ACHIEVING WELL-BEING - BRIDGING PSYCHOLOGICAL DISTANCE IN OUR ENVIRONMENT

EDITED BY: Hong Chen and Yan Sun
PUBLISHED IN: Frontiers in Psychology

frontiers Research Topics

frontiers

ISSN 1664-8714
ISBN 978-2-88974-876-1
DOI 10.3389/978-2-88974-876-1

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ACHIEVING WELL-BEING - BRIDGING PSYCHOLOGICAL DISTANCE IN OUR ENVIRONMENT

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Citation: Chen, H., Sun, Y., eds. (2022). Achieving Well-Being - Bridging Psychological Distance in Our Environment. Lausanne: Frontiers Media SA. doi: 10.3389/978-2-88974-876-1

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frontiers in Psychology

EDITORIAL
published: 17 March 2022
doi: 10.3389/fpsyg.2022.813341

Editorial: Achieving Well-Being—Bridging Psychological Distance in Our Environment

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Keywords: psychological distance, environment, well-being, construal level, green consumption

Editorial on the Research Topic

Achieving Well-Being—Bridging Psychological Distance in Our Environment

BRIDGING PSYCHOLOGICAL DISTANCE IN OUR ENVIRONMENT

Current research suggests that the alienation between people creates psychological distance which leads to the rejection of individual responsibilities of protecting the environment (Kim and Wolinsky-Nahmias, 2014; Wang et al., 2021). Moreover, the rapidly growing environmental issues have harmed people's safety, decreasing public well-being. For those reasons, it is urgent to reduce the psychological distance between citizens and severe environmental problems (such as climate change) to improve the pro-environmental behavior intentions of people.

The concept of psychological distance can be described as the relationship between an individual and a specific object or event (Trope and Liberman, 2003). When the object is perceived as psychologically close, it is represented as being more concrete and authentic, while when the object is perceived as psychologically distant, the representation is more abstract (Liberman and Trope, 2008). Past research revealed that psychological distance could be involved in environmental issues. For instance, people will have a more abstract representation of climate change when they perceive it as more distant (McDonald et al., 2015). By comparison, individuals are more likely to behave in favor of the environment when they perceive the problems of environmental deterioration as having direct consequences for themselves (Lorenzoni and Pidgeon, 2006). Following the previous conclusions, narrowing the psychological distance between the general public and environmental problems is a management strategy for climate change or other environmental issues worthy of consideration.

The current Research Topic aims to advance understanding of the psychological distance between the public and environmental issues at theoretical and practical levels. The validated countermeasures from research of the present topic will provide correct guidance for citizens to develop responsible environmental behaviors and to reach a higher level of life satisfaction and well-being. For policymakers or non-governmental organizations, these findings will help them formulate more appropriate management strategies or more effective public campaign projects.

INFLUENCES OF PSYCHOLOGICAL DISTANCE ON ENVIRONMENTAL ATTITUDE AND BEHAVIOR

From the perspective of psychological distance, the public tends to think that the damage brought by environmental problems may soon occur to people in other regions or countries (Kollmuss and Agyeman, 2010). Applying these insights, Xu et al. explored how the social member's perceived psychological distance affects their willingness to spread pro-environment behaviors; when social

OPEN ACCESS

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Reviewed by:
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Specialty section:
This article was submitted to Environmental Psychology, a section of the journal Frontiers in Psychology

Received: *11 November 2021*
Accepted: *21 February 2022*
Published: *17 March 2022*

Citation:
Tong Z and Sun Y (2022) Editorial: Achieving Well-Being—Bridging Psychological Distance in Our Environment. Front. Psychol. 13:813341. doi: 10.3389/fpsyg.2022.813341

members perceived they had a close psychological distance to environment change, their willingness to spread pro-environment behaviors also increased. Maiella et al. conducted a systematic review on psychological distance and climate change. Their work showed that when individuals perceived climate change as more proximal and concrete within the construct of psychological distance, they had a higher propensity to perform pro-environmental behaviors. Sun et al. reported how people coped with negative emotions in response to the epidemic from the perspective of psychological distance. The longitudinal result showed that independent information effectively decreased fear and anxiety, while interdependent information effectively mitigated sadness. Sheng, Dai et al. discussed the influence of air quality on pro-environmental behavior. They revealed that air pollution within the local spatial distance could make individuals more willing to conduct pro-environmental behavior. Similarly, Liu et al. explored how individuals' psychological distance toward air pollution influences their purchase intentions for new energy vehicles. Their findings suggest that closer psychological distance toward air pollution is accompanied with a stronger intention to purchase new energy vehicles.

EFFECTS OF CONTEXTUAL DETERMINANTS ON PSYCHOLOGICAL DISTANCE

To consider the impact of the cognitive determinants on psychological distance, Tong, Li et al. proved that the anthropomorphic features would affect individuals' green purchase intentions. Moreover, the green trust played a mediating role between the anthropomorphic features and green purchase intention, which means anthropomorphic features could reduce the psychological distance between individuals and the green brand. Lee and Chen evaluated the effects of wearing masks on interpersonal space perception. A smaller interpersonal space was identified when individuals faced peers wearing masks than in the mask-free condition. Wei et al. indicated that individuals' recycling efforts could affect recycling behaviors. For costly recycling behaviors, those requiring physical or mental efforts will receive more attention due to the closer psychological distance. Chen et al. analyzed the psychological distance between people and climate change in the context of digital technology. The findings suggest that online activities bring climate deterioration closer to individuals through the visualization by digital technology, which can encourage individuals to participate in global climate cooperation.

PRACTICAL PROGRESS IN BRIDGING PSYCHOLOGICAL DISTANCE TO ACHIEVING WELL-BEING

To achieve the well-being of the general public, the present research aims to explore the practical application of psychological distance into the real world. Mi et al. studied the effect of personal-organization fit on employees' green behavior. They revealed the impact of personal-organization fit on employees' green behavior is enhanced in the case of close emotional expectation distance. In addition, Sheng, Xia et al. discussed green advertising from the perspective of spatial distance, suggesting that search products (or experience products) could enable consumers to generate a more positive attitude when the environmental aspect of the product was presented with close-up shots (or full-length shots). Ge et al. found that social norm conflict in green consumption created alienation among people by making individuals feel powerless and meaningless, in turn reducing their inclination toward green consumption. Tong, Liu et al. reported that the psychological distance moderating information framework and green product consumption willingness. For enterprises, their findings suggested if the target market was located in a region with more environmental problems (which means a closer psychological distance), the benefits of the products should be emphasized. Feng et al. tested the mediation of psychological distance between green housing buyer comments and purchase intentions. More importantly, in the purchase of green housing in the long run, psychological distance plays a more significant role than the prices.

FUTURE DIRECTIONS

Taking together, it is clear from the articles on the current topic that the study of the psychological distance between the public and environmental issues is blossoming. The contributions of the present editorial cover a wide range of exciting new questions that span the theory, phenomenon, and governing strategy, which could speed up advances in the field of environmental psychology. The special issue explored the effects of various dimensions of psychological distance, but the distance of a stimulus on one dimension may influence its perceived distance on other dimensions (Liberman and Trope, 2008). Furthermore, pro-environment behaviors can be considered a multi-attribute decision task (Gong et al., 2020), which means the association of different dimensions of psychological distance will impact individuals' behavior. Thus, future research should contemplate questions about relationships among the various dimensions of psychological distance. Beyond this, from the perspective of practical management, succeeding research should conduct experiments in real scenarios to facilitate the ecological validity of results and interpretation of findings.

AUTHOR CONTRIBUTIONS

Both authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

FUNDING

This article was supported by grants from the Chinese Academy of Science Engineering Laboratory for Psychological Service (KFJ-PTXM-29) and the Institute of Psychology, Chinese Academy of Science (E1CX423003).

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

frontiers in Psychology

ORIGINAL RESEARCH
published: 30 June 2020
doi: 10.3389/fpsyg.2020.01335

Motivation Analysis of Online Green Users: Evidence From Chinese "Ant Forest"

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Environmental protection activities based on digital technology have cultivated many online green users (OGUs) and may become a critical means to combat global climate change. This paper explores individuals' motivation to participate in online environmental protection activities and whether the activities have significantly increased individuals' intention to participate in global collaboration on climate change. Taking Ant Forest as an example, this paper first summarized 14 trigger reasons for users' participation in online environmental protection activities through interviews, then surveyed 600 OGUs through questionnaires, and studied the behavioral motivation from the four dimensions of environmental awareness, social motivation, online immersion, and global cooperation intention by using a structural equation model. The study found that both environmental awareness and social motivation had significant positive promotional effects on OGUs' online immersion, and environmental awareness was higher than social motivation. Environmental awareness as a long-term motivation is conducive to the achievement of long-term climate goals, and social motivation is focused on short-term entertainment functions. There is a significant positive interactive relationship between environmental awareness and social motivation under the effect of digital technology, which jointly promote the improvement of OGUs' online immersion, and online immersion is conducive to enhancing OGUs' global cooperation intention. This study demonstrated that digital technology can effectively improve individuals' intention to protect the environment and found a means to quickly identify the best OGUs (most willing to participate in global cooperation), which provided a new opportunity to inspire greater public participation in the global action against climate change.

Keywords: climate change, digital technology, international cooperation, motivation, Ant Forest

OPEN ACCESS

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Specialty section:
This article was submitted to Environmental Psychology, a section of the journal Frontiers in Psychology

Received: *24 February 2020*
Accepted: *20 May 2020*
Published: *30 June 2020*

Citation:
Chen B, Feng Y, Sun J and Yan J (2020) Motivation Analysis of Online Green Users: Evidence From Chinese "Ant Forest". Front. Psychol. 11:1335. doi: 10.3389/fpsyg.2020.01335

INTRODUCTION

Human activities have resulted in an increase in greenhouse gas concentrations that has led to climate change and its uncertain consequences (Meehl et al., 2000; Gifford, 2011; Bai et al., 2018; Holmgren et al., 2019). Although this scientific consensus has been reached, reducing emissions under this substantial environmental pressure requires a gradual process (Figueres et al., 2017); thus, the public and industry need to be aware of the seriousness of the problem and participate in mitigation (Oreskes, 2004).

Experiments have demonstrated many factors that affect the public engagement of climate change, such as cognitive bias (Lazarus, 2008; Holmgren et al., 2018), lack of knowledge (Sterman and Sweeney, 2007), negative footprint illusion (Holmgren et al., 2019), and even the experience of extreme weather (Bergquist et al., 2019; Marshall et al., 2019), leading to public disregard for this problem (Mazar and Zhong, 2010; Sorqvist and Langeborg, 2019), which is the so-called "psychological distance of climate change" (McDonald et al., 2015). Recent literature shows a negative relation between psychological distance of climate change and pro-environmental behavioral intentions (Sacchi et al., 2016). Hence, scholars have called for effective means of communication to reduce the psychological distance of climate change (Brugger et al., 2016; Jones et al., 2017; Ejelov et al., 2018).

Fortunately, digital technology might be an effective strategy to increase cooperation to address climate change by reducing the psychological distance. On one side, digital technologies represented by the Internet are changing the behavioral patterns of individuals' participation in environmental protection movements, and possibly becoming an effective policy tool (Mckenna and Bargh, 2000; Engelberg and Sjoberg, 2004; Bierhoff and Vornefeld, 2004). On the other side, the rapid advancement of digital technology has enabled the public to understand climate change in a vivid manner by offering convenient instruments, such as mobile apps, and participate in global environmental protection cooperation, which is vital for global warming mitigation (Bai et al., 2018; Mentes, 2019). Therefore, it is expected that digital technology can promote online activities to help individuals cope with climate change and increase their willingness for global cooperation by reducing psychological distance. However, research regarding how digital technologies improve individual's engagement in climate change activities is relatively sparse and most extant studies are in experimental environment and there is little analysis of the real case.

The purpose of this paper was to explore whether the application of digital technology has improved the public's awareness of the environment and willingness to participate in global responses to climate change, and how this mechanism works with the case of the online green users (OGUs) on Ant Forest app, the world's largest online public environmental platform. Since the launch of Ant Forest app by Alipay in 2016, it has cultivated nearly 500 million OGUs and is—to date—the only environmentally aligned fintech app to achieve mass scale. This success is due to the access it provides to new sets of data and digital tools that incentivize green behaviors. OGUs use the Alipay platform to pay for everything, for example, groceries, food deliveries, bus and train tickets, gasoline, and water and electric bills. Additionally, enabled by artificial intelligence, Alipay provides users with real-time feedback on concrete online actions and behaviors they can take to reduce their individual carbon footprint. Any carbon-light behavioral changes are immediately rewarded with green-energy points on the Ant Forest platform. If the user chooses to "make a game of it," he or she can use the Ant Forest app to monitor the accumulated energy points to aggregate them into a "virtual tree" on the app. A gamification feature of Ant Forest enhances user engagement by having them continually accumulate the additional energy points necessary to sow, water, and care for their virtual tree until it reaches maturity on the screen, and users can give friends energy or collect friends' energy. Once the virtual tree has grown, Alipay matches the virtual tree with the planting of a real tree or the protection of a conservation area as a reward for the continuous reduction in the user's individual carbon footprint. The trees are planted in partnership with established non-governmental organizations (NGOs) and funded directly by Alipay's parent company, Ant Financial Services Group. Users can earn green certificates and view images of their trees in real time through satellites.

Based on this context, this study aims to explore the behavioral motivation of OGUs and then discuss whether online green activities encourage their enthusiasm for environmental issues as well as whether their online immersion originates from increased environmental awareness. Moreover, it is valuable to explore OGUs' intention to participate in global climate change cooperation. The marginal contribution of this study is to reveal how large-scale digital technology affects people's green behavior patterns and increase the willingness to cooperate globally, which enriches the subject of environmental psychological distance.

MATERIALS AND METHODS

Participants

This study consists of a cross-sectional design and was conducted from 1 to 30 October 2019. Random sampling was used to collect the OGU samples through the Internet in China. Participants in the survey had to meet the following criteria: (1) be Chinese Internet users; (2) users on Ant Forest; and (3) able to understand Chinese.

Survey Design and Measures

For this study, we designed a set of OGU-oriented questionnaire surveys. First, prior to this survey, we conducted semi-structural interviews, and 51 OGUs were individually interviewed regarding their usage motivation, frequency of use, public welfare behavior, data privacy, and comments. As a result, 14 triggers were extracted, which reflected the people's complex behavioral motivation. Then, a set of online questions was designed based on these 14 triggers. The participants clicked on a button to verify their consent to complete an online survey named the "Ant Forest User Survey." The survey comprised a series of questions. Demographic measures included age, gender, region, income, and environmental satisfaction. The 14 triggers were as follows:

Trigger 1: Health situation. Using an app that rewards a carbon-light lifestyle can result in positive health outcomes for the user (e.g., if driving is replaced by walking).
Trigger 2: Environmental situation. If a user lives in an area marked by environmental degradation and/or pollution shifting to a greener lifestyle can be triggered.
Trigger 3: Entertainment and socializing. The fun style and chance to interact with others can be a trigger to engage on the app.

Trigger 4: Curiosity and education. Interested in acquiring the learnings from using the app.
Trigger 5: Globalization. Motivated by an understanding that climate change and deforestation have global effects that can impact directly on the user's life.
Trigger 6: Fun interaction of carbon footprint and tree planting. Motivated by a compelling fun function related to carbon footprint and/or tree planting.
Trigger 7: Interactive social elements. Motivated by the social networking, cooperation, competition, and/or other community and competition elements.
Trigger 8: Sense of honor and reputational enhancement. Motivated by a desire to see oneself and to be seen by others as making a positive contribution to society.
Trigger 9: Zero transaction cost. Using the app because there are no costs to the user.
Trigger 10: Incentive level. Engage because one can potentially gain access to advantages.
Trigger 11: Credibility of carbon footprint calculations and of tree planting programs.
Trigger 12: Data privacy protection. Motivation or lack thereof because behavioral data analysis and translation into personal carbon footprints require algorithms based on access private data.
Trigger 13: Interest in nature and biodiversity. Motivated by the ability to contribute to positive impacts on nature.
Trigger 14: Social responsibility. User's own level of social responsibility awareness.

The above 14 triggers reflect the complex driving forces of OGU users, and digital technology integrates these triggers to form the OGU's behavior pattern. In the Ant Forest model, the behavior patterns of OGUs can be described through four dimensions: social motivation (Mckenna and Bargh, 2000; Bargh and Mckenna, 2004; Engelberg and Sjoberg, 2004; Simpson and Willer, 2015), environmental awareness (Fehr and Gintis, 2007; Boyd and Richerson, 2009), online immersion (Bierhoff and Vornefeld, 2004), and global cooperation intention (Lazarus, 2008; Ejelov et al., 2018). In addition, demographic characteristics are considered (Van Vugt et al., 2007; Charness and Rustichini, 2011; Masod and Chin, 2014; Branasgarza et al., 2018; Parrish et al., 2019; Cigarini et al., 2020).

Social Motivation

Social motivation refers to importance of the social networking and fun interaction elements (i.e., energy points, ranking, interaction with others to collect more energy, and concern over others collecting/stealing their energy). Social motivation is a very comprehensive factor, and multiple triggers may be related to it. Therefore, four items with a five-point scale, from "strongly disagree" to "strongly agree," were used to assess social motivation. The four items (see **Figure 1**) were related to social skills (e.g., "I am willing to actively make friends with other people in Alipay to collect more energy"), recognition by the network (e.g., "I care about my position on the energy ranking list very much"), incentive level (e.g., "I will be mad at my friends who have collected around 50 g of my energy at a time"), and benefits (e.g., "I think that the energy points of Ant Forest have a transactional value"). Responses to the four items created a composite score for social motivation (Cronbach's $\alpha = 0.64$; AVE = 0.32; CR = 0.93), with higher scores indicating higher motivation levels.

Environmental Awareness

Environmental awareness refers to importance of real and verified impact (improving the environment as a public good through real tree planting), access to visualizing this impact, and receiving certificate for planting real seedlings. Similar to the approach to social motivation, four items with a five-point scale, from "strongly disagree" to "strongly agree," were used to measure environmental awareness. The items included two triggers: recognition by the network and credibility, such as "I have planted trees with my family and friends" and "I am concerned about the functions and planting areas of the seedlings to be planted." Responses to the four items created a composite score for environmental awareness (Cronbach's $\alpha = 0.69$; AVE = 0.39; CR = 0.95), with higher scores indicating higher levels of environmental awareness.

Online Immersion

Online immersion refers to frequency of use and length of time spent on the Alipay Ant Forest platform. Online immersion was assessed by four items with a five-point scale, from "strongly disagree" to "strongly agree." Online immersion contains four triggers: entertainment, game ability, curiosity, and incentive level, such as "I use Ant Forest frequently" and "I am very familiar with the acquisition and use of game props in Ant Forest." Responses to the four items created a composite score for online immersion (Cronbach's $\alpha = 0.73$; AVE = 0.38; CR = 0.94), with higher scores indicating more online immersion.

Global Cooperation Intention

Global cooperation intention refers to willingness to engage in tree planting or preservation of biodiversity activities outside of China. This dimension is measured by users' willingness to participate in forest conservation in Africa. The variable "global cooperation intention" was constructed as an output variable through three triggers: social responsibility, concern for nature, and globalization. The items consisted of three items (i.e., "I think that Ant Forest is a very effective way to participate in environmental activities"; "China is Africa's largest timber importer, and Chinese citizens should pay attention to the ecological deterioration in Africa"; and "I am willing to participate in Internet-based environmental activities in Africa"). The composite score of "global cooperation intention" was created (Cronbach's $\alpha = 0.70$; AVE = 0.47; CR = 0.97), with higher scores indicating a stronger global cooperation intention.

Data Analysis

First, we investigated the dimensionality of user behavior through an exploratory factor analysis (EFA). We extracted factors using principal component analysis and rotated the solution by means of varimax orthogonal rotation, leading to correlated factors. Factor solutions were interpreted with

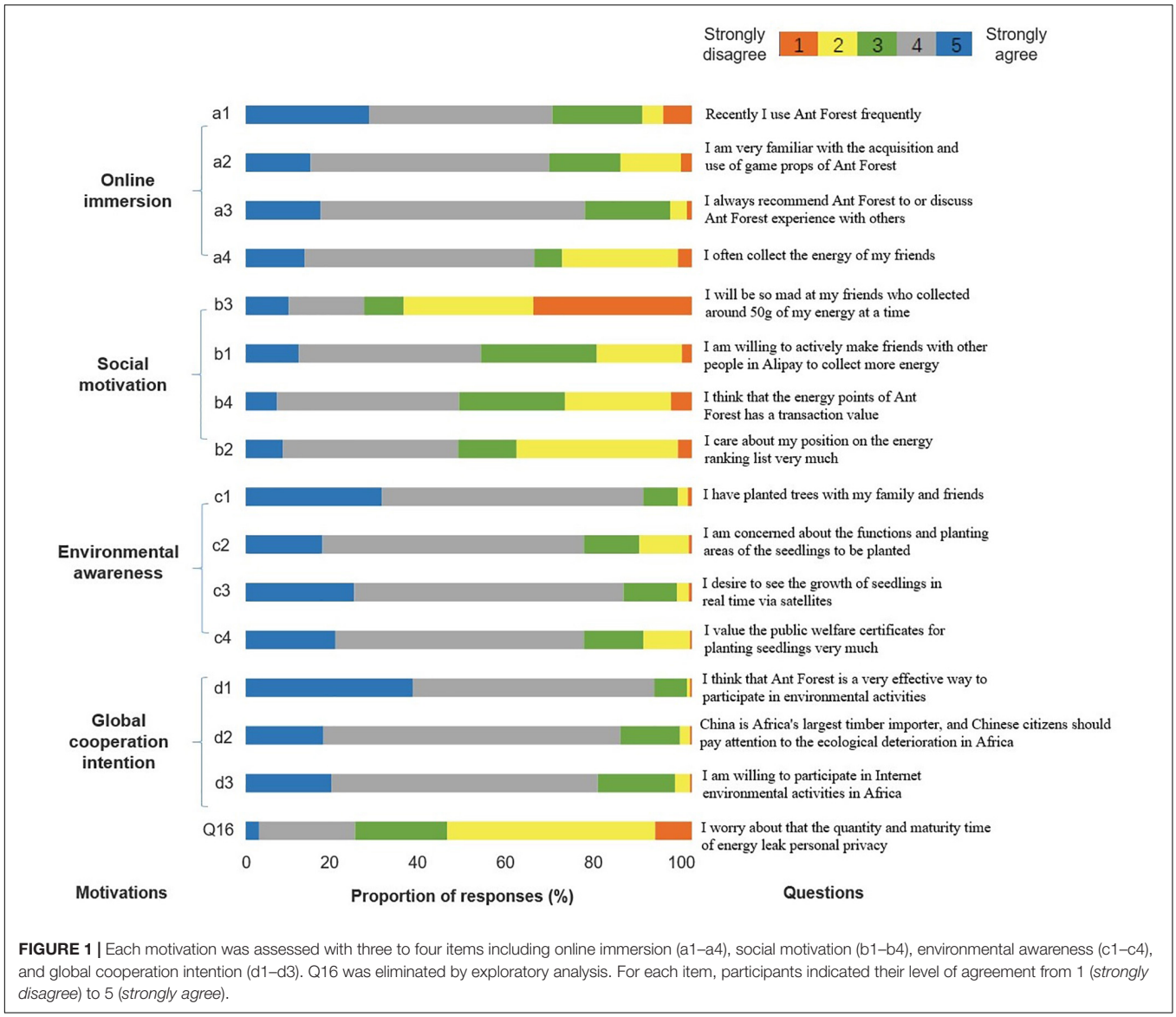

FIGURE 1 | Each motivation was assessed with three to four items including online immersion (a1–a4), social motivation (b1–b4), environmental awareness (c1–c4), and global cooperation intention (d1–d3). Q16 was eliminated by exploratory analysis. For each item, participants indicated their level of agreement from 1 (*strongly disagree*) to 5 (*strongly agree*).

salient factor pattern loadings of 0.45 and higher. Moreover, utilizing items assigned uniquely to factors, we calculated Cronbach's alpha for each factor. Second, according to the result of the EFA, we employed the Shapiro–Wilk test to examine the normality of continuous variables. Spearman correlations between the variables measured above were calculated if the continuous variables were not normally distributed; otherwise, Pearson correlations were calculated. Third, we constructed four variables as latent variables. The hypothesized mediating effect of online immersion was examined by structural equation modeling (SEM) using Amos (version 24) software. The goodness of fit was assessed by computing the comparative fit index (CFI), goodness-of-fit index (GFI), adjusted GFI (AGFI), root-mean-square error of approximation (RMSEA), and the standardized root mean residual (SRMR) (Karl and Dag, 1982; Hu and Bentler, 1998). The acceptable levels of good-fit model parameters are CFI $>$ 0.90, GFI $>$ 0.90, AGFI $>$ 0.90, RMSEA $<$ 0.08, and SRMR $<$ 0.08. The significance level was set 0.05 in this study.

RESULTS

Demographic Characteristics

A total of 1005 questionnaires were randomly issued, with 30 invalid samples removed; the response rate was 97.01%. Because not all Internet users are OGUs, filter conditions were set to screen out OGUs using the item "Please indicate whether you are using Ant Forest or not." The final 600 OGU participants were filtered from the remaining 975 samples. The proportion of women was 63.5% of the total, and 90.1% of those surveyed were aged between 18 and 40 years old. Most of the participants in the sample were from Eastern China (59.2%), and most had an annual income below CNY

200,000 (92.0%). In terms of local environmental satisfaction, the "general" and "satisfied" populations accounted for 41.7 and 43.8%, respectively, indicating that most users have a high level of satisfaction regarding the environment.

Exploratory Factor Analysis

An EFA was conducted, where the KMO value (0.88) was greater than 0.8, and the Bartlett test of sphericity was passed, indicating that the construct validity of the questionnaire was acceptable. The responses related to privacy ("I worry that the quantity and maturity time of energy threaten my personal privacy"; Q16) revealed that OGUs were not very concerned about privacy disclosure and thus had to be deleted, indicating that user privacy is not a significant affecting factor for Ant Forest user behavior. Principal component analysis was conducted for the remaining 15 questions and indicated that the cumulative variance contribution rate (58.08%) of four factors was higher than 55%; thus, four factors could be used to construct the model. The rotated factor matrix differentiated the latent variables of four dimensions: online immersion (a1–a4), social motivation (b1–b4), environmental awareness (c1–c4), and global cooperation intention (d1–d3) (see **Table 1**).

Correlations Analysis

We found that all continuous variables were non-normally distributed, so Spearman correlation analyses were conducted. Significant positive correlations were found between social motivation, environmental awareness, online immersion, and global cooperation intention (see **Table 2**). No significant correlations were found between the demographic variables and the interested variables.

TABLE 1 | Factor loadings for the items in the questionnaire.

	Factor			
Items	**1**	**2**	**3**	**4**
a1. Entertaining	0.84			
a2. Game ability	0.73			
a4. Incentive level of collect energy	0.58			
a3. Curiosity	0.47			
b3. Incentive level by others		0.77		
b2. Recognition of position ranking		0.68		
b4. Transaction value		0.58		
b1. Social skills		0.50		
c4. Certificates for planting			0.73	
c3. Credibility of growth			0.68	
c2. Credibility of function			0.61	
c1. Recognition of close others			0.52	
d2. Concern for nature				0.82
d3. Global activities				0.78
d1. Social responsibility				0.52

Factor 1: Online immersion; Factor 2: Social motivation; Factor 3: Environmental awareness; Factor 4: Global cooperation intention.

Structural Equation Modeling

We used SEM to examine whether or not social motivation and environmental awareness could significantly affect online immersion and whether online immersion could further promote global cooperation intention. **Figure 2** demonstrates the final SEM model, which fits well with the data (χ^2/df = 3.638, CFI = 0.963, GFI = 0.931, AGFI = 0.903, RMSEA = 0.066, SRMR = 0.074). This model showed that environmental awareness and social motivation jointly stimulate users' online immersion. Users' social motivation has a positive effect on online immersion (β = 0.36, $p < 0.01$). Furthermore, environmental awareness has a positive effect on Ant Forest activity immersion (β = 0.62, $p < 0.001$), which is higher than social motivation and indicates that environmental awareness has a greater effect than social motivation. Users with higher levels of online immersion have higher levels of global cooperation intention (β = 0.80, $p < 0.001$), and this positive promotional effect indicates that active users of Ant Forest are more convinced of the environmental benefits of online activities. For example, these users believe that the remediation of the ecological deterioration in Africa is necessary, and they are more willing to participate in online non-profit tree planting activities in Africa. This result reveals the inherent driving factors of OGUs' behavior patterns.

Quick Means to Identify Target Users Through Screening

When formulating a digital climate policy, policymakers need to find the most likely supporters ("best users") from the huge Internet users. One of the most significant concrete outcomes from the research is the validation of a rapid screening tool that accurately identifies potential best users (i.e., those most likely to be persuadable to act on international cooperation) through six indicators that had been refined through the course of the research. The resulting "decision tree" tool accurately identifies potential best users across different segments (see **Figure 3**). Application of the tool demonstrates that more than one fifth (22.3%) of the Chinese users sampled are willing to participate in planting trees to solve the problem of deforestation in Africa. Crucially, the convergence starts to slow after the third step. Thus, as long as the first three steps are completed, the relatively ideal screening (27.2% versus the finer winnowing to the aforementioned 22.3%) can still be achieved but at significantly reduced cost of user screening (see **Figure 4**). When the number of users is extremely large, reducing one screening step means saving huge search costs.

DISCUSSION

The study confirms the notable potential of digital technologies to encourage public participation in mitigating global climate change. Extant studies have suggested that individuals' understanding of climate change is limited; that is, individuals do not recognize the seriousness of the problem, have no strong sense of improving the situation, and may overpraise the behavior of slight emission reduction (Sterman and Sweeney, 2007; Lazarus, 2008; Mazar and Zhong, 2010; Holmgren et al., 2019;

TABLE 2 | Spearman's correlations between main variables.

	1	2	3	4	5	6
1 Gender	1					
2 Age	−0.15**	1				
3 Social motivation	0.03	0.00	1			
4 Environmental awareness	−0.01	−0.04	0.35**	1		
5 Online immersion	−0.01	0.05	0.30**	0.36**	1	
6 Global cooperation intention	0.04	−0.05	0.31**	0.47**	0.32**	1

***p < 0.01. The gender was coded as "1 = male," "2 = female."*

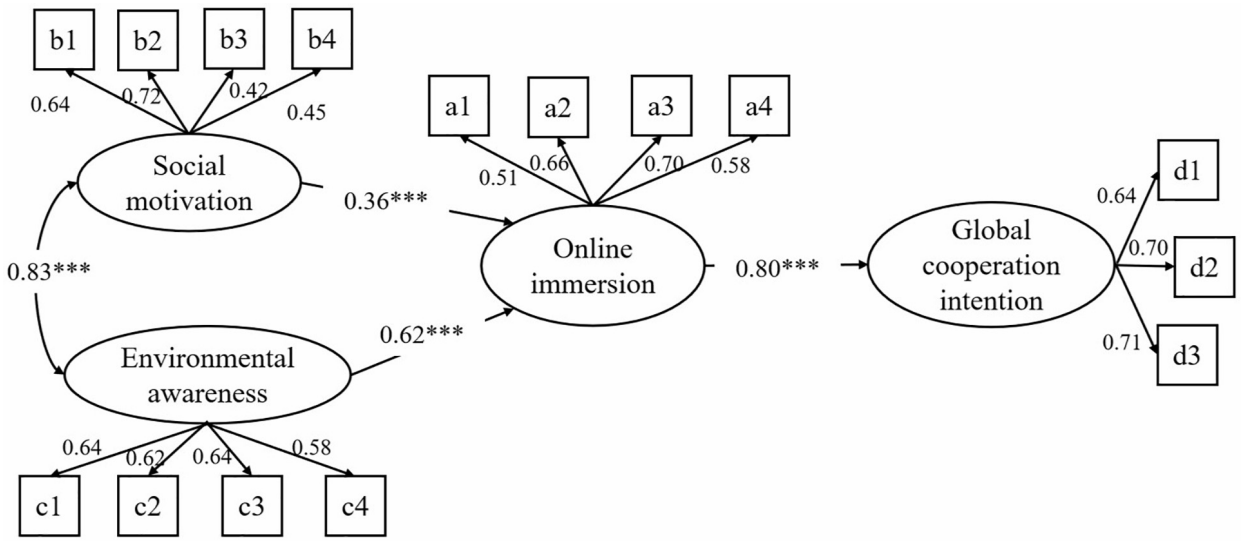

FIGURE 2 | Parameter estimation of the structural equation model. All parameter estimates are all significant at the significance level of 0.001. The results showed that social motivation and environmental awareness jointly influenced online immersion and further determined the global cooperation intention.

Sorqvist and Langeborg, 2019). These misconceptions may result from the large psychological distance between humans and climate change, resulting in a lower intention to participate in environmental protection activities (Brugger et al., 2016; Jones et al., 2017; Ejelov et al., 2018). However, this study demonstrates that under the context of digital technology, individuals can see the real-time planting of seedlings through satellites, care for seedlings in simulated situations online, and earn digital green certificates; thus, public participation in climate change mitigation activities can be significantly increased after these aspirations are fulfilled.

This study also demonstrates that environmental awareness and social motivation had a significant positive promotional effect on OGUs' online immersion, which has not been illustrated by current studies. Environmental awareness was higher than social motivation, indicating that environmental awareness as a long-term motivation is more conducive to the achievement of long-term goals (Ejelov et al., 2018; Marshall et al., 2019) and that social motivation is more focused on short-term entertainment functions and reflects more satisfaction with completion and interaction than that of social and game attributes, which effectively motivate individuals to take concerted action against climate change (Nyborg et al., 2016; Xie et al., 2018). Notably, this study observes a significant positive interactive relationship between environmental awareness and social motivation, and both improve OGUs' online immersion. This finding indicates that users' long-term and short-term motivations are not isolated, but this phenomenon may occur because digital technology makes it easier for individuals to build trust and collaboration (Bierhoff and Vornefeld, 2004; Engelberg and Sjoberg, 2004).

Studies have demonstrated that achieving global environmental cooperation is difficult because of the large differences among regions, the different environmental problems they face, and the possible conflicts of interest (Lazarus, 2008). However, this study demonstrates that online immersion had a significant promotional effect on global cooperation intention, indicating that online activities have a real effect on individuals' intention to participate in global climate cooperation. Therefore, extensive global cooperation can be achieved by visualizing remote environmental problems through digital technology, strengthening the link between climate deterioration and the participants, and encouraging more individuals to participate through more vivid and notable activities.

The study has the following limitations: First, there may be sample bias in collecting questionnaires from the Internet, which can be further improved by collecting offline questionnaires. Second, this study is aimed at Chinese users and does not consider the moderating effects of culture variables, so

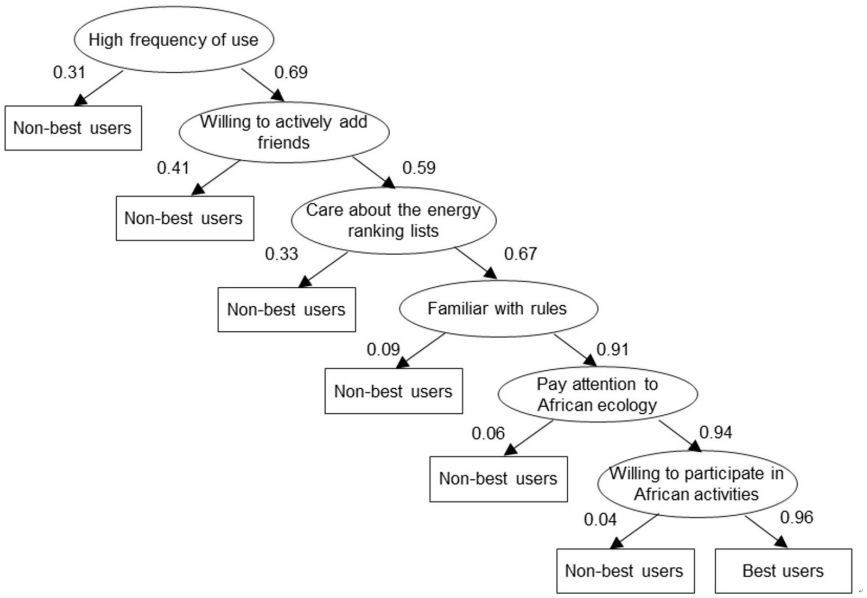

FIGURE 3 | Six steps to quickly identify target users with high global cooperation intention. These six steps represent the six questions in the questionnaire (a1, b1, b2, a2, d2, and d3).

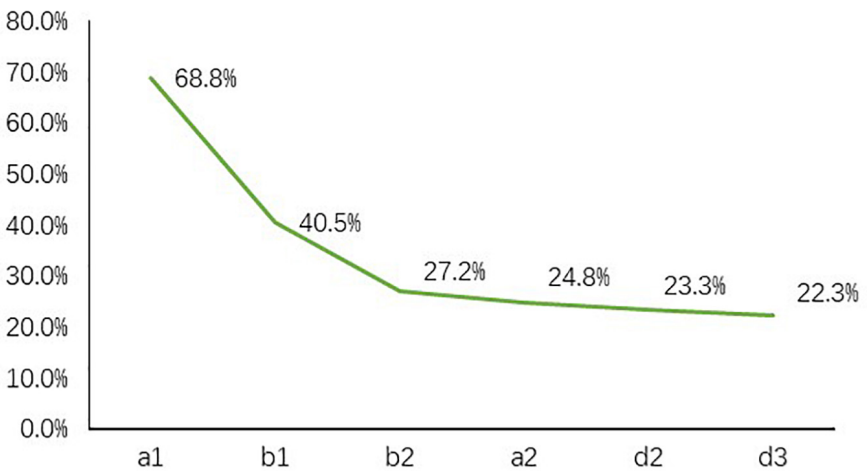

FIGURE 4 | The shape of the OGU best user searching curve indicates that it becomes smoother after the third step.

cross-cultural research can be conducted on OGUs in other countries. Third, this study uses a self-edited questionnaire, which may have certain limitations, for which the interview can be used to further validate the questionnaire. Fourth, the questionnaire method can only explore correlations, and experimental methods can be used to study causality in the future.

APPLIED APPLICATION

The study in this paper has demonstrated that a combination of environmental awareness and social motivation through digital technology can encourage individuals to participate in global climate change mitigation activities in an intuitive, convenient manner. This environmental tool has not been fully exploited. Because climate change is caused by human activities, its solutions are closely linked to human daily activities; thus, further research on the psychology and behavior of OGUs would advance the field. Digital technology can crowd-in engagement from the ground up in manners that multilateral top-down approaches have not managed. Individuals' online environmental protection activities' footprint, combined with digital technology, can be effectively collected, and their intrinsic motivation can be explored based on big data, which further promotes the efficient development of environmental protection activities and more effectively motivates OGUs to participate in mitigating climate

change. However, careful design is required to ensure that the solutions trigger behaviors that make individuals feel committed to resolving the problem and thereby willing to invest time in these solutions through engagement on a digital platform.

DATA AVAILABILITY STATEMENT

The datasets used during this study are available from the corresponding author YF (fengyi@cufe.edu.cn) on reasonable request.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Central University of Finance and Economics. The participants were informed regarding the purpose and procedures of this survey via instructions at the head of the questionnaire. Informed written consent was provided on the first page of the questionnaire for all the participants.

AUTHOR CONTRIBUTIONS

BC was responsible for the overall research ideas, model design, and thesis writing. JS was responsible for literature review writing and data collection and processing. JY was responsible for model optimization and discussion of research conclusions. YF was responsible for manuscript revision and tables re-making.

FUNDING

This research was supported by the Central African Forest Initiative (CAFI) and the Beijing Social Science Foundation (No. 19JDLJB001) as the funders and the Green Digital Finance Alliance (GDFA) as the partner.

ACKNOWLEDGMENTS

We sincerely thank Ms. Marianne Haahr, Ms. Katherine A. Foster, and Ms. Yu Xiaowen from the Green Digital Finance Alliance for their contributions to this research.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

frontiers in Psychology

ORIGINAL RESEARCH
published: 15 September 2020
doi: 10.3389/fpsyg.2020.566046

Influence of Air Quality on Pro-environmental Behavior of Chinese Residents: From the Perspective of Spatial Distance

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Although environmental issues have attracted public attention, there are still many people unwilling to make behavioral changes to solve the problem, which makes promoting pro-environmental behavior become an interesting research topic. This study discusses the influence of air quality on the pro-environmental behavior of Chinese residents from the perspective of spatial distance, providing a theoretical basis and practical application for improving pro-environmental behavior. Through three experiments, this study reveals that air pollution within the local spatial distance could make residents more willing to conduct pro-environmental behavior. In addition, we also find that air pollution within local spatial distance would stimulate residents' environmental affection and promote them to conduct pro-environmental behavior. That is, environmental affection plays a mediating role in the interactive effect of air quality and spatial distance on pro-environmental behavior.

Keywords: air quality, spatial distance, environmental affection, pro-environmental behavior, Chinese residents

OPEN ACCESS

Edited by:
Yan Sun,
Institute of Psychology (CAS), China

Reviewed by:
Kai Chen,
Beijing Forestry University, China
Pingping Liu,
Institute of Psychology (CAS), China

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Specialty section:
This article was submitted to Environmental Psychology, a section of the journal Frontiers in Psychology

Received: *27 May 2020*
Accepted: *19 August 2020*
Published: *15 September 2020*

Citation:
Sheng G, Dai J and Pan H (2020) Influence of Air Quality on Pro-environmental Behavior of Chinese Residents: From the Perspective of Spatial Distance. Front. Psychol. 11:566046. doi: 10.3389/fpsyg.2020.566046

INTRODUCTION

The overexploitation of natural resources and the massive discharge of pollutants have brought great damage to the ecological environment, resulting in a series of severe environmental issues such as shortage of fresh water, land desertification, air pollution, water pollution, global warming, and acceleration of extinction of species (Steg and Vlek, 2009). The frequent occurrence of natural disasters like haze, acid rain, and sea level rise has not only restricted the sustainable development of economy but also seriously threatened health and life of human beings (Guo et al., 2020). Environmental issues have attracted great attention worldwide, and it is vital to find solutions to environmental degradation. Environmental issues caused by environmentally destructive human activities must be solved by human actions of environment protection (Bradley et al., 2020). Actively promoting pro-environmental behavior like green consumption, low-carbon travel, waste classification, and resources conservation may effectively reduce damage to ecological environment, enhance sustainable use of resources, and reduce degree of environmental pollution (Shi et al., 2017). Therefore, researchers have constructed and applied numerous theoretical frameworks to boost pro-environmental behavior, providing a solid theoretical basis. Some studies demonstrate that the theory of reasoned action (TRA) (Fishbein and Icek, 1975), the theory of planned behavior (TPB) (Ajzen, 1991), and the theory of responsible environmental behavior (Hines et al., 1987) can

effectively explain the pro-environmental behavior, and that the individual's personal factors such as attitude, subjective norms, and perceived behavior control determine one's pro-environment behaviors. Many researchers also hold that individual norm, the sense of consequence, attribution of responsibility, and values are important determinants of pro-environmental behavior, explaining it through the norm-activation model (NAM) (Schwartz, 1977) and the value-belief-norm theory (VBN theory) (Stern et al., 1999), and begin to notice the influence of economic and social conditions and other external factors. With the increasing awareness of environmental issues, current studies pay a growing attention to the determinants of pro-environmental behavior (Geng et al., 2016; Wang et al., 2019).

Although scholars have had in-depth discussions on factors affecting pro-environmental behavior and its promoting mechanism, research concerning effects of contextual factors on pro-environmental behavior is relatively insufficient, and impacts of ecological environment conditions, say, air quality, are seldom considered. With the development of China's economy, industrial growth, and advancing urbanization, air quality continues to deteriorate when acid rain, haze, and other harsh weather conditions occur more frequently, seriously affecting and endangering people's health and daily life (Qiu, 2014). Air quality has also been widely explored by scholars. However, most of the research mainly focuses on its causes (Ramanathan et al., 2001) and the effects on residents' health (Rajper et al., 2018), with only a few focusing on the influence of air quality on residents' behavior. For instance, Sun J.et al. (2019) employed the two-way fixed effect panel model and concluded that as the public awareness of haze improved, high-level haze concentration may reduce residents' domestic travel. Zhang et al. (2019) illustrated that the haze pollution perception would increase residents' willingness of green consumption. Air pollution caused by human activities is a serious threat to human life and health, but how air quality affects residents' pro-environmental behavior remains to be further discussed.

Air quality is the signal given by the ecological environment to residents, making residents have a perception of the current environmental conditions (Shi and He, 2012), and then affecting their behavior (Borbet et al., 2018). Air pollution would make people perceive the deterioration of the environment and then generate environmental affection such as worry, anxiety, or self-reproach, so as to be willing to conduct pro-environmental behavior. However, many people, even aware of existing environmental issues, are still unwilling to make behavioral changes to protect the environment (Xu et al., 2018). This study suggests that spatial distance from air pollution may complicate the process. The spatial distance from air pollution would greatly affect residents' cognition of and affection for environmental conditions and then affect their subsequent behavior (Spence et al., 2012). Accordingly, this study designed three experiments to explore the influence of air quality on pro-environmental behavior at different spatial distances and to demonstrate the mediating role of environmental affection. The findings of this study would advance current understandings of the relationship between air quality and residents' pro-environmental behavior from the perspective of spatial distance and provide practical applications for promoting residents' pro-environmental behavior.

PRO-ENVIRONMENTAL BEHAVIOR

Pro-environmental behavior is also known as environment-friendly behavior, environmental responsible behavior, sustainable behavior, etc. (Kiatkawsin and Han, 2017). It refers to behavior that would reduce damage to the environment or be beneficial to the environment as much as possible (Steg and Vlek, 2009). From the perspective of environmental behavior science, scholars divide pro-environmental behavior into two types, namely, public pro-environmental behavior (such as becoming an active environmental citizen, supporting environmental policies, and joining in environment protection organizations) and private pro-environmental behavior (such as purchasing, using, and handling environmentally beneficial products or services by individuals or families) (Dietz et al., 1998; Stern, 2000). Compared with public pro-environmental behavior, private pro-environmental behavior requires less time and energy and is easier to do and to keep. Moreover, public pro-environmental behavior needs higher environmental awareness. The residents first consciously regulate their private sector behavior and become eco-friendly in their daily behavior. After that, they would further engage in all kinds of social environment protection activities and make more contributions to environmental protection.

In order to promote individuals to actively practice pro-environmental behavior, scholars have constructed many influential frameworks to explore antecedents of pro-environmental behavior. TRA (Fishbein and Icek, 1975) and TPB (Ajzen, 1991) discuss the predictive power of individual psychological variables, such as attitude, subjective norms, perceived behavior control, and behavioral intention, on behavior, while the influence of external situational variables is less considered. On this basis, Hines et al. (1987) added variables of responsibility, control point, skills, knowledge, economic conditions, and social pressure to propose a responsible environmental behavior model. Although they put forward that contextual variables would directly affect behavior, what they mainly focused on was still the impact of individual's internal factors on the behavior. In addition, the NAM (Schwartz, 1977) and VBN theory (Stern et al., 1999) believe that individual norm, consequence consciousness, responsibility attribution, and values could predict individual altruistic behavior. Although these theories provide new mentality to the research of pro-environmental behavior, they still focus on the influence of individual's internal motivations, while impacts of contextual factors have not been discussed systematically.

Based on the above theories, scholars have carried out in-depth exploration and discussions on determinants of pro-environmental behavior from two aspects of individual psychological characteristics and contextual factors. Studies of individual psychological characteristics affecting pro-environmental behavior are mainly on three ways of personality traits, cognition, and affection. First, scholars discuss the

impacts of the personality traits, such as educational levels (Borbet et al., 2018), nature connectivity (Dutcher et al., 2007), values (Marshall et al., 2019), and mindfulness (Barbaro and Pickett, 2016), on pro-environmental behavior and reveal that people with certain pro-environmental or pro-social psychological traits are more willing to engage in pro-environmental behavior (Groot and Steg, 2008). Secondly, cognitive factors, such as perceived benefits and costs (Fritsche et al., 2010), could have greatly affected pro-environmental behavior. It is believed that individuals may make rational decisions based on the cognitive factors. In addition, some studies focus on the role of affection in predicting pro-environmental behavior, such as feelings of pride (Bissing-Olson et al., 2016), attitudes (Sun et al., 2020), environmental concern (Landry et al., 2018), and place attachment (Vaske and Kobrin, 2001), and put forward that affective factors have a strong explanatory power for pro-environmental behavior (Kim et al., 2018).

In fact, the motivating effects of individual psychological characteristics on pro-environmental behavior would be greatly influenced by external conditions (Guo et al., 2019). Therefore, scholars have further explored external factors influencing pro-environmental behavior from aspects of society, culture, media, and policy. Previous studies found that external situational variables, including social norms (Nolan et al., 2008) and expectations (Collado et al., 2017), public media (Sun Y.et al., 2019; Zhou et al., 2019), and governmental enforcement (Haddad, 2015), could play an important role in promoting pro-environmental behavior. It has thus expanded the research field of pro-environmental behavior and proposed new research ideas and directions for further exploring external factors affecting pro-environmental behavior in the future.

