.644

Note: Belief is individuals' beliefs that COVID-19 is related to environmental problems; Aware = Environmental awareness; PEB = pro-environmental behaviour; Emotion = negative emotions related to COVID-19 pandemic. Model fit: χ^2 = 411.304, df = 254, RMSEA = 0.044, SRMR = 0.047, CFI = 0.965, TLI = 0.958.

Table 2 Means, standard deviations and correlations among the main constructs

Variable	*M*	SD	1	2	3	4	5
1. Belief	4.420	1.362	0.812				
2. Resilience	3.538	0.680	0.355	0.748			
3. Aware	5.785	0.860	0.235	0.259	0.748		
4. PEB	5.777	0.733	0.203	0.368	0.695	0.735	
5. Emotion	5.482	1.056	0.132	0.063	0.406	0.395	0.727

Note: Belief = individuals believe that COVID-19 pandemic is related to environmental problems; Aware = Environmental awareness; PEB = pro-environmental behaviour; Emotion = negative emotions related to COVID-19 pandemic. N = 398. * $p < 0.05$; ** $p < 0.01$. Values in main diagonal are square root of AVE.

Table 3. Test of mediation effects

Path	Estimate (se)	p-value	CI: LL, UL
Belief → Aware → PEB	0.158 (0.035)	0.005	0.035, 0.174
Belief → Emotion → PEB	0.020 (0.010)	0.185	-0.002, 0.035
Total effect: Belief → PEB	0.178 (0.039)	0.004	0.040, 0.195

Note: Belief = individuals believe that COVID-19 pandemic is related to environmental problems; Aware = Environmental awareness; PEB = pro-environmental behaviour; Emotion = negative emotions related to COVID-19 pandemic. Number of bootstrap samples = 5000. LL and UL are the lower and upper limit of the bias-corrected confidence interval.

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