Although the existing research has discussed various interpersonal and contextual factors predicting pro-environmental behavior, there are still some limitations. First of all, most research still focuses on the influence of psychological variables on pro-environmental behavior, while the discussion of contextual variables is insufficient, and impacts of ecological environment are rarely considered. Secondly, current research on pro-environmental behavior is mostly from a single perspective of psychological or contextual factors, few of which consider comprehensively both external and internal factors. Furthermore, the underlying mechanisms of contextual variables affecting pro-environmental behavior remain to be further discussed. Therefore, this study explores the influence of air quality as an ecological environment condition on pro-environmental behavior in combination with spatial distance and discusses further the internal psychological mechanism from the perspective of environmental affection.

AIR QUALITY AND SPATIAL DISTANCE

Air pollution refers to the phenomenon that a large number of pollutants gather in the air and reach a certain level of concentration due to human activities or natural disasters. People usually use the quality of air to evaluate the degree of air pollution. Poor air quality may cause extreme weather such as haze, acid rain, and greenhouse effects, posing a serious threat to human life and health. The International Agency for Research on Cancer (IARC) of the World Health Organization (WHO) has rated outdoor air pollution as carcinogen. Some studies have shown that air quality would affect residents' preference for environmentally friendly behavior, and air pollution would urge residents to engage in a variety of environmentally beneficial behaviors (Oltra et al., 2017). When air quality is low, the haze weather occurs as a signal of air pollution and could give residents more direct feeling about current environment condition. People would perceive a higher level of environmental risk and thus make environmentally friendly behavior decisions out of risk-averse motive (Zhang et al., 2019). However, some scholars do not believe that air pollution makes everyone pay more attention to environmental issues (Hatfield and Job, 2001). Many people remain indifferent to air pollution and would not have strong emotional response or behavioral intention (Bord et al., 2000; Gurajala et al., 2019). Residents' different responses to the change of air quality may result from different spatial distance, so we cannot consider only impacts of air quality on pro-environmental behavior, but also the spatial distance between residents and the place where air pollution occurs.

Spatial distance, one of the dimensions of psychological distance, refers to the perception of distance or proximity of the target place with reference to the current location of the individual (Trope and Liberman, 2010). Previous research has shown that there are correlations between the four dimensions of psychological distance (temporal, spatial, social distance, and uncertainty). That is, the influence on one dimension will also affect the others (Bar-Anan et al., 2007). Psychological distance is widely used in the field of behavioral decision making and is believed to greatly influence people's cognition, affection, and response to the environment (Liberman and Trope, 2008). In the field of ecological environment, although people are aware of global environmental issues, they are still unwilling to make behavioral changes from themselves because they think them far away (Xu et al., 2018). Meanwhile, some studies believe that people would be more willing to engage in pro-environmental behavior when the environmental issues become proximal to them. For example, Spence et al. (2012) explored impacts of psychological distance on sustainable behavior regarding environmental issues in four dimensions of time, space, society, and probability, and concluded that the shorter the psychological distance was, the higher people's anxiety over environmental problems was, and the more likely they were to conduct sustainable behavior.

Air pollution in faraway places makes people feel powerless about their action and means that the impact of pro-environmental behavior remains uncertain and distant. They think that their pro-environmental behavior will not improve the phenomenon, and their destructive behavior will not worsen it (Dilling, 2007; Schill and Shaw, 2016). If people believe that the change of air quality is far away in space, they will not easily get worried about environment or health problems and will not take responsibility for environment on initiative, so it is not easy for them to take environmentally friendly actions (Sacchi et al., 2016; Wu and Geng, 2019). On the contrary, when change of

air quality occurs in residents' surroundings, their perception of environmental risks and worry about environmental problems grow greatly and their empathy for environmental problems will promote pro-environmental activities (Dong et al., 2019). On the one hand, low air quality makes residents aware of the serious air pollution issue (Wu and Geng, 2019). Therefore, when facing air pollution at close range, people may try to reduce air pollution by some behaviors that have direct effects on it like using public transportation instead of a private car. In addition, they would also adopt some behaviors that have indirect effects on air pollution, such as purchasing green products and participating in afforestation. On the other hand, air pollution also makes residents have a clearer understanding of the overall ecological environment and realize the seriousness and urgency of environmental issues. On this basis, people will make more efforts to improve the environmental status and have a higher willingness to conduct garbage classification, join in environmental protection organizations, advocate the concept of environmental protection, and other pro-environmental behavior. In addition, many people believe that personal actions can have an impact on the environment and that human activities are one of the causes of environmental issues (Pidgeon et al., 2008; Spence et al., 2012). Environmental pollution in the vicinity reflects consequences of residents' past behavior (Zhang et al., 2019). It will not only make people feel regretful and guilty over past destructive behavior but also arouse compensatory pro-environmental behavior in the future. It also communicates that residents' pro-environmental behavior will help improve the environment in the future, so that people can gain confidence to change the *status quo* of environment pollution through pro-environmental behavior. Therefore, this study believes that within local spatial distance, low (vs. high) air quality would stimulate residents' pro-environmental behavior. Thus, the following hypotheses are proposed:

H1a: Within local spatial distance, relative to high air quality, low air quality increases Chinese residents' pro-environmental behavior.

H1b: There is no significant difference between low and high air quality on Chinese residents' pro-environmental behavior within distant spatial distance.

THE MEDIATING EFFECT OF ENVIRONMENTAL AFFECTION

Affection is a response to causal-specific stimuli, and it is the relatively stable physiological evaluation and experience (Agarwal and Malhotra, 2005). Existing research conceptually makes a simple distinction between affection, emotion, and feeling. Feeling is a transient response to a particular situation based on the mind or senses, whereas emotion is a stable response to a particular situation (Agarwal and Malhotra, 2005). Affection is similarly defined as a stable and contextual response. Scholars often think that affection and emotion are basically the same (Gustafson, 1984), but there is still a slight difference in their meanings. Compared with emotion, affection is more based on certain value orientation or inclination (Choi, 2018). To date, the academics have not reached a unified understanding of environmental affection. Basing on the definition of affection, environmental affection is defined here as a stable emotional experience of ecological conditions and environment-related behaviors based on the yearning and love for the ecological environment. It means that people would have a stable emotional response to situations based on ecological commitments, cognition, judgments of value, and so on.

The state of ecological environment is the objective basis and important external stimuli for arousing residents' environmental affection, and air quality is one of the important indicators reflecting the state of ecological environment. We suggest that low air quality within short distance will promote environmental affection. On the one hand, people usually have a place attachment to their residence. If air quality in the local area is low, people will easily get worried about environment pollution. It will also make people perceive threats of environmental problems to their daily life and health and thus become concerned and anxious over environmental problems (Hokka et al., 1999; Panu, 2016). On the other hand, the polluted air makes people think of their own and other residents' environmental behavior and generate a sense of shame and guilt for their own destructive behavior (Rees et al., 2015), as well as a sense of disgust for others' destructive behavior. However, low air quality at long spatial distance cannot promote people to produce strong environmental affection. If air pollution occurs in a faraway area, people cannot have a clear cognition of air quality or environment pollution and cannot have environmental affection of concern or anxiety over environmental problems. Meanwhile, they would not associate air pollution with their own deeds, so they are less likely to form environmental affection of shame or guilt.

With the progress of research, scholars have gradually found the importance of affection in promoting residents' pro-environmental behavior. Some scholars even believe that behavior is based more on affective response than on cognitive factors that only play a secondary role (Wang et al., 2013). Affection can direct behavior, and many scholars have proved the significant positive effects of environmental affection on pro-environmental behavior. Chan and Lau (2000) found that ecological affect could indirectly affect green purchase behavior. Mallett (2012) found that ecological guilt would motivate eco-friendly behavior intention and then increase the possibility of participation in environment protection behavior. Generation of environmental affection reflects residents' psychological activities: Their anxiety over bad environment caused by air pollution and love for a good ecological environment will urge them to make environmentally friendly behavior decisions, while emotions of guilt, pride, disgust, or appreciation generated from past behavior will guide people to correct destructive behavior and prefer pro-environmental behavior.

This study has proposed that the interaction of air quality and spatial distance would affect pro-environmental behavior of residents, in which environmental affection would play a mediating role. According to the "extended knowledge-attitude-practice (EKAP) model" in the field of psychology, the process of behavioral change can be divided into the following stages: the individuals form cognition and judgment of external situations.

Then, they produce affection based on the cognition, and such affection affects the individual's will to mobilize behavioral change (Wang et al., 2013). When the area of air pollution is close to the individual, lower air quality will stimulate the residents to recognize and judge on environmental issues and past environmental behaviors. Residents produce environmental affection on the basis of cognition, such as anxiety over environmental problems, longing for a better environment, guilt of and disgust at destructive environmental behavior, and pride in and appreciation of pro-environmental behavior. Under the direction of a series of environmental affection, people will generate behavioral motivation to protect the environment and tend to engage in pro-environmental behavior. To sum up, this study proposes the following hypotheses:

H2a: Within local spatial distance, environmental affection plays a mediating role between air quality and pro-environmental behavior.

H2b: Within distant spatial distance, the mediating role of environmental affection does not exist.

To sum up, this study proposes a conceptual framework of impacts of air quality on residents' pro-environmental behavior (**Figure 1**).

MATERIALS AND METHODS AND RESULTS

Pretest

Pretest was divided into three parts: the selection of weather phenomena in the materials, the selection of cities in the materials, and the check of manipulation.

In the first part, we initially selected the weather phenomena representing low air quality. With reference to air quality evaluation indicators (SO_2, NO_2, PM_{10}, $PM_{2.5}$, CO, O_3, etc.), we selected seven air pollution phenomena released by the Ministry of Ecology and Environment of China, including acid rain, haze, greenhouse effect, and sulfuric acid smog, as alternative weather phenomena. The experiments require the subjects to be familiar with the selected air pollution phenomenon and have a clear understanding of the air quality it represents. Therefore, familiarity and perceptual air quality were taken as the criteria for screening. Fifty undergraduate students in Jilin University participated in this pretest and were asked to indicate (1) how familiar they are with each of the seven weather phenomena and (2) which level they ranked the air quality from each of the seven weather phenomena, by using a seven-point scale (1 = "very unfamiliar" and 7 = "very familiar;" 1 = "very low" and 7 = "very high"). Results showed that the participants were most familiar with haze weather (M = 6.68, SD = 0.47), followed by acid rain (M = 6.10, SD = 0.74), and the perceptual air quality of haze weather was the lowest (M = 1.58, SD = 0.64), followed by acid rain (M = 2.12, SD = 0.75). Based on these findings, haze weather and clear weather would be used to manipulate air quality in the following experiments.

The aim of the second part was to select two cities that could manipulate the spatial distance. Spatial distance refers to perception of the distance of the target location. Therefore, we selected cities according to the following criteria: (1) the cities have experienced haze weather; (2) the subjects could clearly perceive the spatial distance at a local/distant level. First, since the experiments would be conducted in Changchun, China, we decided to use Changchun as the local spatial distance. Next, we selected 10 famous cities with obvious geographical distance from Changchun as candidates, including Beijing, Shanghai, Guangzhou, London, Seoul, Paris, etc. Fifty undergraduate students in Jilin University participated in this pretest and rated the perceptual spatial distance to the 10 cities on a seven-point scale (1 = "very close" and 7 = "very far"). Results showed that the participants perceived a farthest spatial distance from London (M = 6.06, SD = 0.84), so we decided to use London and Changchun to manipulate spatial distance.

In the third part, we checked the manipulation material of air quality and spatial distance. In psychological experiments, text, images, or videos are often used as stimulus materials to induce specific responses, among which images and videos can play a more effective role through visual effects. Furthermore, compared with video, the image stimulus is easier to operate and response of the subjects is easier to observe. Therefore, we combined the haze and clear weather with the landmark buildings in Changchun and London and invited professional designers to design four groups of still images A, B, C, and D as stimulus materials. Eighty undergraduates in Jilin University participated in this pretest and were randomly assigned into a 2 (Air quality: high vs. low) × 2 (Spatial distance: local vs. distant) between-subjects design. In each condition, participants were asked to browse the images above, respectively, and then

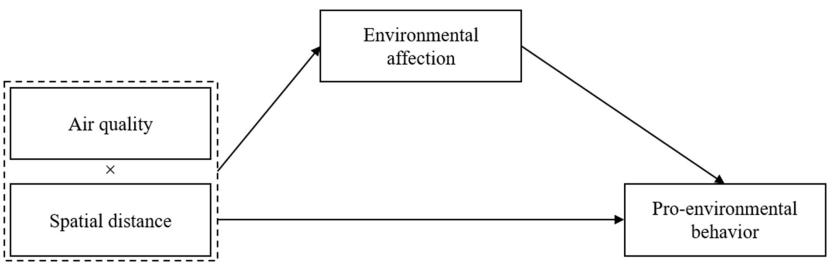

FIGURE 1 | Framework.

rated the air quality and spatial distance that they perceived from the images on a seven-point scale. A *t*-test for the air quality manipulation check revealed that the perceived air quality in the low air quality condition was significantly lower than that in the high air quality condition, M_{low} = 1.60, *SD* = 0.59 vs. M_{high} = 6.40, *SD* = 0.63, $t(78) = 35.08$, $p < 0.001$, Cohen's $d = 7.94$, which means the manipulation of air quality performed as intended. A *t*-test for the spatial distance manipulation check revealed that the perceptual spatial distance in the local spatial distance condition was significantly lower than that in the distant spatial distance condition, M_{local} = 1.85, *SD* = 0.80 vs. $M_{distant}$ = 6.23, *SD* = 0.62, $t(78) = 27.30$, $p < 0.001$, Cohen's $d = 6.18$, which means the manipulation of spatial distance performed as intended.

Experiment 1

To test H1a and H1b, Experiment 1 was designed to provide an examination of how air quality affects pro-environmental behavior intention within different spatial distance.

Participants and Procedure

Two hundred ten undergraduates in Changchun participated in the experiment (M_{age} = 20.42, *SD* = 1.43; 51.9% female, *N* = 107). Before the actual experiment procedure, each participant was informed that they would be shown several images and then completed a questionnaire. Each participant was given a cash reward of 5 yuan after completing the experiment. To eliminate the interference of basic mood, participants were asked to report their basic mood (e.g., happy, sad, angry, fear, etc.) on a seven-point scale. We removed four participants who had an obvious mood tendency.

Two hundred six participants who completed the mood test were randomly assigned to a 2 (Air quality: high vs. low) × 2 (Spatial distance: local vs. distant) between-subjects experimental design. We manipulated the air quality and spatial distance by presenting images that featured landmark buildings in either Changchun or London on an either clear or haze day, respectively. Participants were asked to look at the images for 5 s and then report the air quality and spatial distance that they perceived from the images as a manipulation check.

Next, participants completed a pro-environmental behavior intention scale, based on the Chinese General Social Survey (CGSS), which is the earliest project to do a national, comprehensive, and continuous academic survey. The scale contains a total of 10 items, including 5 items in the private dimension, such as "garbage classification," and 5 items in the public dimension, such as "donation for environmental protection" (**Table 1**). Participants rated their intention to engage in these behaviors on a seven-point scale (1 = "very unwilling" and 7 = "very willing"). We summed scores on the 10 items to measure pro-environmental behavior intention and summed the scores on the 5 items from the private dimension to measure private pro-environmental behavior intention and the 5 items from the public dimension to measure public pro-environmental behavior intention. At the end of the experiment, participants indicated their age and gender.

TABLE 1 | Scales of pro-environmental behavior intention and environmental affection.

Pro-environmental behavior intention
Garbage classification
Discuss environmental issues with friends and relatives
Bring your own basket (bag) for grocery shopping
Purchase green products
Take public transport instead of private cars
Contribute to environmental protection
Participate in environmental publicity organized by the government and the community
Participate in environmental protection activities organized by non-governmental organizations
Attend the maintenance of trees or green space at your own expense
Participate in complaints and appeal activities to solve environmental issues
Environmental affection
I am concerned about the environmental pollution issue.
I am worried about the environmental pollution issue.
I am angry about the environmental pollution issue.
I love the environment without pollution.
I aspire to the environment without pollution.
I cherish the environment without pollution.
I am disgusted by the destruction of the environment.
I despise the destruction of the environment.
The destruction of the environment infuriates me.
I am ashamed of the destruction of the environment.
I feel guilty about destroying the environment.
I feel sad about the destruction of the environment.
I praise the act of protecting the environment.
I appreciate the act of protecting the environment.
I respect the protection of the environment.
I am gratified by the act of protecting the environment.
I am delighted with the act of protecting the environment.
I am proud of the act of protecting the environment.

Results

Reliability and validity analysis

Cronbach's alpha reliability for "pro-environmental behavior intention" equaled 0.87, greater than 0.7, indicating that the reliability of the measurement was acceptable. Average variance extracted (AVE) of "pro-environmental behavior intention" was 0.54, surpassing the acceptable level of 0.50, indicating a satisfactory level of convergent validity.

Manipulation checks

To begin, we examined the perceptual air quality of the images used in the experiment. A *t*-test was used to compare perception of the air quality of the images in high air quality conditions and that in low air quality conditions. Results revealed that participants in the high air quality conditions perceived higher air quality (M_{high} = 6.08, *SD* = 0.88) than participants in the low air quality conditions [M_{low} = 1.52, *SD* = 0.50, $t(204) = 45.62$, $p < 0.001$, Cohen's $d = 6.39$]. We also examined the perceptual spatial distance of the images used in the experiment. A *t*-test was used to compare perception of the spatial distance of the images in the local spatial distance

conditions and that in the distant spatial distance conditions. Results revealed that participants in the local spatial distance conditions perceived closer spatial distance (M_{local} = 6.45, SD = 0.61) than participants in distant spatial distance conditions [$M_{distant}$ = 1.75, SD = 0.57, $t(204) = 57.20$, $p < 0.001$, Cohen's d = 8.02]. Thus, the manipulation of air quality and spatial distance performed as intended.

Main effect analysis

An analysis of variance (ANOVA) was conducted on pro-environmental behavior intention. Results revealed an interaction effect between air quality and spatial distance [$F(1,202) = 8.03$, $p = 0.005$, $\eta^2 = 0.038$], while the main effects of air quality [$F(1,202) = 2.33$, $p = 0.128$] and spatial distance [$F(1,202) = 1.51$, $p = 0.220$] on pro-environmental behavior intention were not significant. The results of the simple effect analysis showed that, when the spatial distance was at local level, compared with high air quality (M_{high} = 4.36, SD = 0.97), low air quality led to higher pro-environmental behavior intention (M_{low} = 4.99, SD = 0.89), $F(1,203) = 9.47$, $p = 0.002$, $\eta^2 = 0.044$. However, when the spatial distance was long, air quality had no significant effect on pro-environmental behavior intention (M_{low} = 4.41, SD = 1.06, M_{high} = 4.59, SD = 1.15), $F < 1$ (**Figure 2A**).

Next, we used a paired-samples t-test to compare private and public pro-environmental behavior intentions. Results showed that private pro-environmental behavior intention and public pro-environmental behavior intention were positively correlated ($r = 0.78$, $p < 0.001$) and that participants rated higher intention to engage in private (vs. public) pro-environmental behavior ($M_{private}$ = 4.73, SD = 1.07, M_{public} = 4.45, SD = 1.15), $t(205) = 5.45$, $p < 0.001$.

We also conducted a multivariate analysis of variance (MANOVA) on private and public pro-environmental behavior intention to further examine the interaction effect between air quality and spatial distance on private and public pro-environmental behavior intention. Results showed that the interaction between air quality and spatial distance had an effect on both private and public pro-environmental behavior intention, and the interaction effect was greater on private pro-environmental behavior intention, $F_{private}(1,202) = 9.07$, $p = 0.003$, $\eta^2 = 0.043$, $F_{public}(1,202) = 5.52$, $p = 0.020$, $\eta^2 = 0.027$, whereas the main effects of air quality [$F_{airquality}(1,202) = 2.69$, $p = 0.102$] and spatial distance ($F_{spatialdistance} < 1$) on private pro-environmental behavior intention were not significant. The main effects of air quality [$F_{airquality}(1,202) = 1.56$, $p = 0.213$] and spatial distance [$F_{spatialdistance}(1,202) = 3.25$, $p = 0.073$] on public pro-environmental behavior intention were not significant. The results of the simple effect analysis revealed that, when the spatial distance was at local level, air quality had a significant effect on both private [M_{low} = 5.10, SD = 0.98, M_{high} = 4.42, SD = 1.04, $F(1,203) = 10.72$,

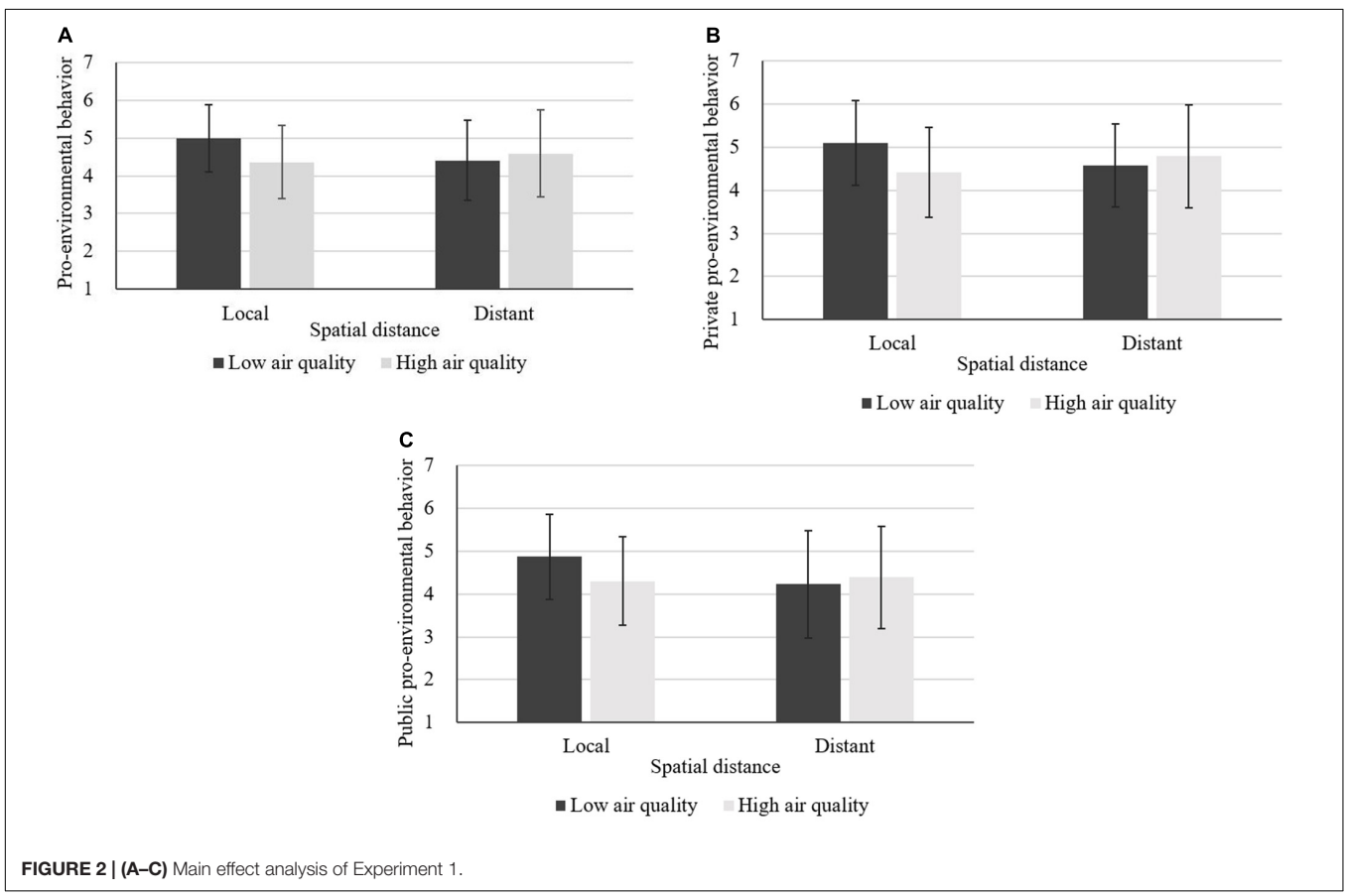

FIGURE 2 | (A–C) Main effect analysis of Experiment 1.

$p = 0.001$, $\eta^2 = 0.050$] and public pro-environmental behavior intention [$M_{low} = 4.87$, $SD = 1.00$, $M_{high} = 4.31$, $SD = 1.03$, $F(1,203) = 6.48$, $p = 0.012$, $\eta^2 = 0.031$]. However, as for the distant level of spatial distance, air quality had no significant effect on private ($M_{low} = 4.59$, $SD = 0.96$, $M_{high} = 4.79$, $SD = 1.19$, $F < 1$) or public pro-environmental behavior intention ($M_{low} = 4.22$, $SD = 1.26$, $M_{high} = 4.39$, $SD = 1.20$, $F < 1$) (**Figures 2B,C**).

Discussion

In support of H1a and H1b, Experiment 1 demonstrated that low air quality promotes pro-environmental behavior intention when the spatial distance is at local level. Notably, air quality has no significant effect on pro-environmental behavior intention when the spatial distance is long. Furthermore, the findings of Experiment 1 also suggested that, compared with the public domain, participants are more likely to engage in private pro-environmental behavior, and the interactive effect of air quality and spatial distance on private pro-environmental behavior intention is greater. Although the results of Experiment 1 were in line with expectations, the student samples still had some limitations. As such, we conducted Experiment 2 to replicate the results of Experiment 1 with non-student samples and to further verify the mediating effect of environmental affection.

Experiment 2

To test H2a and H2b, we designed Experiment 2 to examine the mediating role of environmental affection.

Participants and Procedure

The participants in Experiment 1 were undergraduate students whose ages were between 18 and 23, so the results were questionable for other age groups. Furthermore, compared with local residents, undergraduate students may only live in Changchun for a relatively short time. To generalize our findings, Experiment 2 changed the participants from student samples to non-student samples. Two hundred thirty-six adult residents in Changchun, aged between 18 and 40, participated in the experiment ($M_{age} = 29.09$, $SD = 6.46$, 50.6% female, $N = 117$). Before the actual experiment procedure, each participant was informed that they would be shown several images and then complete a questionnaire. Each participant was given a cash reward of 5 yuan after completing the experiment. To eliminate the interference of basic mood, participants were asked to report their basic mood. We removed five samples with an obvious mood tendency.

Two hundred thirty-one participants with no obvious mood tendency were randomly assigned to a 2 (Air quality: high vs. low) × 2 (Spatial distance: local vs. distant) between-subjects experimental design. We used some images to manipulate air quality and spatial distance as we did in Experiment 1, but there were also some differences as we changed the landmarks in the images. Participants in the four experiment groups were shown some images that were very similar to that in Experiment 1, respectively. Participants were asked to look at the images for 5 s. Next, as manipulation check, participants also reported their perceptual air quality and perceptual spatial distance the same as in Experiment 1.

After that, participants indicated their environmental affection and pro-environmental behavior intention. The items we adopted to measure environmental affection were based on previous literature on people's various affection for the environment (Maloney et al., 1975; Koenig-Lewis et al., 2014) including "worried," "disgust," "guilt," "love," "praise," and "pride," and the scale was slightly modified on the basis of the context of pro-environmental behavior. Participants reported their environmental affection by rating 18 items, such as "I am worried about environmental pollution issue," "I am disgusted by environmental destruction behavior," "I feel guilty about harming the environment," etc. (1 = "strongly disagree," 7 = "strongly agree;" **Table 1**). We used the same 10 items as that used in Experiment 1 to measure pro-environmental behavior intention. Participants also indicated their age and gender.

Results

Reliability and validity analysis

Cronbach's alpha reliability for "environmental affection" equaled 0.94 and that for "pro-environmental behavior intention" equaled 0.89, both greater than the acceptable level (0.7). AVEs of "environmental affection" and "pro-environmental behavior intention" equaled 0.54 and 0.46, which approximated to 0.50 or surpassed 0.50, and the CRs of the two constructs were 0.93 and 0.89, indicating an acceptable level of convergent validity. The correlation between environmental affection and pro-environmental behavior intention was 0.64 ($p < 0.001$), which was below the smallest square root of the AVE (0.68), indicating that the discriminant validity of the measurements was acceptable.

Manipulation checks

Firstly, we conducted a *t*-test for air quality manipulation check. Results showed that the perceptual air quality of participants in high air quality conditions ($M_{high} = 6.00$, $SD = 0.66$) was significantly higher than that in low air quality conditions ($M_{low} = 2.07$, $SD = 0.63$), $t(229) = 46.23$, $p < 0.001$, Cohen's $d = 6.11$. We also conducted a *t*-test for spatial distance manipulation check. Results showed that the perceptual spatial distance of participants in distant spatial distance conditions ($M_{distant} = 6.32$, $SD = 0.54$) was significantly higher than that in local spatial distance conditions ($M_{local} = 1.61$, $SD = 0.71$), $t(229) = 56.69$, $p < 0.001$, Cohen's $d = 7.52$. The air quality and spatial distance manipulation performed as intended.

Main effect analysis

We conducted an ANOVA on pro-environmental behavior intention to confirm the findings of Experiment 1. The results revealed an interactive effect of air quality and spatial distance on pro-environmental behavior intention, $F(1,227) = 9.11$, $p = 0.003$, $\eta^2 = 0.039$, whereas the main effects of air quality [$F(1,227) = 3.30$, $p = 0.070$] and spatial distance ($F < 1$) on pro-environmental behavior intention were not significant. Contrasts showed that, when the spatial distance was at local level, low

(vs. high) air quality led to higher pro-environmental behavior intention (M_{low} = 5.19, *SD* = 1.07, M_{high} = 4.57, *SD* = 0.98), $F(1,228) = 11.28$, $p = 0.001$, $\eta^2 = 0.050$. However, when the spatial distance was long, air quality had no significant effect on pro-environmental behavior intention (M_{low} = 4.69, *SD* = 0.86, M_{high} = 4.84, *SD* = 0.98), $F < 1$ (**Figure 3A**).

Next, to examine the findings of Experiment 1 that the intention of private pro-environmental behavior is higher than that of public pro-environmental behavior, we conducted a paired-samples *t*-test to compare private and public pro-environmental behavior intentions. Results revealed that private and public pro-environmental behavior intentions were positively correlated ($r = 0.75$, $p < 0.001$) and that participants had higher intention to engage in private pro-environmental behavior ($M_{private}$ = 4.97, *SD* = 1.07, M_{public} = 4.68, *SD* = 1.05), $t(230) = 5.85$, $p < 0.001$.

We also conducted a MANOVA to further examine the interactive effect of air quality and spatial distance on private and public pro-environmental behavior intention. Results showed that the interaction between air quality and spatial distance had an effect on both private and public pro-environmental behavior intention, and this interactive effect on private pro-environmental behavior intention was greater, $F_{private}(1,227) = 8.13$, $p = 0.005$, $\eta^2 = 0.035$ vs. $F_{public}(1,227) = 7.67$, $p = 0.006$, $\eta^2 = 0.033$, while the main effects of air quality [$F_{airquality}(1,227) = 3.50$, $p = 0.063$] and spatial distance ($F_{spatialdistance} < 1$) on private pro-environmental behavior intention were not significant. The main effects of air quality [$F_{airquality}(1,227) = 2.29$, $p = 0.132$] and spatial distance [$F_{spatialdistance}$ (1,227) = 1.58, $p = 0.211$] on public pro-environmental behavior intention were not significant. Results of the simple effect analysis revealed that, when the spatial distance was at local level, air quality had a significant effect on both private [M_{low} = 5.33, *SD* = 1.16, M_{high} = 4.67, *SD* = 1.88, $F(1,228) = 11.40$, $p = 0.001$, $\eta^2 = 0.048$] and public pro-environmental behavior intention [M_{low} = 5.05, *SD* = 1.10, M_{high} = 4.47, *SD* = 0.94, $F(1,228) = 9.40$, $p = 0.002$, $\eta^2 = 0.039$]. As for the distant level of spatial distance, air quality had no significant effect on private (M_{low} = 4.87, *SD* = 0.80, M_{high} = 5.00, *SD* = 1.01, $F < 1$) or public pro-environmental behavior intention (M_{low} = 4.51, *SD* = 1.06, M_{high} = 4.68, *SD* = 1.03, $F < 1$) (**Figures 3B,C**).

Mediating effect analysis

We conducted an ANOVA with air quality and spatial distance on environmental affection. Results revealed an interactive effect of air quality and spatial distance on environmental affection, $F(1,227) = 4.20$, $p = 0.042$, $\eta^2 = 0.018$. The main effects of air quality [$F_{airquality}(1,227) = 3.85$, $p = 0.051$] and spatial distance ($F_{spatialdistance} < 1$) on environmental affection were

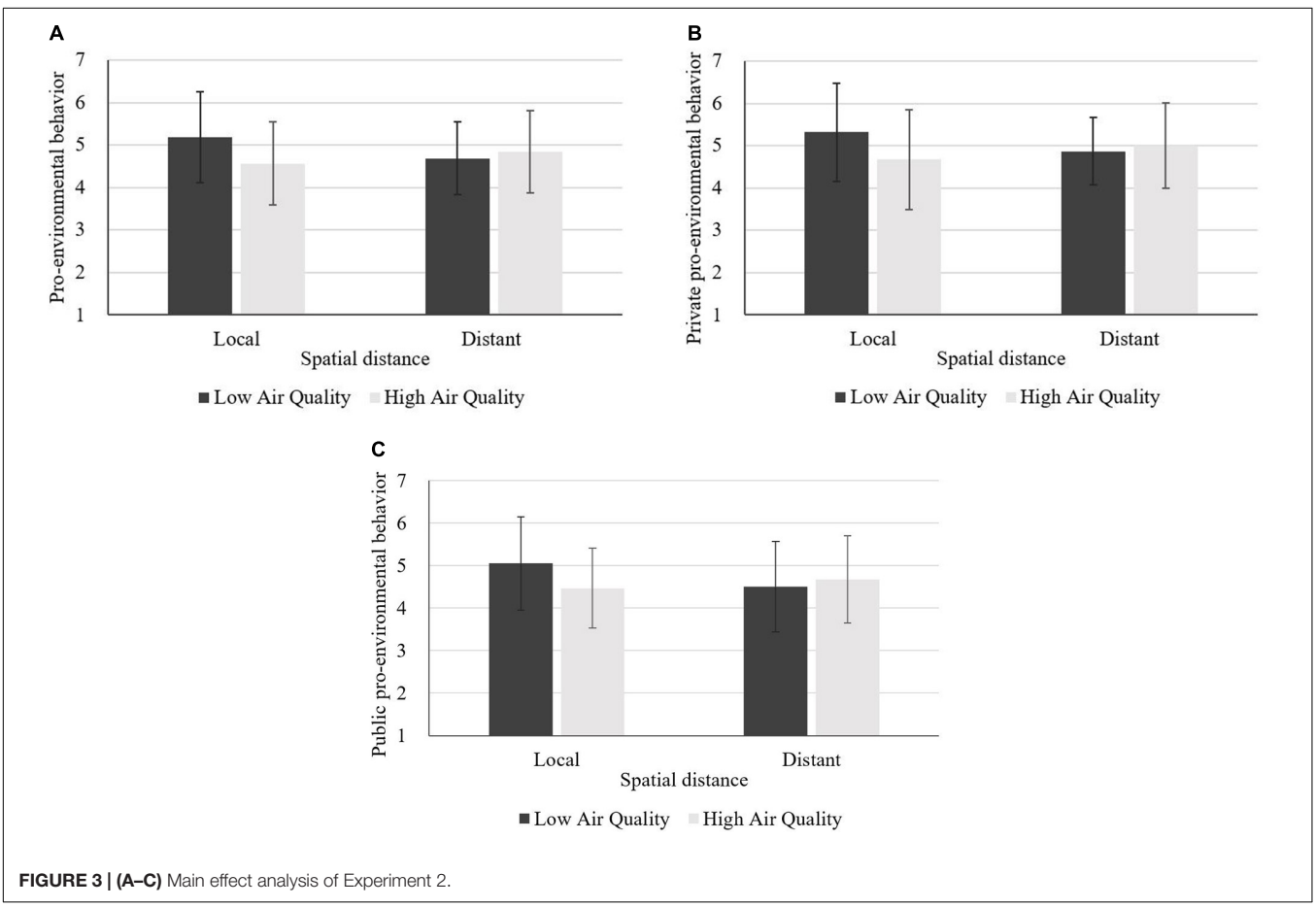

FIGURE 3 | (A–C) Main effect analysis of Experiment 2.

not significant. Results of the simple effect analysis revealed that, when the spatial distance was at local level, low (vs. high) air quality led to higher environmental affection (M_{low} = 5.35, SD = 1.09, M_{high} = 4.80, SD = 1.22), $F(1,228) = 8.24$, $p = 0.004$, $\eta^2 = 0.035$. However, when the spatial distance was long, air quality had no significant effect on environmental affection (M_{low} = 4.99, SD = 0.81, M_{high} = 5.00, SD = 1.05), $F < 1$.

We used the PROCESS macro to test the mediating role of environmental affection. We selected model 8 and conducted a bootstrap at the 95% confidence interval from 5000 bootstrap samples (Hayes, 2013). As shown in **Figure 4**, the direct effect of the interaction between air quality and spatial distance, after controlling for environmental affection, was found to be β = 0.45 (LLCI = 0.047, ULCI = 0.847). The indirect effect of the highest-order interaction was found to be β = 0.32, and the bias-corrected 95% confidence interval did not include zero (LLCI = 0.020, ULCI = 0.654), demonstrating that environmental affection mediated the interactive effect of air quality and spatial distance on pro-environmental behavior intention. Furthermore, as presented in **Table 2**, the results of the analysis for the conditional direct effects of air quality on pro-environmental behavior intention at values of spatial distance revealed that, when the spatial distance was at local level, air quality had a significant effect on pro-environmental behavior intention (β = 0.30, t = 2.09, p = 0.038), whereas within distant spatial distance, air quality had no significant effect on pro-environmental behavior intention (β = -0.15, t = -1.02, p = 0.307). In addition, the results of the analysis for the conditional indirect effects of air quality on pro-environmental behavior intention at values of spatial distance revealed that, when the spatial distance was at local level, the mediating effect of environmental affection was found to be β = 0.32, and the bias-corrected 95% confidence interval did not include zero (LLCI = 0.087, ULCI = 0.570), whereas when the spatial distance was at distant level, the mediating effect of environmental affection was found to be non-significant (LLCI = -0.207, ULCI = 0.192).

TABLE 2 | Conditional direct and indirect effects in Experiment 2.

	Spatial distance	Effect	SE	*t*	*p*	LLCI	ULCI
Direct effect	Local	0.30	0.14	2.09	0.038	0.017	0.584
	Distant	−0.15	0.14	−1.02	0.307	−0.429	0.136
Indirect effect	Local	0.32	0.12			0.087	0.570
	distant	−0.01	−0.10			−0.207	0.192

Discussion

Experiment 2 re-examined the interactive effect between air quality and spatial distance on pro-environmental behavior intention with non-student samples, increasing the stability of the experimental results. Experiment 2 again proved that participants showed higher intention to private (vs. public) pro-environmental behavior, and the interactive effect of air quality and spatial distance on private (vs. public) pro-environmental behavior intention was greater. Furthermore, in support of H2a and H2b, Experiment 2 showed that environmental affection mediated the interactive effect of air quality and spatial distance on pro-environmental behavior intention. Notably, only when the spatial distance is at local level does low air quality trigger greater environmental affection, leading to a higher intention to engage in pro-environmental behavior. In both Experiment 1 and Experiment 2, London was selected to manipulate distant spatial distance. However, there are still some obvious differences between London and Changchun, such as nationality and culture, which may contribute to certain disturbances. Therefore, Experiment 3 was conducted to re-examine the results in Experiment 2 by selecting Guangzhou, a city in China that is also at a distinct geographical distance from Changchun, to manipulate spatial distance with the purpose of improving the robustness of the experiment.

Experiment 3

Participants and Procedure

To generalize our findings, Experiment 3 used Guangzhou, a city in China, to manipulate the distant spatial distance, according to the requirements of the experiment: (a) haze phenomenon exists; (b) a well-known city familiar to people; (c) there is an obvious geographical distance from Changchun. Moreover, Guangzhou and Changchun are both provincial capitals located in China, which could reduce the interference of national and cultural differences to some extent. One hundred eighty adult residents in Changchun, aged between 18 and 40, participated in the experiment (M_{age} = 28.90, SD = 6.74, 51.1% female, N = 92). Before the actual experiment procedure, each participant was informed that they would be shown several images and then

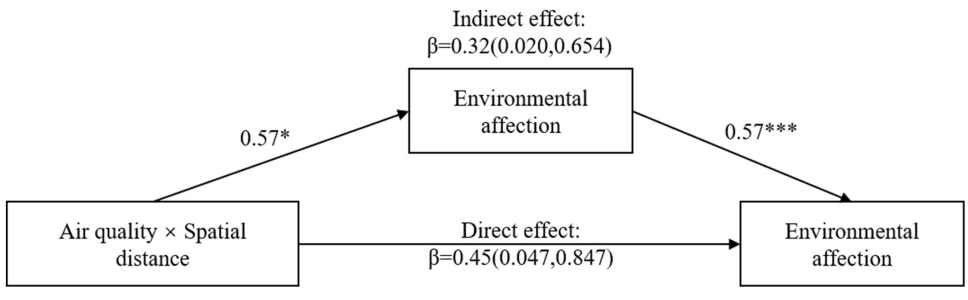

FIGURE 4 | Mediation analysis of Experiment 2. *$p < 0.05$; ***$p < 0.001$.

complete a questionnaire. Each participant was given a cash reward of 5 yuan after completing the experiment. To eliminate the interference of basic mood, participants were asked to report their basic mood. Then, we removed three samples with an obvious mood tendency.

One hundred seventy-seven participants with no obvious mood tendency were randomly assigned to a 2 (Air quality: high vs. low) × 2 (Spatial distance: local vs. distant) between-subjects experimental design. We manipulated the air quality and spatial distance by presenting images that featured landmark buildings in either Changchun or Guangzhou on an either clear or haze day, respectively. Participants were asked to look at the images for 5 s. Next, as manipulation check, participants also reported their perceptual air quality and perceptual spatial distance the same as in Experiment 2.

After that, participants indicated their environmental affection and pro-environmental behavior intention. We used the same measurements as that used in Experiment 2 to measure environmental affection and pro-environmental behavior intention. Participants also indicated their age and gender.

Results

Reliability and validity analysis

Cronbach's alpha reliability for "environmental affection" equaled 0.94 and that for "pro-environmental behavior intention" equaled 0.91, both greater than the acceptable level (0.7). AVEs of "environmental affection" and "pro-environmental behavior intention" equaled 0.56 and 0.50, which equaled or surpassed 0.50, and the CRs of the two constructs were 0.93 and 0.91, indicating that there was convergent validity. The correlation between environmental affection and pro-environmental behavior intention was 0.31 ($p < 0.001$), which was below the smallest square root of the AVE (0.71), indicating that the discriminant validity of the measurements was acceptable.

Manipulation checks

Firstly, we conducted a *t*-test for air quality manipulation check. Results showed that the perceptual air quality of participants in high air quality conditions ($M_{high} = 6.03$, $SD = 0.64$) was significantly higher than that in low air quality conditions ($M_{low} = 2.04$, $SD = 0.62$), $t(175) = 42.07$, $p < 0.001$, Cohen's $d = 6.36$. We also conducted a *t*-test for spatial distance manipulation check. Results showed that the perceptual spatial distance of participants in distant spatial distance conditions ($M_{distant} = 6.33$, $SD = 0.56$) was significantly higher than that in local spatial distance conditions ($M_{local} = 1.69$, $SD = 0.73$), $t(167) = 47.31$, $p < 0.001$, Cohen's $d = 7.31$. The air quality and spatial distance manipulation performed as intended.

Main effect analysis

The results of ANOVA on pro-environmental behavior intention revealed an interactive effect between air quality and spatial distance on pro-environmental behavior intention, $F(1,173) = 9.80$, $p = 0.002$, $\eta^2 = 0.054$, while the main effects of air quality [$F(1,174) = 3.77$, $p = 0.054$] and spatial distance ($F < 1$) on pro-environmental behavior intention were not significant. Contrasts showed that, when the spatial distance was at local level, low (vs. high) air quality led to higher pro-environmental behavior intention ($M_{low} = 5.21$, $SD = 0.77$, $M_{high} = 4.58$, $SD = 0.86$), $F(1,174) = 12.71$, $p < 0.001$, $\eta^2 = 0.068$. However, when the spatial distance was long, air quality had no significant effect on pro-environmental behavior intention ($M_{low} = 4.84$, $SD = 0.88$, $M_{high} = 4.98$, $SD = 0.79$), $F < 1$ (**Figure 5A**).

Next, we conducted a paired-samples *t*-test to compare private and public pro-environmental behavior intentions. Results revealed that private and public pro-environmental behavior intentions were positively correlated ($r = 0.58$, $p < 0.001$) and that participants had higher intention to engage in private (vs. public) pro-environmental behavior ($M_{private} = 5.09$, $SD = 0.86$, $M_{public} = 4.72$, $SD = 1.05$), $t(176) = 5.50$, $p < 0.001$.

We also conducted a MANOVA to further examine the interactive effect between air quality and spatial distance on private and public pro-environmental behavior intention. Results showed that the interaction between air quality and spatial distance had an effect on both private and public pro-environmental behavior intention, and this interactive effect on private pro-environmental behavior intention was greater, $F_{private}(1,173) = 12.78$, $p < 0.001$, $\eta^2 = 0.069$ vs. $F_{public}(1,173) = 4.47$, $p = 0.036$, $\eta^2 = 0.025$, while the main effects of air quality [$F_{airquality}(1,173) = 2.80$, $p = 0.096$] and spatial distance ($F_{spatialdistance} < 1$) on private pro-environmental behavior intention were not significant. The main effects of air quality [$F_{airquality}(1,173) = 3.07$, $p = 0.082$] and spatial distance ($F < 1$) on public pro-environmental behavior intention were not significant. Results of the simple effect analysis revealed that, when the spatial distance was at local level, air quality had a significant effect on both private [$M_{low} = 5.37$, $SD = 0.77$, $M_{high} = 4.71$, $SD = 1.03$, $F(1,174) = 13.45$, $p < 0.001$, $\eta^2 = 0.072$] and public pro-environmental behavior intention [$M_{low} = 5.05$, $SD = 0.97$, $M_{high} = 4.45$, $SD = 1.07$, $F(1,174) = 7.45$, $p = 0.007$, $\eta^2 = 0.041$]. As for long spatial distance, air quality had no significant effect on private [$M_{low} = 5.02$, $SD = 0.70$, $M_{high} = 5.26$, $SD = 0.82$, $F(1,174) = 1.78$, $p = 0.184$] or public pro-environmental behavior intention ($M_{low} = 4.66$, $SD = 1.17$, $M_{high} = 4.71$, $SD = 0.89$, $F < 1$) (**Figures 5B,C**).

Mediating effect analysis

We conducted an ANOVA with air quality and spatial distance on environmental affection. Results revealed an interactive effect of air quality and spatial distance on environmental affection, $F(1,173) = 4.42$, $p = 0.037$, $\eta^2 = 0.025$. The main effects of air quality [$F_{airquality}(1,173) = 1.64$, $p = 0.202$] and spatial distance ($F_{spatialdistance} < 1$) on environmental affection were not significant. Results of the simple effect analysis revealed that, when the spatial distance was at local level, low (vs. high) air quality led to higher environmental affection ($M_{low} = 5.24$, $SD = 0.87$, $M_{high} = 4.72$, $SD = 1.09$), $F(1,174) = 5.73$, $p = 0.018$, $\eta^2 = 0.032$, whereas air quality had no significant effect on environmental affection when the spatial distance was at distant level ($M_{low} = 4.81$, $SD = 0.78$, $M_{high} = 4.93$, $SD = 1.26$), $F < 1$.

To test the mediating role of environmental affection, we conducted a bootstrap at the 95% confidence interval from 5000 bootstrap samples by using the PROCESS macro (Model 8). As shown in **Figure 6**, the direct effect of the interaction between air quality and spatial distance, after controlling environmental

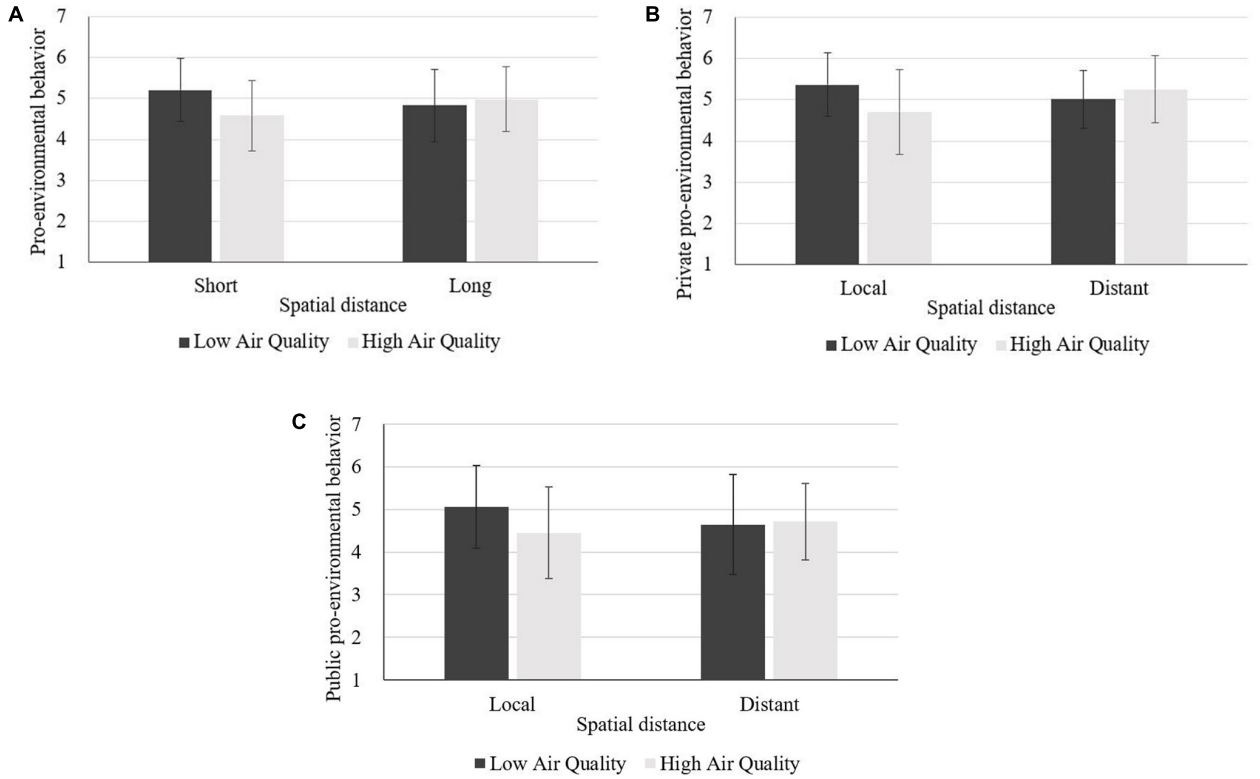

FIGURE 5 | (A–C) Main effect analysis of Experiment 3.

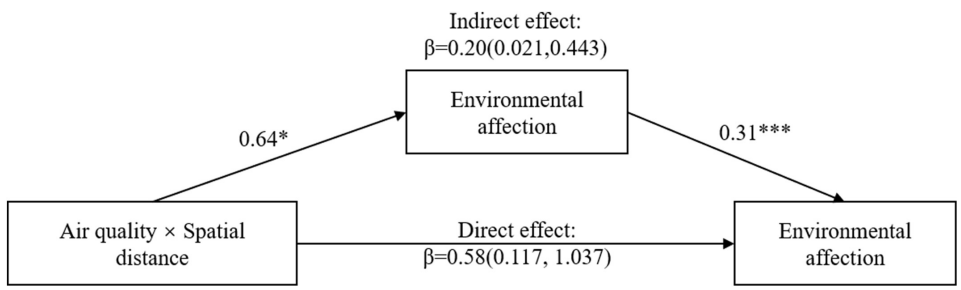

FIGURE 6 | Mediation analysis of Experiment 3. *$p < 0.05$; ***$p < 0.001$.

affection, was found to be β = 0.58 (LLCI = 0.117, ULCI = 1.037). The indirect effect of the highest-order interaction was found to be β = 0.20, and the bias-corrected 95% confidence interval did not include zero (LLCI = 0.021, ULCI = 0.443), demonstrating that environmental affection mediated the interactive effect of air quality and spatial distance on pro-environmental behavior intention. Furthermore, as presented in **Table 3**, the results of the analysis for the conditional direct effects of air quality on pro-environmental behavior intention at values of spatial distance revealed that, when the spatial distance was at local level, air quality had a significant effect on pro-environmental behavior intention (β = 0.47, t = 2.81, p = 0.006), whereas air quality had no significant effect on pro-environmental behavior intention within distant spatial distance (β = -0.11, t = -0.67, p = 0.503). In addition, the results of the analysis for the conditional indirect effects of air quality on pro-environmental behavior intention at values of spatial distance revealed that, when the spatial distance was at local level, the mediating effect of environmental affection was found to be β = 0.16, and the bias-corrected 95% confidence interval did not include zero (LLCI = 0.033, ULCI = 0.334), whereas the mediating effect of environmental affection was found to be non-significant (LLCI = -0.188, ULCI = 0.098) when the spatial distance was at distant level.

Discussion

The results of Experiment 3 replicate the findings of Experiment 2. When facing the low air quality (vs. high air quality) at

TABLE 3 | Conditional direct and indirect effects in Experiment 3.

	Spatial distance	Effect	SE	*t*	*p*	LLCI	ULCI
Direct effect	Local	0.47	0.17	2.81	0.006	0.140	0.798
	Distant	−0.11	0.16	−0.67	0.503	−0.427	0.210
Indirect effect	Local	0.16	0.08			0.033	0.334
	distant	−0.04	0.07			−0.188	0.098

local spatial distance, residents reported a higher intention to engage in pro-environmental behavior, whereas at distant spatial distance, the difference between low and high air quality was not significant. Additionally, residents reported a higher intention to engage in private (vs. public) pro-environmental behavior. The interactive effect of air quality and spatial distance on private pro-environmental behavior intention was greater. Our moderated mediation analysis also revealed that the interactive effect of air quality and spatial distance influenced environmental affection and, in turn, intention to engage in pro-environmental behavior.

DISCUSSION AND CONCLUSION

In this study, three experiments were designed to verify the interactive effect of air quality and spatial distance on Chinese residents' pro-environmental behavior intention and to examine the mediating effect of environmental affection. Based on the results, the following conclusions were drawn. First, air quality and spatial distance have significant interactive effect on residents' pro-environmental behavior intention. That is, within local spatial distance, low (vs. high) air quality would promote residents' pro-environmental behavior. In other words, when people have close contact with air pollution, they are more willing to improve the ecological environment closely related to their own lives through their pro-environmental behavior. There was no significant difference between the effect of low air quality and high air quality on residents' pro-environmental behavior intention at distant spatial distance. In other words, when people are far away from air pollution, they would lack the internal driving force to implement pro-environmental behavior. Second, in most cases, residents' willingness to conduct private pro-environmental behavior is greater than that in the public domain, and the interactive effect of air quality and spatial distance on private pro-environmental behavior intention is greater. Third, environmental affection mediates the interactive effect of air quality and spatial distance on pro-environmental behavior intention. To be specific, within local spatial distance, environmental affection plays a mediating role between air quality and pro-environmental behavior intention. When people come into close contact with air pollution, they will be directly harmed by air pollution and will generate anxiety, guilt, disgust, and other environmental affections, thus driving their pro-environmental behavior. However, the mediating effect of environmental affection is non-significant at the distant spatial distance. When people are far away from air pollution, they tend to form the idea of "none of their own business" so that they may be less likely to generate environmental affection and to engage in pro-environmental behavior caused by the stimulation of environmental conditions.

Theoretical Contributions

This study contributes to previous research through three main aspects.

Enrich the Research on Air Quality and Pro-environmental Behavior

Previous studies have put forward many influential theories in the field of pro-environmental behavior, such as TRA, TPB, NAM, and VBN, mainly focusing on the predictive power of individual personal variables on pro-environmental behavior (e.g., attitudes, norms, the sense of responsibility, values, knowledge, perceived behavioral control, etc.), and explored promoting pro-environmental behavior from the perspective of individual cognition and emotion as well as external economic and social conditions. However, the impact of natural environment conditions is rarely explored. Starting from the existing serious air pollution issue in China, this study discusses the effect of air quality within different spatial distance on the pro-environmental behavior of Chinese residents. Findings of this study verify the influence of external environmental conditions on the pro-environmental behavior of Chinese residents, expanding the research in the field of pro-environmental behavior. In addition, although air pollution has attracted the attention of scholars, the existing studies on air pollution mainly focus on the causes, hazards, prevention, and control methods of air pollution, paying little attention to its impact on residents' behavior, especially pro-environmental behavior. In fact, air pollution resulted from human activities is a manifestation of environmental issues, which, in turn, may affect residents' behavior. The conclusion of this study enriches the research in the field of air pollution and is helpful to better understand the complex relationship between air quality and pro-environmental behavior.

Provide an Important Perspective: Spatial Distance

This study explores the relationship of air quality and residents' pro-environmental behavior from an important perspective: spatial distance. Although air pollution is a global environmental issue, its occurrence and influence scope are relatively local. Its influence on residents may also change with the difference of spatial distance. As a dimension of psychological distance, spatial distance can greatly influence individual's perception of and response to external environment stimuli. Therefore, this study explores the relationship between air quality and pro-environmental behavior from the perspective of spatial distance. The conclusion of this study explains why many people are indifferent to environmental issues and unwilling to make behavioral changes from the perspective of spatial distance, which not only helps to verify the important role of spatial distance in effectively increasing residents' pro-environmental behavior but

also enriches the application of spatial distance in the field of pro-environmental behavior.

Present a Discussion on the Mediating Role of Environmental Affection

In this study, from the perspective of individual inner affection, environmental affection is introduced to explain the psychological mechanism of the interactive effect of air quality and spatial distance on Chinese residents' pro-environmental behavior. Although existing studies have found that affection is one of the important antecedents of pro-environmental behavior, few studies have combined contextual factors with affection. This study combined psychological variables with natural contextual variables to explore the driving factors of Chinese residents' pro-environmental behavior from multiple perspectives, enriching the research on the underlying mechanism of air quality to Chinese residents' pro-environmental behavior.

Implications

The findings of this study also provide practical implications for the policy-makers and business marketers committed to promoting pro-environmental behavior.

Make Rational Usage of Eco-Environmental Information

Policy-makers could release environmental information in a timely and accurate manner to ensure that the public has a full understanding of the state of the eco-environment. The findings of this study reveal that residents experiencing low air quality in close proximity would have a higher intention to conduct pro-environmental behavior. Due to the stimulation of air pollution, they would form a series of environmental affection toward environmental conditions and environment-related behavior and would thus be more willing to practice pro-environmental behavior. Therefore, the government could release environmental information such as the level of air quality to the public to let them have a clear perception of the environmental pollution issues, so as to stimulate their environmental affection and encourage them to actively engage in pro-environmental behavior driven by the affection.

Promote Pro-environmental Behavior From Both Public and Private Sectors

The results of this study show that compared with public pro-environmental behavior, people are more willing to engage in private pro-environmental behavior. The government could not only implement environmental protection into residents' daily behavior but also encourage them to participate more in public pro-environmental activities, such as joining in environmental organizations and activities, making suggestions to relevant departments on environmental issues, and practicing the protection of trees and vegetation. It is important to give full play to the important role of social participation in environmental governance and to further expand the depth and breadth of public participation in environmental protection.

Develop Environmental Policies Tailored to Local Conditions

The government may formulate and implement appropriate environmental protection policies according to the conditions of the ecological environment in different regions. This study has found that residents have different affections for and reactions to environmental issues within different spatial distance. Residents in the regions with severe environmental pollution may more intuitively perceive the impact of the pollution. In such regions, the government could emphasize the effectiveness of residents' pro-environmental behavior in improving environmental issues and encourage residents to improve the surrounding eco-environment through their own pro-environmental behavior, while for residents in the regions with good ecological environment, the government may focus on building public awareness of the environment, the overall view of the environment, and the sense of environmental responsibility. By means of publicity and education, the public could empathize with the environmental conditions of the country and even the whole world and then may be more willing to take practical actions.

Use Eco-Environmental Clues in Green Marketing Strategies

For enterprise marketers, environmental information clues can be appropriately used when formulating advertising or other publicity strategies to increase consumers' intention to purchase green products. According to the conclusion of this study, low air quality within local area may promote private pro-environmental behavior. Green consumption is an important component of private pro-environmental behavior. Enterprises can reasonably use pollution-related advertising appeals to arouse consumers' environmental affection, so as to make them more willing to purchase and use green products.

Limitations and Future Research

This study still has the following limitations to be further discussed in the future. First, in this study, Changchun is taken as an example for experiments. Although foreign and domestic cities were selected in Experiment 2 and Experiment 3, respectively, to minimize the influence of control variables such as nationality and culture, there are still some other variables that may cause interference, such as customs and economic level. Therefore, the external validity of the results needs to be further tested in other regions. Second, the experiments of this study were conducted in the laboratory by means of image stimulation, and the intention to conduct pro-environmental behavior was measured by scale. In the future, field experiments can be conducted in the real environment to observe the actual behavior of the subjects, so as to expand the externality of the study. Third, the scale of pro-environmental behavior contains a variety of behaviors. Although this study compares the different intention of residents to private and public pro-environmental behavior, the preferences of residents for different kinds of pro-environmental behavior still need to be further discussed. Future research could further investigate how to measure the level of people's intention

toward different pro-environmental behavior. Finally, this study mainly focuses on the impact of air quality within different spatial distance on residents' pro-environmental behavior. Whether other environmental issues such as soil pollution and water pollution would also influence the pro-environmental behavior of Chinese residents needs further discussion.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Department of Marketing, Business School, Jilin University. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

GS designed the experiments. GS and JD conducted the experiments and collected and analyzed the data. All authors wrote the first draft of the manuscript.

FUNDING

This study was financially supported by the Major Project of the National Social Science Foundation of China (No. 19ZDA107), the Project of Jilin Province Social Science "Thirteen-Five" Planning (No. JKH20201145SK), and the Fundamental Research Funds for the Central Universities (No. 2020SZQH02).

ACKNOWLEDGMENTS

We wish to thank Siyu Gong, Beibei Yue, and other members of GS's team for their deep discussion on the manuscript.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

frontiers in Psychology

ORIGINAL RESEARCH
published: 02 October 2020
doi: 10.3389/fpsyg.2020.568595

Using Images of Eyes to Enhance Green Brand Purchase Intentions Through Green Brand Anthropomorphism Strategies: The Moderator Role of Facial Expression

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OPEN ACCESS

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Specialty section:
This article was submitted to Environmental Psychology, a section of the journal Frontiers in Psychology

Received: *01 June 2020*
Accepted: *25 August 2020*
Published: *02 October 2020*

Citation:
Tong Z, Li T, Feng J and Zhang Q (2020) Using Images of Eyes to Enhance Green Brand Purchase Intentions Through Green Brand Anthropomorphism Strategies: The Moderator Role of Facial Expression. Front. Psychol. 11:568595. doi: 10.3389/fpsyg.2020.568595

This study uses an experimental comparison to analyze the effects of anthropomorphic strategies that use images with eyes (vs. those without eyes) on consumers' willingness to buy green products, as well as the mechanism of action. The study finds that concerning the anthropomorphic features of a product, anthropomorphic strategies containing images of eyes lead to more positive purchase intention for green products than those without images of eyes. Simultaneously, these green purchase intentions are mediated through the variable of green trust regardless of whether the anthropomorphic strategies feature eyes. Beyond this, the discussed effects are moderated when anthropomorphic strategies featuring different facial expressions are used. The findings of this study provide useful suggestions for green brand marketing strategies and management practices that use anthropomorphism.

Keywords: anthropomorphism, eye effect, green trust, purchase intention of green products, anthropomorphic strategies

INTRODUCTION

Environmental concerns have been integrated into marketing practices for roughly 50 years, and green marketing has experienced an evolution from "ecological" green marketing, "environmental" green marketing, to "sustainable" green marketing (Peattie, 2001). Green consumption is of great significance to the sustainable development of humankind. A lot of countries have carried out active, practical exploration in the field of green consumption, such as legislation and environmental labeling certification (Prakash, 2002; Rahbar and Wahid, 2011; Sun et al., 2018). Many companies are also aware of the importance of green marketing and are working toward it. Nevertheless, consumers' motivation to buy green products is not very high, due to insufficient information about the extent of the product's greenness, lack of credibility regarding corporate claims, and the tendency to free-ride (Prakash, 2002). Therefore, how to promote consumers' green consumption has become an important research agenda, and how to increase consumers' willingness to buy green products has become a topic of discussion among many scholars.

Using anthropomorphism as a marketing tool can lead to many positive outcomes (Epley et al., 2007; Kim and McGill, 2011; Chen et al., 2016), including having a positive impact on the purchase intention of green products. Outlined in previous research, common anthropomorphic implementation strategies predominantly contain verbal communication (Ma et al., 2017), product design (Kim and McGill, 2011), and virtual spokesperson (Chen and Yang, 2017), and previous studies on the influence of anthropomorphic strategies on green behaviors mainly used verbal communication. For example, research has found that the anthropomorphism of nature leads people to feel more connected to nature, thus to show stronger use intention of green products (Tam et al., 2013). Recipients who have a strong need for effectance or social connection, anthropomorphic appeals motivate more conservation behavior and elicit more favorable message responses (Tam, 2015). As green consumption is a pro-environment and pro-social behavior, we argue that the use of anthropomorphic strategy will have a positive impact on the purchase intention of green products.

Eyes and expressions are often used to enhance the anthropomorphic effect. For example, the headlights and grilles of cars, the different modality of M & M bean villains, products or brands often use eyes or expressions to make their anthropomorphic image more vivid. Eye gaze has unique psychological properties; studies have shown that eye gaze increases pro-social motivation and induces more pro-social behaviors (Haley and Fessler, 2005; Bateson et al., 2006, 2013; Fathi et al., 2014). However, research has found that anthropomorphism can still be achieved in the absence of "eyes" (Xie and Wang, 2017). Therefore, it is unclear whether the anthropomorphic strategy with eyes has an impact on the purchase intention of green products or not. The main question examined in this study was whether the use of anthropomorphic strategies with or without images of eyes affects consumers' willingness to buy green brands; if so, how.

In addition, anthropomorphic expressions have received a great deal of attention. The study found that participants were more likely to regard the car as a person and to rate it more positively when it presented a smiling face, and if the anthropomorphic facial expression of the product does not match the product positioning, the friendly expression will also lead to a conflict consumer perception (Aggarwal and McGill, 2007). Therefore, the effect of facial expressions of anthropomorphic products is uncertain. For example, for products with a higher luxury level, aggressive expressions are more favored by consumers than friendly ones. However, for products with lower luxury level, consumers would prefer products with friendly emoticons (Xie and Wang, 2017). There have been a large number of studies on the impact of facial expressions of anthropomorphic products on consumers. However, there are few studies that have specifically explored anthropomorphic effects by combining eyes and expressions, and the effect of the interaction between eyes and expressions on the purchase intention of green products in the anthropomorphic strategy is not clear.

To explore the question earlier, this research systematically examined the impact of anthropomorphic strategies with or without images of eyes, on consumers' purchase intentions toward green brands. This research showed the positive effect of using anthropomorphic strategies with images of eyes compared with those without eyes on the purchase intention toward green products in the case of products that already contain anthropomorphic features through study 1. Study 2 shows that green trust mediates the relationship between anthropomorphic strategy and green brand purchase intention, with happy and sad expressions serving as boundaries for the anthropomorphic strategy. Finally, through study 3, we demonstrate the robustness of the experimental results and show that anthropomorphic strategies using images of eyes have a significant impact on green brand purchase intentions, whether through a virtual brand spokesperson or a product design.

LITERATURE REVIEW AND RESEARCH HYPOTHESES

Anthropomorphism

In marketing, anthropomorphism refers to the tendency to attribute humanlike characteristics, intentions, and behaviors to non-human objects (Aggarwal and McGill, 2007; Epley et al., 2007). Using anthropomorphism as a marketing tool can lead to many positive outcomes, such as reducing consumers' perceptions of risk (Kim and McGill, 2011), enhancing consumers' perceptual fluency (Epley et al., 2007), and satisfying consumers' need for social affiliation (Chen et al., 2016). As a result, more and more companies are starting to consciously anthropomorphize their products or brands. However, anthropomorphism does not always lead to positive effects, and many scholars have studied the negative effects of anthropomorphism and its mechanisms. For example, research has found that the presence of an anthropomorphized helper reduced game enjoyment during a computer game (Kim et al., 2016). Additionally, compared with non-anthropomorphic brands, anthropomorphic brands are more likely to elicit negative consumer attitudes toward the brand when it faces negative publicity caused by product wrongdoings (Puzakova et al., 2013). As a result, many scholars have explored which factors influence the way consumers used to respond to anthropomorphism from different perspectives. Among them, consumer characteristics and anthropomorphic implementation strategies are major concerns (Kim and Kramer, 2015; Chen et al., 2016).

As mentioned earlier, anthropomorphism has an impact on consumers' attitudes and behaviors. How will anthropomorphism affect the purchase intention of green products? The study found that anthropomorphism can improve individuals' pro-social behavior and promote one's green purchase intention. Anthropomorphism enables individuals to associate products with their own similar characteristics (Kim and McGill, 2011), thus improves pro-social behavior toward others and doubles the donation amount (Burger et al., 2004). Similarly, research has found that the anthropomorphism of nature leads people to feel more connected to nature, which in turn promotes environmental conservation behavior (Tam et al., 2013). In addition, anthropomorphism makes individuals feel

closer to the anthropomorphic object, which is more likely to stimulate green consumption behaviors (Nisbet et al., 2011).

Impact of Eyes on a Customer's Willingness to Buy Green Products

The eyes are the window to the mind and are an important representation for identifying the spiritual world. In facial recognition, the eyes tend to be the feature that people stare at the most (Bindemann et al., 2009). Both morphologically and functionally, eye gaze has unique psychological properties, and its psychological functions mainly include five aspects: providing information, maintaining interaction, expressing intimacy, social control, and service tasks (Lin, 2005). An extensive amount of empirical research suggests that eye gaze increases pro-social motivation (Fathi et al., 2014), inducing more pro-social behaviors (Bateson et al., 2013), such as reducing littering on campus and increasing the amount of charitable giving. Studies presented by Haley and Fessler (2005) and Bateson et al. (2006) have shown that both the presentation of eye images and eyelike images elicit pro-social behavior. It is worth mentioning that the eye effect on pro-social behavior has good validity, which has been confirmed in laboratory and field studies by many scholars (Haley and Fessler, 2005; Bateson et al., 2006, 2013; Oda et al., 2011).

In laboratory studies, Haley and Fessler (2005) found that in eyespots conditions, when two stylized eyelike shapes were displayed on a computer screen, participants who played the role of dictator distributed almost twice as much money to their partners as the those in the control group. Similarly, it was found that a picture of eyes displayed on participants' computer screens acted as a cue for monitoring, thereby enhancing participants' altruistic behavior (Mifune et al., 2010). The findings of Haley and Fessler (2005) are supported by Oda et al. (2011) study, which shows that eyes influence participants' behavior by enhancing their expectations of rewards, in that participants expected their actions would enhance their reputation with third parties. In field experiments, Bateson et al. (2006) validated that images of eyes can elicit cooperative behavior in a real-world setting. They explored this by analyzing the number of customer payments that were made in an honesty box when different posters were hung in a café. They found that participants donated more money to boxes underneath a poster featuring a pair of eyes compared with the control image with pairs of flowers. In conclusion, people are more inclined to engage in altruistic and pro-social behavior when presented with images of eyes, which have a positive impact on the purchase intention of green products.

Role of Eyes on Green Purchase Intention in Anthropomorphic Strategy

On the one hand, in the facial features of anthropomorphic products, eyes are one of the commonly used elements. For example, the decorative red strip of slot machines and the headlights of cars are manipulated as eyes (Kim and McGill, 2011; Xie and Wang, 2017) and anthropomorphized the computerized helper by adding humanlike facial features such as eyes (Kim et al., 2016). In addition, people will spontaneously personify objects with eyes (Haley and Fessler, 2005), and participants will feel being watched by presenting eyes images (Bateson et al., 2006). On the other hand, existing studies have found that when anthropomorphizing through facial features, subjects can still perceive different product appearance expressions in the absence of the "eye" element (Xie and Wang, 2017), i.e., the effect of anthropomorphizing without the "eye" can still be achieved. The product can be anthropomorphized by simply manipulating the arc geometry elements into the mouth (Xie and Wang, 2017). After reviewing the literature, what is not clear is whether eyes affect the effectiveness of product personification strategies. Specifically, this study focuses on whether eyes can improve the purchase intention of green products in the process of anthropomorphism influencing green purchase intention.

Based on the important role of eyes in facial recognition and the influence of eye effect on green purchase intention, this study suggests that in the process of anthropomorphic influence on green purchase intention, eyes can enhance the effect of anthropomorphic strategy on green product purchase intention. Both eyes and anthropomorphic strategies can promote pro-social behaviors, and the anthropomorphic strategies with eyes are more likely to enhance consumers' motivation of pro-social behaviors, thus generating more positive purchase intention of green products. In addition, eyes, as an important facial feature, can enhance interaction and express intimacy (Lin, 2005). Therefore, this study suggests that eyes can enhance the effect of anthropomorphic strategy, although without eye element can make the interactive object perceive anthropomorphism (Xie and Wang, 2017). In conclusion, the researchers suggest that the anthropomorphic strategy with eyes can increase the willingness to buy green products. The following hypothesis is proposed:

> H1: Anthropomorphic strategies featuring the use of images with eyes (vs. images without eyes) lead to more positive purchase intention of green products.

Mediation Role of Green Trust

Green trust refers to "the willingness to rely on a product, service or brand based on the belief or expectation of its credibility, benevolence, and ability in terms of its environmental performance" (Chen, 2010), which emphasizes consumers' trust in the environmental performance of products and trust willingness of companies' green products or services, and believes that companies can fulfill their commitments (Chen and Chang, 2013). In green marketing, scholars have found that consumers can react badly to environmental marketing due to false, unsubstantiated, or exaggerated claims (Carlson et al., 1993; Sun et al., 2020). The credibility of the information presented to consumers is a key factor influencing whether green marketing is effective (Prakash, 2002) because consumers' skepticism toward green claims will lead to their negative attitude toward green products (Chang, 2011). Similarly, consumers' trust in eco-labels and eco-brands positively affects their purchase intentions and actual purchase behavior (Nik Abdul Rashid, 2009; Rahbar and Wahid, 2011). Empirical studies from different countries also show that there is a significant positive relationship between consumers' trust in green brands and their

willingness to use green products (Alshura and Zabadi, 2016). In short, when companies carry out green marketing activities, green trust will influence consumers' green purchase intention (Sheng and Lin, 2018).

The presentation of eyes will increase the perception of trust; for example, adding a virtual agent with head and eyes will increase user's perception of trustworthiness and friendliness toward the virtual communication object (Donath, 2007). In addition, using a set of three dots resembling the watching eyes weak social cues in investment gaming improves interpersonal trust and trust-based decision-making, demonstrating the important role of eye cues in enhancing interpersonal trust (Xin et al., 2016). In the marketing process of green products, anthropomorphic strategies will urge consumers to judge products in a humanlike way (Aggarwal and McGill, 2007; Xie and Wang, 2017). Therefore, presenting eyes can provide interpersonal information (Lin, 2005) and convey trustworthy social clues, thus improving consumers' trust in green attributes. Therefore, this study argues that anthropomorphic strategies with eyes increase consumers' green trust in products and thus positively influence green purchase intentions. From this, the following hypothesis is proposed:

> H2: An anthropomorphic strategy that uses eyes enhances consumers' green trust in green products, thus increasing consumers' willingness to buy.

Moderating Effect of Facial Expressions

Facial expressions play a very important role in emotional communication and interpersonal interactions. Although emotion theorists and behavioral ecologists have different views on facial expressions, studies have shown that facial expressions can convey both emotional states and feelings, intentions, and wishes (Horstmann, 2003). Knutson (1996) validated that expressions of emotion (e.g., anger, disgust, fear, happiness, and sadness) can convey interpersonal messages, and Aggarwal and McGill (2007) found that expressions found on products influence consumer attitudes. Further, some scholars have confirmed that the "expressions" of products, like those in interpersonal interactions, affect the judgment of the interacting subjects (Xie and Wang, 2017).

Ekman (1993) identified anger, disgust, fear, happiness, and sadness as the basic emotional facial expressions, whereas Marin et al. (2006) classified the virtual character's emotions like joy, distress, pity, boredom, and fear. We selected happy facial expression and sad facial expression, the two most common expressions, as study variables. On the one hand, happy facial expression increases ratings of familiarity (Baudouin et al., 2000). Also, Aggarwal and McGill (2007) argue that a smile is more congruent with the general human schema than a frown. On the other hand, scholars have found that sad facial expression can awaken empathy, enhance individuals' willingness to give charitably (Fisher et al., 2008), and increase people's spending while shopping (Lerner et al., 2004). When people perceive other's sadness, their behavior and judgments will change dramatically (Marsh et al., 2003). Although there have been several previous studies exploring facial expressions found on products, according to our research, it is still inconclusive whether happy or sad facial expressions found on anthropomorphic products have a more significant effect on consumers' willingness to buy. Additionally, there is no specific study combining facial expressions with eyes in anthropomorphism strategies.

Facial expression processing is based on communication signals, such as eye gaze (Adams and Kleck, 2003). Therefore, the presence of eyes can affect the processing of a facial expression. However, experiments by Boucher and Ekman (1975) demonstrate that no one region of the face best reveals emotions and that different facial regions disclose different emotions. For example, the eyes are most important for expressing sadness, whereas the mouth is most important for expressing happiness. Calvo et al. (2014) study also show that happy expressions are mainly identified through the mouth. Therefore, in the happy facial expression of anthropomorphic products, the effect of eyes on the processing of interpersonal information of product expression is weak. However, the presentation of eyes is very important for consumers to process the interpersonal information of sad facial expressions of products. This study argues that the presence or absence of eyes interacts with facial expressions and influences consumers' purchase intentions. Specifically, the following hypotheses are proposed:

> H3a: In the product anthropomorphism feature, when sad facial expressions are present, anthropomorphic strategies with images of eyes (vs. without eyes) promote higher purchase intention of green products.
>
> H3b: In the product anthropomorphism feature, when happy facial expressions are present, anthropomorphic strategies with images of eyes (vs. without eyes) do not significantly affect the purchase intentions of green products.

The theoretical framework of this study is shown in **Figure 1**.

MATERIALS AND METHODS

In this study, three studies were conducted to test the earlier hypotheses. Study 1 aims to explore whether the presence of eyes can improve the effect of anthropomorphic strategy on the purchase intention of green products and the mediation role of green trust. Study 2 aims to examine further the moderation role of expression in anthropomorphic facial features. Finally, study 3 replicated the findings in study 1 and study 2 using different anthropomorphic experimental materials, which verified the robustness of the experimental results.

Study 1

In study 1, researchers presented anthropomorphic green products by advertising slogans and image stimuli to examine the different effects of anthropomorphic strategies with and without eyes on consumers' green purchase intentions and their mechanisms of action. This study predicted that the use of anthropomorphic strategies containing images with eyes in brands' anthropomorphic features would lead to more positive green brand purchase intentions.

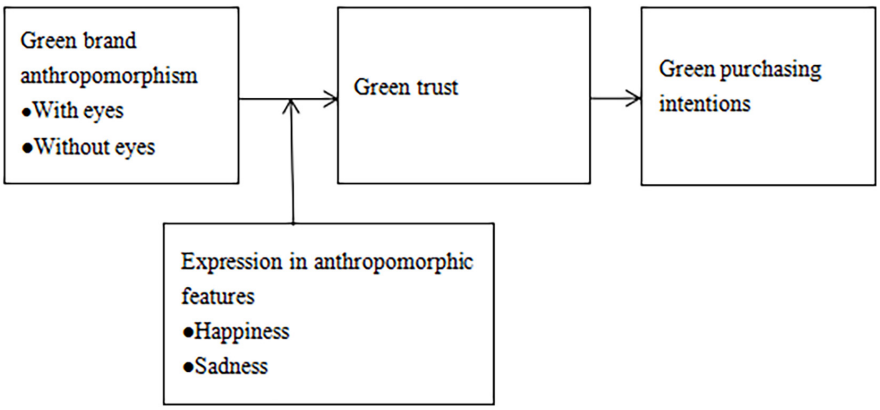

FIGURE 1 | Research framework.

Design, Stimuli, and Procedure

In study 1, sample collection was conducted through an online platform, and a total of 216 subjects were chosen to participate in the study. Excluding the five samples that were disrupted by environmental interference, the total valid samples obtained were 211 (95 females; M_{age} = 27.31, SD_{age} = 9.30).

The study used a one-factor (an anthropomorphic strategy with eyes vs. without eyes) between-subjects design, and participants were randomly assigned to either the group for the anthropomorphic strategy with eyes or to the group for the anthropomorphic strategy without eyes. To avoid consumers being directly influenced by familiar brands, the researchers used virtual brands and designed advertising slogans and product images. First, both groups of participants read the same green laundry detergent ad (see **Appendix A**). Participants were then shown pictures of the corresponding green laundry detergent products (as shown in **Figures 2,3**). Next, participants were asked to describe their willingness to buy the product as well as feelings of green trust and did the anthropomorphic manipulation check. These were all done via a seven-point Likert scale. Finally, subjects filled out demographic information.

Measures

First, this study referred to the scale developed by Lao (2013) (α = 0.785) to measure green purchasing intentions. Participants were asked how strongly they agree or disagree with the following statements: (1) I would be willing to collect and learn more about green laundry detergent; (2) I would recommend that my relatives and friends purchase green laundry detergent; (3) I would show and recommend green laundry detergent to my family; and (4) I would purchase green laundry detergent if I needed to (1 = strongly disagree; 7 = strongly agree). Next, participants' measure of green trust was assessed (Chen, 2010) (α = 0.797). They were asked how strongly they agree or disagree with the following statements: (1) You feel that this brand's environmental commitments are generally reliable; (2) You feel that this brand's environmental performance is generally dependable; (3) You feel that this brand's environmental argument is generally trustworthy; (4) This brand's environmental concern meets your expectations; and (5) This brand keeps its promises and commitments regarding environmental protection (1 = strongly disagree; 7 = strongly agree). For the anthropomorphic manipulation check, the subjects were asked to answer on a seven-point Likert scale (1 = not very much; 7 = very much) how much they associated the product they had just seen with a person (Wang et al., 2014).

Results and Discussion

Manipulation check

The results of the data showed that the anthropomorphic manipulation was successful ($M_{\text{with eyes}}$ = 5.60, SD = 1.10 vs. $M_{\text{without eyes}}$ = 5.49, SD = 1.11, $t(209) = 0.760$, $p = 0.448$) and there was no significant difference between the two in terms of anthropomorphic degree.

Willingness to buy green products

The researchers found (as shown in **Figure 4**) that the presence of eyes (the anthropomorphic strategy) has a significant effect on purchase intentions for green brands using an independent sample *t*-test. The purchase intentions for green products in the group of anthropomorphic strategies with eyes were significantly higher than anthropomorphic strategies without eyes ($M_{\text{with eyes}}$ = 5.75, SD = 0.81 vs. $M_{\text{without eyes}}$ = 5.47, SD = 0.90, $t(209) = 1.981$, $p < 0.05$), thus supporting Hypothesis 1.

Mediation analysis

To further analyze the potential mechanisms through which anthropomorphic strategies affect consumers' green product purchase intentions, we conducted a mediation analysis (Model 4; bias-corrected bootstraps = 5,000; Hayes, 2013) using PROCESS. The results showed that the direct effect of anthropomorphic strategies with and without eyes on consumers' willingness to buy green products was not significant (95% confidence interval [CI] [−0.2656, 0.0737]), and the indirect effect was significant (95% CI [−0.3731, −0.0332]). Consistent with Hypothesis 2, green product trust fully mediated the effect of anthropomorphic strategies with or without eyes on consumers' green product

FIGURE 2 | Anthropomorphic strategy with eyes.

FIGURE 3 | Anthropomorphic strategy without eyes.

purchase intentions. **Figure 5** shows the mediating effect path between green brand anthropomorphism with or without eyes and green brand purchase intention.

Study 1 found that among product anthropomorphic features, compared with anthropomorphic strategies without eyes, anthropomorphic strategies with eyes led to more positive green purchase intentions, which are mediated by green trust.

In the next study, this paper continues to explore the boundary conditions for the discussed effects. We will check the interaction effect of eyes and emotional facial expression on green purchase intentions. We hypothesize that in the product anthropomorphism feature, when sad facial expressions are present, anthropomorphic strategies with images of eyes (vs. without eyes) promote higher purchase intention of green products; however, the effect is not significant in the condition of happy facial expressions.

Study 2

Design, Stimuli, and Procedure

In study 2, a total of 400 subjects participated in the study. Excluding the 10 samples that were disrupted due to environmental interference, the final valid sample obtained was a total of 390 (198 females; M_{age} = 28.32, SD_{age} = 8.16). Study 2 used a 2 (anthropomorphic strategy: with eyes vs. without eyes) × 2 (facial expression: sadness vs. happiness) between-subject design in which participants were randomly assigned to any one of four experimental groups. To avoid consumers being directly influenced by familiar brands, the researchers used virtual brands and designed advertising slogans and product images. Participants read the same green laundry detergent ad as in study 1 (see **Appendix A**) and were then shown pictures of the corresponding green laundry detergent products (as shown in **Figures 6–9**). Further, to ensure that differences in emotions did not drive participants' evaluations due to the different expressions, the possible confounding effects of emotions were examined (α = 0.821) (Hagtvedt, 2011). Further, participants were asked to describe their willingness to buy green products, their feelings about green trust, and

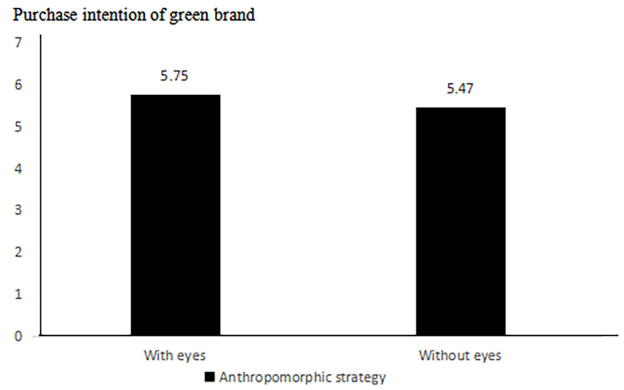

FIGURE 4 | Impact of anthropomorphic strategies on green brand purchase intention.

their anthropomorphic manipulation was checked. All of these data were captured via a seven-point Likert scale. Finally, subjects performed an expression recognition check and filled in demographic information.

Measures

As in study 1, participant's willingness to buy green was measured on a scale developed by Lao (2013) (α = 0.814), and their green trust was measured on a scale developed by Chen (2010) (α = 0.775). For the anthropomorphic manipulation check, the subject was asked to answer on a seven-point Likert scale (1 = not very much; 7 = very much) how much they associated the product just seen with a person. To test the manipulation of expressions, subjects were asked to indicate on a scale whether they perceived the stimulus as happy or sad (Landwehr et al., 2011).

Results and Discussion

Manipulation check

Results showed that anthropomorphic manipulation was successful ($M_{\text{with eyes}}$ = 5.35, SD = 1.02 vs. $M_{\text{without eyes}}$ = 5.29, SD = 1.09, $t(388) = 0.550$, $p = 0.583$) and there was no significant difference between the two in terms of anthropomorphic degree. As expected, subjects assigned to different anthropomorphic strategic expressions did not differ significantly on the mood check items (M_{happy} = 5.10, SD = 1.03 vs. M_{sad} = 5.03, SD = 1.09, $t(388) = 0.613$, $p = 0.540$), ruling out the idea that different moods add to the manipulation of the consumer. In addition, participants in the happy facial expression group and those in the sad facial expression group identified each expression correctly.

Willingness to buy green products

We conducted a two-way ANOVA and simple effect analysis. The results of the two-way ANOVA showed an interacting effect between anthropomorphic strategies with and without eyes and the expressions of anthropomorphic features ($F(1,386) = 7.16$, $p < 0.05$). Simple effect revealed that anthropomorphic strategy with eyes would lead to higher purchase intentions of green products when the expression is sad ($M_{\text{with eyes}}$ = 5.69, SD = 0.84 vs. $M_{\text{without eyes}}$ = 5.26, SD = 1.07, $F(1,386) = 9.03$, $p < 0.05$). In contrast, participants' willingness to buy green products did not differ between anthropomorphic strategy with eyes vs. without eyes group when the expression is happy ($M_{\text{with eyes}}$ = 5.65, SD = 0.94 vs. $M_{\text{without eyes}}$ = 5.74, SD = 0.94, $F(1,386) = -0.45$, $p = 0.503$). Results support Hypothesis 3 (as shown in **Figure 10**).

Moderated mediation analysis

We conducted a moderated mediation analysis (Model 8; bias-corrected bootstraps = 5,000; Hayes, 2013) using PROCESS. The anthropomorphic strategy is used as an independent variable and the consumer's willingness to buy green products as a dependent variable. Green trust is used as a mediating variable and the anthropomorphic strategy's expression as a moderating variable. The results reveal that the moderated mediation effect was significant (95% CI [−0.5756, −0.0726]). Specifically, the mediating effect of green trust was not significant for happy facial expressions (95% CI [−0.1244, 0.2455]) and was significant for sad facial expressions (95% CI [−0.4323, −0.0908]) among the product anthropomorphic features.

To verify the robustness of the results and to broaden the range of product anthropomorphic features (from product pattern anthropomorphism to product design anthropomorphism), a

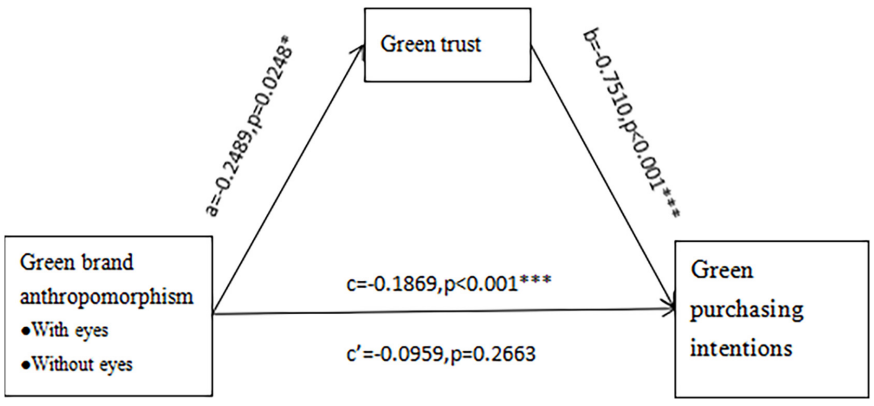

FIGURE 5 | Mediation effect of green trust. *$p < 0.05$, ***$p < 0.001$.

FIGURE 6 | Anthropomorphic strategy of happy expressions with eyes.

FIGURE 7 | Anthropomorphic strategy of happy expressions without eyes.

more representative green air conditioner (Lao, 2013) was selected as a stimulus for study 3.

Study 3

Design, Stimuli, and Procedure

In study 3, a total of 450 subjects participated in the study. Excluding the 14 samples that were disrupted due to environmental interference, a total of 436 valid samples were obtained (196 females; M_{age} = 29.35, SD_{age} = 9.47). This study used a 2 (anthropomorphic strategy: with eyes vs. without eyes) × 2 (expression: sadness vs. happiness) between-subject design in which participants were randomly assigned to any one of four experimental groups. To avoid consumers being directly influenced by familiar brands, the researchers used virtual brands and designed advertising slogans and product images. First, participants read the green air conditioner ad (see **Appendix B**). The participants were then shown pictures of the corresponding green air conditioning products (as shown in **Figures 11–14**). The presence or absence of eyes, as well as the happy or sad expressions, was manipulated using the outlet and rectangular bars, respectively. Next, to ensure that differences in emotions did not drive participants' evaluations due to the expressions they saw, the possible confounding effects of emotions were examined (α = 0.724) (Hagtvedt, 2011). Additionally, participants were asked to describe their willingness to buy green products and feelings about green trust. Anthropomorphic manipulation checks were also performed. This was all done via a seven-point Likert scale. Finally, subjects performed an expression recognition check and filled in demographic information.

Measures

As in studies 1 and 2, the green purchase intention scale (α = 0.802) developed by Lao (2013) was drawn on as well as and the green trust scale (α = 0.815) developed by Chen (2010).

FIGURE 8 | Anthropomorphic strategy of sad expressions with eyes.

FIGURE 9 | Anthropomorphic strategy of sad expressions without eyes.

For the anthropomorphic manipulation check, the subjects were asked to answer on a seven-point Likert scale (1 = not very much; 7 = very much) how much they associated the product just seen with a person. To test the manipulation of expressions, subjects were asked to indicate on a scale whether they perceived the stimulus as sad or happy (Landwehr et al., 2011).

Results and Discussion

Manipulation check

The data results showed that anthropomorphic manipulation was positive ($M_{\text{with eyes}}$ = 5.41, SD = 1.00 vs. $M_{\text{without eyes}}$ = 5.38, SD = 1.10, $t(434) = 0.310$, $p = 0.757$) and there was no significant difference between the two in terms of anthropomorphic degree. As expected, subjects assigned to different anthropomorphic strategic expressions did not differ significantly on the mood check items (M_{happy} = 5.27, SD = 0.81 vs. M_{sad} = 5.14, SD = 0.89, $t(434)$ = 1.477, p = 0.140), ruling out the idea that different moods add to the manipulation of the consumer. In addition, participants in the happy facial expression group and those in the sad facial expression group identified each expression correctly.

Willingness to buy green product

We conducted a two-way ANOVA and simple effect analysis. The results of the two-way ANOVA showed an interaction between anthropomorphic strategies with and without eyes and the expressions of anthropomorphic features ($F(1,432) = 4.61$, $p < 0.05$). Simple effect revealed that in the happy facial expression condition, the effect of the product featuring eyes on green purchase intentions was not significant ($M_{\text{with eyes}}$ = 5.86, SD = 0.09 vs. $M_{\text{without eyes}}$ = 5.84, SD = 0.09, $F(1,432) = 0.04$, p = 0.85); however, in the sad facial expression condition, the effect of the presence of eyes on green purchase intentions was significant ($M_{\text{with eyes}}$ = 5.85, SD = 0.83 vs. $M_{\text{without eyes}}$ = 5.45, SD = 1.18 $F(1,432) = 10.52$, $p < 0.05$). Results support Hypothesis 3 (as shown in **Figure 15**).

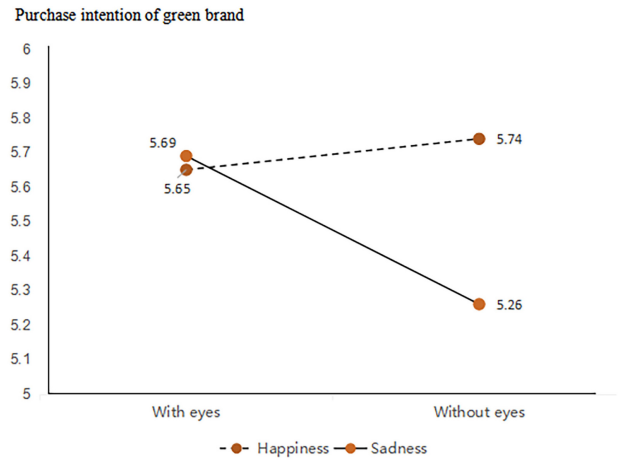

FIGURE 10 | Moderating role of expression.

FIGURE 11 | Anthropomorphic strategy of happy expressions with eyes.

FIGURE 12 | Anthropomorphic strategy of happy expressions without eyes.

FIGURE 13 | Anthropomorphic strategy of sad expressions with eyes.

FIGURE 14 | Anthropomorphic strategy of sad expressions without eyes.

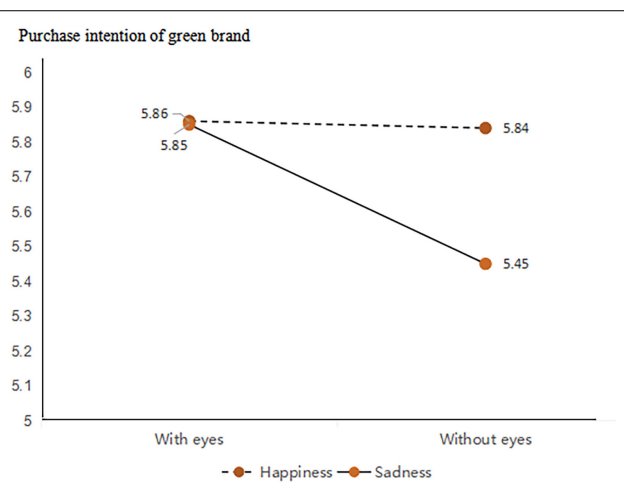

FIGURE 15 | Moderating role of expression.

Moderated mediation analysis

We conducted a moderated mediation analysis (Model 8; bias-corrected bootstraps = 5,000; Hayes, 2013) using PROCESS. The anthropomorphic strategy is used as an independent variable and the consumer's willingness to buy green products as a dependent variable. Green trust is used as a mediating variable and the anthropomorphic strategy's expression as a moderating variable. The results reveal that the moderated mediation effect

was significant (95% CI [−0.4904, −0.0065]). Specifically, the mediating effect of green trust was not significant for happy facial expressions (95% CI [−0.1385, 0.1557]) and was significant for sad facial expressions (95% CI [−0.4273, −0.0585]) among the product anthropomorphic features.

Study 3 replicated the findings in study 1 and study 2 using different anthropomorphic experimental materials, which enhanced the robustness of the experimental results.

GENERAL DISCUSSION

In green marketing, how to enhance consumers' willingness to buy green brands is a common concern of scholars as well as a problem in green marketing practices. Previous studies have focused on the demographic characteristics, psychological factors, and psychological mechanisms of green consumption behavior. However, according to the current research, no in-depth studies have been conducted from an anthropomorphic perspective. Using anthropomorphism as a marketing tool has many positive effects for businesses, brands, or products (Epley et al., 2007; Kim and McGill, 2011; Chen et al., 2016). Therefore, this study combines anthropomorphic strategies with green marketing to explore the impact of anthropomorphic strategies with or without images of eyes on green purchase intentions. This study expands the perspective of green marketing and provides new ideas for increasing consumers' willingness to buy green brands.

Study 1 found that among product anthropomorphic features, anthropomorphic strategies with images of eyes (vs. images without eyes) led to more positive green product purchase intentions, as anthropomorphic strategies with images of eyes increased consumers' green trust and thus green brand purchase intentions. Many literature have focused on the effects of anthropomorphism on consumers (Epley et al., 2007; Kim and McGill, 2011; Chen et al., 2016); however, little researches have been done to combine eyes and facial features with anthropomorphism. Our study further enriches and deepens the field of anthropomorphism. Further, study 2 targeted the moderating factors that influence consumers' willingness to buy green brands, further revealing the boundary conditions that underlie the earlier discussed findings. Among the product anthropomorphic features, anthropomorphic strategies with or without images of eyes were not significant for green brands' purchase intentions when happy expressions were presented, whereas anthropomorphic strategies with images of eyes (vs. images without eyes) were more positive for green brands' purchase intentions when sad expressions were presented. Although there have been a number of previous studies exploring anthropomorphic product expressions (Aggarwal and McGill, 2007; Xie and Wang, 2017), there have been few studies that explore the effect of combining images of eyes and facial expressions on consumers' purchase intentions, and our study explores this gap. Finally, study 3 extended the brand anthropomorphism feature from product packaging anthropomorphism to broader product design anthropomorphism, verifying the robustness of the experimental results. Therefore, this study provides a reference for future research on green brand anthropomorphism.

This study examines the positive impact of anthropomorphic implementation strategies on green brand purchase intentions from the perspective of anthropomorphic facial features and also makes recommendations for firms' marketing campaigns. Firstly, the researcher reminds companies that they can use anthropomorphic strategies for green marketing campaigns. When conducting product design, companies can manipulate the perceived facial areas and facial expressions of consumers through product appearance or product packaging, and so on. The use of anthropomorphic strategies with images of eyes can reduce consumers' guardedness and suspicion, thereby increase their willingness to buy green products. Secondly, this study found that the interaction effect of facial expressions in anthropomorphic features and anthropomorphic strategies with or without images of eyes affected consumers' willingness to buy green. Companies can determine the product's expression based on the actual needs of the product or brand and then design anthropomorphic facial features.

This study explores the impact of different anthropomorphic strategies on consumers' green brand purchase intentions, enriching and deepening the research in the field of green marketing. However, there are also limitations to this study. Also, in the future, the researcher hopes to conduct a more in-depth study in the following areas. First, product facial expressions do not only include happy and sad (Marin et al., 2006); this study explores only two more typical facial expressions, and other facial expressions in green product anthropomorphism can be explored in the future. Secondly, whether product anthropomorphism of other facial areas or limbs other than the eyes affects green product purchase intentions is also a research question worth exploring. In addition, due to limited resources, the sample for this study was selected from China. Ekman et al. (1987) noted that people interpret facial expressions differently in different cultural contexts. Future research could consider starting with the dimension of cultural variables to check whether facial expressions in brand anthropomorphism have the same effect on consumers in different cultures.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent from the participants was not required to participate in this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

ZT and QZ contributed to the conception and design of the study. ZT organized the database. TL performed the statistical analysis. TL and JF wrote the first draft of the manuscript. QZ wrote sections of the manuscript. All authors contributed to manuscript revision, read and approved the submitted version.

ACKNOWLEDGMENTS

The authors are grateful for the financial support from the National Natural Science Foundation of China (grant number: 71772003, 71962007, and 71872184) and the Scientific Research Fund of Hainan University (kyqd[sk]1919).

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

APPENDIX

A. Study 1 and Study 2: Green Laundry Detergent Ad

The following product is a non-toxic, healthy, and skin-friendly green laundry detergent. The product has strong stain removal qualities and can effectively remove stubborn stains such as oil stains, sweat stains, juice residues, and others. Compared with similar products, this laundry detergent is water-saving and electricity-saving and consumes only 50% of the total energy of ordinary laundry detergent, making it a low-carbon, environmentally friendly green product. However, this green laundry detergent is 20% more expensive than regular laundry detergent.

B. Study 3: Green Air Conditioning Ads

The following product is an air conditioner made from recycled materials. It is sustainably produced and creates no pollution in the manufacturing process. The air conditioner uses energy-saving technology and consumes 50% of the energy of conventional air conditioners on the market. The air conditioner has a good combination of performance and longevity in accordance with national standards. Moreover, the air conditioner can be recycled, making it a low-carbon, environmentally friendly green product. However, this green air conditioner is 20% more expensive than a regular air conditioner.

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ORIGINAL RESEARCH
published: 09 October 2020
doi: 10.3389/fpsyg.2020.568385

Promoting Employee Green Behavior Through the Person-Organization Fit: The Moderating Effect of Psychological Distance

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The importance of employee green behavior (EGB) to an enterprise's green development goal is increasingly emphasized in many industries. However, to date promoting EGB through interaction, namely between individuals and organizations, has not been a central concern. Therefore, from the perspective of the person-organization fit, this study considers the psychological distance between employees and the organization as a moderating variable, exploring the mechanisms of values fit, needs-supplies fit, and demands-abilities fit on green behaviors as within and outside the scope of employee responsibility. After collecting the results of questionnaires from 412 employees, our hypotheses were tested using the Structural Equation Model (SEM). The results show that (1) person-organization fit can effectively promote EGB in the workplace. However, different types of person-organization fit have different influencing paths and effect-strengths on employees' task-related green behavior and proactive green behavior. (2) Values fit has the greatest incentive effect on EGB, followed by demands-abilities fit, while needs-supplies fit promotes only eco-helping behavior. (3) Psychological distance has a significant moderating effect on the relationship between the person-organization fit and EGB. The effect of person-organization fit on EGB is enhanced when employees are close with less emotional distance, while the effect is weakened in the case of close expectation distance. Finally, this study provides suggestions for enterprise managers providing ways to motivate EGB through the selection and allocation of human resources.

Keywords: employee green behavior, psychological distance, person-organization fit, values fit, needs-supplies fit, demands-abilities fit, structural equation model

OPEN ACCESS

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Specialty section:
This article was submitted to Environmental Psychology, a section of the journal Frontiers in Psychology

Received: *01 June 2020*
Accepted: *13 August 2020*
Published: *09 October 2020*

Citation:
Mi L, Sun Y, Gan X, Yang H, Lv T, Shang K, Qiao Y and Jiang Z (2020) Promoting Employee Green Behavior Through the Person-Organization Fit: The Moderating Effect of Psychological Distance. Front. Psychol. 11:568385. doi: 10.3389/fpsyg.2020.568385

INTRODUCTION

Global warming, water pollution, air pollution, and other environmental issues are becoming increasingly serious, making environmental sustainability a high concern (He et al., 2016; Bansal and Song, 2017). Research shows that social production and enterprises are a decisive force for sustainable development (Figueres et al., 2018). An increasing number of enterprises are implementing corporate social responsibility and/or sustainable development strategies. However,

research shows that these strategies can only reduce the environmental impacts of organizations to a certain extent (King et al., 2005), and the response of employees to these strategies is a crucial boundary condition (Davis et al., 2011). The implementation of corporate green measures largely depends on the cooperation and participation of employees (Zhang et al., 2013). Therefore, employee green behavior (EGB) is key to promoting the green development of an enterprise (Haugh and Talwar, 2010). EGB refers to all the environmentally sustainable behaviors implemented by employees in the workplace (Ones and Dilchert, 2012). On the one hand, EGB can achieve a competitive advantage for the company (Brio et al., 2007), improve the company's environmental performance, and earn them an environmental reputation (Paillé et al., 2014). At the same time, it can also improve the company's market orientation, save costs, and reduce resource consumption (Chen et al., 2015). On the other hand, for employees, implementing green behavior can improve their work motivation (Osbaldiston and Sheldon, 2003), increase job satisfaction (Norton et al., 2014), and promote their career development (Bauer and Aiman-Smith, 1996).

Existing studies on EGB mainly focus on individual factors and the situational factors of employees (Norton et al., 2015). Among them, individual factors mainly include personality traits (Kim et al., 2017), affections (Bissing-Olson et al., 2013), attitudes, values, personal norms (Liu et al., 2018; Gkargkavouzi et al., 2019), perceived behavioral control (Greaves et al., 2013), and environmental knowledge (Liobikienė and Poškus, 2019). Situational factors mainly include organizational support (Lamm et al., 2013), leadership style (Graves et al., 2013; Mi et al., 2019), green atmosphere (Norton et al., 2014), green human resource management practices (Dumont et al., 2017), and corporate social responsibility (Tian and Robertson, 2019). These studies provided a basis for our understanding of EGB. However, the role of the interaction between individuals and organizations in terms of EGB has not yet received wide attention.

Individual employees exist in interdependent organizational situations. Their behaviors will not only be affected by personal factors and their specific organizational context but also by their interaction with other individuals and their organizations (i.e., person-organization fit) (Afsar and Badir, 2016). Person-organization fit refers to the compatibility between individuals and their organizations. This is an important factor in predicting individuals' attitudes and behaviors (Kristof, 1996). When the individual's values, capacity, and demand and the organizational values, job requirements (specification), as well as remuneration system fit well, individuals will experience higher job satisfaction (Jin et al., 2018; Roczniewska et al., 2018), organizational commitment (Bahat, 2020), lower work-related pressure (Gould-Williams et al., 2015), and lower turnover intention (Memon et al., 2018). At the same time, they will also implement more pro-organizational behaviors, such as performance behaviors (Goodman and Svyantek, 1999), organizational citizenship behaviors (Kristof-Brown et al., 2005; Hoffman and Woehr, 2006), and innovative behaviors (Afsar et al., 2015). This paper is interested in whether the person-organization fit may motivate employees to implement green behaviors. If the person-organization fit can effectively promote EGB, it will provide a new path with high potential to promote workplace sustainability.

Recently, research on psychological distance has begun to emerge in the field of environmental science, aiming to better promote public environmental behavior (Li et al., 2020). Ryoo et al. (2017) use psychological distance to explain the failure of the public to implement environmental protection. Yu et al. (2017) explore the relationship between the decrease in psychological distance related to climate change and loyalty to green products from the perspective of environmental sustainability. Later, Chen and Li (2018) introduced psychological distance into the study of organizational behavior and proposed the concept of "employee-organizational psychological distance" (EOPD), used to describe employees' subjective judgment of the distance between themselves and organizations. Chen and Li (2018) point out that employees' perception of psychological distance affects their emotional experience and behavior in the organization. For example, when the psychological distance between employees and organizations is relatively close, several positive employee characteristics will be activated and often manifest as increased occupational mental health. Conversely, when the psychological distance is greater, employees will pay more attention to the negative impact of working, and their mental health levels will also be negatively affected (Liu et al., 2020). The application of psychological distance in the field of environmental protection and organizational behavior provides new ideas and theoretical methods for solving current environmental behavior problems. Therefore, this study attempts to introduce psychological distance as a moderating variable to further analyze the internal influence mechanism of person-organization fit on EGB. In this study, psychological distance refers to employees' subjective judgment as well as evaluation of the distance between themselves and organizations, which is used to describe the strength of the psychological connection between employees and organizations.

This study provides the contributions to the field: first, it expands the person-organization fit theory, exploring the influence of values fit, needs-supplies fit, and demands-abilities fit on EGB. At the same time, it extends the antecedent's study of EGB from the individual level to the interaction level between individuals and organizations, providing a new perspective for understanding and predicting EGB in the workplace. Second, this study introduces psychological distance into the study of EGB, dividing it into two dimensions, emotional distance, and expectation distance, thus examining the moderating effect of psychological distance. This is an important supplement to the existing literature on the topic. Finally, this study provides powerful suggestions for how to motivate EGB through the selection and allocation of human resources and thus is conducive to promoting the greening of human resource management. Moreover, this study responds to the dynamic nature of the mechanism of EGB, which cannot be solved by mandatory regulations and technological progress.

The paper is organized as follows: in section "Theoretical Basis and Hypothesis," research hypotheses are proposed

after a literature review. Section "Research Methodology" then describes the research method and data collection. Section "Results" presents the data analysis results obtained from empirical tests, and the discussion takes place in Section "Discussion." Finally, the conclusions, implications, and suggestions for future research are discussed in the last sections.

THEORETICAL BASIS AND HYPOTHESIS

Employee Green Behavior

Green behavior refers to any behavior that is beneficial to the environment or minimizes harm to the environment (Steg and Vlek, 2009). With the implementation of enterprise sustainable development strategy, increasing attention has been paid to the green behavior of employees in the workplace (Norton et al., 2015; Wang et al., 2018). EGB refers to all environmentally sustainable behaviors implemented by employees in the workplace (Ones and Dilchert, 2012). According to the autonomous standards of behavior (organizational requirements and individual self-determination), EGB includes two aspects: task-related green behavior implemented within employee responsibilities and proactive green behavior implemented outside of employee responsibilities (Bissing-Olson et al., 2013). Task-related green behavior refers to the green behavior enacted by employees to complete the core work tasks required by the organization (such as environmental protection responsibilities stipulated in the performance of duties, compliance with environmental standards, etc.). Proactive green behavior refers to discretionary and environmentally friendly behavior that is not explicitly recognized by the formal reward system (Boiral, 2009; Bissing-Olson et al., 2013) (such as double-sided printing, reminding colleagues to save energy, etc.).

Employee proactive green behavior can not only directly contribute to the environmental performance of enterprises but also help fill the environmental gap that the enterprises' formal rules and regulations do not pay attention to Alt and Spitzeck (2016) and Raineri and Paillé (2016). This kind of proactive green behavior is also known as organizational citizenship behavior for the environment (OCBE) (Daily et al., 2009). Boiral and Paille (2012) divided it into three dimensions: eco-initiatives behavior, eco-civic engagement behavior, and eco-helping behavior. Among them, eco-initiatives behavior refers to employees' initiative to promote the enterprise's environmental protection practice, which indicates the employees' intrinsic environmental protection motivation. Eco-civic engagement behavior refers to employees' voluntary participation in the organizations' environmental projects and activities. Eco-helping behavior refers to helping and encouraging colleagues to pay more attention to environmental issues. The effectiveness of this three-dimensional division is confirmed by Terrier et al. (2016) and Boiral et al. (2018). Thus, according to the research of Boiral and Paille (2012) and Bissing-Olson et al. (2013), we divide EGB into four dimensions: task-related green behavior, eco-initiatives behavior, eco-civic engagement behavior, and eco-helping behavior.

The Influence of Person-Organization Fit on EGB

The concept of person-organization fit is derived from interactive psychology, which is developed from the person-environment fit theory. It is generally defined as the adaptability of individuals and organizational environments, and it is interpreted as the common basic characteristics between individuals and the organizational environment or the ability of the two to meet the other's needs (Chatman, 1989). The well-known A-S-A (attraction-selection-attrition) model proposed by Schneider (1987) explains the formation mechanism of the fit between individuals and organizational environments. Schneider believes that people are attracted to organizations with personality characteristics similar to their own, enter organizations through organizational-selections and self-selections, and decide to stay or resign during the process of organizational socialization. The A-S-A model emphasizes that personal goals and values conform to the values, goals, and personality traits of the organization's founders. Subsequently, Kristof (1996) divided the concept of person-organization fit into two dimensions: similarity fit and complementary fit. Similarity fit refers to the degree of consistency between the basic characteristics of individuals (values, personality, goals, and attitudes) and those of organizations (values, atmosphere, goals, and norms). Complementary fit means that the needs of organizations (individuals) are satisfied by the supply of individuals (organizations). Based on Kristof's (1996) classification, Cable and DeRue (2002) believe that, in addition to similarity fit, the complementary fit should be subdivided into needs-supplies fit and demands-abilities fit. Needs-supplies fit refers to the degree to which the supply of work can meet individual needs. Demands-abilities fit refers to the degree of fit between employees' knowledge, skills, ability, and job requirements. Moreover, their research proves that the three kinds of fit perceptions are independent and the three dimensions point to different result variables, respectively. The result of factor analysis also confirms that the conceptual model of three-dimensional fit is indeed superior to the two-dimensional one by Kristof (1996). Therefore, our study uses the three-dimensional fit model of Cable and DeRue (2002) for reference to divide the person-organization fit into values fit, needs-supplies fit, and demands-abilities fit.

Chatman (1991) argues that values fit is the most important factor affecting the person-organization fit. He defines values fit as the consistency between employee values and organizational values. Individual values, which represent a series of basic beliefs of individuals, are the reference and selection criteria when people measure their behavior and goals, and the standard for individuals to judge right or wrong, beauty or ugliness, good or evil (Robbins and Judge, 2009). Organizational values are the core and soul of organizational culture (Hofstede et al., 1990), which refers to the normative beliefs shared by the members of an organization. These beliefs reflect the pursuit of goals that

the organization considers to be the most valuable and that have become the code of conduct and norms for the members of the organization (O'Reilly et al., 1991). Previous studies have found that a good organizational culture can promote individuals' extra-role behavior (Goodman and Svyantek, 1999). When employees are in harmony with the values of the organization, they experience a sense of belonging to and identity in the organization, which, in turn, results in them forming favorable attitudes and behaviors toward the organization (Saks and Ashforth, 1997; Cable and DeRue, 2002; Gould-Williams et al., 2015). According to the findings of Cable and DeRue (2002) in a study of 185 MBA graduates from Southeast University, 187 managers from 143 different organizations, and 135 supervisors or peers, a higher values fit between individuals and organizations can effectively reduce employees' turnover intention and generate more extra-role behaviors such as organizational citizenship behavior (OCB). Later, Gould-Williams et al. (2015) conducted a study with Egyptian public sector managers and confirmed that when employees believe their values and goals fit those of the organization, they are more likely to participate in OCB. EGB in the workplace, whether it is the green behavior required by the task or proactive green behavior outside of employee responsibilities, is of vital importance. It is valuable to the organization's implementation of environmental regulations, improvement of environmental performance, development of green innovation, and establishment of an environmental-protection-centered reputation. In particular, employee proactive green behavior outside organizational roles, also known as OCBE, is a special type of OCB. Therefore, it is reasonable to infer that when employees' values fit those of the organization, it will also promote EGB. Therefore, we propose H1:

H1: Values fit positively affects EGB.
H1a: Values fit positively affects task-related green behavior.
H1b: Values fit positively affects eco-initiatives behavior.
H1c: Values fit positively affects eco-civic engagement behavior.
H1d: Values fit positively affects eco-helping behavior.

Needs-supplies fit refers to the consistency between the needs of employees and the rewards (such as wages, benefits, training, promotion, etc.) obtained from their contributions at work (Cable and DeRue, 2002). Needs-supplies fit is used to guide employees' behavior according to several extensive theories such as Herzberg's motivator-hygiene theory (dual-factor theory) (Herzberg, 1966), Maslow's hierarchy of needs (Maslow, 1954), and the expectancy theory of motivation (Vroom, 1964). In these theoretical models, organizational members try to maximize their benefits and minimize their costs. Employees plunge time and energy into their careers to generate the rewards they need in financial (e.g., pay level), social (e.g., good peers), or psychological (e.g., power over others) aspects. From the perspective of employees, the needs-supplies fit is probably the most important type of fit (Cable and DeRue, 2002). Individuals' attitudes toward the organization depend on the degree of consistency between their needs and the benefits and rewards provided by the organization to meet those needs. When the needs of employees are met, they experience a positive work attitude that promotes better behavior (Cable and Edwards, 2004; Kristof-Brown et al., 2005). Cable and DeRue (2002) show that needs-supplies fit has a significant positive impact on employees' job satisfaction, career satisfaction, and career commitment. A meta-analysis by Kristof-Brown et al. (2005) on 172 existing studies about person-environment fit also finds that needs-supplies fit was positively correlated with job satisfaction. Other studies confirm that employees' job satisfaction (Paillé and Boiral, 2013) can promote OCBE. In summary, we propose that when the individual needs of employees in the organization are met, higher job satisfaction will be generated, and employees will be more willing to implement green behaviors to benefit the organization. Therefore, we propose H2:

H2: Needs-supplies fit positively affects EGB.
H2a: Needs-supplies fit positively affects task-related green behavior.
H2b: Needs-supplies fit positively affects eco-initiatives behavior.
H2c: Needs-supplies fit positively affects eco-civic engagement behavior.
H2d: Needs-supplies fit positively affects eco-helping behavior.

Demands-abilities fit is the main measure of person-job fit (Kristof-Brown, 2000). A basic principle of industrial psychology is that a high degree of consistency between personal abilities and job requirements leads to higher job performance. On the one hand, if individuals' ability level is lower than the job requirements, the efficiency of the work process, and the quality of the work results will be reduced. The low performance will cause employees to feel frustrated and affect their self-esteem, thereby reducing job satisfaction. On the other hand, if individuals' ability level is much higher than the job requirements, they may feel that they are not fully utilized, and will invest less in their career, which will harm the organization (Cable and DeRue, 2002). Therefore, the fit of employees' abilities and job requirements has always been the focus of research (Kristof-Brown, 2000; Venkatesh et al., 2017). When an employee first approaches a job, the demands-abilities fit predicts the organization's attractiveness to them and determines whether the employee will take the job or not (Carless, 2005). After entering the organization, the fit of personal ability and job requirements becomes an important predictor of employees' performance. This has been confirmed by many studies (Ferris and Judge, 1991; Scroggins, 2008; Lin et al., 2014). Moreover, a high demands-abilities fit will also increase employees' job satisfaction (Nguyen and Borteyrou, 2016). In addition, Afsar et al. (2015) researched multi-source data from 459 employees and their supervisors and found that demands-abilities fit can also positively promote employees' innovative behaviors. In summary, if task-related green behavior is a job requirement, the demands-abilities fit will have a positive impact on it. Proactive green behavior is behavior outside of the employees' role; therefore, we draw similarities between innovative behavior and proactive green behavior as both are individual and self-determined. Although there are no hard-and-fast requirements for rules and regulations, these are

also constantly advocated and promoted by the organization. Therefore, we propose H3:

H3: Demands-abilities fit positively affects EGB.
H3a: Demands-abilities fit positively affects task-related green behavior.
H3b: Demands-abilities fit positively affects eco-initiatives behavior.
H3c: Demands-abilities fit positively affects eco-civic engagement behavior.
H3d: Demands-abilities fit positively affects eco-helping behavior.

The Moderating Effect of Psychological Distance

In the natural sciences, "distance" refers to the length of time or space between specific objects. "Psychological distance" originates from western aesthetics. The concept was first proposed by the Swiss psychologist Bullough (1912). He focuses on visual art and suggests that psychological distance refers to the separation of the actual interests between the viewer of the artwork and the artwork itself, rather than the distance in time or space (Bullough, 1912). Later, scholars studied psychological distance from different perspectives. Researchers concerned with the perspective of information flow believed that psychological distance is a negative factor for the flow of information between the host country market and multinational companies (Brewer, 2007), including differences in religion, lifestyle, business practices, language, and culture (Madsen, 1989). Researchers with a subjective perception perspective believe that psychological distance is not a simple collection of external environments but is closely related to the perception of individuals. It is the perception of the differences between the management of multinational companies and other countries. Cultural background, educational level, international experience, language ability, and values all affect this subjective perception (Evans and Mavondo, 2002; Prime et al., 2009). The construal level theory (CLT) proposes that psychological distance refers to an individual's perception of distance, such as distance in time and space, affinities or estrangements in social relations, and the probability of occurrence of certain events or behaviors based on his or her own direct experience as a reference point (Trope et al., 2007). Most of the concepts of psychological distance in these studies were used in international business and cross-cultural management (Håkanson, 2014; Ciszewska-Mlinarič and Trąpczyński, 2016), which were later introduced into the study of interpersonal communication and social relations (Huang, 2015). Recently, to better describe the relationship between employees and organizations, Chen and Li (2018) introduced psychological distance into the study of organizational behavior, and the concept of EOPD was proposed. EOPD can be used to describe the level of perceived correspondence or interaction between employees and organizations, which is a direct reflection of the relationship between employees and organizations. In this study, we define psychological distances as employees' subjective judgment as well as evaluation of the distance between themselves and organizations. It is used to describe the strength of the psychological connection between employees and organizations.

Because of different research perspectives and research fields of psychological distance, understandings of psychological distance are not the same. CLT believes that psychological distance includes time, space, social distance, and probability (Trope et al., 2007). Xiao and Nie (2018) divide the psychological distance of employees into four dimensions: expectation distance, power distance, professional background distance, and regional culture distance. Chen and Li (2018) divide the psychological distance into six dimensions: experiential distance, behavioral distance, emotional distance, cognitive distance, spatial-temporal distance, and objective social distance. These dimensional divisions of psychological distance include the psychological relationship of the internal driving force and the realistic relationship of the external driving force. As psychological distance assesses the distance between employees' perception of the relationship between themselves and the organization, this is also a manifestation of social exchange relationships. In social exchange theory, social exchange relations are usually divided into the social exchange and economic exchange. The former emphasizes emotional relations, while the latter focuses on interest relations (Shore et al., 2006). According to the above literature, we divide the psychological distance between individuals and organizations into emotional distance and expectation distance only from the perspective of the psychological relationship of the internal driving force. Emotional distance refers to employees' emotional judgment of the partnership formed in their daily interactions with the organization. Expectation distance refers to the degree of acceptance of the gap between the employees' actual gains in the organization and their expected benefits as per their interests. The former emphasizes the degree of distance between employees and the organization in their emotional relationship, while the latter emphasizes this between employees and the organization in their professional relationship.

Studies have shown that the psychological distance (time, space, social distance, and probability) of different dimensions can guide behavior through mental construal (Trope et al., 2007). In terms of environmental protection, Spence et al. (2012) use CLT to measure British consumers' psychological distance from climate change and their willingness to use eco-friendly energy. They find that consumers with a lower level of psychological distance show higher environmental concerns and willingness to save energy. Yu et al. (2017) explore the relationship between the shrinking of psychological distance associated with people's relationship to climate change and their loyalty to green products. Their study supports the idea that psychological distance can affect people's willingness to protect the environment through the intermediary role of environmental ethics and social responsibility. Similarly, in organizational practice, employees are often self-centered when they perceive various information (salary, promotion space, colleagues' relationship, etc.). After integrating this information, employees form a subjective perception and emotional experience of their relationship distance with the organization (Li and Chen, 2019), which may be manifested as attraction or rejection (Agnew et al., 2004).

Liu et al. (2020) found that psychological distance between employees and the organization may positively moderate the relationship between work hours and employees' occupational mental health, and a "close" employee-organizational psychological distance may alleviate the pressure of work hours, thus helping to maintain high-quality occupational mental health. Similarly, when employees and organizations are in a "distant" relationship, it may weaken employees' sense of identity and belonging to the organization, thereby making it more difficult to implement EGB. On the contrary, individuals have a high level of psychological involvement with organizations that are "closer," potentially activating several positive psychological variables, one of which is adopting green behavior. Therefore, we speculate that the impact of different types of fits between individuals and organizations on EGB may also be moderated by psychological distance. To better analyze the relationship between person-organization fit and EGB, this study attempts to incorporate psychological distance as a moderating variable into the model of person-organization fit and EGB. Thus, we propose H4 and H5:

H4: Emotional distance will moderate the effect of person-organization fit on EGB, such that the effect will be greater when the emotional distance is close rather than distant.

H5: Expectation distance will moderate the effect of person-organization fit on EGB, such that the effect will be greater when expectation distance is close rather than distant.

The theoretical model of this study is shown in **Figure 1**.

RESEARCH METHODOLOGY

Survey Sample

We randomly selected and contacted human resource managers from six different industries in an MBA class at a Chinese university, and informed them of our research purpose, data collection procedures, and data confidentiality. With their support, we obtained the email addresses of the employees of their enterprises. The anonymous questionnaire survey was conducted online in February 2020. It contained three sections of measurements: person-organization fit, psychological distance, and EGB. E-mails were sent to 548 employees. They were informed that the study would be conducted anonymously and would not link anyone's name or other private information with the final questionnaire data. This was ensured to alleviate employee concerns. A total of 467 questionnaires were received in this study. After eliminating 55, which had incomplete or casual answers, 412 valid questionnaires were obtained. The sample size meets the SEM indicator requirements set by Mueller (1997) (the ratio of the sample size to the number of measured items is at least between 10:1 and 15:1). The structural characteristics of the samples are shown in **Table 1**.

Variable Measurement

The measures of the constructs in this study were based on established scales. All items used a five-point Likert scale ranging from 1 = "strongly disagree"/"never" to 5 = "strongly agree"/"always." **Supplementary Appendix 1** shows the complete questionnaire.

Person-Organization Fit

The person-organization fit scale is based on the three-dimensional scale developed by Cable and DeRue (2002). The scale has been used by several scholars and has been proven to be highly credible. Three items assessed values fit (e.g., "The things that I value in life are very similar to the things that my organization values"); three items assessed needs-supplies fit (e.g., "There is a good fit between what my job offers me and what I am looking for in a job"); and three items assessed demands-abilities fit (e.g., "The match is very good between the demands of my job and my personal skills").

Psychological Distance

The psychological distance scale is mainly based on the organization-employee emotional distance scale developed by Chen and Li (2018) and the organization-employee expectation distance scale developed by Nie (2017). Four items assessed emotional distance (e.g., "I will protect organizational interests at the cost of my own interests when necessary") and two items assessed expectation distance (e.g., "I will work harder only if the return of work meets my expectations").

Employee Green Behavior

The EGB scale is divided into task-related green behavior and proactive green behavior. Task-related green behavior was revised regarding the employee task performance scale (Bachrach et al., 2007). Four items assessed task-related green behavior (e.g., "I can accomplish the environmental protection tasks within my duties competently"). Proactive green behavior was revised based on the scale developed by Boiral and Paille (2012) and Paillé et al. (2016), and localized corrections were made. The revised scale consists of three dimensions (i.e., eco-initiatives behavior, eco-civic engagement behavior, and eco-helping behavior). Three items assessed the eco-initiatives behavior (e.g., "I pay attention to energy conservation and low-carbon travel in my daily work"); three items assessed eco-civic engagement behavior [e.g., "I actively participate in environmental events organized by my company (or department)"]; and five items assessed eco-helping behavior (e.g., "I am willing to spend time reminding my colleagues to pay attention to environmental protection at work").

Scale Test

Considering that the questionnaire is filled out by the same object, it may cause a common method bias (Harman, 1976). For this reason, before hypothesis testing, we conducted a common method bias test. The results of the Harman single factor test showed that the contribution rate of the largest factor precipitated is 47.187%, which is lower than the threshold value of 50%, indicating that common method bias was unlikely to be a serious problem in this study (Podsakoff and Mackenzie, 2003).

Then, we conducted a confirmatory factor analysis (CFA) by using the maximum likelihood method with Mplus7.4.

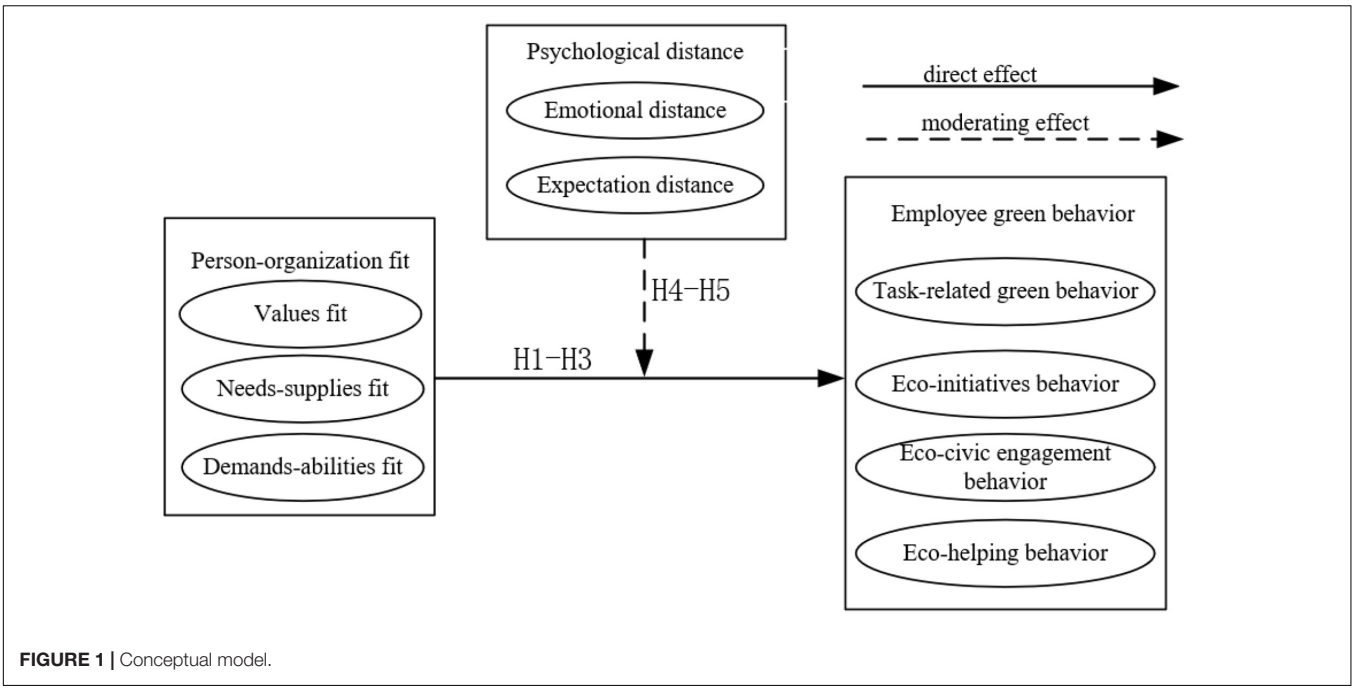

FIGURE 1 | Conceptual model.

TABLE 1 | Sample demographic characteristics (N = 412).

Variable	Category	Number	Percentage
Gender	Male	209	50.7%
	Female	203	49.3%
Age	<20	30	7.3%
	20–30	221	53.6%
	31–40	99	24.0%
	41–50	51	12.4%
	>50	11	2.7%
Education	Below junior high school	38	9.2%
	High school, technical secondary school or technical school	47	11.4%
	Bachelor's degree	259	62.9%
	Graduate degree	68	16.5%
Profession	General workers	278	67.5%
	Junior managers	75	18.2%
	Middle managers	52	12.6%
	Senior managers	7	1.7%
Monthly disposable income	Below 3,000 CNY	97	23.5%
	3,000–5,000 CNY	112	27.2%
	5,000–10,000 CNY	128	31.1%
	10,000–20,000 CNY	49	11.9%
	20,000–50,000 CNY	16	3.9%
	More than 50,000 CNY	10	2.4%

We compared four different models: Single model, in which all questions measure the same factor; double-factor model, that is, EGB measures one factor, psychological distance and person-organization fit measure the other one; triple-factor model consists of EGB, psychological distance, and person-organization fit; nine-factor model consists of values fit, needs-supplies fit, demands-abilities fit, task-related green behavior, eco-initiatives behavior, eco-civic engagement behavior, eco-helping behavior, emotional distance, and expectation distance. The summary of model fit indices is presented in **Table 2**. As shown in **Table 2**, compared with the other three models, the nine-factor model fits the data best. The fit index was up to the standard (Hu and Bentler, 1998), which means that there was a good distinction between the constructs.

Reliability and validity were tested using SPSS19.0 and Mplus7.4 (see **Table 3**). The standardized factor loadings range from 0.717 to 0.917 for all items and are greater than the threshold value of 0.6. Cronbach's α are from 0.706 to 0.921, and composite reliability (CR) values are from 0.712 to 0.921, which are all greater than the recommended value of 0.7 (Hair et al., 2010). The results indicate that the scale has appropriate reliability. The average variance extracted (AVE) are from 0.553 to 0.744 and are all greater than the recommended value of 0.5, which indicates that the scale has an appropriate convergence validity.

RESULTS

Descriptive Analysis and Correlation Analysis

Descriptive statistical analysis is performed to obtain an overall understanding of the data and the correlation between variables is calculated to clarify the intensity of the correlation between each variable. The numbers in the cells of the diagonal

TABLE 2 | Summary of model fit indices.

Model	χ^2	DF	χ^2/DF < 3	CFI >0.9	TLI >0.9	RMSEA <0.08	SRMR <0.08
M1: Single model	3292.615	405	8.130	0.693	0.670	0.132	0.091
M2: Double-factor model	2798.497	404	6.927	0.746	0.726	0.120	0.084
M3: Triple-factor model	1877.531	402	4.670	0.843	0.830	0.094	0.100
M4: Nine-factor model	881.054	369	2.388	0.946	0.936	0.058	0.032

χ^2, chi-square statistic; DF, the degree of freedom; CFI, comparative fit index; TLI, Tucker-Lewis index; RMSEA, root mean squared error of approximation; SRMR, standardized root mean squared residual.

TABLE 3 | Results of reliability and validity tests.

Variable	Item	Estimate	Cronbach's α	Composite reliability	Convergence validity
				CR	AVE
Task-related green behavior	TRGB 1	0.801	0.885	0.885	0.657
	TRGB 2	0.812			
	TRGB 3	0.815			
	TRGB 4	0.815			
Eco-initiatives behavior	EIB 1	0.777	0.842	0.844	0.643
	EIB 2	0.790			
	EIB 3	0.837			
Eco-civic engagement behavior	ECB 1	0.830	0.877	0.877	0.705
	ECB 2	0.850			
	ECB 3	0.838			
Eco-helping behavior	EHB 1	0.815	0.921	0.921	0.700
	EHB 2	0.859			
	EHB 3	0.822			
	EHB 4	0.854			
	EHB 5	0.833			
Values fit	VF 1	0.760	0.828	0.828	0.616
	VF 2	0.781			
	VF 3	0.812			
Needs-supplies fit	NSF 1	0.813	0.857	0.860	0.672
	NSF 2	0.858			
	NSF 3	0.787			
Demands-abilities fit	DAF 1	0.817	0.851	0.853	0.659
	DAF 2	0.824			
	DAF 3	0.794			
Emotional distance	EMD 1	0.798	0.920	0.921	0.744
	EMD 2	0.843			
	EMD 3	0.917			
	EMD 4	0.887			
Expectation distance	EXD 1	0.770	0.706	0.712	0.553
	EXD 2	0.717			

TRGB, Task-related green behavior; EIB, Eco-initiatives behavior; ECB, Eco-civic engagement behavior; EHB, Eco-helping behavior; VF, Values fit; NSF, Needs-supplies fit; DAF, Demands-abilities fit; EMD, Emotional distance; EXD, Expectation distance.

line are the square root of AVE. The results show that the square root value of AVE for each latent variable is greater than the correlation of all the remaining constructs in the row and column in which it is located. Therefore, the structure has an appropriate discriminant validity (Fornell and Larcker, 1981). The mean (M), standard deviation (SD), and the Pearson correlation coefficient for all variables are presented in **Table 4**. There are significant correlations between EGB, person-organization fit, and psychological distance. These results provide the basis for the following hypothesis testing.

Structural Equation Model and Path Analysis

To test our hypotheses, Mplus7.4 was used to verify the complete structural equation model (SEM). According to the fitting indices

TABLE 4 | Descriptive statistical analysis.

Dim	M	SD	Discriminate Validity								
			1	2	3	4	5	6	7	8	9
TRGB	4.052	0.794	0.811								
EIB	3.971	0.853	0.739**	0.802							
ECB	3.866	0.894	0.682**	0.774**	0.840						
EHB	3.621	0.986	0.610**	0.688**	0.754**	0.837					
VF	3.972	0.749	0.648**	0.615**	0.650**	0.682**	0.785				
NSF	3.846	0.844	0.603**	0.587**	0.624**	0.694**	0.778**	0.820			
DAF	4.006	0.781	0.660**	0.643**	0.612**	0.618**	0.747**	0.754**	0.812		
EMD	3.604	1.048	0.269**	0.248**	0.284**	0.331**	0.296**	0.336**	0.327**	0.863	
EXD	3.678	0.938	0.320**	0.372**	0.392**	0.421**	0.429**	0.463**	0.443**	0.160**	0.744

*N = 412. **p < 0.01. The numbers in the cells of the diagonal line are the square root of AVE. TRGB, Task-related green behavior; EIB, Eco-initiatives behavior; ECB, Eco-civic engagement behavior; EHB, Eco-helping behavior; VF, Values fit; NSF, Needs-supplies fit; DAF, Demands-abilities fit; EMD, Emotional distance; EXD, Expectation distance.*

suggested by Hu and Bentler (1998), the model in this study has a good fitting effect ($\chi^2 = 610.575$, DF = 231, $\chi^2/DF = 2.643 < 3$, CFI = 0.951 > 0.9, TLI = 0.941 > 0.9, RMSEA = 0.063 < 0.08, SRMR = 0.030 < 0.08). **Table 5** reports the direct effect results of person-organization fit on EGB.

Table 5 shows that values fit has a significant positive effect on task-related green behavior (β = 0.544, $p = 0.015 < 0.05$), eco-civic engagement behavior (β = 0.605, $p = 0.007 < 0.01$), and eco-helping behavior (β = 0.506, $p = 0.014 < 0.05$); thus, H1a, H1c, and H1d are supported. Needs-supplies fit has a significant positive effect on eco-helping behavior (β = 0.375, $p = 0.049 < 0.05$); thus, H2d is supported. Demands-abilities fit has a significant positive effect on task-related green behavior (β = 0.467, $p = 0.001 < 0.01$) and eco-initiatives behavior (β = 0.505, $p < 0.001$); thus, H3a and H3b are supported. However, the person-organization fit has no significant effect on eco-initiatives behavior (β = 0.390, $p = 0.084 > 0.05$); thus, H1b is rejected. Needs-supplies fit has no significant effect on task-related green behavior (β = −0.213, $p = 0.314 > 0.05$), eco-initiatives behavior (β = −0.105, $p = 0.620 > 0.05$), and eco-civic engagement behavior (β = 0.045, $p = 0.829 > 0.05$); thus, H2a, H2b, and H2c are rejected. The demands-abilities fit is not significant for both task-related green behavior (β = 0.129, $p = 0.362 > 0.05$) and eco-initiatives behavior (β = −0.082, $p = 0.532 > 0.05$); thus, H3c and H3d are rejected. The results of the SEM are shown in **Figure 2**.

TABLE 5 | Analysis results of the direct effects.

Path relationship	Estimate	S.E.	Est./S.E.	*P*-Value	Supported
(1)VF →TRGB	0.544	0.224	2.427	0.015*	YES
(2)VF→EIB	0.390	0.226	1.728	0.084	NO
(3)VF→ECB	0.605	0.226	2.681	0.007**	YES
(4)VF→EHB	0.506	0.206	2.463	0.014*	YES
(5)NSF→TRGB	−0.213	0.212	−1.006	0.314	NO
(6)NSF→EIB	−0.105	0.212	−0.496	0.620	NO
(7)NSF→ECB	0.045	0.208	0.216	0.829	NO
(8)NSF →EHB	0.375	0.19	1.973	0.049*	YES
(9)DAF→TRGB	0.467	0.139	3.354	0.001**	YES
(10)DAF→EIB	0.505	0.143	3.526	***	YES
(11)DAF→ECB	0.129	0.142	0.911	0.362	NO
(12)DAF→EHB	−0.082	0.132	−0.625	0.532	NO

**p < 0.05, **p < 0.01, ***p < 0.001. TRGB, Task-related green behavior; EIB, Eco-initiatives behavior; ECB, Eco-civic engagement behavior; EHB, Eco-helping behavior; VF, Values fit; NSF, Needs-supplies fit; DAF, Demands-abilities fit.*

The Moderating Role of Psychological Distance

The second objective of this study is to investigate the possible moderating effects of psychological distance on the relationship between person-organization fit and EGB. We followed the methods and procedures for the analysis of the moderating effect as recommended by scholars (Klein and Moosbrugger, 2000; Kelava et al., 2011). We also used the latent moderated structural equations in the SEM to analyze the potential moderating effects of psychological distance. To this end, we designed a series of models using Mplus7.4. First, we added the concepts of emotional distance and expectation distance; then, we added the direct path of each dimension of the person-organization fit to each dimension of EGB; finally, we made these items, the two dimensions of psychological distance and the three dimensions of the person-organization fit interact (psychological distance × person-organization fit), and tested the influencing path of each interaction item on EGB. The moderation results of emotional distance and expectation distance are shown in **Table 6**.

In the results of the moderating effect, the regression coefficient and significance of interaction terms are used to judge whether the moderating effect exists. As shown in **Table 6**, emotional distance significantly moderates the relationship between values fit and eco-civic engagement behavior (β = 0.136, $p = 0.017 < 0.05$), values fit, and eco-helping behavior (β = 0.154, $p < 0.001$) as well as needs-supplies fit and eco-helping behavior (β = 0.150, $p < 0.001$). Moreover, the effect will be greater when the emotional distance is close rather than

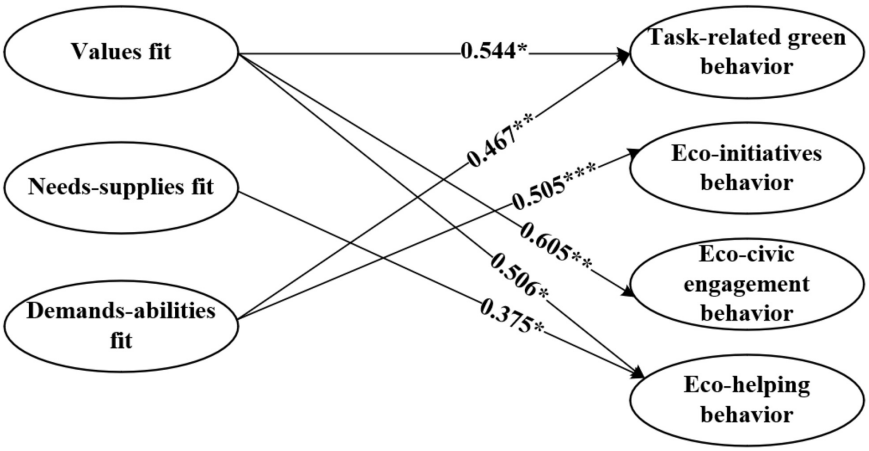

FIGURE 2 | Final results of the structural equation model. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

TABLE 6 | Results of psychological distance moderation.

Interaction effect	Estimate	S.E.	Est./S.E.	*P*-Value
VF × EMD→TRGB	0.105	0.060	1.758	0.079
VF × EMD→ECB	0.136	0.057	2.397	0.017*
VF × EMD→EHB	0.154	0.042	3.653	***
NSF × EMD→EHB	0.150	0.039	3.793	***
DAF × EMD→TRGB	0.115	0.067	1.720	0.085
DAF × EMD→EIB	0.048	0.078	−0.610	0.542
VF × EXD→TRGB	0.002	0.079	0.022	0.983
VF × EXD→ECB	−0.079	0.072	−1.091	0.275
VF × EXD→EHB	−0.204	0.043	−4.777	***
NSF × EXD→EHB	−0.176	0.035	−5.085	***
DAF × EXD→TRGB	−0.057	0.093	−0.611	0.541
DAF × EXD→EIB	−0.048	0.078	−0.610	0.542

*$p < 0.05$, ***$p < 0.001$. TRGB, Task-related green behavior; EIB, Eco-initiatives behavior; ECB, Eco-civic engagement behavior; EHB, Eco-helping behavior; VF, Values fit; NSF, Needs-supplies fit; DAF, Demands-abilities fit; EMD, Emotional distance; EXD, Expectation distance.*

distant. Therefore, H4 is partly supported. In addition, the expectation distance significantly moderates the relationship between values fit and eco-helping behavior ($\beta = -0.204$, $p < 0.001$) as well as the needs-supplies fit and eco-helping behavior ($\beta = -0.176$, $p < 0.001$). However, the effect will be weaker when expectation distance is close rather than distant. So, H5 is rejected.

According to the results of the moderating effect test, we plotted the simple slope diagram. As **Figure 3** shows, in the case of close emotional distance, values fit has a stronger positive effect on eco-civic engagement behavior and eco-helping behavior, and needs-supplies fit also has a stronger positive effect on eco-helping behavior. However, in the case of distant expectation distance, values fit and needs-supplies fit has a stronger positive effect on eco-helping behavior.

DISCUSSION

This study expands the theory of person-organization fit, introduces psychological distance as a moderating variable, and explores the mechanism of values fit, needs-supplies fit, and demands-abilities fit on EGB. Additionally, it expands existing research from the individual level to the interaction level between individuals and organizations, which provides a new perspective for understanding and promoting EGB, as well as a new path for promoting the green development of enterprises. This study concludes as follows:

(1) Person-organization fit can effectively promote employees' task-related green behavior and proactive green behavior (eco-initiatives behavior, eco-civic engagement behavior, and eco-helping behavior). The psychological distance between employees and the organization plays a moderating role in this. Managers can increase the degree of person-organization fit by improving recruitment practices and the allocation of human resources in the organization, resulting in higher green performance. They can also promote EGB by changing the psychological distance between employees and the organization.

(2) There are significant differences in the driving effects of the three different types of person-organization fit relationships on the four types of EGB. First, the effect of values fit on EGB is the most significant, and the effect intensity is approximately 0.5, which further verifies that values fit is the most important element of person-organization fit (Chatman, 1991). Second, demands-abilities fit can significantly promote task-related green behavior and eco-initiatives behavior. However, its influence on eco-civic engagement behavior and eco-helping behavior is not significant. Needs-supplies fit only has a positive effect on eco-helping behavior and has no significant effect on the other three types of EGB. Therefore, the three person-organization fits have different effects on the role of different types of green behaviors. Additionally, the roles of the three fits have a certain complementary relationship. Therefore, to promote task-related green behavior and proactive green behavior comprehensively, the values fit, needs-supplies fit, and demands-abilities fit need to be placed together.

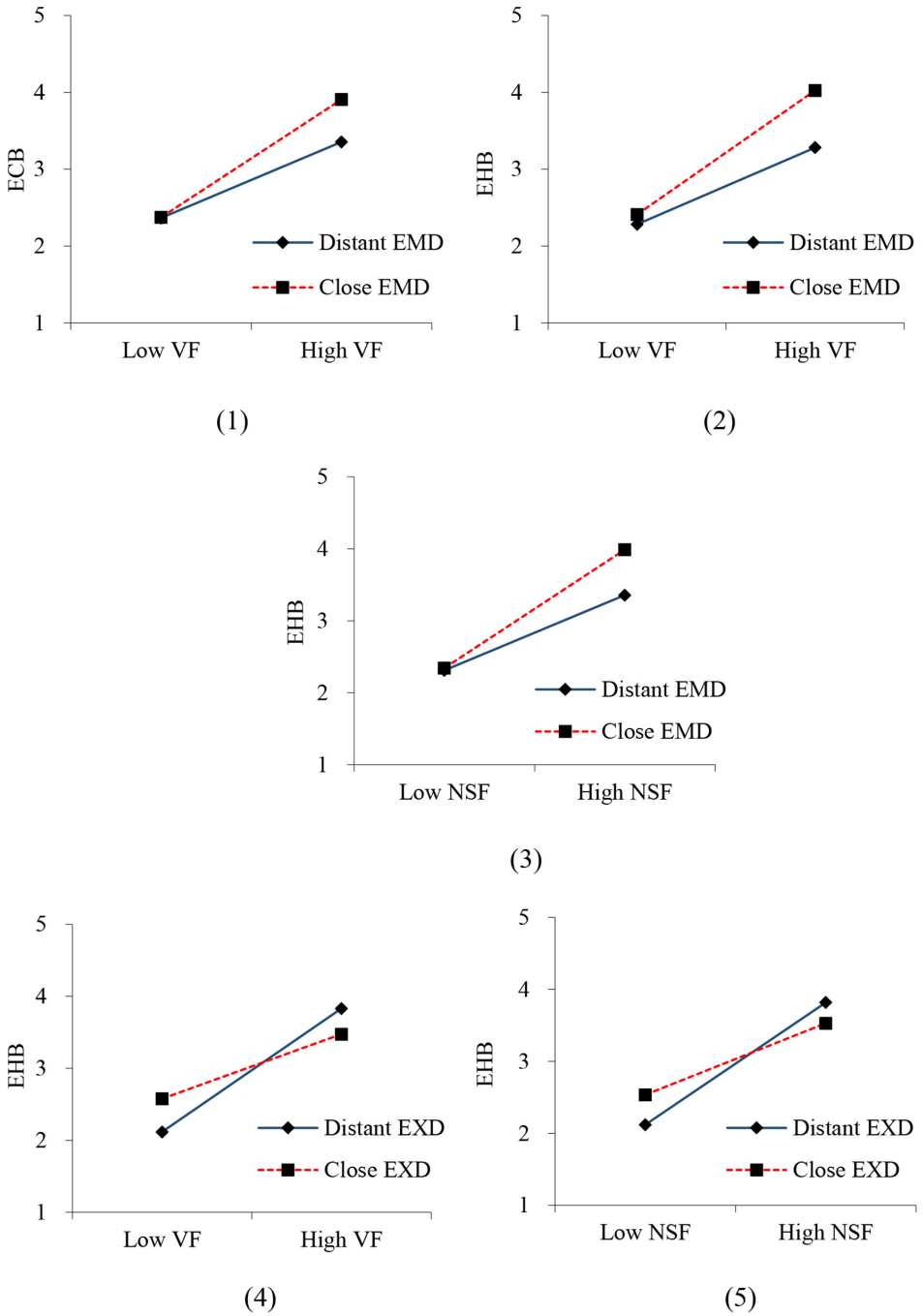

FIGURE 3 | The moderating effect of psychological distance. ECB, Eco-civic engagement behavior; EHB, Eco-helping behavior; VF, Values fit; NSF, Needs-supplies fit; EMD, Emotional distance; EXD, Expectation distance.

(3) Values fit is the most important fit that affects EGB. It has a significant positive effect on eco-civic engagement behavior, task-related green behavior, and eco-helping behavior. When the degree of values fit is high, the employees' sense of belonging to and identity in the organization will increase and they will actively participate in organizational activities (Hicklenton et al., 2019) and implement more extra-role behaviors (Cable and DeRue, 2002). Thus, values fit significantly promotes employees to actively participate in the organization's environmental protection activities. At the same time, other studies confirm that values fit positively affects employees' job satisfaction and organizational commitment to promoting performance behavior (Westerman and Cyr, 2004). The task-related green behavior is already part of work, so the values fit also actively promotes it. In addition, adapting and integrating the values of colleagues within the organization will actively promote relationships among

employees, so they are more willing to remind or help colleagues to implement green behavior and work in a more environmentally friendly manner.

However, contrary to our expectations, values fit has no significant effect on eco-initiative behavior. One of the possible reasons for this difference is that this kind of personal behavior reflects more about the personal predisposition of employees (pre-existing values, attitudes, and habits) (Ramus and Killmer, 2007) instead of depending on the degree of values fit between individuals and organizations.

(4) Demands-abilities fit promotes eco-initiatives behavior and task-related green behavior, while needs-supplies fit promotes only eco-helping behavior. When the employee's ability fits with the work requirements of the organization, employees will have more energy to do other things by choice, such as implementing environmental protection initiatives. Moreover, eco-initiatives behavior is a direct reflection of the environmental protection value orientation of the organization and the awareness it promotes environmental responsibility. In addition, demands-abilities fit has been proven to be an important predictor of employees' job performance (Lin et al., 2014); thus, this fit will naturally contribute to task-related green behavior. However, demands-abilities fit mainly reflects the relationship between individuals and jobs, rather than the relationship among individuals. Therefore, demands-abilities cannot significantly promote engagement with eco-civic behaviors and eco-helping behavior outside of employees' duties.

Finally, the result that surprised us most, is that needs-supplies fit only has a positive effect on eco-helping behavior. This result may be due to the complex mechanisms at play in needs-supplies fit and EGB. It is confirmed that higher needs-supplies fit between employees and organizations will bring higher job satisfaction and organizational commitment (Cable and DeRue, 2002; Bahat, 2020). However, it may not directly promote EGB, rather working indirectly through intermediaries such as job satisfaction and organizational commitment. Therefore, it is necessary to study the complex mechanisms at work between needs-supplies fit and EGB further.

(5) Psychological distance has a moderating effect between person-organization fit and EGB, but the moderating effects of emotional distance and expectation distance are opposite to one another. Emotional distance strengthens the relationships between values fit and eco-civic engagement behavior, values fit and eco-helping behavior, as well as needs-supplies fit and eco-helping behavior. This shows that the closer the emotional distance is, the more positive it can promote EGB. This may be because when the emotional connection between employees and the organization is relatively close, it can promote emotional communication, enhance employees' sense of identity with the organization (Wang et al., 2009), and improve employees' job satisfaction (Lapierre and Hackett, 2007). This also means that employees may want to perform more behaviors beyond their job responsibilities to improve organizational efficiency (Bowler et al., 2010). So, emotional distance plays a positive role in moderating the relationship between person-organization fit and EGB.

Contrary to our hypothesis, expectation distance weakens the relationship between values fit and eco-helping behavior as well as needs-supplies fit and eco-helping behavior. This may be because expectation distance is a judgment based on interest relationship distance, which emphasizes the acceptance degree of the gap between the benefits obtained by employees in the organization and their own interest goals. The closer this distance cognition based on interest relationship is, the more likely it will make employees' psychology and behavior more utilitarian. However, eco-helping behavior is a kind of non-utilitarian citizen behavior. Therefore, when the expectation distance is close rather than distant, it will weaken the relationship between person-organization fit and eco-helping behavior. At the same time, employees' judgment of the expectation distance with regards to their interest relationship may also lead to unhealthy competition among employees within the same organization, thus inhibiting the relationship between person-organization fit and eco-helping behavior.

SUMMARY AND SUGGESTIONS

From the perspective of person-organization fit, this study uses the psychological distance between employees and organizations as the moderating variable and explores the impact of different types of person-organization fit on EGB. Through the survey data from 412 employees, the SEM was used to analyze the effects of values fit, needs-supplies fit, and demands-abilities fit on employees' task-related green behavior and proactive green behavior. In terms of theoretical significance, we expanded the person-organization fit theory, using the psychological distance between employees and organizations as the moderating variable. For the first time, this research studied the effect of person-organization fit on EGB and tested the moderating effect of psychological distance between employees and organizations. The results show that values fit has the greatest effect on EGB, followed by demands-abilities fit. Needs-supplies fit significantly promotes only eco-helping behavior. Psychological distance has a significant moderating effect on the relationship between person-organization fit and EGB. Moreover, the effect of person-organization fit on EGB is enhanced in the case of close emotional distance, while the effect is weakened in the case of close expectation distance. These results provide new insight into understanding employees' motivation to implement green behavior from the perspective of interactions between individuals and organizations. In addition, it also outlines a new path to promote the green transformation of enterprises.

Our research results provide insights into new ways for enterprise managers to promote green and sustainable behaviors in employees through the practice of green human resource management:

(1) Organizations should improve the degree of fit between individuals and organizations in the process of recruitment and allocation management. First, in the organization's personnel recruitment and selection process, employees with higher compatibility between personal values and organizational values should be selected as much as possible. Since individual values are stable and do not easily change, enterprises need to choose employees who are more consistent or compatible with the values of the organization and who promote task-related green behavior, eco-civic engagement behavior, and eco-helping behavior. Second, personnel evaluation, training, and performance management are recommended to improve the fit between personal ability and job requirements to promote

task-related green behavior and eco-initiatives behavior. Finally, eco-helping behaviors should be promoted through the design of incentive mechanisms (such as salary incentives, training mechanisms, promotion mechanisms, etc.) to improve the fit of needs and supplies.

(2) Organizations should pay attention to the management of employees' psychological distance, reduce emotional distance, and increase expectation distance. First, more emotional care and human-focused management should be given to employees so that they truly feel valued and part of the organization. Additionally, employees should be encouraged to implement green behavior through the guidance of reasonable expectations and the increase of expectation distance.

In terms of the interactions between individuals and organizations, this research investigated the impact of person-organization fit on EGB, and the results provide an important addition to existing literature on the subject. However, there are still several limitations that need to be noted and can be improved in future research. First, our research is conducted in the context of Chinese culture. In Chinese society where there is a focus on "high context culture," individual behavior is more likely to be influenced by one's interaction with an organization. Considering the differences in people's perception of person-organization fit in different cultures, future research can expand the sample to other cultural backgrounds. Second, only direct paths of person-organization fit and EGB are considered, and indirect paths are excluded. For example, it was found that needs-supplies fit only has a positive effect on eco-helping behavior, while needs-supplies fit simultaneously causes job satisfaction and organizational commitment. Whether these psychological variables can indirectly drive green behavior remains to be tested. Future research could also further explore whether person-organization fit can play an indirect role in EGB through other mediating variables. Third, we used the psychological distance between employees and the organization as the moderating variable, and only two dimensions (emotional distance and expectation distance) from the psychological relationship were selected for moderation. Whether time distance, space distance, and other psychological distances based on real relationships play a role in EGB is worth exploring in future research.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethics Committee of China University of Mining and Technology. The participants provided their written informed consent to participate in the study.

AUTHOR CONTRIBUTIONS

LM: conceptualization, resources, supervision, project administration, funding acquisition, writing the original draft, writing-review, and editing. YS: methodology, validation, formal analysis, data curation, writing-original draft, writing-review, and editing. XG: investigation, data curation, writing-original draft, writing-review, and editing. HY: visualization, methodology, and writing-original draft. TL: conceptualization, supervision, and investigation. KS: data curation, writing-review, and editing. YQ: conceptualization, investigation, and data curation. ZJ: methodology and data curation. All authors contributed to the article and approved the submitted version.

FUNDING

This work was supported by the Fundamental Research Funds for the Central Universities (No. 2020ZDPYSK06) and the National Nature Science Foundation of China (No. 72074212).

ACKNOWLEDGMENTS

We would like to thank Editage (www.editage.com) for English language editing.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2020.568385/full#supplementary-material

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

frontiers in Psychology

ORIGINAL RESEARCH
published: 28 October 2020
doi: 10.3389/fpsyg.2020.567093

The Role of Psychological Distance in Influencing Pro-environmental Behavior Spread: Perceived Justice Enforceability as a Moderator

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The social system can spread tightly coupled complex practices under the context that members of the social system do not have the shared experience that enables them to coordinate within longstanding tight formal organizations. To promote the understanding of such a process, and given the possibility for other members in the social system to cheat and adopt pro-environment behavior, we draw on the organizational justice literature and the perspective of justice enforceability, and construal level theory, to develop a conceptual model in which the impact of social members' perceived psychological distance on their response to other social members adoption of pro-environmental behaviors (PEBs) is contingent on their perception of justice enforceability and cognitive appraisals (positive, not significant) towards other social members' adoption of PEBs. We find that when social members perceive that the adoption of pro-environment behaviors is justice-enforceable, their cognitive appraisals of other social members' adoption of PEBs is high, and then the more proximal the psychological distance they perceive, the stronger they will react to other social members' adoption of PEBs. Further, they will adopt and enact such behaviors, otherwise, they would be unwilling to adopt and enact such behaviors. So, uneven perceived psychological distance of social members can harm their adoption and the spread of pro-environment behavior. We tested our model in a survey study. Results show that the proposed model is supported, and our understanding is enhanced about how social members' willingness to adopt and spread pro-environment behavior is contingent on their perceptions of justice enforceability. This paper is comprised of five parts, of which include an introduction, a part on the theory and hypothesis, data and methods, results and discussion, and conclusion.

Keywords: loose social system, perceived unfairness, psychological distance, pro-environmental behavior (PEB), justice enforceability

OPEN ACCESS

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Specialty section:
This article was submitted to Environmental Psychology, a section of the journal Frontiers in Psychology

Received: *29 May 2020*
Accepted: *07 September 2020*
Published: *28 October 2020*

Citation:
Xu Z, Cao Q and Li S (2020) The Role of Psychological Distance in Influencing Pro-environmental Behavior Spread: Perceived Justice Enforceability as a Moderator. Front. Psychol. 11:567093. doi: 10.3389/fpsyg.2020.567093

INTRODUCTION

Environmental problems, especially those in developing countries, are still deteriorating, and the negative externalities generated by this deterioration have not only made developed countries suffer due to climate warming, but has also led to many other serious environmental problems, such as floods and drought (Swim et al., 2011). Research by Doran and Zimmerman (2009) has

demonstrated that 97% of climatologists agree that human activities have affected climate change, which has caused serious environmental problems. Today, the governments of most countries in the world have begun to stress the importance of environmental protection, and policymakers in some countries have begun to implement policies dedicated to reducing greenhouse gas emissions (Mohai et al., 2010). Scholars have also devoted a lot of attention to addressing environmental issues and exploring measures on how to make economic and social development more environmentally friendly (De Groot and Steg, 2010). They believe that if humans can engage in pro-environmental behaviors (PEBs) in life and at work, it will be helpful in reducing the detrimental effect of human activity on the environment and improve the well-being of mankind (Wibeck, 2014).

A large number of studies on the perceived psychological distance of environmental problems have shown that people around the world are very concerned about environmental problems, but most of them do not believe that environmental problems are the most urgent problems that need to be resolved first among various problems faced by human beings (Kim and Wolinskynahmias, 2014). From the perspective of optimism (Cheng et al., 2019), people think that the risk caused by environmental changes will not bring immediate damages to them. Using their own awareness of the severity of environmental problems, they feel that such damages may soon occur to people in other regions or other countries (Kollmuss and Agyeman, 2002); From the perception of distance, they may feel that the risks brought about by environmental changes are global rather than local, and may not be able to adversely affect the area in which they live. In addition, social members may think that good environment is public goods, and protecting the environment is the responsibility of the government or other public sectors or other people, and they tend to rely on such public goods (Lorenzoni and Pidgeon, 2006), so that they may think that although environmental issues are important in their minds, they are still unwilling to adopt and spread PEBs in practice (Espeland and Kettenring, 2018). To put it differently, although the social members' perception of the psychological distance of environmental issues affects their attitudes and behaviors toward environmental issues, the magnitude of the impact is uncertain and contingent on other factors (Gärling et al., 2003).

In this study, we address the issues of social members' perceived psychological distance of environmental issues which affect the adoption and spread of PEBs in social systems. To put it specifically, we employ a cognitive and organizational justice perspective to explain why the adoption and spread of PEBs in social systems depend on the perceived justice enforceability of adopting PEBs and the level of cognitive appraisal (Valentine, 2017). From a cognitive perspective, there is always a gap between individuals' cognition and their actions (Gärling et al., 2003), which can exert a very critical impact on individual behavior. When confronting environmental problems, most individuals agree that the continuing environmental degradation will do harm to all human beings, but they do not agree that it will do very serious harm to themselves (Chen, 2019). Chen's (2015) research on self-efficacy and collective efficacy shows that people in a collectivist cultural atmosphere are more willing to adopt PEBs than the individualist cultural atmosphere in a social system because the former can foster much more of a sense of fairness than the latter can do. In addition, people in a collectivist atmosphere are more closely connected to each other (Williams and O'Reilly, 1998), this can enhance the social contacts between social members. PEBs are a new behavior for those who have not previously adopted PEBs, so their adoption of PEBs means that they will incur more of a personal cost. If they adopt PEBs but others do not, then they will feel that it is unfair (Greenberg, 1993). Thus, from the perspective of fairness, when a person is ready to adopt a new behavior, they will make a social comparison and reaffirmation to decide whether or not to adopt such a behavior (Greenberg, 1993). In a collective environment, if the psychological distance perceived by social members is proximal, then most of them voluntarily adopt PEBs, this will create a fair atmosphere which exerts positive influence on those who have not adopted PEBs (Hackman and Katz, 2010). However, in a social system, the connections between people are relatively weak, and social members tend to be more individualistic in their action orientation. The psychological distance between people is larger and more uneven, the interaction between different social members' activities is also weaker. It is impossible to restrict social members' behaviors by mandatory administrative means beyond legal constraints, so it is more difficult to form a fair atmosphere (Matta et al., 2017). So, we argue that there exist different mechanisms between the spread of PEBs in social systems and tightly coupled social systems. In a tightly coupled social system, due to the closer relationship between members, what members are forced to comply and are subjected to formal system constraints on what they should and should not do (Rodell and Colquitt, 2009). However, PEBs in a social system are mostly not enforced by law (Thibaut et al., 1973). Therefore, we posit that in a social system, whether social members adopt PEBs is contingent on the level of their cognitive appraisal and their fairness perception of engaging in PEBs.

We chose the Chinese society as the background to test the hypothesis in this article. In contrast to formal organizations, taking enterprise for example, Chinese society is loosely coupled, the structure of which is much more uneven. At present, China, as the largest developing country, is committed to addressing the issues of the ecological environment. The government of China not only promulgates the benefits of environmental protection but also advocates that its residents actively protect the environment. With the continuous development of China's market economy, the government's administrative intervention on individual behaviors of social members is becoming less evident. Whether social members adopt PEBs is largely voluntary. Therefore, it is appropriate to test the hypothesis of this study within Chinese society.

Theoretical and empirical studies of this paper contribute to the literature on psychological distance, the spread of behaviors, and organizational justice. First, our research deepens the understanding that the mechanism of impact of social members' psychological distance on the adoption and spread of their PEBs in social systems is different from that of tightly coupled organizations.

Second, we extended the study of psychological distance to the field of spread of PEBs and found that the uneven distribution of psychological distance affects the spread of PEBs.

Finally, we introduced two key constructs of perceived fairness and cognitive appraisal into the theoretical model developed in this study, and posit that the effect of psychological distance on the positive attitude of spreading PEBs in a social system depends on the social members' perception of fairness and cognitive appraisal of the spread of PEBs. Besides, our research can be used by the government to promote the implementation of pro-environment policies and initiatives, and therefore has important practical implications.

THEORY AND HYPOTHESES

Perceived Psychological Distance of Environmental Changes

The concept of psychological distance was first proposed by Beckerman (1956). He found that trade between countries is not only affected by geographic distance, but also by importers' perceived psychological distance of potential suppliers. Later, some scholars borrowed the concept of psychological distance to study environmental problems, which proved that the public's awareness of climate change is positively related to the severity of climate change that they perceive (Sun and Han, 2018), and Wibeck (2014) found that social members' adoption of PEBs plays a key role in protecting the environment and countering the deterioration of the environment. Scholars in organizational behavior have demonstrated that behavior is a function of perception, and perception guides human behavior (Vanderstukken et al., 2019). The change in perception occurs before the change in behavior, and this relationship will cause a delay in the actions taken by humans to deal with the environment change (Tang et al., 2019). As environmental changes occur at a relatively slow pace and do not form a very obvious accumulative effect, after a long period of time, environmental problems will have become much more serious before humans are alarmed and make critical responses. To put it a different way, the subjectivity of psychological distance may delay human's positive reaction to environmental changes (Milfont, 2010).

Scholars have developed many theories with psychological distance as the core concept. Among them, the construal level theory (CLT) is a relatively famous one. The CLT mainly illustrates the relationship between the psychological distance and the degree of abstract or specific human thoughts (Trope and Liberman, 2010), In other words, the subjective psychological distance perceived by the individual will have a substantial impact on its behavior in reality (Trope et al., 2007). The study of Liberman and Trope (2008) showed that psychological distance has roughly four dimensions, namely temporal distance, spatial or geographical distance, distance between the perceiver and another individuals or groups, and other dimensions that cannot be determined. In a social system, although environmental changes have had a negative effect on human society, the subjective perception of social members' psychological distance to environmental changes lead them to believe that the problems incurred by environmental changes (such as warming and disease spread) will affect those who are far away from them, and will not have a bad influence on themselves in a short time (Spence et al., 2012). That is to say, when social members perceive that they have a large psychological distance from environmental changes, they will think that bad effects incurred by environmental changes will happen to other people or groups (Chen et al., 2018). However, when social members perceive a proximal psychological distance to environmental changes, they will be prompted to respond more positively to environmental changes (Li K. et al., 2019). To put it differently, when social members recognize or feel that the impact of environmental disasters on themselves is more proximal and visible, then their response to environmental issues will be more positive (Chu and Yang, 2018).

Although psychological distance has been extensively studied as an important academic field in the past few decades (Chen and Li, 2018), there are still many controversies on the empirical research of psychological distance among scholars (Vaccarini et al., 2017). At the micro-level, scholars have found that psychological distance affects people's cooperation tendencies and conflicts of opinion (Zheng et al., 2019), but they do not hold consistent views on how psychological distance affects individual behavior, promotes the spread of a behavior, and makes collective behaviors emerge. In a social system, due to the bias of social members' perception of the psychological distance of environmental changes, the government cannot achieve the goal of environmental protection by forcing all social members to adopt PEBs through compulsory means (Schultz, 2000). Previous studies rarely treated PEB as a discretionary behavior, which is determined by the social members' willingness and depends on their fairness perception when they engage in the PEBs. Before the emergence of environmental problems, there was no so-called PEB in the classification of human social behavior, so we can even call PEB an extra-role social behavior. Research by Smith and Joffe (2013) showed that in a region with serious ecological and environmental problems, whether residents adopt or refuse to adopt PEBs is not controlled by the government, even if the government strongly advocates residents to adopt PEBs to protect the environment.

At present, residents in some countries and regions are advocated to engage in trash sorting, but few of them do this in their daily lives. This will create an unfair perception of the social members who have adopted or are about to adopt PEBs (Olivola and Shafir, 2013). There is a paucity of existing research on the above problems. In addition, the existing research has not built a consensus on how the spread of pro-environment behaviors is dependent on the perception and cognition of social members. In the face of serious environmental problems, most residents still deem that the responsibility they should bear for the consequences of environmental degradation is very insignificant and their daily lifestyle of not adopting PEBs is not enough to cause serious harm to the environment. This cognitive bias will ultimately affect the enthusiasm of them to cooperate with the government over environmental protection (Stern, 2000). Therefore, in this study, we introduce the two important concepts of fairness perception and cognitive bias to explain

the contingency of social members' spread of pro-environment behaviors affected by the perception of psychological distance.

According to the definition of psychological distance, the more proximal the psychological distance to environmental problems is perceived by social members, the more likely they are to react positively to environmental changes (Dunlap et al., 1983). However, in a social system, social members are often "not concerned about issues that have no close relation to themselves," to put it differently, social members' perceived psychological distance to environmental problems is subjectively much more distal, promoting the spread of PEBs by shortening social members' psychological distance to environmental changes. In this study, we draw on the CLT of psychological distance, cognitive bias, and perceived fairness to shed new light on how social members' perception of psychological distance of environmental issues affect the spread of PEBs (Gifford, 2011). We argue that it the subjectivity of the social members' perceived psychological distance that can be used to promote the spread of PEBs in social systems. Research on behavioral and psychological science showed that perception and cognitive biases can make the preference or bias of human behavior, and encourage humans to resolve those problems that are considered to be urgent and important (Liberman and Trope, 1998). Thus, the social members' prejudice in the perceived psychological distance can be leveraged to influence their decision, to promote the engagement of actions that help enhance the overall interests of the social system, and to prevent the adoption of actions that are not conducive to the society. Frankly speaking, most of the people in the world have interests in environmental protection. The deterioration of the environment will hurt their interests to some degree. However, in the process of economic development, almost all countries or regions have experienced a period of severe environmental damage in the process of them evolving into developed economies. Most of developing countries consciously or unconsciously prioritize economic development over environmental protection before they become a developed country. In the same vein, social members' perceived psychological distance toward the environmental changes is also biased. In addition, in a social system, the social members' perception of the psychological distance of environmental changes will affect their psychological response to other social members' adoption of PEBs, and will further have a critical impact on whether they themselves adopt PEBs or not. Further research shows that the magnitude of the impact of the psychological distance on psychological response is contingent on the level of social members' cognitive appraisal and their perception of justice enforceability (Lea, 1994). In a region or country with a relatively high level of education, the social members' perception of the psychological distance of environmental problems usually invokes a much stronger psychological response to PEBs and further enhances their willingness to adopt PEBs (Lorenzoni and Pidgeon, 2006). Similarly, social members will also be more willing to adopt PEBs if the governmental environmental policies and initiatives are perceived to be fair and fairly enforceable. Because, if the environmental protection initiatives are perceived by social members to be fair and fairly enforceable in reality, they will not feel deceived when adopting PEB themselves. Besides, social members engaging in PEB need to pay the extra cost and consume extra resources, so when they are adopt PEB, but others do not adopt it, then they will feel that their extra effort has been for nothing, and will have a sense of injustice (Colquitt, 2004). In this unfair atmosphere, the influence of social members' perception of psychological distance on social members' psychological responses to other people who do not adopt PEBs will be weakened, thereby further reducing their willingness to adopt PEBs (Colquitt et al., 2001). Following Klöckner and Blöbaum (2010), and based on the above discussion, we can develop the conceptual model of this study (see **Figure 1**).

Relationship Between PEBs, Social Members' Perceived Psychological Distance of Environmental Changes, and Their Psychological Responses to Other Social Members' PEBs

Drawing on signaling theory, Harmon argued that social members in a social system can receive a lot of information about PEBs from different sources, some of which are issued by the government, some by the news media, and some by their own friends (Harmon, 2019). When social members are faced with so much information, they will rank the importance of this information according to their perceived cognitive distance and time distance, so naturally they will not treat the information fairly. Information that supports their own beliefs, or is beneficial to them, is usually given priority. In so doing, the information received will be filtered, they will consciously or unconsciously avoid messages that are in conflict with their predispositions (Spence, 1973). Therefore, in the social system, psychological distance is considered to be a key factor affecting behavior (Puchalska-Wasyl, 2018). For an American, when they face two problems, the plague in Africa and their friend's toothache, if they are required to rank the importance of the above two things, they are likely to put much more weight on the latter over the former. According to the CLT theory, Americans perceived the psychological distance of their friends' toothache to be much more proximal than that of the African plague. If they are asked to take immediate action, they will go to send their friend to the dentist as soon as possible, instead of running to the Red Cross to donate money to help Africans fight the plague. In a social system, not only is the physical distance between people uneven, but the psychological distance between people is also uneven, so social members' behavior will have a greater impact on their friends than strangers (Kivetz and Tyler, 2007).

In a similar vein, social members' prejudice against the perceived psychological distance of environmental changes will form a filtering effect of cognition and perception. For policymakers in China, they will tend to allocate more resources to promote economic development than to protect the environment. For the individual social member, the deterioration of the environment that can do damage to individual interests (wellbeing) and can also form a bad public effect. An old Chinese proverb says, "the tall person will hold up the sky when it collapses," and the individual will also free-ride on environmental

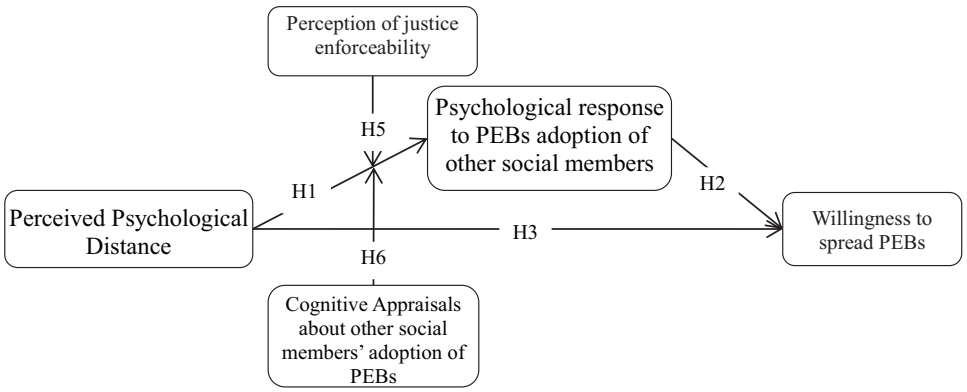

FIGURE 1 | A conceptual model of social members' psychological responses to their perceived psychological distance. Hypothesis 4 (H4) denote by the path from perceived psychological distance to willingness to spread PEBs through psychological response to PEBs adoption of other social members.

protection, because he deems that environmental degradation is hurting other people more than himself, or the damage he has suffered is minimal, so he will feel that it is reasonable that the responsibility for protecting the environment should be borne by others or the government (Ambos et al., 2019). However, if social members often have contact with friends or neighbors who are negatively affected by environmental problems in their daily lives, then they will make a more positive evaluation when other social members adopt pro-environment behaviors (Safari and Chetty, 2019). Using the same logic, when a social member who does not adopt PEB faces increasingly serious environmental problems, if his friends, not strangers or distant foreigners, have adopted pro-environment behaviors, they will react more positively to their friends' adoption than to strangers'.

This leads us to predict:

> *Hypothesis 1. The more proximal social members' perceived psychological distance of environmental changes is, the more positive their response is to other social members' adoption of pro-environment behaviors.*

(*Note: below, we use the reverse indicator to measure the psychological distance, so this effect in the later statistical analysis is positive.*)

The Effect of Social Members' Psychological Response to Others' Adoption of PEBs on Them Spreading PEBs

In a social system, if social members perceive a proximal psychological distance to environmental issues, and most of the other social members have adopted PEBs, they will respond more positively by spreading positive word-of-mouth to the person who is engaging in PEBs (Swan and Oliver, 1989), and be willing to donate to environmental protection organizations (Nordman and Tolstoy, 2014). However, social members' positive reaction to PEBs is not the ultimate goal of a social system. We expect that social members' positive attitudes toward others' adoption of the PEBs can be transformed into their own PEBs, then they will voluntarily spread PEBs to others who do not adopt PEBs (Bord et al., 1998). In other words, we hope that they not only think that PEB is very important, but also engage in it in reality, and are willing to spread, through social contact, PEB to other social members who have not adopted the PEB.

In reality, the government strives to resolve increasingly serious environmental problems by the implementation and propaganda of environmental protection policies which can inspire social members to form a positive attitude toward PEBs. It is not the ultimate goal of the government to change social members' attitudes toward environmental issues, the government wishes all social members to engage in PEBs in their daily life or work. Obviously, it is not enough to only rely on the power of the government to solve environmental problems. The government also needs to mobilize all social members to participate in the work of environmental protection, and make PEBs spread among different social members through extensive social contacts. Therefore, creating a positive psychological response to environmental protection issues is different from making social members adopt and spread PEBs. In the social system, all human social behavior can spread through social contact. PEB, as a kind of social behavior, can also spread through social contact between people (Van Kleef, 2009).

Pro-environmental behavior is a strong predictor of whether social members will take action to protect the environment. Through social contact, we expect that social members' positive psychological response to others' adoption of PEBs will eventually prompt them to actively adopt PEBs. When more and more social members adopt PEBs, the cost of implementing environmental protection policies will not only be reduced, but also the spread of PEBs through social contact will be promoted. The intention to adopt or spread PEBs is a behavioral construct that is influenced by the attitudes and emotions of social members toward PEBs (Avloniti and Filippaios, 2014). The positive attitudes of social members to adopt and spread PEBs are mainly displayed through the social members' lifestyle changes in reality, advocacy and participation in various environmental protection actions (Piazza and Jourdan, 2018). For those social members who are willing to adopt and spread PEBs, they will make positive statements

on the adoption of PEBs to those they contact. Willingness is a key predictor of behavior (Vlachos et al., 2017). The same logic holds true that if social members' willingness to adopt and spread PEBs increases, the possibility of their adopting and spreading PEBs will increase too. Drawing on the theory of spread and social comparison theory, we posit that social members' positive psychological response to others' adoption or spread of PEB will enhance the possibility of themselves adopting PEB in reality in several ways.

First, from the perspective of the spread of behavior, both social influence and social contact can have an impact on the spread of behavior (Theeke et al., 2018). In other words, social contact and social influence can promote the spread of behavior. So, social members can spread PEBs through social contacts. For example, an individual may adopt PEBs because relatives and friends they often contact have adopted PEBs. On the other hand, social members' adoption of PEB may also be due to social influence. Although there is no so-called social contact between most of people in a social system, when more and more social members adopt PEBs, the social pressure generated by the spread of PEBs grows on the individuals who have not adopted PEBs. Such pressure will gradually force them to adopt PEBs. Dunlap et al. (1983) showed that some tourists from a country with serious environmental problems will quickly change their existing behavior patterns and adopt PEB when they come to tourist destinations where environmental protection is very good. Thus, both social influence and social contact can prompt social members to adopt and spread PEBs. Social contact can promote the spread of PEB through individuals' point-to-point interaction, while social influence can promote the spread of PEB through group-to-individual interaction.

Second, social members' psychological responses to others' adoption of PEBs can be incurred by social comparisons. The social system has the function of filtering and assimilating its members' behaviors. Social members will make a dynamic comparison of behaviors they want to engage in. When they feel that their behaviors are different from the behaviors of most people engaged, then they return their deviated behavior to the existing social behavior trajectory through social comparisons (Selenko et al., 2017). Said differently, the behavior of social members in a social system must always conform to social norms, and evolve with the evolution of social norms. When most people have adopted PEBs, those who have not adopted PEBs will find their behavior deviates from the norm through social comparison and correct their behaviors according to mainstream social norms. So, we hypothesize:

> *Hypothesis 2. Social members' positive psychological reaction to others' adoption of PEBs has a direct positive effect on their willingness to spread PEBs.*

When the social members respond positively to others' adoption of PEBs, they tend to invest more effort into spreading PEBs through social contact. Research on psychological distance showed that the more proximal the social members' perceived psychological distance of environmental problems is, the more positive their psychological response is to others adopting PEB. To put it another way, when social members feel that the environmental degradation is very serious, and their close relatives and friends all begin to adopt PEBs, their strong positive psychological reactions to PEBs will be stirred, then their willingness to adopt PEBs will increase too. So, on the basis of hypothesis 1 and 2, we can make the following hypothesis:

> *Hypothesis 3. The perceived social members' psychological distance of environment changes also has a direct positive influence on their willingness to spread pro-environmental behavior.*

Indirect Effect of Psychological Distance on the Willingness of Social Members to Spread PEBs

Furthermore, social members' positive response to others' adoption of PEBs is the leading indicator of their willingness to spread PEBs, and social members' perceived psychological distance of environmental issues is the leading predictor that can be used to judge if they react positively when other social members adopt PEBs (Weisner and Sutton, 2015). Therefore, we can speculate that the changes in the social members' perceived psychological distance of environmental issues can first exert an impact on their positive psychological reactions to others' adoption, then on their own willingness to spread PEB. Said differently, social members' positive psychological reactions may mediate the impact of psychological distances on willingness to spread PEB.

In a social system, when the environmental problems perceived by the social members become more serious, more social members who actively address the environmental problems will form social pressures on those who have not acted yet, and such social pressures can stir their willingness to engage in environmental protection (Trautmann, 2019).

This leads us to propose the following hypothesis:

> *Hypothesis 4. Social members' psychological reaction to others' adoption of PEBs mediates the effect of their perceived psychological distance on their willingness to spread PEBs.*

The Moderating Effect of Cognitive Appraisals and Justice Enforceability

As such, we have discussed the reasons why social members' perceived psychological distance affects their psychological responses to others' adoption of PEBs, and how their psychological responses to others' adoption of PEBs affect their willingness to spread PEB. Below, we will focus on the interaction between social members' psychological distance, perception of justice enforceability, and cognitive appraisals. Thus far, we have argued that the perception of psychological distance affects social members' positive psychological response to others' adoption of PEBs, the latter in turn affects the willingness of them to spread PEBs. Because social members' perception of psychological distance toward environmental changes can enhance their psychological response to others' adoption of PEBs, so we posit that the impact yielded in the process from social members' psychological distance to their

willingness to spread PEB relies on social members' perception of justice enforceability and cognitive appraisals. It will be of significance in theory and management practice to determine under what conditions impact produced in the above process will be strengthened or weakened. The studies of Kruglanski (1989) and Van Kleef et al. (2004) and others showed that the impact yielded in the above process depends largely on the social members' cognitive appraisals and their perception of justice enforceability toward PEBs. That is to say, when social members have a higher level of cognitive appraisal toward environmental issues, and feel that government environmental protection policies or initiatives can be implemented fairly, the effect of social members' perceived psychological distance on their positive psychological reactions to others' adoption of PEBs will be magnified.

Following Valentine (2017), we introduce the idea of justice enforceability, "defined as the perception that authorities can act fairly, given the potential for other people to cheat" (Valentine, 2017). In a social system, the social members' perceptions of justice enforceability of PEBs were focused on whether the adoption of PEBs could be cheated. Because some social members may verbally promise that they will adopt PEBs, but do not put PEBs into action. When this occurs, the impact of the social members' perception of psychological distance on their positive psychological response to others' adoption of PEBs will change too. Thus, we posit that the effect of social members' perceived psychological distance on their positive psychological reactions is expected to become stronger as social members' perceived justice enforceability toward the execution of environmental protection initiatives increases. To put it differently, if social members deem that the government's environmental protection initiatives or environmental protection policies can be fairly enforced in reality, their positive psychological response to others' adoption of PEBs will be amplified, and their willingness to spread PEB is also enhanced.

Cognitive appraisals are inferences that a social member draws about the other social members' true feelings and intentions of adopting PEBs. Cognitive appraisals require social members to make inferences about the intention of PEBs' adoption by other social members, which guide the former's behaviors by providing contextually relevant information about the latter. Thus, drawing on the study of Valentine (2017), we further argue that when social members find that they need to pay extra costs or consume extra resources for adopting altruistic extra-role behaviors, they will become more cautious and reaffirm whether it is fair for them to expense the extra cost or resources. As environmental problems begin to deteriorate, those social members with low cognitive appraisals will deem that the deteriorating environmental problems can do little harm to themselves, they will be indifferent to other people who are engaging in PEB (Chen, 2019). On the contrary, for people with high cognitive appraisals, they will deem that environmental deterioration will eventually make everyone a victim, and they will have a more positive psychological response to others who are engaging in or have adopted PEBs. In this case, whether social members have a positive psychological response to others who are engaging in PEB will largely depend on their own cognitive appraisals. So, we predict that cognitive appraisal and perceived justice enforceability moderate the relationship between social members' perceived psychological distance and their psychological responses to others' adoption of pro-environment behaviors.

Therefore, we can hypothesize:

> ***Hypothesis 5. Social members*** *perceived justice enforceability moderates* ***the impact of*** *their perceived psychological distance on their psychological responses to others' adoption of pro-environment behaviors.* ***As the social members perceive that environmental protection policies can be more fairly enforceable, the impact of their perceived psychological distance to environmental issues on*** *their psychological responses to others' adoption of pro-environment behaviors* ***will be weakened.***
>
> ***Hypothesis 6. Social members*** *cognitive appraisals moderate* ***the impact of*** *their perceived psychological distance on their psychological responses to others' adoption of pro-environment behaviors.* ***As the social members'*** *cognitive appraisals increase****, the impact of their perceived psychological distance to environmental issues on*** *their psychological responses to others' adoption of pro-environment behaviors* ***will be weakened.***

(*Note: we use the reverse indicator to measure the psychological distance, so the above moderating effect in the later statistical analysis is positive*).

DATA AND METHODS

Sample

Urban residents showing the initiative to classify domestic waste are considered to be engaging in PEBs. At present, most urban residents in China are faced with the problem that their city is besieged by garbage, which has seriously damaged the ecological environment they are living in. In addition, most cities in China use landfills to dispose of garbage, which not only wastes a lot of land resources, but may even cause very long-lasting pollution problems of groundwater resources. What is more, some cities have already faced a situation where there is no land to bury garbage. Some cities besieged by garbage also face the issue of how to sustain economic development and reduce negative impacts on the daily lives of residents. So, when urban residents see the bad ecological environment in their urban-rural linking area, will they perceive a more proximal psychological distance to environmental degradation and respond positively to environmental protection? In addition, the Chinese government is now encouraging urban residents to classify garbage, and garbage classification is regarded as an important measure for handling the deterioration of environmental problems by the Chinese government. At present, a small number of cities in China have begun to carry out garbage classification, but the effect is current unsatisfactory. Externalities shaped by garbage classification are not significant. In particular, cities that have carried out garbage classification have not formed a good

spillover effect on those cities that have not implemented garbage classification. Some cities have already built up infrastructure for garbage classification, why are their residents still unwilling to engage in garbage classification? In order to test the hypotheses proposed in this study, we mainly collected data about urban residents' garbage classification.

This study mainly selected urban residents in three different cities in China as the respondents of the questionnaire distributed. In mid-April, Surveys were distributed to 330 respondents who live in these 3 different cities, namely Xuzhou in Jiangsu province (A), Jining in Shandong province (B), and Huaibei in Anhui province (C), 110 for each city. Respondents were a random sample of urban residents who have lived in these 3 different cities for many years. The first author and two research assistants were responsible for distributing and collecting questionnaires in Huaibei, Anhui, and then the two research assistants went to Xuzhou, Jiangsu and Jining, Shandong to distribute and collect questionnaires. The survey lasted approximately 6 weeks. We usually distributed questionnaires to local residents in shopping malls or squares. Before issuing the questionnaires, we usually asked the residents how many years they have lived in the city. If they have lived there for more than 3 years, we would continue the investigation.

Finally, 234 respondents completed the questionnaires. The number of questionnaires recalled from the three cities Xuzhou, Jining, and Huaibei were 91, 67, and 76, respectively. The overall response rate was 70.91%. An abbreviated 5-point Likert scale, which contained no more than 25 questions, was used for improving the quality of the survey and data collection. In so doing, respondents could complete the survey within 15 min.

The average age of respondents was 35.53 years (sd = 10.56), and other demographic data are presented in **Table 1**.

TABLE 1 | Demographic data of the respondents (*N* = 234).

Demographic characteristics	Terms	Frequency	Percentage
Sex	Male	107	45.7
	Female	127	54.3
Age	≤35	55	23.5
	36–45	62	26.5
	46–55	63	26.9
	≥56	54	23.1
Education	Other	10	4.3
	Below bachelor' degree	84	35.9
	Bachelor's degree	95	40.6
	Master's degree	45	19.2
Region	Xuzhou (A)	91	38.9
	Jining (B)	67	28.6
	Huaibei (C)	76	32.5

Measures

Psychological Distance

Given the large number of items measuring psychological distance, following Williams and Oboyle (2008), we modeled the construct with four items selected from its four different dimensions. The items, adapted from Li S. et al. (2019) and Spence et al. (2012), were on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). Here, we place particular emphasis on the relationships between social members' psychological distance and their psychological response to others' adoption of PEBs. We use negative effects to measure the psychological distance. Doing so will turn the negative relationship into a positive one. The item measuring spatial or geographical distance is: "I feel that the place where I live has been negatively affected by environmental changes"; the item measuring social distance is: "I feel that the lives of people around me are negatively affected by environmental changes"; the item measuring temporal distance is: "I think in recent years my life has been more negatively affected by environmental changes." The item measuring uncertainty of social members' perception of environmental changes is: "I am more and more confident about the negative results brought about by environmental changes." Cronbach's α for the scales was 0.973.

Social Members' Psychological Reaction to Others Adoption of Pro-environmental Behaviors

Here, we drew on and adapted the scales developed by Hennig-Thurau et al. (2006), Tsai and Huang (2002) to measure social members' psychological reaction to others' adoption of PEBs. The items are on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree) and include: "I wish to adopt pro-environmental behaviors when more and more people around me have adopted pro-environmental behaviors"; "I feel that environmental protection is really important when I frequently exposed to the propaganda of the environmental protection"; "I really enjoyed interacting with social members who have adopted PEBs." Cronbach's α for the scales was 0.984.

Social Members' Willingness to Spread Pro-environmental Behaviors

Following Groth et al. (2009), we created a three-item scale to measure social members' willingness to spread PEBs. The 5-point Likert scale (1 means completely disagree, and 5 means completely agree) included: "I am willing to actively spread PEBs because the protection of the environment is very important for human beings"; "Next time if I see someone doing damages to the environment, I am willing to stop them"; "I am willing to recommend pro-environmental behaviors to others." Cronbach's α for the scales was 0.962.

Social Members' Perception of Justice Enforceability

In this study, we measured social members' perception of justice enforceability by assessing their perception of justice enforceability of government environmental policy. Following Rupp et al. (2013), we created a four-item scale to measure social members' perception of justice enforceability of government environmental policy: "I feel that the existing environmental protection policies can fairly promote everyone's willingness to protect the environment"; "I feel that the existing environmental protection policies do not just make a few people adopt pro-environmental behaviors"; "I feel that if other people have begun to engage in pro-environmental behaviors, I should also adopt

pro-environmental behaviors"; "I feel that if I have adopted pro-environmental behavior, others should also adopt pro-environmental behavior" (1 means completely disagree, and 5 means completely agree). Cronbach's α for the scales was 0.972.

Social Members' Cognitive Appraisals of Others' Engagement in Pro-environmental Behaviors

Social members' cognitive appraisal of others' engagement in PEBs was measured by their assessment of the positive value of others' adoption of PEBs. Following Wang et al. (2017), we used a three-item scale to assess social members' cognitive appraisal of others' engagement in pro-environmental behaviors: "I'd say that social members who adopt pro-environmental behaviors really love the beautiful environment"; "I think that those social members are really voluntary to adopt pro-environmental behaviors"; "I'd say that purpose of those social members who adopt PEBs is really for protecting the environment." Cronbach's α for the scales was 0.970.

Control Variables

In the literature of psychological distance and cognitive science, scholars have proved that people's education, age, and region will affect their psychological response to others' adoption of PEBs. We control for the academic background of the respondents, mainly because respondents with higher education will be more susceptible to the severity of environmental problems. Their psychological reaction will be more positive when they see others' adoption of pro-environment behaviors. We code a 1 for "Other," a 2 for "Below bachelor's degree," a 3 for "Bachelor's degree," and a 4 for "Master's degree." We control for the age of the respondents, because the younger generation in China will be more concerned about environmental changes. We code a 1 for age "≤35," a 2 for "36–45," a 3 for "46–55," and a 4 for "≥56." We control for the region that the respondents live in, because city managers have different propaganda on environmental protection, so that respondents living in different cities have different attitudes toward PEB. We code a 1 for "Huaibei," a 2 for "Jining," and a 3 for "Xuzhou."

Validity Analysis

We evaluated the factor structure of the measures through a confirmatory factor analysis (CFA) of the latent variables in our model: p*erceived psychological distance*, p*sychological response to PEBs adoption of other social members*, w*illingness to spread PEBs*, p*erception* of *justice enforceability*, and *cognitive appraisals about other social members' adoption of PEBs*. Usually, the threshold of factor loading needs to exceed 0.6, and the threshold of scale reliability needs to be greater than 0.7 (Campbell and Fiske, 1959). The standardized loadings in the measurement model exceed 0.6 and load on their respective factors (see **Table 2**). The hypothesized five-factor model displayed good fit, when individual scale items were loaded on separate first-order latent factors ($\chi^2(109) = 487.02$; $p = 0.000$, RMSEA = 0.099; SRMR = 0.05; CFI = 0.954; Hu and Bentler, 1999).

In order to rule out the possibility of common method bias accounting for these results, we also tested a model with two latent factors, one of the latent factors contains the whole items measuring *perceived psychological distance*, *psychological response to PEBs adoption of other social members*, and the other latent factors contains the whole items measuring *perception* of *justice enforceability* and *cognitive appraisals*. The fit of this model is poor ($\chi^2 154 = 710.32$; RMSEA = 0.17; SRMR = 0.16; CFI = 0.955). In the same vein, we also tested the model with three or four latent factors, the fits of these models are all worse than the five-factor model.

TABLE 2 | Results of the confirmatory factor analysis.

Variables	Items	Standardized loadings	SE	*p*
Perceived psychological distance	x11	0.955	0.019	***
	x12	0.972	0.014	***
	x13	0.976	0.013	***
	x14	0.973	0.014	***
Psychological response	x21	0.964	0.012	***
	x22	0.986	0.008	***
	x23	0.98	0.009	***
Willingness to spread PEBs	x31	0.952	0.015	***
	x32	0.948	0.013	***
	x33	0.944	0.014	***
Perception of justice enforceability	x41	0.954	0.012	***
	x42	0.957	0.011	***
	x43	0.945	0.013	***
	x44	0.933	0.015	***
Cognitive appraisals	x51	0.944	0.014	***
	x52	0.961	0.012	***
	x53	0.965	0.011	***

*n = 234, For ease of discussion, with X1 designating perceived psychological distance, X2 designating psychological response to PEBs adoption of other social members, X3 designating willingness to spread PEBs, X4 designating justice enforceability, and X5 designating cognitive appraisals. ***p < 0.01.*

RESULTS

The means, standard deviations, correlations of the variables, and reliability estimates are shown in **Table 3**. *Psychological response* is positively related to *perceived psychological distance* (r = 0.648, $p < 0.01$) and *willingness to spread PEBs* ($r = 0.646$, $p < 0.01$), *perceived psychological distance* is positively related to *willingness to spread PEBs* ($r = 0.825$, $p < 0.01$).

Below, we tested these hypotheses about (conditional) indirect effects by relying on Hayes's (2013) PROCESS macro in SPSS.

After we controlled for education, age, and region, the results of the hypothesis testing using the Model 9 of the process (Hayes, 2013) are reported in **Tables 4–6**.

Direct Effects

We used the Hayes's (2013) PROCESS procedure (model 14, default settings) for testing hypotheses in this study. The results of the model fit are shown in **Table 4**.

We estimated 95% confidence intervals for the direct effects by bootstrapping 5,000 samples, results are reported in **Table 4**. As **Table 4** indicates, there is a positive correlation between

TABLE 3 | Descriptive statistics, correlations, and reliabilities.

	Mean	SD	1	2	3	4	5	Age	Sex	Education	Region
X1	3.33	1.42	(0.973)								
X2	2.43	1.22	0.648**	(0.984)							
X3	2.5	1.04	0.825**	0.846**	(0.962)						
X4	2.31	1.05	0.718**	0.786**	0.630**	(0.972)					
X5	2.24	1.11	0.681**	0.750**	0.616**	0.668**	(0.97)				
Age	35.53	10.56	-0.979**	-0.974**	-0.855**	-0.774**	-0.734**				
Sex	0.42	0.49	-0.014	0.009	-0.003	0.020	0.031	0.010			
Education	2.58	0.7	0.083	0.060	0.130*	0.099	0.103	-0.087	-0.049		
Region	2.01	0.82	0.955**	0.940**	0.774**	0.686**	0.633**	-0.946**	-0.013	0.047	

*Internal reliabilities (Cronbach's alphas) for the constructs are provided in parentheses on the diagonal. *p < 0.05; **p < 0.0.01.*

TABLE 4 | Path coefficients of the conceptual model.

		Consequent						
		X2			X3			
Antecedent		Coeff	SE	p		Coeff	SE	p
X1	α	0.275	0.034	0.000	c_1'.	163	0.080	0.043
X2					c_2'.	542	0.093	0.000
常数项	i_{X2}	0.948	0.109	0.000	i_{X3}	0.648	0.0966	0.000
		R^2_{X2}0.9574				R^2_{X3}0.7210		
		$F_{X2}(5, 228)$1023.859,p < 0.05				$F_{X3}(2, 231)$298.471,p < 0.05		

α denotes the path from perceived psychological distance to psychological response; c_1'enotes the path from psychological response to willingness to spread PEBs; c_2'enotes the path from perceived psychological distance to willingness to spread PEBs.

TABLE 5 | Index of moderated mediation (X1→X2→X3).

X4	X5	Effect	BootSE	BootLLCI	BootULCI
1.000	1.000	0.272	0.057	0.154	0.378
1.000	2.000	0.303	0.073	0.161	0.450
1.000	3.667	0.357	0.113	0.157	0.595
2.000	1.000	0.362	0.073	0.211	0.494
2.000	2.000	0.394	0.078	0.228	0.532
2.000	3.667	0.447	0.106	0.237	0.653
3.500	1.000	0.497	0.109	0.278	0.708
3.500	2.000	0.529	0.104	0.309	0.718
3.500	3.667	0.583	0.114	0.336	0.777

TABLE 6 | Results of the fit of the conditional process model.

	coeff	se	t	p	LLCI	ULCI
constant	0.948	0.109	8.686	0.000	0.733	1.163
X1	0.275	0.034	8.104	0.000	0.208	0.342
X4	−0.338	0.190	−1.779	0.077	−0.712	0.036
Int_1	0.167	0.060	2.801	0.006	0.049	0.284
X5	−0.279	0.190	−1.469	0.143	−0.653	0.095
Int_2	0.059	0.059	0.994	0.321	−0.058	0.176
age	−0.0681	0.0085	−8.0618	0.0000	−0.0848	−0.0515
edu	−0.0314	0.0196	−1.5998	0.1110	−0.0700	0.0073
region	0.3604	0.0597	6.0383	0.0000	0.2428	0.4781

R^2 = 0.957, $F(5, 228)$ = 1023.859, p = 0.000 Int_1 = X1 × X4, Int_2 = X1 × X5

X1 denotes perceived psychological distance, X2 denotes psychological response to PEBs adoption of other social members, X3 denotes willingness to spread PEBs, X4 denotes perception of justice enforceability, and X5 denotes cognitive appraisals.

social members' perceived psychological distance and their psychological responses to other people's adoption of PEB (because *we use negative effects to measure the psychological distance*). The regression coefficient between the above two variables is 0.275 (β = 0.275, $p < 0.05$), and the 95% confidence interval is [0.208, 0.342] that does not straddle zero, so zero can be confidently ruled out, thus Hypothesis 1 was supported. To put it differently, the more proximal the psychological distance that the social members in a social system perceive, the stronger they will positively react to others' adoption of PEBs. Social members' psychological response to others' adoption of PEBs exhibit a positively effect on their willingness to spread PEBs (β = 0.163, $p < 0.05$), supporting Hypothesis 2. We found that the direct effect of social members' perceived psychological distance on their willingness to spread PEBs was significant and positive (β = 0.542, $p < 0.05$), providing support for Hypothesis 3.

Through the test of Hypotheses 1–3, we observed that social members' perceived psychological distance not only exhibited a direct effect on their psychological response to others' adoption of PEBs, but also exhibited a direct effect on their willingness to spread PEBs. Therefore, if social members' psychological responses to other people's adoption of PEB mediates the influence of their perceived psychological distance (X1) on their willingness to spread PEB (X3), the mediating effect is just partial. Below, we will further examine whether the indirect effect of perceived psychological distance (X1) on the willingness of social members to spread PEB is significant or not.

Indirect Effect

We estimated 95% confidence intervals for the indirect effects by bootstrapping 5,000 samples, results are reported in **Table 5**.

As **Table 5** and **Figure 2** indicate, at three different values for *cognitive appraisals* corresponding to the 1.000, 2.000, and 3.667, all confidence intervals [BootLLCI, BootULCI] do not included zero. So, we could claim that social members' *psychological response to PEBs adoption of other social members* just partially

mediated the effect of their *perceived psychological distance on their willingness to spread PEBs*. Hypothesis 4 was supported. In addition, we can see from **Figures 2**, **3** that in contrast to the condition of justice enforceability, when the social members' cognitive appraisals gradually increased, the effect of changes of their perceived psychological distance on their willingness to spread PEB was much weaker.

Test of the Moderating Effects

We estimated 95% confidence intervals for the moderating effects by bootstrapping 5,000 samples, results are reported in **Table 6**.

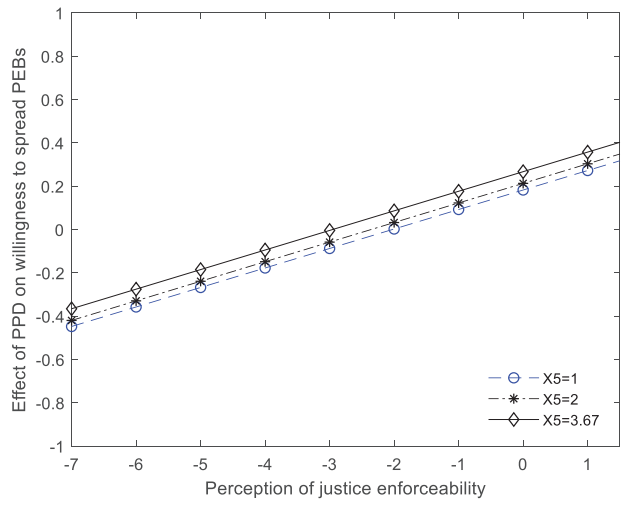

FIGURE 2 | A visual representation of the conditional indirect (values of perception of justice enforceability is 1, 2, and 3.67, respectively). PPD, perceived psychological distance, X5 = cognitive appraisals.

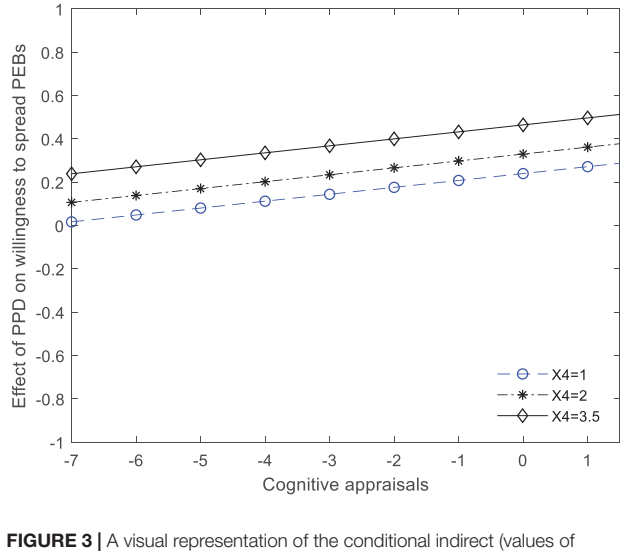

FIGURE 3 | A visual representation of the conditional indirect (values of perception of *cognitive appraisals* is 1, 2, and 3.5, respectively). X4 = perception of justice enforceability.

The regression coefficient of "perceived psychological distance × *perception* of *justice enforceability*" is positive and significant (β = 0.167, $p < 0.05$), supporting Hypothesis 5. Therefore, we could claim that the *perception* of *justice enforceability* positively moderated the impact of social members' perceived psychological distance (X1) on their psychological responses to others' adoption of PEBs.

Besides, the regression coefficient of "perceived psychological distance × *cognitive appraisals*" is positive but not significant (β = 0.059, $p = 0.321$), the confidence interval [-0.058, 0.176] includes zero. Therefore, we could not definitely claim that the *cognitive appraisals* positively moderated the impact of social members' perceived psychological distance (X1) on their psychological responses to others' adoption of PEBs. So, Hypothesis 6 was not supported.

For the covariates "age, edu, and region," we can see from results of the fit of the conditional process model that the effect of social members' education on their psychological responses to other people's adoption of pro-environment behaviors is not significant (β = -0.0314, $p = 0.1110$). Age of social members have a negative effect on their psychological responses to other people's adoption of pro-environment behaviors (β = -0.0681, $p < 0.05$). That is, the older the social members are, the weaker the positive psychological reactions they would make to other social members' adoption of pro-environment behaviors. Social members in economically developed areas will have a more positive psychological response when facing other social members' adoption of pro-environment behaviors (β = 0.3604, $p < 0.05$).

Figure 4 display the visualizing moderating effects of *perception* of *justice enforceability* and *cognitive appraisals*. In this study, we use the 16th, 50th, and 84th percentiles of the distribution of X4 (*perception* of *justice enforceability*). These are 1, 2, and 3.5, respectively. In the same vein, the 16th, 50th, and 84th percentiles of the distribution of X5 (*cognitive appraisals*) are 1, 2, and 3.67, respectively. From the above three figures, we could clearly observe that as the value of X4 increases, the effect of social members' perceived psychological distance (X1) on their psychological response (X2) to others' adoption of PEBs also increases. Besides, we can see from **Figure 4** that as the value of *cognitive appraisals* gradually increase (X5 = 1, 2, 3.67, respectively), the slope of the line in **Figure 4** become much steeper, although the moderating effect of *cognitive appraisals* is not significant, which suggest that with the value of *cognitive appraisals increasing*, the impact of perceived psychological distance on social members' psychological responses (X2) to others' adoption of PEBs will be further amplified.

DISCUSSION

The purpose of this study is to investigate the conditions on which the social members' perception of psychological distance in a social system affects their positive psychological response to others' adoption of PEBs. By testing the hypotheses with the data collected by survey, we find that in a social

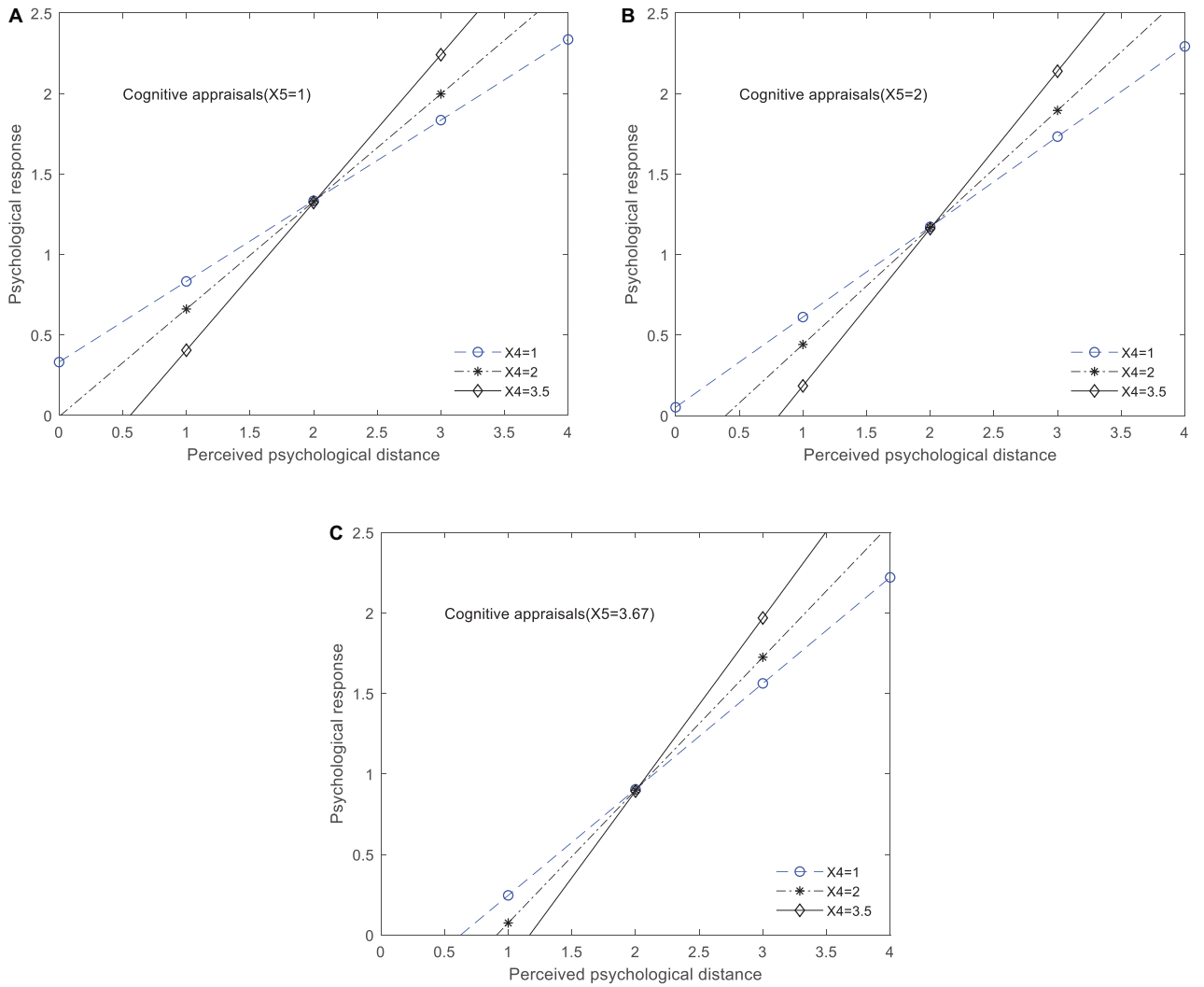

FIGURE 4 | (A) The moderating effect of *perceived psychological distance* and *perception* of *justice enforceability* on the relations between social members' perceived psychological distance and their *psychological response to PEBs adoption of other social members* (*cognitive appraisals = 1*). **(B)** The moderating effect of *perceived psychological distance* and *perception* of *justice enforceability* on the relations between social members' perceived psychological distance and their *psychological response to PEBs adoption of other social members* (*cognitive appraisals = 2*). **(C)** The moderating effect of *perceived psychological distance* and *perception* of *justice enforceability* on the relations between social members' perceived psychological distance and their *psychological response to PEBs adoption of other social members* (*cognitive appraisals = 3.67*).

system, when the government cannot force social members to adopt PEBs through compulsory means, social members' perceived psychological distance to environment change plays a key role in driving the adoption of the PEBs. Because social members engagement with PEBs need to pay extra costs, when only a few members but not most members engage in PEB, this will create an unfair atmosphere in which those social members who have adopted PEBs will have a sense of unfairness, thereby reducing their willingness to adopt PEBs. The results of the study show that social members' willingness to adopt and spread PEB could be strengthened by enhancing their *perception* of *justice enforceability*, even under the condition that in their adoption of PEB they need to pay additional costs. In the following, we will focus on the theoretical and practical implications of this research.

Theoretical Implications

Our theoretical model clarifies the mechanism by which social members' perceived psychological distance affects their willingness to spread PEBs. Scholars have explored the spread of behaviors from the structure of social networks. In this study, we study the spread of behaviors, from some non-network structure parameters, that need people to pay extra costs. Existing studies suggested that network structure parameters, such as network connectivity, network distance, network density, and network centrality, are important factors that affect the spread of behaviors. Our research demonstrated that social

members' perceived psychological distances, their psychological responses to others' adoption of PEBs can also affect their willingness to spread PEBs.

Further, our research found that social members' perception of justice enforceability is a condition under which their perceived psychological distances affect their psychological responses to other social members' adoption of PEBs. From the perspective of social comparison and social fairness, the deterioration of environmental problems will have a direct or indirect impact on all people in the world. Therefore, everyone has a responsibility to protect the environment. In the social system, moral standards will make people feel that it is unethical to not adopt PEBs, although doing so is not illegal, they are still willing to bear the responsibility of adopting PEBs. When a social member observes that other social members have adopted PEBs and made contributions to the protection of the environment, this will result in the effect of spillover and a social comparison, which will also encourage him to adopt PEBs, otherwise, he himself could have a sense of injustice. We know that injustice mainly coming from social comparison is an important factor motivating a person's social behavior.

Finally, our work fleshes out the research on the spread of behavior in the social system. Our research found that social members' psychological distance can decrease their willingness to spread PEBs through the mediating role played by their psychological reaction to other people's adoption of PEBs. When the social members perceived they had a proximal psychological distance to environmental changes, they had a more positive psychological response to other social members engaging in PEBs, and their willingness to spread PEBs will also increase.

Practical Implications

Our research suggests that when we face the deterioration of environment changes, and the objective network distance is not conducive to the spread of PEBs, or when social members need to pay more additional costs for PEBs, then we can enhance their willingness to spread PEBs by changing their perceived psychological distance toward environment changes. Because it is difficult for us to change the objective distance of social networks in reality, but it is much easier for us to change the psychological distance that social members perceive. We suggest that social members engaging in PEBs can also have some negative impacts on and bring an extra burden to their daily lives. Additionally, China is not actually the country with the most serious environmental problems in the world. Thus, social members in China have a distal perceived psychological distance to environmental changes, their enthusiasm for engaging in PEBs is not high. However, from a long-term perspective, environmental degradation will have a very serious negative impact on China's economy and society, so protecting the environment must not be delayed. In this context, by changing the social members' distance perceptions of environmental changes, their willingness to spread PEBs can increase, the implementation of environmental protection measures can be promoted, and a healthier and safer environment for future generations can created.

Our research shows that in reality, by raising social members' awareness of environmental changes, their positive attitudes to environmental issues can be strengthened too. As China gradually enters a well-off society, people' demands for a healthy and safe environment is enhanced too. At present, Chinese people's awareness of environmental protection is gradually increasing, but their environmental awareness has not been completely transformed into real PEBs. Whether the environmental protection initiative is issued by the government or advocated by NGOs, its implementation will still encounter resistance in reality. In reality, perhaps people deem that environmental protection is very important, but they may not actually engage in PEBs in reality. Many people have the idea that protecting the environment is the business of other people, not their own. They think that the deterioration of the environment may harm other people rather than themselves. Therefore, when the government makes an effort to implement environmental protection policies, it is important to change the attitude of social members toward the issue of environmental protection, so as to amplify the effect of their psychological distance on the spread of PEBs.

Besides, our research findings can provide support for the government promoting the implementation of environmental protection policies. Our research shows that the abstract perception of psychological distance can change social members' psychological responses to other people's adoption of pro-environment behaviors, this depends on their perception of justice enforceability. If the government can create a fair environment for implementing environmental protection initiatives or policies, then the more proximal the psychological distance of environmental issues are perceived to be by social members, the more positive psychological reaction they will have to others' adoption of PEBs, and their own willingness to adopt PEBs also is enhanced.

Limitations of This Study and Further Research

Most studies have limitations, and this study is no exception. In this study, although we have verified from the perspective of fairness that the effect of social members' perceived psychological distance on the spread of PEB that needs them to pay extra costs depends on the perception of justice enforceability and cognitive appraisals, yet we do not accurately measure the magnitude of the dependence. In addition, although our research shows that social members' perceived psychological distance affects their response to other social members' adoption of PEBs, yet we could not definitely claim that such an effect is linear or non-linear. So, the above questions can be the focus of future research. In the process of data collection, the questionnaires were distributed to residents who have lived in a city for more than 3 years, doing so may cause sampling bias. Because the length of time residents live in a city may affect their perceived psychological distance to the environmental protection of a city. In addition, our questionnaires are distributed at different times, which may also invoke sample bias.

CONCLUSION

By our research findings, we suggest that the government can use social members' perceived psychological distance as an effective tool to enhance the spread of PEBs. However, our conceptual model highlights the need to consider the contingency of the impact of social members' perceived psychological distance on their response to other social members' adoption of PEBs. Our research reveals that the impact of social members' perceived psychological distance on their response to other social members' adoption of PEBs is contingent on their perception of justice enforceability and cognitive appraisals (not significant) toward the adoption of PEBs. This research finding thus contributes to theory refining of the spread of behaviors and provides implications and recommendations about the implementation of environmental protection policies for the government.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the ethics committee of China University of Mining & Technology. The ethics committee waived the requirement of written informed consent for participation.

AUTHOR CONTRIBUTIONS

ZX was responsible for reviewing the literature and doing statistical analysis. QC contributed to manuscript drafting and helped to collect data. SL contributed to conventionalizing the core constructs and design of the study. All authors contributed to the article and approved the submitted version.

FUNDING

This study was supported by the National Natural Science Foundation of China (71972176).

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

frontiers in Psychology

SYSTEMATIC REVIEW
published: 19 November 2020
doi: 10.3389/fpsyg.2020.568899

The Psychological Distance and Climate Change: A Systematic Review on the Mitigation and Adaptation Behaviors

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Background and Objective: Currently, climate change represents an existential, physical, and psychological threat. Therefore, mitigation and adaptation actions and measures have become increasingly necessary to preserve individual and collective well-being. The psychological distance is one of the main psychological constructs that explains the most concrete or abstract perception of the objects and events surrounding people. The psychological distance is a multidimensional construct, and in accordance with the construal level theory (CLT), temporal, hypothetical, spatial, and social distance are considered the most critical dimensions. This systematic review aims to provide an update of the literature on the role of psychological distance in the commitment to engagement mitigation and adaptation attitudes toward climate change.

Method: The review was carried out following PRISMA guidelines and a systematic search was performed on PubMed, Psycinfo, Web of Science, Cochrane, and Scopus databases.

Results: Nineteen articles have been identified as being eligible for the final synthesis. Results showed, in general, that individuals have a higher propensity to perform pro-environmental and resilient behaviors against climate change when it is perceived as more proximal and concrete within the construct of psychological distance. However, not all studies show this result. Some studies showed that, despite people considering climate changes as real and tangible, they do not perform mitigation and adaptation behaviors. Other studies showed that people implement these behaviors despite perceiving climate changes as distal and abstract.

Conclusions: The current literature shows the existence of a relation among psychological distance and pro-environmental and resilient behaviors applied to climate change. For a deeper understanding of the conflicting results that emerged, more studies are necessary to explore the possible presence of further psychological variables involved in the relation within psychological distance, mitigation, and adaptation in environmental contexts.

Keywords: climate change, psychological distance, adaptation, mitigation, pro-environmental behavior, resilient behavior, environmental attitudes, construal level theory

OPEN ACCESS

Edited by:
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Chinese Academy of Sciences (CAS), China

Reviewed by:
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Specialty section:
This article was submitted to Environmental Psychology, a section of the journal Frontiers in Psychology

Received: *02 June 2020*
Accepted: *27 August 2020*
Published: *19 November 2020*

Citation:
Maiella R, La Malva P, Marchetti D, Pomarico E, Di Crosta A, Palumbo R, Cetara L, Di Domenico A and Verrocchio MC (2020) The Psychological Distance and Climate Change: A Systematic Review on the Mitigation and Adaptation Behaviors. Front. Psychol. 11:568899. doi: 10.3389/fpsyg.2020.568899

INTRODUCTION

The theory of the Construal Level explains that there is a relation among the psychological distance and response of people to a specific event (Liberman and Trope, 1998, 2003). The psychological distance is composed of four dimensions: spatial, social, temporal, and hypothetical (Liberman et al., 2007; Liberman and Trope, 2008). Each dimension is interrelated to the others (Fiedler et al., 2012), despite the lack of commonalities (Trope and Liberman, 2012).

The psychological distance is one of the main psychological constructs that explains the most concrete or abstract perception of the objects and events surrounding people. An object, or event, can be perceived as psychologically close or far away. When it is perceived as psychologically close, it is represented as being more concrete, while when it is perceived as psychologically far away, the representation is more abstract (McDonald et al., 2015). Therefore, psychological distance is linked with different construal's of objects and events (Trope and Liberman, 2010). While the constructs on a concrete level are focused on the details, those on a more abstract level are concentrated on the "big picture" (McDonald et al., 2015).

Psychological distance, therefore, could be involved in pro-environmental and resilient behaviors in relation to climate change. People are more likely to perceive climate change more concretely when they perceive it more closely and, as a result, there may be a growing willingness to engage in pro-environmental and resilient behaviors. Whereas, when people have a more abstract representation of the event it is because climate change is perceived as more distant (McDonald et al., 2015).

The spatial distance represents the physical distance toward an event. Therefore, people perceive worsening environmental conditions to be occurring in remote geographical areas (Gifford et al., 2009). People often tend to perceive more serious climate changes in developing areas and less severe where they live (Jamieson, 2005; Reser et al., 2012). This may happen because there is a tendency for people to detach themselves from information that could increase fear (Shepherd and Kay, 2012). People tend to see the positive aspect of climate change when this is psychologically close to their place. On the contrary, individuals tend to incline to the negative aspect when climate change is psychologically distant.

The hypothetical distance relates to the probability of whether an event can happen, or not. It also relates to the certainty perceived regarding a future event (McDonald et al., 2015). The uncertainty of the climate change occurrence often leads to people not fully understanding the different climate change predictions and, therefore, incorrectly analyzing the probability of its occurrence (Budescu et al., 2012).

Regarding the temporal distance, although it is accepted that actual climate change is occurring and that it has consequences, people could perceive it as psychologically far because its related effects are far in the future. About climate change, Leiserowitz (2005) highlighted that people generally tend to perceive that impacts are happening now. Still, they tend to consider that in the future, the consequences of impacts will be more severe.

Finally, social distance explains how people can accept climate change and how they can socially ward off the phenomenon when the most severe threats are considered. The impacts of climate change are frequently perceived as more severe in developing countries and in more geographically distant zones (Gifford et al., 2009; Reser et al., 2012). Self-closeness to an event appears to be related to a greater concern. The way people perceive an event defines how "socially distant" they are from the situation. Indeed, with greater social distance, people can prepare to act as soon as possible.

Generally, when climate change is discussed, several interventions are considered to address it. These interventions are mainly represented by behaviors that minimize harm to the environment as much as possible, or even benefits it: pro-environmental behaviors (Steg and Vlek, 2009). Various types of environmentally significant behaviors have been identified in the literature. According to the value-belief-norm (VBN) theory of Stern et al. (1999) there are four environmentally significant behaviors: environmental activism, non-activist public-sphere behaviors (e.g., environmental citizenship, policy support), private-sphere environmentalism (e.g., consumer purchase behaviors, maintenance of household equipment, waste disposal behaviors), and behaviors in organizations (i.e., behaviors affecting organizational decisions).

Furthermore, all environmentally significant behaviors are influenced by four main causal variables: attitudinal (e.g., general environmentalist predisposition, behavior-specific norms and beliefs, perceived costs, and benefits of action), personal capabilities (e.g., financial resources, social status, behavior-specific knowledge, and skills), contextual factors (e.g., material costs and rewards, laws and regulations, available technology), and habit and routine (Stern, 2000). However, pro-environmental behaviors can be considered as interventions that positively modify the environment directly and indirectly. Other types of attitudes can be implemented, not to alter the surrounding environment, but to support the inevitable changes that the environment undergoes and to live safely with them: resilient behaviors. These types of behaviors do not act directly toward the environment, but toward the individual, by changing the lifestyle and attitudes in synergy with the changes in the surrounding environment. They are especially needed when the environment is already changing. As well as climate change, the change is already underway. There are two main intervention behaviors for climate change: mitigation and adaptation. Mitigation is the possible reduction of climate change, for example, through pro-environmental behavior such as the reduction of emissions, greenhouse gases, and the use of renewable energy and eco-sustainable products. Adaptation is the preparation and the coexistence with climate change by preventing and reducing the effects of its impact and by exploiting the possible opportunities that may derive from it. Adaptation attitudes are implemented through resilient behaviors such as different tourism strategies (e.g., more summer activities than winter activities in mountain locations) or changes in the cultivation of agricultural products more suitable for different temperatures and climate conditions due to climate change. However, resilient behavior can coincide with

pro-environmental behavior as co-beneficial actions (Mayrhofer and Gupta, 2016). For example, growing a type of plant that is more resistant to insects that thrive in increasing temperatures, can lead to a reduction in the use of pesticides and, consequently, less air pollution.

The psychological distance can explain the commitment to engage pro-environmental and resilient behaviors and, consequently, a more significant engagement of mitigation and adaptation attitudes toward climate change. Perception, from a personal stance is essential because individuals are more probable to behave in favor of the environment, and/or respond resiliently to changes in the surrounding environment, when they perceive the problem of climate change as a difficulty that can have direct consequences for themselves (Lorenzoni and Pidgeon, 2006).

Implementing these types of strategies is often difficult, as a widespread commitment is required. In addition to the general commitment, motivation from a people's stance is also particularly important, because the adaptation responses, in particular, must start from the individuals themselves.

The present systematic review is intended to provide an upgrade of the literature on the role of the psychological distance in the commitment to engage in mitigation and adaptation attitudes toward climate change. The key query that pushed us toward this work addresses the complex and broad understanding of the link between psychological distance, pro-environmental and resilient behaviors, and the underlying reasons for the choice to engage, or not, in behaviors, intentions, and attitudes toward the environment.

METHODS

Information Sources and Searches

A systematic review of the literature was performed following the guidelines for systematic reviews and meta-analysis (PRISMA) (Moher et al., 2009). An electronic research strategy was carried out to identify peer-reviewed articles, assessing the role of psychological distance in the commitment to mitigation and adaptation attitudes to climate change up to mid-November 2019.

The keywords used for the review of the literature were: "climate change" OR "global warming" AND "psychological distance" OR "temporal distance" OR "spatial distance" OR "social distance" OR "hypothetical distance" AND "adaptation" OR "mitigation" OR "adaptation AND mitigation" OR "pro-environmental behavior" OR "resilient behavior" OR "environmental attitudes" OR "sustainable behavior."

PubMed, Psycinfo, Web of Science, Scopus, and the Cochrane Library were used as databases for the systematic search.

Eligibility Criteria

Only papers written in English were considered and if they examined the role of psychological distance on pro-environmental and resilient behaviors applied to climate change.

We excluded papers that considered further psychological variables related to mitigation and adaptation behaviors in the context of climate change. We also excluded theses, books, book chapters, meta-analyses, and reviews. Regarding study design, both qualitative and quantitative studies were included.

Analysis and Data Synthesis

The eligible studies described several results, also with regards to sample, design, and measures. In order to have a more complete evaluation, both qualitative and quantitative studies were included. The studies were categorized by comparing the sample and highlighted measures evaluated for each study and by summarizing the main results.

RESULTS

Study Selection

The search on databases initially produced 253 articles. Out of 253 articles, 79 were selected for the screening of the full text, and 42 were not included for other reasons (as shown in the PRISMA flowchart, **Figure 1**). Nineteen articles were considered as eligible and pertinent for the final qualitative synthesis. At an early phase of the research, 25 studies were thought to be eligible. Still, after the analysis of the full text, we considered it appropriate to exclude six studies that dealt with the construct of psychological distance in relation to other variables.

Results of Studies

Regarding the psychological distance: 12 studies investigated the spatial distance; 12 studies investigated the temporal distance; 10 studies investigated the social distance, and 7 studies investigated the hypothetical distance (see **Table 1**).

The studies are included in **Table 1** following the alphabetical order of the title of the paper. For each study we also reported the geographical area in which the study was carried out in. This is especially relevant because the impacts of climate change may differ between different geographical territories and may consequently be perceived differently. The description of results for each study is divided into three paragraphs based on environmental behavior: two studies explored the role of psychological distance in the commitment to adaptation behavior toward climate change (Niles et al., 2015; Singh et al., 2017); 10 studies focused on engagement in mitigation with reference to some dimensions of psychological distance and climate change (Spence et al., 2012; Busse and Menzel, 2014; Milfont et al., 2014; Carmi and Kimhi, 2015; Jones et al., 2017; Soliman et al., 2018; Chen et al., 2019; Griffioen et al., 2019; Kim and Ahn, 2019; Kyselá et al., 2019); seven studies analyzed the link between psychological distance and each dimension with mitigation and adaptation behaviors applied to climate change (Haden et al., 2012; Brügger et al., 2015a, 2016; Rickard et al., 2016; Schuldt et al., 2018; de Guttry et al., 2019; Wang et al., 2019).

Psychological Distance and Adaptation

Singh et al. (2017), using a simple mediation model, examined the force and direction of the link between the perceived dimension of psychological distance of climate change effects, the individuals' degree of concern for climate change effects, and the individual's support for adaptation policies. For each dimension (social, spatial, hypothetical), the direct effect of psychological

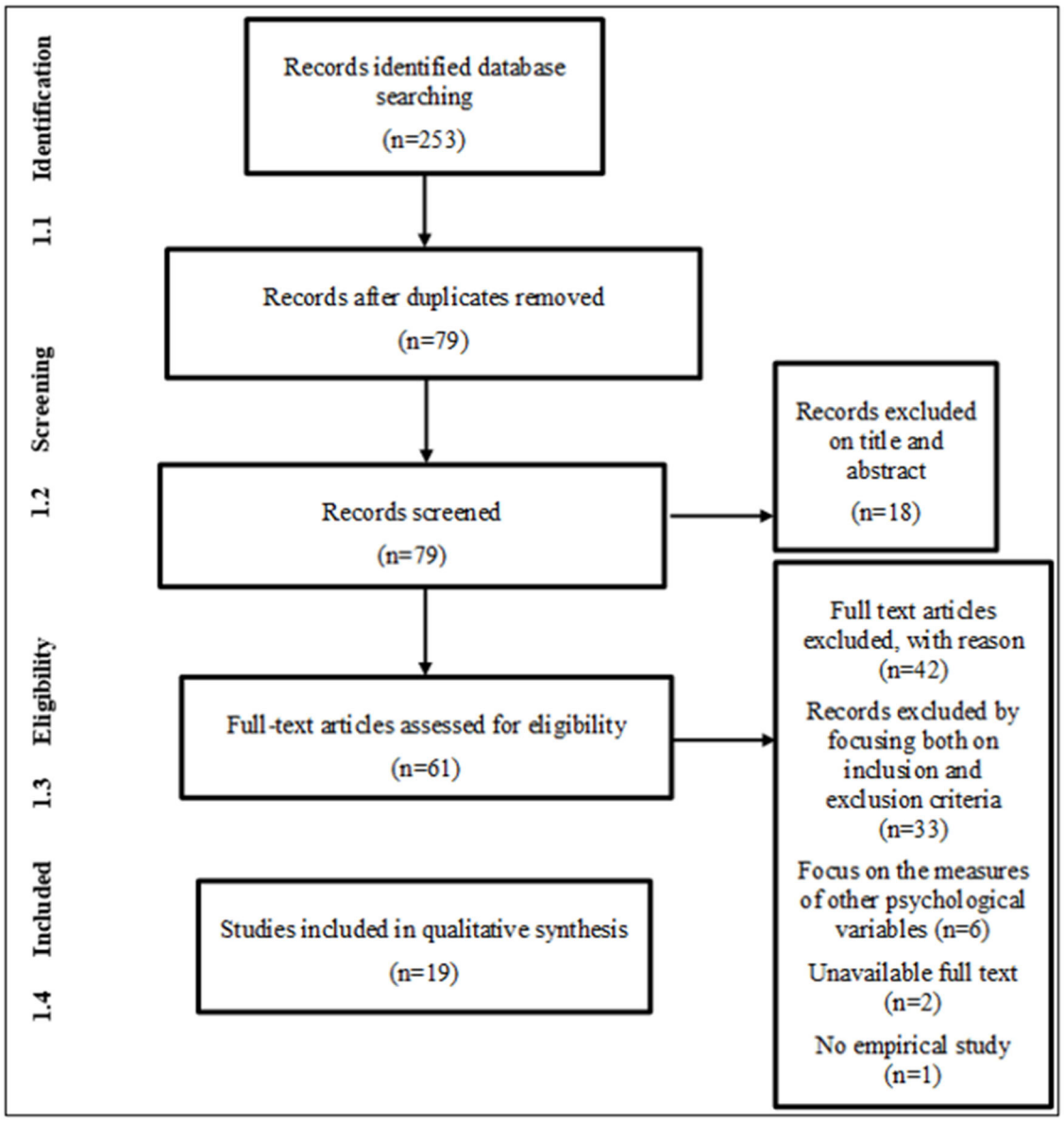

FIGURE 1 | Flowchart of the systematic.

distance on supporting adaptation policies has been significant except for temporal dimension, that has a significant indirect effect on policy support, as it is completely mediated by the degree of concern for climate change effects. Regarding relation between climate change impacts and support of climate adaptation policies, the results showed a significant total effect of psychological distance compared to hypothetical distance, and a significant overall negative effect (c') was detected for social and spatial distance. Considering the level of concern and perceived effectiveness of an adaptation approach, no significant effect of the temporal dimension of climate change impacts on support of the combined measure adaptation policies was found. For all dimensions of psychological distance (spatial, temporal, hypothetical, and social), response effectiveness was negatively correlated to both concern for climate change impacts and support for adaptation policy. People's perception of the effectiveness of an adaptation approach mitigates the effect of concern for climate change impacts on their degree of support for the combined measure of adaptation policies. When the psychology of distance is reduced and concern rises, the response efficacy may explain lower levels of support for adaptation measures.

Niles et al. (2015) connected the ecological principle of "Liebig's law of the minimum" with the psychological distance

TABLE 1 | Features of included studies assessing psychological distance and climate change behavior.

References "Title" (Sample's country)	Aims	Study type	Sample information	Type of psychological distance	Measure of psychological distance	Type of behaviors	Measure of behaviors
Kyselá et al. (2019) "Attitudes to public spending on environmental risk reduction: the role of temporal and spatial distance" (Norway)	To find out whether a more positive attitude on delayed action and distant or near risk reduction of two different environmental problems is different.	Quantitative *ad hoc* questions	*N* = 1,714; 839 male, 875 female; mean age = NA (18+) 8 randomized groups with no statistically differences	Spatial Temporal	8 *ad hoc* questions (1 for each group) with 7-point Likert-type scale	Mitigation	The agreement to use public funds to reduce environmental risk in the same 8 *ad hoc* questions with 7-point Likert-type scale
Wang et al. (2019) "Climate change from a distance: an analysis of construal level and psychological distance from climate change" (Australia)	To understand the possible link between perceived psychological distance, construal level, and support for climate action.	Quantitative 3 Studies S1: Survey S2: Survey S3: Survey + Task	S1: *N* = 218; 104 male, 114 female; mean age = 47.35 (18–84) S2: *N* = 216; 111 male, 105 female; mean age = 43.48 (18–79) S3: *N* = 320; 122 male, 198 female; mean age = 20.83 (17–68); 7 randomized groups	S1: All four dimensions + Construal level S2: All four dimensions + Construal level S3: Temporal + Construal level	S1: Psychological distance 1: 18-item measure with 5-point Likert-type scale; Psychological distance 2: NP-item measure with continuous sliding scale (0–100) + Environmental behavioral identification form (BFI-E); Response category width (RCW) S2: Psychological distance 1; Psychological distance + Environmental behavioral identification form (BFI-E); General behavioral identification form (BFI-G); Response category width (RCW) S3: Short-form of the Psychological distance 1 + Augmented version of the Behavioral identification form (BFI); Response category width (RCW)	Mitigation Adaptation	S1: Individual pro-environmental behavior; Community-level pro-environmental behavior (policy choice) S2: Individual pro-environmental behavior; Community-level pro-environmental behavior (policy choice) S3: Pro-environmental behavior (survey); Donation behavior (task)
Schuldt et al. (2018) "Does reduced psychological distance increase climate engagement? On the limits of localizing climate change" (USA)	To explore whether exposure to proximal (vs. distal) visual cues in term of spatial distance would lead to increased support for climate change-mitigation policies.	Quantitative Task + Survey	*N* = 251; 103 male, 148 female; mean age = 36 (NA)	Spatial + Construal level	Distance judgment (task); Attention check (1 multiple-choice question); Construal level (video description)	Mitigation Adaptation	Policy support: 12-item measure with 10-point Likert-type scale
Carmi and Kimhi (2015) "Further than the eye can see: psychological distance and perception of environmental threats" (Israel)	To show that individual differences in psychological distance determine the interpersonal differences in the perception of their severity, the level of environmental emotions, and the willingness to sacrifice for the environment.	Quantitative Survey	*N* = 305; 153 male, 152 female; mean age = 25 (NA)	Social Temporal Hypothetical	Social distance: 1-item measure with 5-point Likert-type scale Temporal distance: 1-item measure with 5-point Likert-type scale Hypotheticality: 1-item measure with 5-point Likert-type scale	Mitigation	Willingness to sacrifice scale: 6-item measure with 5-point Likert-type scale
Haden et al. (2012) "Global and local concerns: what attitudes and beliefs motivate farmers to mitigate and adapt to climate change?" (California)	To show that global beliefs and concerns about climate promote farmers mitigation behavior, while psychologically proximate concerns for local climate impacts will promote farmers adaptation behavior.	Quantitative Survey	*N* = 162; NA male, NA female; mean age = NA (NA)	Temporal + Construal level	Perceived change in local climate: 2-item measure with 3-point Likert-type scale; Future local water availability concerns: 3-item measure with 4-point Likert-type scale; Future local temperature concerns: 3-item measure with 4-point Likert-type scale; Global climate change belief and concerns: 5-item measure with 5-point Likert-type scale	Mitigation Adaptation	Energy and N efficiency practices: 4-item measure with 5-point Likert-type scale; New irrigation practices: 3-item measure with 5-point Likert-type scale; New cropping practices: 3-item measure with 5-point Likert-type scale
Brügger et al. (2015a) "Hand in hand: public endorsement of climate change mitigation and adaptation" (UK and Switzerland)	To explore the relationship between mitigation and adaptation actions by examining the correlations between different types of mitigation and adaptation and by investigating people's motives to mitigate and to adapt.	Quantitative 2 Studies S1: Survey S2: Survey	S1: *N* = 612; 280 male, 254 female, 78 no report gender; mean age = 39.3 (16–83) S2: *N* = 309; 159 male, 150 female; mean age = 36.6 (19–81)	S1: Spatial, Social S2: Spatial	S1: Risk perception (spatial): 7-item measure with 2 levels (proximal vs. distal); Support for mitigation/adaptation policies and personal behavioral intentions to adapt/mitigate (indirect social) S2: Risk perception (spatial) 7-item measure with 2 levels (proximal vs. distal)	Mitigation Adaptation	S1: Support for mitigation policies with 14 propositions; Support for pro-active adaptation policies with 15-item; People's future intentions to engage in behaviors to mitigate with 10 actions; Personal behavioral intentions to adapt with 8 actions S2: Support for mitigation policies with 14 propositions; Support for pro-active adaptation policies with 15-item

(Continued)

TABLE 1 | Continued

References "Title" (Sample's country)	Aims	Study type	Sample information	Type of psychological distance	Measure of psychological distance	Type of behaviors	Measure of behaviors
Rickard et al. (2016) "Here and now, there and then: How "departure dates" influence climate change engagement" (New York State and Singapore)	To explore how manipulating temporal and spatial distance in the context of climate change messaging about "departure dates" can influence policy support, risk perception, and affect.	Quantitative Survey	*N* = 376; 2 groups = New York State and Singapore N (New York State) = 193; 120 male, 73 female; mean age = 19.55 (NA) N (Singapore) = 183; 53 male, 130 female; mean age = 22.44 (NA)	Spatial Temporal	6 Messages types (short stories) with 3 temporal distance (2020, 2047, or 2066) and 2 spatial distance (New York City vs. Singapore)	Mitigation Adaptation	Policy support: 12-item measure with 10-point Likert-type scale
Niles et al. (2015) "How limiting factors drive agricultural adaptation to climate change" (New Zealand: Marlborough and Hawke's Bay)	To assess how farmers' past climate experiences influence their concern for future climatic limiting factors (water and temperature) and in turn, their likelihood to adopt adaptation behaviors.	Qualitative Quantitative Interviews + Survey	*N* = 490; 2 groups = Marlborough vs. Hawke's Bay N (Marlborough) = 177; NA male, NA female; mean age = NA (NA) N (Hawke's Bay) = 313; NA male, NA female; mean age = NA (NA)	Spatial	Local water concerns: 5-item measure with 4-point Likert-type scale; Local temperature concerns: 4-item measure with 4-point Likert-type scale; Global climate change concerns: 5-item measure with 5-point Likert-type scale	Adaptation	Climate change adaptation practices: 6-item measure with 6-point Likert-type scale
Brügger et al. (2016) "Proximising climate change reconsidered: A construal level theory perspective" (UK)	To reconsider the widespread belief that focusing on proximal (vs. distant) impacts of climate change should directly increase people's motivation to support mitigation and adaptation actions.	Quantitative Survey	*N* = 80; 14 male, 66 female; mean age = 20.6 (18–50)	Spatial + Construal level	Perceived risk: 7-item measure with 2 levels (proximal vs. distal) with 5-point Likert-type scale; High-construal level skepticism: 6-item with 5-point Likert-type scale	Adaptation Mitigation	Support for mitigation policies: 11-item measure with 5-point Likert-type scale; Personal intentions to mitigate: 10-item with 5-point Likert-type scale; Support for adaptation policies: 12-item measure with 5-point Likert-type scale; Personal intentions to adapt: 9-item with 5-point Likert-type scale
Milfont et al. (2014) "Proximity to coast is linked to climate change belief" (New Zealand)	To observe the distance to coast effect in a sample of a coastal nation with the measure climate change belief and support for government action to regulate emissions.	Quantitative Survey	*N* = 5,815; 2,328 male, 3,487 female; mean age = NA (NA)	Spatial	Geographic and regional information (based on the smallest geographical units in the census)	Mitigation	Support for emissions regulation: 1-item measure with 7-point Likert-type scale
de Guttry et al. (2019) "Situating climate change: Psychological distances as tool to understand the multifaceted dimensions of climate change meanings" (Germany)	To analyze how local and global, past, future and present, and social and individual dimensions of climate change interact in people's framings of climate change.	Qualitative Semi-structured interview	*N* = 36; NA male, NA female; mean age = NA (NA)	All four dimensions	Global phenomenon; Local phenomenon; Uncertain phenomenon; Issue of future; Anthropogenically-driven phenomenon	Mitigation Adaptation	Issue of materialization; political issue
Chen (2019) "Social representations of climate change and pro-environmental behavior intentions in Taiwan" (Taiwan)	To examine how people attribute meanings to climate change using social representations theory to explore the relationships between the social representation viewpoints and the people's intentions to engage in pro-environmental behaviors.	Qualitative Quantitative Semi-structured questionnaire	*N* = 245; 111 male, 134 female; mean age = NA (NA)	All four dimensions	Psychological distance: 6-item measure with 7-point Likert-type scale	Mitigation	Pro-environmental behavior intentions: 5-item measure with 7-point Likert-type scale
Jones et al. (2017) "The future is now: reducing psychological distance to increase public engagement with climate change" (Australia)	To observe how the four dimensions of psychological distance would mediate the message framing effect on climate change concern, and that both psychological distance and climate change concern would mediate the message framing effect on mitigation behavior.	Quantitative Video + Survey	*N* = 333; 190 male, 143 female; mean age = NA (18+); 2 groups = proximal frame vs. distal frame; N (proximal frame) = 178; N (distal frame) = 155	All four dimensions	Psychological distance: 26-item measure (spatial = 6-item; temporal = 8-item; social = 5-item; hypothetical = 7-item) with 5-point Likert-type scale	Mitigation	Mitigation intentions: 7-item measure with 5-point Likert-type scale

(Continued)

TABLE 1 | Continued

References "Title" (Sample's Country)	Aims	Study type	Sample information	Type of psychological distance	Measure of psychological distance	Type of behaviors	Measure of behaviors
Kim and Ahn (2019) "The moderating role of cultural background in temporal framing: focusing on climate change awareness advertising" (USA and South Korea)	To examine the effects of two temporal message frames in environmental advertising on attitude toward and intention to engage in the pro-environmental behavior.	Quantitative Image + Survey	*N* = 193; 27 male, 156 female; mean age: 20.82 (NA)	Temporal	Perceived temporal distance: 1-item measure with 7-point Likert-type scale	Mitigation	Attitude toward behavior with 7-point semantic-differential items; Behavioral intention: 3-item measure with 7-point Likert-type scale
Singh et al. (2017) "The perceived psychological distance of climate change impacts and its influence on support for adaptation policy" (United States)	To explore how an individual's perception of climate change impacts may influence their support for adaptation actions.	Quantitative Survey	*N* = 653; NA male, NA female; mean age = NA (NA)	All four dimensions	Psychological distance: 4-item with 7-point bi-polar Likert-type scales (if, when, where, and who)	Adaptation	Support for adaptation policies: 6-item measure with 5-point Likert-type scale
Spence et al. (2012) "The Psychological Distance of Climate Change" (Great Britain)	To provide an exploration of all dimensions of the psychological distance on climate change, and how the different dimensions of relate to each another.	Quantitative Survey	*N* = 1,822; 875 male, 947 female; mean age: NA (15+)	All four dimensions	Geographic distance: 2-item measure with 5-point Likert-type scale; Social distance: 2-item measure with 5-point Likert-type scale; Temporal distance: 1-item measure with 7-point Likert-type scale; Uncertainty/skepticism: 1-item measure with 6-point Likert-type scale and 4-item measure with 5-point Likert-type scale	Mitigation	Preparedness to act: 1-item measure with 5-point Likert-type scale
Busse and Menzel (2014) "The role of perceived socio spatial distance in adolescents' willingness to engage in pro-environmental behavior" (Germany)	To examine the effect of perceived social and spatial distance on adolescents' willingness to engage in pro-environmental behavior.	Quantitative 2 Surveys	*N* = 938; 2 groups = Germany vs. "Developing Country"; N (Germany) = 470; 209 male, 254 female, 7 unspecified; mean age = 16.35 (14–19) N ("developing country") = 468, 208 male, 252 female, 8 unspecified; mean age = 17.56 (12–18)	Spatial Social	Egoistic awareness of consequences resulting from ecological problems: 3-item measure with 5-point Likert-type scale; Biospheric awareness consequences resulting from socio-economic problems: 3-item measure with 5-point Likert-type scale	Mitigation	Willingness to engage in pro-environmental behavior: 11-item measure with 5-point Likert-type scale
Griffioen et al. (2019) "Which construal level combinations generate the most effective interventions? A field experiment on energy conservation" (Netherlands)	To investigate which combinations of high and low construal level interventions are most effective on a target behavior, warm water use, as well as on related behaviors, such as electricity use.	Quantitative task + 2 Surveys (Pre-intervention and Post-intervention)	*N* = 197; 2 groups = April 2015 vs. September 2015; N (April 2015) = 91; 45 male, 46 female; mean age = 22.13 (NA) N (September 2015) = 106, 46 male, 60 female; mean age = 20.36 (NA)	Social + Construal level	"How vs. Why" Task (2 conditions: low vs. high construal level); Trait construal level with 10-item Behavior Identification Form test (BIF); The option to choose a gift (task with 2 conditions: low vs. high social distance)	Mitigation	Water behavior (Shower and Shower time): 6-item; Electricity behavior (Switching off and Appliance use): 6-item; Pro-environmental behavior (Recycling, Buying envir-friendly products and Eating meat): 6-item measure with 5-point frequency scale
Soliman et al. (2018) "Wrinkles in time and drops in the bucket: circumventing temporal and social barriers to pro environmental behavior" (Canada)	To provide empirical evidence on the temporal distance, pro-environmental behavior and social norms.	Quantitative Survey + Task	*N* = 147; 30 male, 117 female; mean age: 18.8 (17–25)	Temporal	Subjective temporal distance (2 conditions: close vs. distant) + 2 measures with 11-point Likert-type scale	Mitigation	Environmental behavior inventory: 13-item measure with 5-point Likert-type scale; Environmental Intentions: the same 13-item measure with 5-point Likert-type scale

N, Sample sizes; NA, Not Available.

theory. In this study, limiting factors within a farm system were considered (water or temperature impacts). The study was conducted by surveying farmers from two regions of New Zealand: Hawke's Bay and Marlborough. The adoption of adaptation practices was influenced differently by the limiting factors between the two regions and their farm systems. The limiting factors differed between farm systems and regions, in relation to past climate changes, agro-ecological context, infrastructure, and adaptation capacity. In particular, water acted as a limiting factor in Hawke's Bay, while water and temperature acted as limiting factors in Marlborough. In general, the results showed that past climate experiences have not influenced global concerns (major psychological distance) about climate change and, therefore, they did not promote the adoption of adaptation behaviors. Instead, the climate adaptation behaviors have been conditioned primarily by a local pathway (minor psychological distance) where past experiences influenced local concerns on future climate change (see also Azadi et al., 2019).

Psychological Distance and Mitigation

Griffioen et al. (2019), considering the construal level theory and the social psychological distance, analyzed the interaction and the effects of different approaches (high vs. low construal and social level) implicated in interventions on pro-environmental behaviors. In particular, the authors assessed the use of electricity and warm water (usage time) in a sample of students residing in one-person apartments in an all-inclusive student housing facility and evaluated, through surveys, their perceived sustainability, environmental self-identity, and self-efficacy. Four experimental conditions were composed, two congruent (high construal and high social level or low construal and low social level), and two incongruent (high construal and low social level or low construal and high social level). Which experimental condition could promote mitigation behavior during the intervention period (6 weeks) was explored. In the high social distance condition, subjects who were in a high construal level condition (congruent), decreased the use of warm water more than those who were in a low construal level condition (incongruent). In the low social distance condition, no difference was found between high (incongruent) and low (congruent) construal level conditions. The results suggest that a high construal level approach is exclusively efficient when merged with another high construal level approach (social distance), while it is not efficient when merged with a low-level construal approach. In the latter case, the low construal level component could be considered the driving element for behavior, which may not be very efficient when aiming for pro-environmental behavior. Furthermore, social distance manipulation individually did not show significant differences in the use of warm water for both construal level conditions. Regarding the effect of the experimental conditions on the use of electricity, the results showed that the social distance manipulation, independent from the construal level manipulation, had a significant effect on electricity use. Those who were in a high social distance condition decreased electricity consumption more than those who were in a situation of a low social distance condition.

Kim and Ahn (2019) studied the relationship between temporal psychological distance and pro-environmental behaviors using a sample of college students in the U.S. and South Korea. In particular, this study analyzed the effects of an environmental ad explaining the distant future (i.e., end of the twenty-first century, high temporal distance) vs. near-future (i.e., next summer, low temporal distance) effects of climate change and the engagement commitment to use low consumption light bulbs (mitigation behavior). The authors used a model based on the theory of the constructive level and its relationship with climate change mitigation behavior, including the cultural background as a moderator. In particular, the interactions of four dependent variables were considered: perceived temporal distance (proximal vs. distal), perceived relevance, attitude for the pro-environmental behavior, and behavioral intention. The results showed that the perceived temporal distance had negative effects on attitude toward behavior and perceived relevance; subjects exhibited a more positive attitude toward behavior and higher perceived relevance when they perceived the future effects of climate change as temporally more proximal. Additionally, perceived relevance had a positive effect on attitude toward behavior, and attitude toward behavior positively influenced behavioral intention. Regarding the role of cultural background, when exposed to the distant-future frame, South Korean subjects were inclined to perceive the distant-future (high temporal distance) effects of climate change as more impending and personally important. They also reported a more positive demeanor for behavior and higher behavioral intention than U.S. subjects. Regarding the near future (low temporal distance) frame, though, no significant differences in the four dependent variables were found among U.S. and South Korean subjects. In short, a lower temporal distance level promoted a greater attitude toward climate change mitigation behavior, regardless of the geographical area.

Kyselá et al. (2019), investigated the stability of individuals' responses related to temporal and spatial characteristics of policy scenarios in the public funding condition on climate change or air pollution risk decrease. They also explored if political orientation conditions these effects for the two issues. The authors used a factorial survey experiment, carried out in Norway, to investigate temporal and spatial distance on environmental issues. The scenarios consisted of three characteristics: spatial scale, timing, and target risks (air pollution or climate change). The items of the survey investigated the decrease of climate change or air pollution in Norway or the world. The authors highlighted the effect of geographical distance in the scenarios (air pollution or climate change). The results showed that air pollution (a local issue) received a higher agreement regarding immediate public spending. On the contrary, climate change scenarios (perceived as more distant) received a higher agreement for delayed public spending. Little or no evidence has been found about the influence of political orientation.

Soliman et al. (2018), using an experimental methodology, provided empirical evidence for temporal distance, pro-environmental behavior, and social norms. The results showed that a given message could help consider the problem as subjectively current and stimulate a change of actions toward

situations that could happen in a distant future. The findings showed that, when they were considered individually, neither subjective temporal proximity nor social norms encouraged ecologically sustainable behavior. When they were considered together, they increased both mitigation intentions and behaviors. The subjects that have received the most support to perceive objectively distant results as subjectively imminent have reported a greater willingness to commit in ecologically responsible behavior, and therefore, stated having implemented sustainable behavior in the weeks succeeding the study. Accordingly, believing that climate change is imminent is not enough to become in favor of the environment, as people need to believe that their efforts are also part of social norms.

Jones et al. (2017), through the construal level theory, studied if communication intervention, focused on the reduction of psychological distance from climate change, could increase people's commitment in mitigation behavior. The authors created two treatment conditions, a multimedia message framed to increase psychological distance (distal condition), and a message framed one to decrease psychological distance (proximal condition). To measure the concerns on climate change and individuals' intentions to commit to mitigation behavior, subjects were casually included in one of two conditions. Moreover, the authors observed whether the effects of the treatment frames on climate change concern and mitigation intentions were totally mediated by all psychological distance dimensions (spatial, temporal, hypothetical, and social). The results indicate that the spatial, temporal, hypothetical, and social dimensions, are all significantly positively associated with climate change concern and mitigation intentions. The treatment frame manipulation was significantly associated with geographic (spatial), social, and uncertainty (hypothetical) of psychological distance dimensions, except for temporal distance. The participants in the proximal condition (lower psychological distance level) showed high levels of concern for climate change and strong intentions to undertake climate change mitigation behaviors compared those in the distal condition. However, through more in-depth analysis, it emerged that only hypothetical and social distances played an essential role in mediating the effect of the message frame manipulation. Subjects in the proximal frame condition considered climate change as less unsure and with greater probability to impact people like themselves. Additionally, reductions in perceived uncertainty and social distance were related to more climate change concern and greater intentions to commit to mitigation activities. Reduction of psychological distance could be achieved through messages that highlight the proximal impacts contrary to the distal of climate change. At the same time, the impact of the message on the concern of climate change could promote mitigation behaviors.

Carmi and Kimhi (2015) measured how people perceive climate change and the relative threats as close to themselves (social distance), imminent (temporal distance), and certain (hypothetical distance) in order to explore the reasons behind the discrepancy between the environmental threat, public response, and individual behavior. In particular, the study considered two sources of threats: environmental damage, such as air and water pollution and waste, etc., and global warming. The results showed that both environmental and global warming threats had a positive relationship with the three dimensions of psychological distance. The analyses also revealed that psychological distance is a strong and significant predicting factor for the perception of the two environmental threats. Furthermore, the effect of the psychological distance from both threats was also measured in relationship to three variables: perceived severity, environmental emotion, and willingness to practice mitigation behavior. Environmental emotions and willingness to practice mitigation behavior, were negatively correlated with psychological distance. Therefore, a lower level of psychological distance encouraged individuals to express stronger emotions toward the environment and a greater willingness to adopt mitigation attitudes.

Busse and Menzel (2014) evaluated the impact of the perception of social and spatial psychological distance on the willingness of adolescents to commit to pro-environmental behavior (mitigation behavior) concerning the biospheric consequences related to climate change. The authors administered two different questionnaires to two samples that referred to either a socio-spatially or a national distant position: one relating to the country of residence of the participants (sample 1) and another relating to a developing country (sample 2). The results showed that willingness to commit to pro-environmental behavior was associated with all independent variables (awareness of consequences and perceived behavioral control) except for perceived helplessness which was correlated with willingness to commit to pro-environmental behavior in sample 1 only. Therefore, all variables were correlated with each other in sample 1. Regarding perceived helplessness, no correlation was found. In sample 2, perceived helplessness was not associated with whatever the variables that measured awareness of consequences were, while it was negatively associated with perceived behavioral control. The correlation of all the variables with the categorical variable codifying the socio-spatial reference, highlighted a significant correlation with all the independent variables. Therefore, the results showed that biospheric awareness of consequences was negatively associated with psychological distance but positively correlated with all other variables. A correlation between willingness to commit to pro-environmental behavior and socio-spatial distance was not found.

Milfont et al. (2014) investigated the relation between physical closeness and the real belief of climate change, starting from the assumption that closeness is related to direct experience or anticipation of climate change. The results demonstrated how important geographic location is in addressing climate change. Distance from the coast, and therefore lower concerns for floods, rising sea levels, and other issues related to living near the coast, significantly predicted the reduction of levels of beliefs in climate change together with an inferior level of support for carbon emissions regulation. Proximity to the coast, instead, seemed to raise confidence in climate change, as people living on the coast have different opportunities to experience climate change because they can suffer different impacts such as floods and storms and rising sea levels, which therefore require greater adaptation.

Spence et al. (2012) investigated all dimensions of psychological distance (proximal vs. distal: spatial, temporal, hypothetical and social) on climate change and their interaction, as well as concerns toward climate change and sustainable behavior intentions (mitigation behavior concerning the energy use reduction). A survey in a nationally representative British sample was administered. The results indicated that the association between different psychological distance dimensions were all positive and very significant. In particular, the results showed that climate change was perceived as spatially, temporally, and hypothetically proximal. Regarding social dimension, the results were mixed. Specifically, the respondents perceived climate change as socially distant. Impacts of climate change are probably greater when experienced by other people, but also socially proximal because these effects are considered to be the same for all people. Significant correlations between psychological distance, concern regarding climate change, and sustainable behavior intentions were also found. Moreover, through a mediation model analysis, this study demonstrated that when concern regarding climate change was integrated inside the analysis, it operated as a significant mediating variable, thus decreasing the direct relation between psychological distance and mitigation behavior concerning energy use reduction, and highlighted the importance of people's concern for climate change.

Chen (2019), based on the Social Representations Theory (SRT), developed a self-reported, semi-structured, questionnaire on social representations of climate change in Taiwan. Social representations theory refers to the social psychological processes implicated in the construction of everyday knowledge of risk and the common-sense comprehension of the emergence of contemporary risk concerns (Moscovici, 1973; Smith and Joffe, 2013). In this exploratory study, Structural Equation Modeling (SEM) was used to analyze the determinants of social representation factors that may influence the intentions of the public to commit to mitigation behavior. Through this analysis, four factors of social representation of climate change were extracted: emerging climate change risk, media coverage and influence, psychological distance, and pro-environmental behavior intentions. A positive significant correlation, of social representations of emerging climate change risk and media coverage and influence on pro-environmental behavior intentions, was found. In particular, the two factors (emerging climate change risk and media coverage and influence) were decisive because they predict the public's mitigation behavior. Regarding social representation of psychological distance, climate change was perceived as proximal. Nevertheless, no significant correlation between psychological distance and pro-environmental behavior intentions was found.

Psychological Distance, Adaptation, and Mitigation

de Guttry et al. (2019), across a qualitative method and 36 semi-structured interviews with inhabitants of North Frisia (Germany), analyzed the proximal and distant levels of all four psychological distance dimensions (spatial, temporal, hypothetical, and social) regarding materialization of climate change and political issue (indirectly, mitigation, and adaptation behaviors). The analysis of qualitative interviews presented an elaborated model. In particular, the perception of climate change regarding materialization of climate change and political issue oscillated among various, or also ambiguous, distances and proximities, sometimes combining them. These results have shown multifaceted climate change meanings, simple or binary descriptions, which usually explain the perception of climate change as a distant problem, thus demonstrating the complex nature of climate change consequences. For this reason, according to the authors, considering a mixed perception (distal and proximal) of the psychological distance dimensions could be the best approach to promote mitigation and adaptation behaviors.

Schuldt et al. (2018) conducted two experiments attempting to decrease the spatial psychological distance of climate change, to increase people's commitment and political support for mitigation and adaptation behaviors. In particular, the subjects performed a visual-spatial task that described the Maldives as relatively proximal or distal. Subsequently, the participants judged the geographic distance of the nation (both in experiment 1 and 2) and watched and summarized a video describing its climate vulnerabilities (only in experiment 2). The results showed an effect on spatial psychological distance in both experiments. The participants in the proximal condition defined the Maldives as geographically closer and depicted its climate effects using a more tangible language. However, the reduced psychological distance did not increase public commitment and policy support. Additionally, the reduction of the spatial psychological distance did not increase the commitment to mitigation and adaptation behaviors.

Brügger et al. (2016), taking into consideration the construct of fear and skepticism, highlighted how proximal (compared to distal) effects of climate change could raise the motivation of people to implement mitigation and adaptation practices (see also Brügger et al., 2015b). The results show that in subjects with a proximal perspective, fear was correlated with risk perception. Therefore, the more individuals fear climate change, the more they perceive it as a risk. On the contrary, fear and risk perception, in people with a distant mindset, were not systematically correlated with each other. The higher the degree of fear in a proximity dimension, the more people are supportive of mitigation policies. On the contrary, low levels of fear did not show an effect on mitigation policy support. Regarding adaptation, the result highlighted that skepticism is negatively correlated with support for adaptation policies in the distant condition except for participants who had a proximal mentality.

Rickard et al. (2016) analyzed how modifying temporal and spatial psychological distance associated with climate change messaging can influence policy support to tackle climate change (an indirect measure to engage mitigation and adaptation behaviors) across a survey with an integrated experiment. Two groups from distant geographic areas (New York State and Singapore) were recruited. The study consisted of evaluating a message describing the same negative effects of climate change that could occur in three different time frames (proximal=2020; distal=2047; more distal = 2066) either in New York State or Singapore (3 × 2 experimental design). A total of six

experimental conditions were created and all subjects were included randomly into one of the six conditions. The authors investigated the subjects' political ideology (i.e., liberal vs. conservative) and included it in the analysis. Few results have been found confirming that exposure to these different messages has relevant effects on the perception related to climate. Despite this, it has been shown that exposure to different information is linked in relevant ways to the political orientation of individuals. In particular, regarding support for policies directed at mitigating and/or adapting to climate change, the analysis showed that exposure to different time frames and locations played a significant role in the preferences of U.S. conservatives. While both U.S. liberals and their counterparts in Singapore have shown more perseverance in their policy support according to condition. The main result showed that, in the U.S. sample, liberals reported higher scores for policy support with the message of proximal space distance (New York state) and with more distal time distance (2066). This score was significantly different from both conservatives and other conditions. The contrasting levels of the spatial (proximal) and temporal (distal) dimensions of distance psychology have promoted greater commitment to policy support to engage in mitigation and adaptation behaviors.

Wang et al. (2019) conducted three studies with Australian participants. Through two surveys (study 1 and 2); the authors investigated whether the construal level (abstract vs. concrete) and the psychological distance (proximal vs. distal) from climate change, predicted pro-environmental and resilient intentions (individual vs. community) and policy support (individual vs. community). With one experiment (study 3), they observed whether the manipulation of temporal psychological distance and the construal level could increase pro-environmental and resilient behaviors. Study 1 and 2 investigated the same variables regarding psychological distance, construal level, pro-environmental and adaptation behaviors, and policy support. The only difference was the scale used for the construal level measurement (BFI): a long version was used in study 2 (see **Table 1**). The results showed that: in study 1, the community level policy support was predicted by construal level, whereas inferior support for individual-level pro-environmental and resilient behaviors was predicted by perceived psychological distance to climate change. On the contrary, in study 2 psychological distance did not predict support for individual-level pro-environmental behaviors, but some demonstrations were found in relation to construal level. In study 3, in addition to compiling the same construal level scales and the same pro-environmental and resilient behaviors scales used in study 2, subjects were shown a video about the change in precipitation due to climate change in Western Australia–screenshots. The video could cover three different time intervals (past, present, and future) and was followed either by a question with a concrete construal level or by a question with an abstract construal level (how/why method; see Hansen and Trope, 2012; Soderberg et al., 2015). The results showed that, contrary to the construal level theory, construal level did not predict pro-environmental and resilient behaviors. Furthermore, a greater temporal distance from climate change was related to greater levels of commitment in mitigation and adaptation behaviors.

Brügger et al. (2015a), through online surveys in two European countries, investigated the relationship between social psychological factors and mitigation and adaptation behaviors. Risk perception based on spatial psychological distance (proximal vs. distal) was considered in regard to social psychological factors. Furthermore, willingness to tackle climate change, based on social psychological distance (individual actions vs. policy support), was considered in regard to mitigation and adaptation behaviors. First, the authors found that the willingness to engage mitigation and adaptation behaviors were strongly associated; individuals willing to engage in mitigation behavior were also willing to engage in adaptation behavior. The results showed that the distant risk perceptions predicted willingness of people to support mitigation and adaptation policies better than the proximal risk perceptions. Perception of proximal risk did not predict individual behavioral intentions to mitigate climate change. Both perception of proximal risk and distant risk, provided a contribution to the prediction of personal behavioral intentions. When solely considering individual adaptation behaviors, proximal risk perceptions was found to be a predictor.

Haden et al. (2012) analyzed whether past climate experiences and global and local concern of farmers, in relation to climate change, can affect their intent to use mitigation and adaptation behavior. The authors focused on a total of six agricultural practices in both, mitigation (buy fuel-efficient farm equipment, reduce electricity usage in farm operations, improve nitrogen use efficiency, adopt conservation tillage, install solar panels or wind turbines, and use biomass or biofuels for on-farm energy use) and adaptation (pump more groundwater, adopt drip or micro-sprinkler irrigation, concentrate surface water on less acreage, use drought-tolerant varieties, drill more wells, shift to less water-intensive crops). The factor analysis produced two types of dependent variables for mitigation ("energy and nitrogen efficiency practices" and "renewable energy technologies") and two for adaptation ("new irrigation practices" and "new cropping practices"). The mediation variables involved local concern about the availability of water and change in temperature, and the belief for global climate change. The results showed an indirect effect on the two types of mitigation practices due to the perceived change in past water availability. Furthermore, mitigation practices were mediated exclusively through the beliefs and concerns on global climate change of farmers. Instead, for the two types of adaptation practices, local water concerns significantly influenced exclusively the new irrigation practices and played a mediating role in the effect of perceived change of water availability in the past. In general, in this study two assumptions were established. The first was that mitigation and adaptation behaviors are cognitively represented at different construal levels. In particular, a higher construal level leads to mitigation activities, whereas a lower construal level promotes adaptation activities. The second was that psychologically distant concerns were a determinant factor of mitigation activities while adaptation between these farmers was principally driven by

their concern for local climate effects and therefore considered psychologically close.

DISCUSSION AND CONCLUSION

The present study aimed to systematically examine published original research reports that analyze the role of psychological distance in the commitment to undertake mitigation and adaptation attitudes toward climate change. Although most of the results reported above showed that more pro-environmental and resilient behaviors are engaged through lower levels of psychological distance, the relationship between the two constructs is complex and still unclear. In fact, in some studies it seems that mitigation behaviors are mainly related to a high psychological distance (distal) and adaptation behaviors to a low psychological distance (proximal). For example, the study of Chen (2019) reported that proximal perception of psychological distance was not a determinant of the level of intention of the public to manage with climate change by committing to mitigation behaviors. However, further studies have described conflicting results. For example, Schuldt et al. (2018) showed in their results that there was no significant difference between the willingness to commit to mitigation and adaptation behaviors and spatial and social distance (proximal vs. distal). A similar result was observed by Busse and Menzel (2014) and Brügger et al. (2015a).

Furthermore, as shown in the analysis of the collected articles, there are several differences in the methodologies used for examining the role of psychological distance and pro-environmental and resilient behaviors. In fact, in the selected studies, different tools and measures were used for both psychological distance dimensions and mitigation and adaptation behaviors. This could explain the conflicting results. Additionally, only a few dimensions of psychological distance were observed in most of the selected studies. Specifically, in 12 studies, only one or two dimensions of psychological distance were measured, as already done in previous studies given the simplest manipulation and the best control of the observed variables (Nicolaij and Hendrickx, 2003; Spence and Pidgeon, 2010). However, to better analyze how the dimensions of psychological distance interreact, studies should investigate the effects of manipulating distance on all dimensions (spatial, social, hypothetical, and temporal) at the same time. All four dimensions of psychological distance were considered simultaneously only in six of the selected studies. This approach would allow us to detect optimal framing and to favor willingness to act on climate change through mitigation and adaptation behaviors (McDonald et al., 2015).

This review also considered studies that measured the construal level, a major construct related to psychological distance, which may have importance for how people react to demands of climate change. In five of the selected studies, the psychological distance and the construal levels (abstract vs. concrete) were related to pro-environmental and resilient behaviors. A previous study, which already investigated the constructive level linked to the will to act on climate change (Rabinovich et al., 2009; Sanna et al., 2010), demonstrated the existence of a connection between the two factors. However, Wang et al. (2019) observed no correlation between the levels of psychological distance and the construal level. In fact, when the psychological distance of climate change had lower scores, climate change was not perceived as more concrete. Although, high scores of pro-environmental and resilient behaviors were recorded equally. These results suggest the limited use of the construal level in predicting pro-environmental behaviors. Moreover, contrary to the expected results, the study of Griffioen et al. (2019) showed that a high social distance condition was correlated with high construal levels which had a greater effect on mitigation behaviors. For these reasons, the existence of the relation among psychological distance and construal levels is not always obvious, especially in the situation of climate change and related adaptation and mitigation behaviors.

Given the complexity of measuring the factors considered, further variables that modulate the relation among psychological distance and pro-environmental behaviors of mitigation and resilient behaviors of adaptation could be involved. Some studies, not considering in this review, have already considered other types of variables (psychological and non-psychological) and measured them in relation to psychological distance and pro-environmental and resilient behaviors (Sacchi et al., 2016; Steynor and Pasquini, 2019).

In conclusion, psychological distance and all its dimensions contributed to the commitment to adopt pro-environmental and resilient behaviors of mitigation and adaptation, respectively. Although, it is an important topic for the psychological and physical well-being of individuals and the well-being of the whole planet, the studies conducted are still limited. This is because the research field has only recently become interested in this topic. The aim of this systematic review is to offer a good scientific starting point for future studies aimed at exploring and deepening the link among psychological distance and mitigation and adaptation behaviors in the hope of encouraging them more and more.

DATA AVAILABILITY STATEMENT

All datasets generated for this study are included in the article.

AUTHOR CONTRIBUTIONS

DM, RP, LC, ADD, and MV contributed to the conception and project of this review. RM, PL, EP, and ADC conducted the literature search and wrote the first draft of the manuscript. RP, LC, DM, ADD, and MV revised the first draft of the manuscript. All authors participated to the subsequent drafting and rewriting of the manuscript and approved the final version of the manuscript.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

frontiers in Psychology

HYPOTHESIS AND THEORY
published: 24 November 2020
doi: 10.3389/fpsyg.2020.566571

How to Solve the Social Norm Conflict Dilemma of Green Consumption: The Moderating Effect of Self-Affirmation

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Social norms are important social factors that affect individual behavioral change. Using social norms to promote green consumption is receiving increasing attention. However, due to the different formation processes and mechanisms of the behavioral influence of the different types of social norms, using social norms to promote green consumption often has social norm conflict situations (injunctive norms + negative descriptive norms). Thus, it is difficult to attain the maximum utility of social norms. The present research found that social norm conflict weakens the role of injunctive norms in promoting green consumption. Specifically, negative descriptive norms weaken the role of injunctive norms in promoting green consumption. Alienation, which manifests through powerlessness and meaninglessness, plays a mediating role in the relationship between social norm conflict and green consumption. Self-affirmation moderates the mediating role of alienation between social norm conflicts and green consumption. Self-affirmation reduces the alienation caused by social norm conflict, thereby alleviating the weakening effect of social norm conflict on green consumption.

Keywords: green consumption, social norm conflict, alienation, powerlessness, meaninglessness, self-affirmation

OPEN ACCESS

Edited by:
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Institute of Psychology, Chinese Academy of Sciences (CAS), China

Reviewed by:
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Specialty section:
This article was submitted to Environmental Psychology, a section of the journal Frontiers in Psychology

Received: *28 May 2020*
Accepted: *29 October 2020*
Published: *24 November 2020*

Citation:
Ge W, Sheng G and Zhang H (2020) How to Solve the Social Norm Conflict Dilemma of Green Consumption: The Moderating Effect of Self-Affirmation. Front. Psychol. 11:566571. doi: 10.3389/fpsyg.2020.566571

INTRODUCTION

Green consumption, also known as sustainable consumption, refers to consumption behavior wherein consumers consider the environmental impact when buying, using, or disposing products to minimize environmental harm (Carlson et al., 1993; Roozen and De Pelsmacker, 2000; Wang et al., 2019). On the one hand, environmental degradation is largely caused by residents' unreasonable consumption habits and consumption patterns, and green consumption is crucial in solving environmental problems (Smith et al., 2012; Sheng et al., 2019). On the other hand, green consumption can form a green market demand to protect the ecological environment, forcing enterprises to formulate green development strategies and leading enterprises to adopt green environmental protection (Sheng et al., 2017; Pongpiachan, 2019; Nguyen et al., 2019). Green consumption requires consumers to increase their efforts by, for instance, paying environmental premiums for green products and changing original consumption habits. The environmental benefits generated by green consumption are not only individually enjoyed by consumers but also shared by the whole society. The generation of green consumption behavior requires consumers to balance their interests with social interests (Olson, 2013). The generation and solution of environmental problems are of a natural collective character and require the collective participation of all members of society (Fritsche et al., 2018). Therefore, even if consumers realize the importance

of protecting the environment, "high green consumption preference" and "low green consumption behavior" may occur. Focusing on effectively realizing green consumption, scholars have conducted a series of useful explorations. Among them, social norms have become the focus of scholars' attention in recent years (Eom et al., 2016; Sparkman and Walton, 2017; Fritsche et al., 2018; Pongpiachan, 2018).

Social norms are behavioral standards gradually formed in social practice and social interaction to regulate individual behaviors to maintain social order (Magill, 1995; Nolan et al., 2008), and these can be divided into descriptive and injunctive norms (Cialdini et al., 1990; Farrow et al., 2017). Descriptive norms are behavioral standards formed by the behaviors of most group members (Cialdini et al., 1990; Farrow et al., 2017), such as "75% of consumers have already made green consumption." Descriptive norms can reflect positive (respected) or negative (prohibited) behaviors. Injunctive norms are standards of conduct formed by the majority of members of a group in favor of or against a certain behavior (Farrow et al., 2017). This includes codes of conduct issued by the government or a spontaneously formed within a group. An example of this could be: "people highly agree with green consumption." Compared with commonly used arguments are employed in public appeals to encourage green consumption (such as "protecting the environment, everyone is responsible"), social norms have received increased attention from scholars due to their low implementation cost and effective intervention effect, and social norms have been applied into practice. However, social norm conflicts also occur in real life (McDonald et al., 2013; Chen and Hong, 2015). Social norm conflict refers to the situation in which injunctive norms and negative descriptive norms coexist (injunctive norms + negative descriptive norms). Sometimes social norm conflicts are demotivating and undermining actions (Schultz et al., 2007; McDonald et al., 2014; Hassell and Wyler, 2018). The effects of social norm conflict are likely to be relevant to conservation or saving behaviors, particularly where the behavior in question is visible and must be enacted collectively (McDonald et al., 2014).

As green consumption needs customers to distribute various costs, and the environmental benefits generated by green consumption are uncertain, negative descriptive norms will arise and may discourage many to refrain from conducting green consumption (Sheng and Ge, 2019). If the injunctive norm is used to promote green consumption, a social norm conflict has occurred. Negative descriptive and injunctive norms coexist, and injunctive norms cannot effectively promote green consumption. The focus theory of normative conduct believes that the situation of conflicting social norms will make negative descriptive norms the focus of consumers' attention. Currently, consumers will preferentially follow negative descriptive norms, making it difficult for social norms to play a regulatory role in consumer behavior (Cialdini et al., 1990). However, few studies have focused on the issue of conflicting social norms of green consumption (injunctive norms + negative descriptive norms) nor have they explored the internal psychological process of conflicts of social norms affecting green consumption or found effective solutions to resolve the negative impact of conflicts of social norms on green consumption.

This paper contributes to the literature in several ways. First, based on the social norm conflict in green consumption and the focus theory of normative conduct, this study explores the negative impact of social norm conflict on green consumption. Second, the concept of alienation is introduced to explain the internal influence mechanism between social norm conflict and green consumption. Third, we examine how self-affirmation can be used to alleviate the negative impact of social norm conflict on green consumption based on the self-integrity theory.

THEORETICAL REVIEW AND RESEARCH HYPOTHESIS

Social Norms and Conflicts of Social Norm

Social norms refer to the rules and standards that guide or limit the behavior of group members to ensure the realization of group goals and consistency of group activities (Cialdini et al., 1990; Cialdini and Goldstein, 2004). Different from the mandatory legal system, social norms are based on informal social sanctions or rewards, which guarantee the implementation of behavior. American psychologist Cialdini et al. (1990) proposed the focus theory of normative conduct, dividing social norms into descriptive and injunctive norms. Descriptive norms tell people what kind of behavior is effective, acceptable, and safest in a specific situation, which is related to effective personal goals and more likely stimulates the individual's heuristic information-processing mode. When individuals face descriptive norms, they need not spend a lot of cognitive resources to think about their behaviors. Descriptive norms help individuals make quick decisions (Cialdini et al., 1990; Jacobson et al., 2011). The effects of descriptive norms on behavior are similar to the generation of herd behavior. The safest and most effective practices are those of the majority, and individuals tend to emulate this behavior (Cialdini et al., 1990; Cialdini and Goldstein, 2004; Zhang, 2016). Injunctive norms reflect the value judgment tendency of most members of the group and guide people's behavior by emphasizing the good or bad behavior of the group, stimulating the individual's systemic information-processing mode. When individuals are facing injunctive norms, they think systematically about the content of the norms. Considering the appropriateness of their behaviors, group members will expend more cognitive resources (Cialdini et al., 1990; Cialdini and Goldstein, 2004; Stok et al., 2014a). Only when the majority of the members of the group approve or disapprove a certain behavior will the injunctive norm have effect, and the value judgment of certain behavior by a few members will neither form a social norm nor will a "social sanction force" that restricts behaviors (Zhang, 2016).

Studies have shown that consumers considering themselves engaged in green consumption are still driven by many internal psychological factors, such as environmental values, environmental attitudes, and other moral characteristics. However, results showed that normative messages can be quite persuasive, and that their influence is often overlooked and underdetected (Nolan et al., 2008; Sheng and Ge, 2019;

Eyink et al., 2020). Due to the effective normative effect on behaviors, social norms have been used to guide green consumption behaviors in the stages of a green product purchase, product use, and product recycling. For example, Schultz (1999) fed back social norms and advocacy information about garbage collection to residents' families. Schultz found that the amount of garbage collection in those families that received social normative information was significantly higher than those families that were fed advocacy information. Moreover, through experimental research, Sheng and Ge (2019) found that compared with ordinary environmental protection information, injunctive normative information can significantly enhance consumers' social value perception of green products, thus enhancing their purchase of green products. However, the forming process of descriptive and injunctive norms and their impact on behavior is different. Further, different types and directions of social norms may exist simultaneously, resulting in conflicts of social norms (Chen and Hong, 2015). Keizer et al. (2011) believed that a dirty and messy environment will highlight the negative descriptive norm of "everyone litters," at which point individuals tend to litter. If the situation is accompanied by an injunctive norm (such as "no littering"), littering behavior may increase. At this point, the descriptive norm is not consistent with the injunctive norm, and social norms react against the guidance of behavior (Keizer et al., 2008).

Injunctive norms reflect generally accepted behavior in society and are the correct code of conduct; descriptive norms reflect behaviors generally exhibited by others and may be either consistent with injunctive norms or inconsistent with injunctive norms. Descriptive norms have both positive and negative directions (Smith et al., 2012; Chen and Hong, 2015). Positive descriptive norms are those in which most members of the group exhibit behavior consistent with injunctive norms, and there are no norm conflicts; negative descriptive norms mean that most members of the group exhibit behaviors inconsistent with injunctive norms. When injunctive norms are used to guide people's behavior, social norm conflicts occur (injunctive norms + negative descriptive norms). In the case of norm conflict, the focus theory of normative conduct states that individuals will first follow descriptive norms (Cialdini et al., 1990; Keizer et al., 2008) because descriptive norms can provide a smooth information-processing process for individuals, and individuals will make behavioral decisions based on this reference point (Stok et al., 2014a; Zhang, 2016; Farrow et al., 2017). Thus, descriptive norms will now be the focus of individual attention, and individuals believe at this point that it is the best behavior in accordance with descriptive norms. Many social norm conflicts exist in real life, and an example of this is "Chinese-style road crossing."

The Weakening Impact of Social Norm Conflict on Green Consumption

For green consumption, using injunctive norms alone can positively enhance consumers' willingness to implement green consumption in theory. Injunctive norms can associate green consumption with the attitudes of most members of the group. Group members will recognize green consumption behaviors that obey the injunctive norms and deny behaviors that do not comply with these norms and apply social sanctions (Stok et al., 2014b; Chen and Hong, 2015). In addition, injunctive norms can also enable individuals to realize normative behaviors in the context of social approval or disapproval of normative behavior, reevaluate the importance and rationality of this behavior, and comply with the injunctive norms (Paek et al., 2014; Farrow et al., 2017).

However, when injunctive norms are used to guide consumers' green consumption behavior, social norm conflicts will occur (injunctive norms + negative descriptive norms). Since green consumption incurs costs on the consumers (Olson, 2013), most consumers cannot consciously practice green consumption (Yue et al., 2020). Thus, negative descriptive norms arise, and negative descriptive and injunctive norms will generate conflict. For consumers influenced by eastern culture, they have a high sense of group consciousness and are more often influenced by group opinions. The conflict situation of social norms encourages them to abide by negative descriptive norms (Keizer et al., 2008; Wang et al., 2016). Aiming at the dilemma of conflicting social norms in green consumption, this study believes that environmental improvement benefits brought by green consumption require the cooperation of all members of society. Injunctive norms will make consumers aware of the urgency of implementing green consumption when other consumers do not consciously implement the descriptive norms of green consumption. However, consumers will also believe that their green consumption behavior will not have much impact on the improvement of the environment as group pressure is absent. This leads consumers to relax their self-control in their consumption behavior. They tend to show behavior consistent with negative descriptive norms, that is, tend not to conduct green consumption. Therefore, the following hypotheses are proposed in this study:

H1: Social norm conflicts weaken the role of injunctive norms in promoting green consumption. Specifically, negative descriptive norms will weaken injunctive norms in promoting green consumption.

The Mediating Effect of Alienation

Alienation was originally a philosophical proposition, referring to a situation wherein an individual is separated from the existing world. In sociology, alienation, a negative feeling of being estranged from others or the existing world, is a pervasive theme (Tome et al., 2016). For instance, when immigrants reject or dissociate from prevailing social norms and values, they may face cultural alienation (Miller et al., 2009). When workers realize that their work situation cannot meet their needs or is inconsistent with their expectations, individuals may feel alienated from work. This is when alienation becomes a psychological state that separates him from the job (Banai et al., 2004). When adolescents lack functional ties with primary socialization agents, including family and school, he may have a feeling of adolescent alienation (Slater, 2010). Although alienation can be defined in several ways, Seeman's (1959) original conceptualization (five characteristics: powerlessness, meaninglessness, normlessness, isolation, and self-estrangement) referred to a more general

sense of alienation from mainstream society's values. Negative outcomes of alienation include feelings of despair, hopelessness, stress, anxiety, anguish, tension, or demoralization. Furthermore, alienation can lead to bad things. Immigrants separated from the local context will be at high risk to acculturative stress and isolation (Miller et al., 2009). Work alienation usually manifests externally as counterproductive work behavior, such as job burnout, lack of enthusiasm, and decreased performance (Li and Chen, 2018). Parent–teen alienation and higher rates of delinquent behavior and psychosocial maladjustment are correlated (Clarke et al., 2020).

Negative descriptive norms weaken the role of injunctive norms in promoting green consumption. To explain this weakening effect, this study suggests that alienation can provide a unique perspective. Alienation is often used as a sensitive and effective mediator to explain employees' negative behavior (Ceylan and Sulu, 2010). We consider two main dimensions of alienation (powerlessness and meaninglessness) in this study. Previous research has shown that social norm conflicts affect their perceptions of the effectiveness of performing environmental behavior. Green consumption can provide long-term benefits for human beings, but generating long-term benefits also requires everyone's participation (Fritsche et al., 2018). Norm conflict signals that not all others are acting and taking action are therefore ineffective and futile (McDonald et al., 2014). Therefore, social norm conflict of green consumption will lead to alienation between consumers and green consumption, specifically, powerlessness and meaninglessness. Powerlessness means that consumers believe their efforts have little impact and cannot help achieve the purpose of improving the environment. Meaninglessness implies that consumers cannot feel the environmental value and significance of their practice of green consumption. Therefore, the following hypotheses are proposed in this study:

H2: Alienation mediates the weakening effect of social norm conflict on green consumption.
H2a: Powerlessness mediates the weakening effect of social norm conflict on green consumption.
H2b: Meaninglessness mediates the weakening effect of social norm conflict on green consumption.

The Moderating Effect of Self-Affirmation

Individuals are generally motivated to maintain a degree of self-integrity. Self-integrity is the individual's belief that he (she) is generally good, moral, and fit for society (Steele, 1988). When self-integrity is threatened, psychological threats arise, and individuals can maintain their moral identity by thinking about their self-value in areas unrelated to threats or engaging in other activities of self-value through self-affirmation (Steele, 1988; Lv and Zhao, 2017). In other words, individuals can maintain self-integrity by compensating for their shortcomings in some areas with their strengths in other areas (Sherman and Cohen, 2006). In this process, because the individual's self-value is anchored, they can process and accept threat information in a more open, fair, and objective manner. This weakens threatening information, which is the basic idea of the self-affirmation theory (Steele, 1988). As self-affirming individuals maintain their integrity, they can make significant changes in their cognitive, emotional, and behavioral tendencies and beneficial effects, such as objectivity, emotional relief, improved self-control, and growth promotion (Shi and Liu, 2009). Self-affirmation can reduce the individual's defensive processing of threat information, making it easier for individuals to encode and extract threat information and improve information quality, and individuals can integrate threat information with themselves better, which will lead to adaptive behavior (van Koningsbruggen et al., 2009). Self-affirmation can positively enhance an individual's positive implicit emotion so individuals can objectively assess self-threatening information (Crocker et al., 2008). Self-affirmation can encourage individuals to focus on the abstract, core, and essential characteristics of information and long-term goals and significance of their behaviors and improve the level of individual self-control (Schmeichel and Vohs, 2009). Because of the many beneficial effects of self-affirmation, Harris et al. (2017) believe that the reason is that self-affirmation affects the individual's potential ability "executive functioning." Since self-affirmation maintains one's integrity, and self-integrity is a necessary condition for individuals to stay focused, set and complete goals, and to reason, self-affirmation indirectly improves the individual's inhibitory control ability and reduces working memory tasks, therefore it leads to beneficial effects.

As mentioned, social norm conflict will weaken the promotion effect of injunctive norms on green consumption. Mitigating this weakening effect has become an urgent issue that needs to be addressed. This study suggests that self-affirmation can mitigate this weakening effect. Social norm conflict can make negative descriptive norms become the focus of consumers' attention. The non-objectivity of this information-processing mode makes consumers pay too much attention to others' "non-action" on green consumption and refuse to conduct green consumption on the grounds that others do not engage in this activity. Self-affirmation can maintain individual integrity, promote the openness of individual information processing, and enable individuals to assess information more objectively, fairly, and calmly (Cohen et al., 2007). Sherman and Hartson (2011) also proposed a three-stage model to explain the objective processing effect of self-affirmation on information. Self-affirmation is believed to first enhance self-resources. Second, individuals with self-resources, rather than simply accepting information, can respond to information with a broader perspective. Eventually, individuals will pay less attention to threat information and isolate it. After self-affirmation, consumers can effectively distinguish between short-term satisfaction and long-term interests and gain more overall awareness. They can effectively control their impulses and maintain self-control (He and Huang, 2012). Self-affirmation enables individuals to judge related events with more adherence to the ultimate purpose (Wakslak and Trope, 2009). This study believes that self-affirmed individuals will deal with conflict information more calmly and objectively when confronted with the social norm conflicts on green consumption. First, these individuals control their impulses, automatically alienate negative descriptive norms, and only focus on the injunctive norms that transmit positive social values.

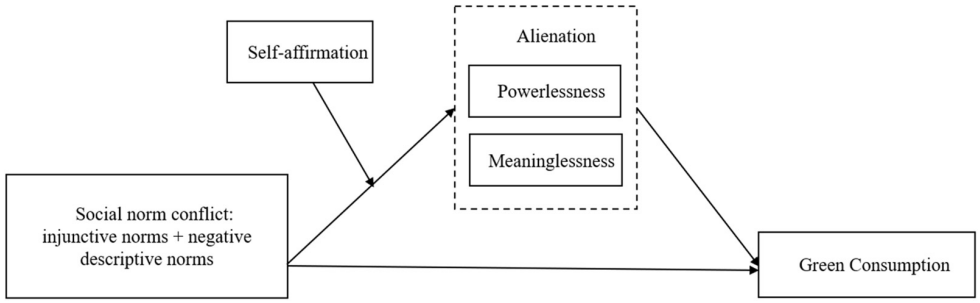

FIGURE 1 | The conceptual model of this study.

Second, this manifests in the state of construal level, and, in facing the conflicts of social norms, they think more on the positive results brought by consuming green products and focus on the environmental benefits brought by green products. In this situation, no alienation exists between individuals and green consumption. Instead, consumers will think that green consumption is their responsibility, and that feelings of powerlessness and meaninglessness will decrease. Compared with consumers who are not self-affirmed, consumers who are self-affirmed have a weaker sense of alienation when faced with conflicting social norm information. Based on the mediating role of alienation in the impact of social norm conflict on green consumption, this study proposes the following hypotheses:

> H3: Self-affirmation moderates the mediation of alienation between social norm conflict and green consumption.
> H3a: Self-affirmation moderates the mediation of powerlessness between social norm conflict and green consumption.
> H3b: Self-affirmation moderates the mediation of meaninglessness between social norm conflict and green consumption.

Based on the above theoretical review and hypothetical deduction, this study believes that social norm conflict will weaken the role of injunctive norms in promoting green consumption. Alienation (powerlessness and meaninglessness) mediates the weakening effect of social norm conflict on green consumption. Self-affirmation moderates the mediating role of alienation (powerlessness and meaninglessness), whereas social norm conflict influences green consumption. Self-affirmation will reduce the alienation caused by social norm conflict and thus alleviate the weakening influence of social norm conflict on green consumption. The conceptual model of this study is shown in **Figure 1**.

EXPERIMENT 1

Experiment 1 verified the weakening impact of social norm conflict on green consumption. The study had a three-cell between-subjects design (social norms: injunctive norm vs. negative descriptive norm vs. social norm conflict).

Participants and Procedure

A total of 141 undergraduates (M_{age} = 21.16 years, 74 males) studying at a university in east China participated in the experiment. Participants were randomly assigned to one of three social norms to reduce experimental errors and then asked to read a specific scenario to assess the target social norms. The three scenarios were injunctive norm, negative descriptive norm, and social norm conflict. The detailed instructions they were given are outlined below (adopted from Schultz et al., 2008; White and Simpson, 2013; Wang et al., 2016; Hassell and Wyler, 2018). Simultaneously, key parts of the material are highlighted, and identification questions are compiled based on the material content to enhance participants' impression of the material. Before reading the social norm material, participants were asked to report their biospheric value (1 = extremely unimportant, 5 = extremely important): preventing pollution; conserving natural resources; respecting the earth, harmony with other species; unity with nature, filling into nature; protecting the environment; and preserving nature (α = 0.83).

Injunctive Norm Condition

The results of the green product market survey conducted by the Chinese Consumers Association show that 75% of consumers approve the purchase of green products. In a random interview with one of the consumers, they said "Now the environment is polluted, the ecosystem is degraded, and the environment is the home of human survival, each one of us should protect the environment. It is commendable to take an active part in environmental protection. Buying green products is a very simple and effective way."

Negative Descriptive Norm

The results of the green product market survey conducted by the Chinese Consumers Association show that 75% of consumers do not actively buy green products.

Social Norm Conflict Condition

The material of social norm conflict is the combination of an injunctive and negative descriptive norm. Simultaneously, the key parts of the material are highlighted.

After reading the social norm material, participants completed manipulation checks for message appeal. Here, we used a 7-point Likert scale (White and Simpson, 2013), including injunctive

norm ("The results you viewed asked you to consider what others want you to do") and negative descriptive norm ("The results you viewed asked you to consider what others are not doing"). Next, the situation simulation was used to measure the green consumption intention of the participants. Green products refer to all products that can improve environmental quality (Seuring and Müller, 2008). Green is just a relative concept. Based on the above considerations, this experiment uses environmentally friendly water cups as specific experimental objects (Sheng and Ge, 2019). Referring to the green product experimental materials used in the research by Ku et al. (2012), the research team invented "A water cup" and "B water cup" of the same brand for the two products, and it is emphasized that the shape, capacity, and thermal insulation effect of the two water cups are the same. The two water cups are different only in the degree of environmental hazards produced in the production process. The product information of A cup emphasizes functional features, whereas that of B cup emphasizes environmental features. Simultaneously, considering the price difference between green products and ordinary products, we set the price of green products as relatively high rather than very high, as the price of green products is generally 20–25% higher than ordinary ones (Lin and Chen, 2016). The price of cup A is set at 60 yuan, and the price of cup B is set at 75 yuan. After reading the product information of the water cup, we asked the participants to evaluate the relative greenness of the two water cups. Based on a 7-point scale, 1 is the assigned value for cup A (means "A is more environmentally friendly"), whereas 7 is the assigned value for cup B (means "B is more environmentally friendly"). Then, participants were instructed to imagine that they need to purchase a water cup because of their daily needs and let them make a relative choice between cup A and cup B, using a 7-point scale: 1 means "willing to buy cup A," and 7 means "willing to buy cup B" (Griskevicius et al., 2010). Finally, participants completed the items on demographic information.

Results and Discussion

Manipulation Checks

Biospheric values did not significantly differ among the three groups: $F(2,138) = 0.530$, $p = 0.590$. The one-way ANOVA results showed that an injunctive norm check revealed a main effect for material appeal [$F(2,138) = 192.229$, $p = 0.000$]. Those in the injunctive condition viewed the appeal as more injunctive ($M = 6.10$, $SD = 0.85$) than those in the negative descriptive condition ($M = 2.43$, $SD = 1.15$) and not than those in the conflict condition ($M = 5.7$, $SD = 1.01$). A similar analysis of the negative descriptive norm check also revealed a main effect for material appeal [$F(2,138) = 194.643$, $p = 0.000$]. Those in the negative descriptive condition viewed the appeal as being more negative descriptive ($M = 5.72$, $SD = 1.14$) than those in the injunctive condition ($M = 2.30$, $SD = 0.85$) and not than those in the conflict condition ($M = 5.95$, $SD = 1.18$). These findings suggest that the manipulation was successful.

Since the green degree was measured by a single 7-point scale, the scale score was compared with the median value of 4. The data show that the average value of greenness is 6.34 ($SD = 0.85$), and single sample t-test results indicate that the greenness degree is significantly greater than 4. The results of the manipulation check reveal a significant effect of the greenness of the product: $t(141) = 36.389$, $p < 0.001$.

Main Effect Analysis

One-way ANOVA results showed that there were significant differences in green consumption intention among the three groups, $F(2,138) = 70.845$, $p = 0.000$. *Post hoc* analysis revealed that participants in the negative descriptive norm condition were less willing to engage in green consumption than those in the injunctive norm condition ($M_{\text{negative descriptive}} = 3.02$, $SD = 0.85$; $M_{\text{injunctive}} = 5.47$, $SD = 0.89$; negative descriptive norm vs. injunctive norm: 95% confidence interval (CI) for mean difference [−2.93, −1.97], $p = 0.000$, **Table 1**). Meanwhile, the green consumption willingness of the social norm conflict condition (injunctive norms + negative descriptive norms) was significantly lower than that of the injunctive norm condition ($M_{\text{norm conflict}} = 4.55$, $SD = 1.02$; $M_{\text{injunctive}} = 5.47$, $SD = 0.89$; social norm conflict vs. injunctive norm: 95% CI for mean difference [−2.00, −1.05], $p = 0.000$). These findings prove that negative descriptive norm weakens the role of injunctive norm in green consumption. Thus, the results support H1.

Discussion

The green consumption willingness of the negative descriptive norm is significantly lower than that of the injunctive norm condition, and the green consumption willingness of the social norm conflict condition (injunctive norms + negative descriptive norms) is significantly lower than that of the injunctive norm

TABLE 1 | Multiple comparisons of green consumption of three conditions.

Conditions		I–J	*SE*	*p*	95% CI	
					LLCI	ULCI
Injunctive norms	Negative descriptive norms	2.45*	0.19	0.000	1.97	2.93
	Social norm conflict	0.92*	0.19	0.000	0.45	1.39
Negative descriptive norms	Injunctive norms	−2.45*	0.19	0.000	−2.93	−1.97
	Social norm conflict	−1.52*	0.19	0.000	−2.00	−1.05
Social norm conflict	Injunctive norms	−0.92*	0.19	0.000	−1.39	−0.45
	Negative descriptive norms	1.33*	0.19	0.000	1.05	2.00

*$p < 0.05$.

condition. This indicates that the social evaluation of green consumption contained in the injunctive norms encourages consumers to engage in green consumption, whereas the non-green consumption behaviors of others described in the negative descriptive norms do not encourage consumers to engage in green consumption. In the context of the coexistence of injunctive norms and negative descriptive norms, negative descriptive norms weakened the role of injunctive norms in promoting green consumption. In Experiment 2, we further explore the psychological mechanism by which social norm conflict affects green consumption.

EXPERIMENT 2

The purpose of Experiment 2 was to verify the mediating role of alienation in the process of conflicting social norms weakening the role of green consumption. Specifically, it tests the mediating role of powerlessness and meaninglessness in the process of social norm conflict weakening the role of green consumption. The study had a two-cell between-subjects design (social norms: injunctive norm vs. social norm conflict).

Participants and Procedure

A total of 131 undergraduates (M_{age} = 21.71 years, 67 males) participated in the study. They were randomly divided into two groups. All participants were asked to report their biospheric value as in Experiment 1 and were randomly assigned to read a specific scenario of injunctive norms and social norm conflict as in Experiment 1. After reading the social norm material, participants completed manipulation checks same as in Experiment 1 and answered a set of questions using a 7-point Likert scale to measure their powerlessness (α = 0.84), meaninglessness (α = 0.86), and their willingness to engage in green consumption as in Experiment 1. We used 10 items adapted from Mottaz (1981) to measure powerlessness and meaninglessness, such as "The effect of buying green products on the environment is small"; "Buying green products at the present stage is not worth doing"; "I am thinking of the purpose of buying green products"; "It is difficult for me to associate green products with environmental protection"; "I can hardly believe that buying green products has a positive effect on environmental protection"; and "Even if I buy green products, the environmental benefits are minimal."

Results and Discussion

Manipulation Checks

Biospheric values did not significantly differ among the two groups: $t(129) = 0.236$, $p = 0.813$. Independent sample t-test results showed that those in the injunctive condition viewed the appeal as being not more injunctive ($M = 5.91$, $SD = 0.94$) than those in the conflict condition ($M = 5.76$, $SD = 0.85$), $t = 0.95$, $p = 0.344$. Those in the conflict condition viewed the appeal as being more negative descriptive ($M = 5.88$, $SD = 1.03$) than those in the injunctive condition ($M = 2.48$, $SD = 1.01$), $t = 19.012$, $p = 0.000$. These findings suggest that the manipulation was successful.

Main Effect Analysis

To test the weakening effect of social norm conflict on the promotion of green consumption by social norms, an independent sample *t*-test was performed on the willingness to engage in green consumption among the two conditions of participants. The results showed that the green consumption intention of the injunctive norm condition ($M_{\text{injunctive norm}} = 5.43$, $SD = 1.08$) was significantly higher than that of the social norm conflict condition ($M_{\text{norm conflict}} = 4.43$, $SD = 0.97$), $t = 5.51$, $p < 0.001$, thereby proving H1 once more.

Mediating Effect Analysis

We tested the mediating role of powerlessness and meaninglessness in the weakening effect of social norm conflict on injunctive norms promoting green consumption. We implemented a bootstrapping analysis that generated a sample size of 5,000 (Hayes, 2013; Model 4) to test the mediating role of powerlessness and meaninglessness between social norm conflict and green consumption. The independent variable was social norms (injunctive norm, 1; social norm conflict, 0). The result demonstrates that the 95% CI for the indirect effect of powerlessness was significant and excluded 0 (β = 0.30, 95% CI: [0.1034,0.5639]), which means that powerlessness plays a mediating role between social norm conflict and green consumption, as shown in **Figure 2**. In addition, the 95% CI for the indirect effect of meaningless was significant and excluded 0 (β = 0.24, 95% CI: [0.0612, 0.4911]). Therefore, hypothesis H2a and hypothesis H2b are supported. Thus, it is assumed that H2 is also supported.

Discussion

Experiment 2 tested the mediating role of alienation in the process of social norm conflict affects green consumption. Specifically, powerlessness and meaninglessness play a mediating role in the relationship between the two. In the next experiment, we further explore how to solve the weakening role of social norm conflict in green consumption.

EXPERIMENT 3

Experiment 3 verified the moderating effect of self-affirmation on the mediating effect of alienation, specifically to verify that the mediating relationship between powerlessness and meaninglessness in social norm conflict and green consumption is regulated by self-affirmation, namely, to verify hypothesis H3a and hypothesis H3b.

Participant and Procedure

This experiment needs to elicit self-affirmation and target social norms. For the order of manipulation of social norms and self-affirmation, the timing of self-affirmation may affect the degree of processing of social norm information. Most studies show that manipulating self-affirmation at the beginning of the experiment or after the subject is exposed to self-threat information will effectively reduce the defensive processing of the subject to self-threat information, but the premise is

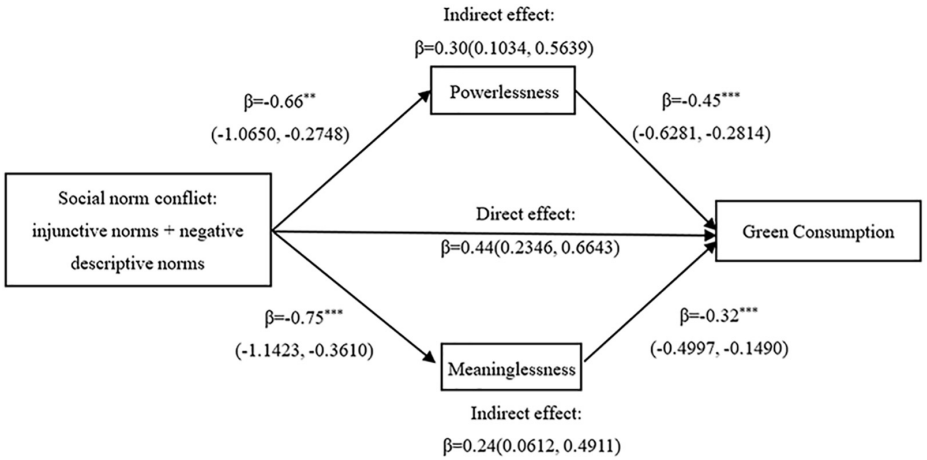

FIGURE 2 | The mediating effect of alienation. $^{**}p < 0.01$, $^{***}p < 0.001$.

that it is effective only when the participant has no chance to react defensively after facing self-threatening information. In other words, self-affirmation cannot relieve the defensive response that has already occurred. Moreover, the timing of self-affirmation also affects the acceptance of the persuasive information by the participants (He and Huang, 2012). Since self-affirmation can increase participants' self-confidence, they will be less disturbed by persuasive information (Brinol et al., 2007). Subjects' self-affirmation before and after receiving persuasive information may produce opposite results. According to the self-efficacy hypothesis, after receiving the persuasive information, individuals form the first level of idea, they will rethink the idea, the individual's attitude toward persuasive information does not affect the behavior, and they are also affected by the confidence level of the individual in persuasive information (Petty et al., 2007). If before receiving the persuasive information self-affirmation is carried out, since self-affirmation will increase an individual's self-confidence, the individual will reduce the motivation for careful handling of persuasion information, and the persuasion effect will be weakened; when self-affirmation is conducted after receiving the persuasive information, the increased confidence of individuals will increase the first ideas they hold on the persuasive information, reduce the corresponding thinking, and trust their judgment more, thus enhancing the effect of persuasion. Based on the above considerations, for the order of manipulation of social norms and self-affirmation, this study first manipulates the subject's self-affirmation and then manipulates social norms.

The study was a 2 (social norms: injunctive norm vs. social norm conflict) × 2 (self-affirmation: high vs. control) between-subjects design. A total of 248 participants completed the study. They were randomly divided into four groups, including 122 males and 126 females, with an average age of 30.47 years old. The study was divided into four parts. First, all participants were asked to report their biospheric value same as in Experiment 1 and completed a state measure of mood using single items (Brief Mood Introspection Scale; Mayer and Gaschke, 1988) to control the participants' existing self-affirmation level (1 = not at all, 5 = extremely): happy, calm, active, nervous, tired, and sad. Second, the subjects were told to complete two unrelated tasks. One task was a description of a person's characteristics, which was the manipulation of self-affirmation, by allowing the subjects to affirm the core value of the individual (Napper et al., 2009; Cambon and Yzerbyt, 2018). The selection of core values is based on the questionnaire compiled by Cloninger (2005), which reflects the six major virtues in human nature (wisdom, courage, love, justice, temperance, and excellence). The six major virtues contained a total of 24 positive psychological qualities, from which 16 excellent qualities were selected. Specifically, the participants were asked to score the performance of the 16 excellent qualities listed in the questionnaire using a 7-point Likert scale and choosing one item that they thought best reflected their own best advantages. Afterward, write the reasons and give examples in daily life. Participants without self-affirmation must choose their favorite fruit from the 16 listed in the questionnaire and write the reason. This method has been widely used in previous studies to manipulate self-construal (Napper et al., 2009). After completing the above tasks, subjects answered four questions to test the results of self-affirmation manipulation, such as "the above writing task will make me think about the positive aspects of myself," and adopted a 7-point Likert scale. Another task is in manipulating social norms. The manipulation of social norms is same as in Experiment 1, that is, let the subjects read the corresponding material of the injunctive norms and social norm conflict. Participants completed social norms manipulation checks same as in Experiment 1.

The third part is to measure powerlessness ($\alpha = 0.86$) and meaninglessness ($\alpha = 0.89$). The measurement of powerlessness and meaninglessness is the same as in Experiment 2. The fourth part is the measurement of green consumption willingness. After collective discussion by the research team, the environmental protection notebook was selected as the specific green product. Referring to the specifications of the green product experimental materials used in the research by Ku et al. (2012), two products of the same brand "A notepad" and "B notepad" were presented. It is emphasized that the specifications of these

two notepads are the same. The difference between the two notepads is in the raw materials. The product information of A notepad emphasizes the functional characteristics: "the production of high-density Dowling paper, fluent writing, clear handwriting, tight and opaque texture, non-bleeding, page-turning resistance, easy damage, good water resistance, and non-glare paper." The product information of B notepad emphasizes environmental protection characteristics, particularly "made of high-quality recycled paper, thick and easy to write without ink seepage, yellowish color for eye protection, FSC environmental protection forest system certification, effectively reducing wood consumption, reducing energy consumption, and very environmentally friendly." Moreover, considering the price difference between green products and ordinary products, to control the price of green products relatively high rather than absolute high, the price of A notepad is set to 10 yuan, and the price of B notepad is set to 13 yuan. Participants were also asked to evaluate the degree of the greenness of the two notepads. Next, participants were instructed to imagine that they need to buy a notepad because of their daily needs and let them make a relative choice between A notepad and B notepad, using a 7-point scale: 1 means "willing to buy A notepad," and 7 means "willing to buy B notepad."

Results and Discussion

Manipulation Checks

Biospheric values did not significantly differ among the four groups: $F = 1.121$, $p = 0.341$. Through an average of the sum of mood scores, it did not significantly differ among the four groups, $F = 0.809$, $p = 0.490$. Independent sample t-test results showed that those in the injunctive condition viewed the appeal as being not more injunctive ($M = 5.89$, $SD = 0.86$) than those in the conflict condition ($M = 5.81$, $SD = 0.87$), $t = 0.772$, $p = 0.441$. Those in the conflict condition viewed the appeal as being more negative descriptive ($M = 5.73$, $SD = 1.17$) than those in the injunctive condition ($M = 2.46$, $SD = 0.91$), $t = 24.525$, $p = 0.000$. For self-affirmation, participants in the self-affirmed group ($M = 5.14$, $SD = 0.91$) showed more positive thinking than those in the non-self-affirmed group ($M = 3.99$, $SD = 0.94$), $t = 9.813$, $p = 0.000$. These findings suggest that the manipulation of social norms and self-affirmation was successful. As expected, the average value of the green degree is 6.39, which is significantly greater than 4, $t = 40.121$, $p < 0.001$.

Moderated Mediating Effect Analysis

Moderated mediating effect analysis tests the moderating effect of self-affirmation on the mediating role of powerlessness and meaninglessness in social norm conflict weakening green consumption. We implemented a bootstrapping analysis that generated a sample with a size of 5,000 (Hayes, 2013; Model 7) to test the moderated mediating role of self-affirmation, and the results are shown in **Table 2**.

The spotlight analysis revealed that the 95% CI for the mediating role of powerlessness was not significant and included 0 (β = −0.14, 95% CI: [−0.35, 0.09]) under the self-affirmation condition; the mediating role of powerlessness was significant and excluded 0 (β = −0.47, 95% CI: [−0.83, −0.19]) under the no self-affirmation condition. Thus, the mediating role of powerlessness in the process of social norm conflict weakening green consumption is moderated by self-affirmation. The spotlight analysis revealed that the 95% CI for the mediating role of meaninglessness was not significant and included 0 (β = −0.05, 95% CI: [−0.18, 0.07]) under the self-affirmation condition; the mediating role of meaninglessness was significant and excluded 0 (β = −0.27, 95% CI: [−0.52, −0.09]) under the no self-affirmation condition. Thus, the mediating role of meaninglessness during social norm conflict weakening green consumption is moderated by self-affirmation. Therefore, hypothesis H3a and hypothesis H3b are supported, and, consequently, H3 is supported.

TABLE 2 | Moderation of self-affirmation on the mediating effect of powerlessness and meaninglessness.

Type	Self-affirmation	Effective value	*SE*	Include/exclude	95% CI	
					LLCI	ULCI
Power-lessness	Yes	−0.14	0.12	Included 0	−0.35	0.09
	No	−0.47	0.16	Excluded 0	−0.83	−0.19
Meaning-lessness	Yes	−0.05	0.04	Included 0	−0.18	0.07
	No	−0.27	0.11	Excluded 0	−0.52	−0.09

Discussion

Experiment 3 tested the moderating effect of self-affirmation on the mediating effect of powerlessness (H3a) and meaninglessness (H3b) in social norm conflict and green consumption.

DISCUSSION AND CONCLUSION

This study explores the weakening impact of social norm conflicts on green consumption, and, simultaneously, the mechanism of action and how to alleviate the impact of weakening are discussed. First, social norm conflict weakens the role of injunctive norms in promoting green consumption, and, particularly, negative descriptive norms weaken the role of injunctive norms in promoting green consumption. The negative descriptive norms describe that most members of the group are not engaged in green consumption. Currently, the injunctive norms guaranteed by social sanctions do not promote the green consumption behavior of individuals, and the negative descriptive norms weaken the promotion of the imperative norms (Keizer et al., 2008).

Second, alienation (powerlessness and meaninglessness) mediates the weakening effect of social norm conflict on green consumption. Social norm conflicts make consumers believe that their green consumption will not bring about significant environmental improvements and create a "feeling of powerlessness" when others "do nothing." Moreover, these conflicts will also make consumers become unable to value the effectiveness of green consumption for environmental improvement and understand the actual meaning of green

consumption, and this creates a "feeling of meaninglessness," which reduces their inclination toward green consumption.

Third, the mediating role of alienation in weakening the influence of green consumption by social norm conflict (powerlessness and meaninglessness) is moderated by self-affirmation. Self-affirmation will reduce the alienation caused by social norm conflict, thus alleviating the weakening influence of social norm conflict on green consumption. Self-affirmed consumers think more about their own advantages and positive aspects, maintain their complete self-perfection, and have high moral integrity (Sherman and Cohen, 2006; Lv and Zhao, 2017). They can calmly process the social norm conflict information of green consumption. Currently, no psychological alienation between consumers and green consumption exists, and this alleviates the weakening impact of social norm conflicts on green consumption.

Implication

This paper has three main contributions to the field. First, reduce the activation level of negative descriptive norms for green consumption and increase the activation level of positive descriptive norms for green consumption. To solve the problem of social norm conflict of green consumption, reducing the activation level of negative descriptive norms of green consumption, so that they do not conflict with injunctive norms, is vital. The government should reduce the implementation cost of green consumption behavior through fiscal subsidies, tax incentives, and consumption rewarding points. The government should make green consumption a positive descriptive norm by increasing the supply of green products, improving the community resource recycling system, and building a sharing economy.

Second, the government should enhance the role of injunctive norms in monitoring and promoting green consumption and preventing probable social norm conflict situations. When green consumption has not yet become a consumer's conscious behavior, the government should use injunctive norms to keep the green consumption high-pressure situations of the social atmosphere through media publicity, policy guide, and so on. The government should increase the exposure and criticism of non-green consumption, reduce the negative descriptive activation level of consumers, and then guide the formation of green consumption.

Third, during green consumption marketing, self-affirmation should be used purposely to reduce the alienation between consumers and green consumption. The existing marketing information of green products is mostly presented in the form of an information framework. This information presentation method will, to a certain extent, make consumers habitually resist. In the product marketing process, adopting self-affirmation methods, for example, to affirm the simple environmental behaviors consumers have done before, such as garbage disposal, turning off lights on time, and so on. This will improve overall self-cognition, reduce the consumer's resistance to green consumption, and allow the consumer to be more objectively aware of green consumption and make green consumption decisions.

Limitations

This research analyzes the relationship between social norm conflicts and green consumption, but some limitations and directions remain for future research. First, all research was conducted in the laboratory, which, to some extent, limited their externality. The measurement of green consumption in this study does not reflect the actual purchase behavior of consumers, but it is the green consumption tendency of consumers when compared with ordinary products. Future research should be conducted in real consumption scenarios to minimize experimental deviation. Second, the present research controls participants' level of existing self-affirmation level by measuring mood, and results show that it can be controlled. But the measurement of mood could reflect the situational self-affirmation level to some extent, and the characteristic self-affirmation was not measured and controlled. The present research controls participants' level of social norms, existing preference for green products, and other variables by random grouping, but existing ideas about the social norms, preference for green products, and other variables were not measured and controlled. Future research should consider the measurement of existing ideas about the social norms and the characteristic self-affirmation level to minimize experimental deviation. Third, additional mediating or moderating variables may exist that can explain and alleviate the weakening impact of the social norm conflict on green consumption. Therefore, additional possible mediating and moderating variables should be included to explore the influence of the social norm conflict on green consumption.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Qilu University of Technology (Shandong Academy of Sciences) Research Ethics Committee. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

WG and GS involved in all steps of the study. HZ performed the statistical analysis and revised the manuscript. All authors contributed to the article and approved the submitted version.

FUNDING

This study was financially supported by the Major Project of National Social Science Foundation of China (Research on the Supervision System to Promote the Upgrading of Residents' Green Consumption, No. 19ZDA107).

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

frontiers in Psychology

ORIGINAL RESEARCH
published: 13 January 2021
doi: 10.3389/fpsyg.2020.609371

Are Recycling People Also Saving? Costliness Matters

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In view of the fact that vigorously promoting recycling has become a viable means to promote sustainable development, it is important to better understand the impact of recycling efforts on subsequent resource saving behavior. This research empirically examines the effects of recycling efforts on subsequent resource saving by analyzing the survey data of 356 college students in China. The recycling efforts, environmental self-identity and feeling of pride were measured using existing scales while saving behaviors and recycling cost were measured by developing new scales. Partial least squares structural equation modeling was performed to test the structural relationships among recycling efforts, environmental self-identity, feeling of pride, and saving behaviors. Further, the moderation role of recycling cost was tested. The results showed that (1) saving behaviors could be classified into two types based on their costliness; (2) recycling efforts have a positive effect on costless saving behaviors, while having a negative effect on costly saving behaviors; (3) both the positive and negative effect of recycling efforts on resource saving is mediated by pride feeling and environmental self-identity; and (4) recycling cost negatively moderates the effects of recycling efforts on pride feeling. We discuss the theoretical and managerial implications of the findings.

Keywords: recycling effort, resource saving, self-identity in environment, pride feeling, recycling cost

OPEN ACCESS

Edited by:
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Reviewed by:
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Specialty section:
This article was submitted to Environmental Psychology, a section of the journal Frontiers in Psychology

Received: *23 September 2020*
Accepted: *15 December 2020*
Published: *13 January 2021*

Citation:
Wei S, Xu J, She S, Wang Y and Zhang Y (2021) Are Recycling People Also Saving? Costliness Matters. Front. Psychol. 11:609371. doi: 10.3389/fpsyg.2020.609371

INTRODUCTION

China having the highest population in the world not surprisingly produces one of the largest if not the largest amounts of solid waste. Promoting the reduction of solid waste sources and recycling to minimizes the negative impact on the environment is the advocated green urban development model. Recycling is "the process of collecting and processing materials that would otherwise be thrown away as trash and turning them into new products"[1]. Governments and environmental public welfare organizations have invested many resources in cultivating, publicizing and promoting people's recycling behavior, such as recycling facilities installed in public places, household waste classification and recycling policies, school education program and ubiquitous public service commercials, and propagandas. Many businesses have also launched second-hand goods recycling deduction plans (such as old clothes recycling plan by H&M) and idle goods circulation market (such as Taobao online idle goods market).

Resource recycling is an important mean to achieve sustainable development. However, the main focus on the work so far has been on factors affecting recycling behavior (e.g., Tonglet et al., 2004; Schultz et al., 2007; Goldstein et al., 2008; Trudel et al., 2016; Wang et al., 2016;

[1]https://www.epa.gov/recycle/recycling-basics

Echegaray and Hansstein, 2017; Wan et al., 2017). These studies focused on garbage charges, identity exposure, information presentation, commodity appearance, individual attitudes, level of education, and other factors related to recycling habits. The insights from the these studies can help policymakers educate and persuade the public to participate in recycling activities, though the long term overall effect of these efforts is questionable. The basic assumption underlying such research is that garbage recycling is an effective way to prevent pollution, save energy, and save natural resources (Troschinetz and Mihelcic, 2009; Varotto and Spagnolli, 2017). Nevertheless, an initial sustainable act may lead the individual to perform unsustainable behaviors (Meijers et al., 2013), so peoples' recycling efforts may increase their levels of future consumption, thus increasing overall resource use. For example, consumers who recycled their used clothes may feel that buying new clothes is more acceptable. If the potential negative consequences of recycling (such as promoting waste) cannot be avoided, it will be hard for policymakers to maximize the beneficial effects of recycling (Ma et al., 2019). Therefore, it is very important to study the subsequent resource saving behavior related to involvement in waste recycling.

The aftermath of recycling behavior has received limited investigation and the questions whether it encourages saving or wasteful behavior remains to be answered. Social psychology studies suggest that humans have motivation for consistent behaviors (Beaman et al., 1983; Burger, 1999; Mullen and Monin, 2016). The theory of self-perception suggests that people will infer their attitudes, beliefs and self-characterizations according to their previous behavior, and then make choices consistent with self-concept. Past environment sustainable behavior leads to the perception that "I am a pro-environmental person," and this perception promotes the subsequent emergence of similar behavior (Bénabou and Tirole, 2011). Studies have found that moral behavior promotes subsequent moral behavior (Gneezy et al., 2012), and green consumption promotes green consumption or environmental behavior (Cornelissen et al., 2013; Summers et al., 2016). On the other hand, a large amount of literature illustrated just the opposite, i.e., when individuals took sustainable behavior before, they will reduce their sustainable behavior or engage in unsustainable behavior subsequently. For example, after consuming green products, the possibility of purchasing the green products in the future decreases (Mazar and Zhong, 2010). Compared with ordinary cars, hybrid cars drivers use cars more frequently, drive more mileage (Sun and Trudel, 2017), and have more traffic violations and accidents (Woodyard, 2009). Individual support for green funds is lower after garbage recycling (Truelove et al., 2016). When economic incentives were used to encourage household waste recycling, the consumption of electricity in the same household increased (Xu et al., 2018).

A recent study on how recycling behavior affects future consumption comes from Ma et al. (2019) who investigated the negative consequences of recycling behavior. Although previous studies have given conflicting conclusions, their results provide evidence to support the prediction that recycling activities indeed increase future resource consumption. This effect is mediated by two mechanisms, i.e., pride feeling and environmental self-identity, that decrease negative emotions from wasting behaviors. Feelings of pride, as a self-conscious emotion, play an important role in self-regulation. Environmental self-identity, the degree to which individuals regard themselves as environmentalists (Whitmarsh and O'Neill, 2010; Werff et al., 2013, 2014) were found to decrease negative self-attributions associated with wasteful consumption (Bolton et al., 2006; Ma et al., 2019). Furthermore, they indicated that the consideration of future consequences negatively moderates the effects of recycling efforts on pride feeling and environmental self-identity. Based on the above evidence, we tend to presume that individuals' recycling efforts would reduce their saving behavior. Unfortunately, few studies have examined the relationship between recycling efforts and resource saving behavior. Existing studies have either only focused a specific consumption behavior (such as using paper cups or scrap paper) in an experimental research situation (Catlin and Wang, 2013; Sun and Trudel, 2017) or taken a proxy variable of resource saving, such as average monthly expenditure (Ma et al., 2019), which provided limited insights into the understanding of resource saving behaviors.

In this research, we empirically investigate these issues based on survey data from college students in China, using structural equation modeling. We argue that resource saving behavior is a set of behaviors rather than a single action and saving behaviors could be classified into two types, i.e., costly and costless saving behaviors. From a viewpoint of evolution, the perceptions of the costs of saving behaviors might play a substantial role for different individuals (Poškus, 2017). It is suggested that the self-oriented attitude reflecting personal gain may have different effects on environmental behavior than social-oriented attitude reflecting altruism. Although individuals sometimes show socially desirable behaviors such as carrying a reusable shopping bag and try to improve their social status at the cost of losing resources (costly signaling), at other times, they may be reluctant to pay a cost to save resources, so as to maintain their personal advantages (Gintis et al., 2001; McAndrew, 2002; Millet and Dewitte, 2007; Bereczkei et al., 2010). Therefore, the individual's resource saving behaviors may not only be affected by the previous recycling behavior in terms of moral self-regulation, but also the costliness of recycling behavior can not be ignored. The current study's framework are based on the Ma et al. (2019)'s study, and further extends it by examining two types of saving behaviors, which shows different consequences. In addition, we investigated the role of recycling cost when examining the effect of recycling efforts on pride feeling and environmental self-identity.

HYPOTHESIS

To investigate the relationship between recycling efforts and subsequent saving behavior, we used Ma et al. (2019) conceptual framework with modification of adding recycling costliness as a moderator. Furthermore, we used a set of saving behaviors to replace the single indicator (i.e., monthly living expenses) used by Ma et al. (2019), and found that the structure of saving behavior show two dimensions. Ma et al. (2019) proposed that recycling efforts can increase peoples' consumption level, which is mediated by feelings of pride and environmental self-identity that

can reduce negative emotions from resource wasteful behaviors. Firstly, as the study is based on the Ma et al. (2019) framework, we wanted to confirm the relationships observed in the original study and explore the relationships between recycling efforts, environmental self-identity, and pride feeling.

H1. Recycling efforts positively affect environmental self-identity.

H2. Recycling efforts positively affect pride feeling.

H3. Pride feeling positively affect environmental self-identity.

Further, we predict that the impact of recycling efforts on saving behavior depends on the costliness of saving behavior, that is, whether it is costly or costliness for individuals. Recycling efforts promote costless saving behavior, but they inhibit costly saving behavior, which is mediated by pride feeling, and environmental self-identity. In addition, we predict that the cost of recycling activities will moderate the effects of recycling efforts. Below, we discuss each concept in more detail and present our hypotheses.

The findings from empirical research consistently suggested that there is a positive correlation between ecological affect referring to the degree of emotionality an individual is attached to environmental issues and ecological behavior (e.g., green purchase; Chan and Lau, 2000). He et al. (2013) found that ecological emotion (such as pride, cherishing) played a mediating role in the positive impact of green cognition (i.e., knowledge about green products) on green behavior. Sun and Trudel (2017) argued negative emotions experienced during resource wasting behavior can be reduced by positive emotions arousing from the following recycling or resource saving activities. Thus, pride feelings are likely to decrease resource saving by reducing the negative emotions of wasteful behavior (Ma et al., 2019). Besides, based on social exchange theory's rank equilibrium norm (Cropanzano and Mitchell, 2005), individuals' feeling of pride arousing from their recycling efforts, makes them feel more entitled to make less other environmentally responsible decisions, such as feel comfortable about using more resources (Ma et al., 2019). Therefore, we propose:

H4. Pride feeling negatively affect saving behaviors.

Previous work on social cognition based on the concept that individuals have different identities (Reed, 2002; DeMarree et al., 2005) has proved that individuals' prior behaviors can stimulate a certain self-concept and influence their subsequent behaviors. The moral licensing effect showed that previous moral behavior might activate and promote a positive self-concept, thus allowing consumers to make more of self-indulgent choices later (Khan and Dhar, 2006; Merritt et al., 2010). Following this, an increased feeling of environmental self-identity could act as one of the factors for decreasing negative emotions from wasteful behavior (Bolton and Alba, 2012; Sun and Trudel, 2017). Empirical research in the effect of moral licensing found similar evidence. For example, people who see themselves as typical recyclers are more likely to recycle than those who do not perceive themselves as recyclers (Mannetti et al., 2004), garbage recycling leads to lower green fund support (Truelove et al., 2016). In this research context, recycling efforts also have the potential to activate and confirm environmental self-identity, which can be a "get out of jail free card," making high levels of consumption more acceptable (Whitmarsh and O'Neill, 2010; Ma et al., 2019). Therefore, engaging in recycling could boost environmental self-identity, which decreased the negative self-attribution associated with wasteful consumption (Ma et al., 2019) and, thus decreased the likelihood of saving behaviors.

H5. Environmental self-identity negatively affects saving behaviors.

Recycling activity is a collection of multiple actions rather than a single behavior, many of which require individuals to accept some costs, including financial costs (such as purchasing recycling equipment), physical costs (going to a specific recycling point), and mental burdens (garbage sorting), etc. Sun and Trudel (2017). Gneezy et al. (2012) proposed that the costliness of initial pro-social behavior is a key moderator of moral consistency between a sequence of behaviors. Costly pro-social behavior signals a pro-social identity, leading to moral consistency of sequential behaviors, whereas costless behavior does not, leading to no moral consistency. In their experiment, compared to the control condition, participants lied significantly less in the costly condition and significantly more in the costless condition. Participants in the costly condition also rated themselves as more helpful and less selfish than participants in either of the other two conditions, and the difference in truth-telling between the costly and the costless conditions was mediated by this self-rating of pro-social identity.

Accordingly, costly recycling behavior is more diagnostic about oneself, leading people to embrace the value indicated by that behavior (Burger, 1999; Gneezy et al., 2012). Individuals who accept the higher cost of recycling, which can prove that they are a person who abides by social norms, thus strengthening their environmental identity. In addition, if the recycling was costly, it means that consumers contributed more efforts for recycling, which will be converted into more moral credits or improve the quality of moral credentials (a mechanism of moral licensing). In the model built by Sun and Trudel (2017), higher recycling cost (for example, putting the recycling bin farther away in the field experiment) would produce stronger positive emotions. Thus, we hypothesize the following:

H6. Recycling cost positively moderates the effect of recycling efforts on environmental self-identity.

H7. Recycling cost positively moderates the effect of recycling efforts on pride feeling.

We constructed a conceptual model to better present the relationships between each constructs (**Figure 1**).

TABLE 1 | Constructs and measure.

Construct	To what extent do you agree with the following statements? 1 = strongly disagree, 7 = strongly agree.	Factor loading
Recycling efforts	I usually separate and dispose of all recyclable materials	0.850
	I have high involvement in recycling activities.	0.842
	I tend to buy products which can be recycled in the future.	0.767
	I have high adherence levels to separating and disposing of recyclable materials.	0.839
Environmental self-identity	I think of myself as an environmentally-friendly individual.	0.853
	I think of myself as someone who is very concerned with environmental issues.	0.850
	I would be happy to be seen as having an environmentally-friendly lifestyle	0.829
	I would want my family and friends to think of me as someone who is concerned about environmental issues.	0.767
	I think everyone should contribute to environmental protection.	0.695
Pride feelings	I am proud of my recycling efforts.	0.955
	I feel good about my recycling efforts.	0.959

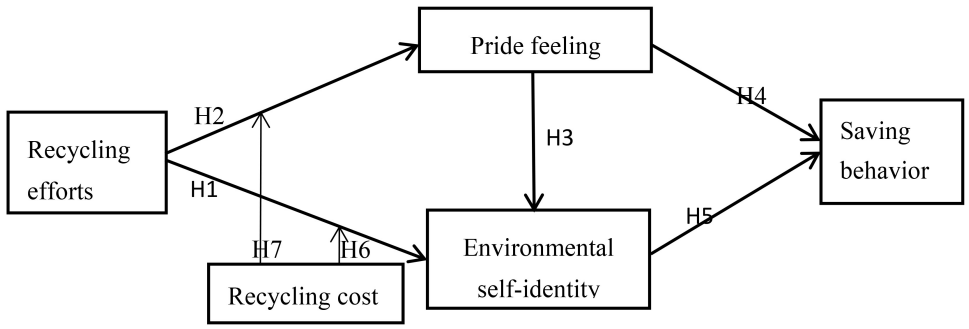

FIGURE 1 | Conceptual model.

EMPIRICAL STUDY

The subjects of this study were college students majoring in economics and management from Shaanxi University of Technology in China. Respondents who completed the questionnaire were rewarded with money of 10 RMB. A total of 442 questionnaires were sent out during the class and 436 valid sample was obtained. Among them, there were 135 males and 301 females. 58% of the population grew up in rural areas and 42% in urban areas. The M_{age} was 19.13 (SD = 1.02). Though the females are much more than males in our sample, we included control variables for gender (male/female), and growing background (rural/city), to capture unobservable differences.

We adopt PLS-SEM (partial least squares structural equation modeling) for our data analysis. Using PLS is appropriate because it does not assume normal distributions and allows for analyses with small samples (Hair et al., 2011). Besides, SmartPLS 3.0 can provide consistent results when all constructs are reflective (Dijkstra and Henseler, 2015). If properly used, PLS-SEM can provide more robust estimations of structural models than can covariance-based SEM (Reinartz et al., 2009). Using SmartPLS 3.0 software, a two-stage analytical procedure was applied to analyze the data (Hair et al., 2011). Firstly, we assessed the reliability and validity of the measurement model and then examined the parameters and the explanatory power of the structural model. The significance of the model estimates was based on a bootstrapping procedure with 5,000 samples.

Measure

The questionnaire included five constructs: recycling efforts, environmental self-identity, pride feeling, saving behaviors, and recycling cost. We used scales from prior research to measure the first three constructs (Ma et al., 2019; See **Table 1**) and developed the scales to measure saving behaviors and recycling costs.

Recycling Efforts, Environmental Self-Identity and Pride Feeling

Recycling efforts was adapted from Ramayah et al. (2012) and Wang et al. (2016), environmental self-identity was adapted from Truelove et al. (2016), and pride feeling was adapted from Harth et al. (2013). The three constructs as well as the measurement also had been used in Chinese consumer context by Ma et al. (2019). To evaluate the psychometric adequacy of the constructs in this study, confirmatory factor analysis were conducted. The factor loadings for each construct are shown in **Table 1**. All factor loadings are significant ($p < 0.001$), ranging from 0.695 to 0.955. According to **Table 2**, Cronbach's alphas for the main constructs are 0.843 or above, and composite reliability ranges from 0.895 to 0.956 (**Table 2**), both of which exceed the benchmark of 0.7, suggesting that all of these measures are reliable. Convergent validity was assessed using the average variance extracted (AVE) from the constructs. All

TABLE 2 | Description statistics and reliability of measures.

Measure	Mean	SD	α	AVE	CR	1	2	3
1.Recycling efforts	4.405	1.477	0.843	0.681	0.895	0.825		
2.Environmental self-identity	6.165	0.884	0.860	0.641	0.899	0.368	0.801	
3.Pride feeling	5.917	1.143	0.908	0.915	0.956	0.396	0.559	0.957

Note: SD, standard deviation; AVE, average variance extracted; and CR, composite reliability.

constructs range from 0.641 to 0.915 in AVE, well above the recommended value of 0.50. According to Fornell and Larcker (1981), the AVE of each construct exceeds its squared correlation to any other construct, assuring the discriminant validity of the constructs. Further, the variance inflation factors of all constructs are lower than the recommended value of 5 (the maximum is 3.228), demonstrating that multicollinearity is not a threat in this research.

Saving Behavior and Recycling Cost

This study developed a pool of items to measure saving behavior and recycling costliness since there are no existing scales to use. We tested the initial item pool in qualitative interviews with 20 undergraduate students at a university in Guiyang, China. The final survey instrument was developed by selecting and modifying the items according to feedback from the interviews. The items are shown in the **Tables 3**, **4**, respectively. Prior to reply, the respondents read: to what extent are the following statements consistent with your actual situation? The main constructs were measured with a 7-point Likert scale (1 = very inconsistent, 7 = very consistent). To ensure the validity of the scale, exploratory factor analysis (EFA) was carried out on the two newly designed measures, namely, saving behavior and recycling cost.

Measure of saving behavior

Exploratory factor analysis extracted two factors and explained 45.563% of the total variance. According to the semantic content of measurement items, they are named as costless saving behavior (including 4 items) and costly saving behavior (including two items; see **Table 3**).

In terms of costliness, there are differences in the difficulty of people's saving behaviors. Costless saving behaviors are easy to implement, which require not much physical, mental or psychological cost, such as turning off the lights after use. On the contrary, the costly saving behavior is not as easy to take, because it will bring a certain physical or psychological cost. For examples, carrying a shopping bag not only brings trouble but may also appears strange especially for young people. Although wearing worn-out socks is a effort of saving resources, it may detract from one's self-concept and therefore produce a psychological cost. In fact, the sample on the whole scored higher on costless saving behavior (M = 6.22, SD = 1.218) and lower on costly saving behavior (M = 3.982, SD = 1.997), indicating that there are substantial differences between the two dimensions of saving behavior for the college students. Considering this fact, it is necessary to distinguish the two types of saving behavior when testing the hypotheses.

TABLE 3 | Results of exploratory factor analysis of saving behaviour.

item	Factor loading	
	Costless saving behavior	Costly saving behavior
Retain printed papers with a clean side	**0.754**	−0.107
Turn off the lights after use	**0.680**	−0.135
Shut off water while applying bath foam.	**0.676**	−0.121
Use toothpaste to completely squeeze out	**0.661**	0.165
Take shopping bags with you	−0.104	**0.796**
Wear worn-out socks	−0.015	**0.757**
Cronbach *a* coefficient	0.650	0.603
KMO	0.675	
Bartlett spherical test	0.000	

Note: The items with bold value in a column belong to one factor.

TABLE 4 | Exploratory factor analysis of recycling cost.

Item M = 4.281 SD = 1.507	Factor loading
I spend time on recycling.	0.818
I paid mental efforts for recycling	0.789
I paid extra money for recycling.	0.714
Recycling is easy for me (Reverse scoring)	0.544
Cronbach *a* coefficient	0.681
KMO	0.650
Bartlett spherical test	0.000

Measure of recycling cost

As shown in **Table 4**, EFA extracted one factor and explained 52.466% of the total variance. The factor loads of all items ranged from 0.544 to 0.818, which was greater than the recommended value of 0.4. Cronbach *a* coefficient is 0.681, which is greater than the recommended value of 0.6. Drawing on Sun and Trudel (2017), recycling efforts is associated with financial cost (e.g., purchasing of expensive recycling equipment or recycling depot fees), physical cost (e.g., walking some distance to recycle), and mental cost (e.g., sorting trash and using multiple bins). In our scale, recycling cost mainly covers the time, energy and money paid by individuals in implementing recycling behavior. The fourth item measures the difficulty of recycling as a whole.

HYPOTHESES TESTING

Structural Model

Since two different factors are obtained with regard to saving behavior, the influence paths between variables are tested by estimating structural equation models for two kinds of saving behavior, respectively. R^2 level and significance of the path coefficients were used as the primary evaluation criteria for the structural model (Hair et al., 2011). The analysis started by investigation whether the results of the Ma et al. (2019) study still holds when introduced outcome variables of costless saving behavior and costly saving behavior.

Costless Saving Behavior as a Dependent Variable

Taking the costless saving behavior as the dependent variable of the structural equation model In H1, following the Ma et al. (2019) study, we tested and evidenced that recycling efforts positively affect environmental self-identity (b = 0.174, t = 4.051, and $p < 0.001$). In addition, environmental self-identity significantly positively affects costless saving behavior, reflecting a effect of reinforcement, so H5 is rejected (b = 0.425, t = 6.800, and $p < 0.05$). The path coefficients show that the path between recycling efforts and pride feeling is positive and significant (H2; b = 0.396, t = 9.434, and $p < 0.001$). The path coefficient indicates that the effect of pride feeling help to boost environmental self-identity (b = 0.490, t = 10.759, and $p < 0.001$), which supports H3. The effect of pride feeling on costless saving behavior, however, is not significant (H4; b = 0.091, t = 1.534, and p = 0.125). Males have more costless saving behaviors than females (b = 0.167***, t = 4.003, and $p < 0.001$), but there is no gender difference in costly saving behaviors (b = -0.081***, t = 1.556, and $p > 0.1$). No matter in rural or urban areas, the growth background has no significant impact on saving behaviors (b = -0.075***, t = 1.784, and $p > 0.05$).

The model explains 33.8 percent of the variance in environmental self-identity (adjusted R^2 = 0.335), 15.7 percent of the variance in pride feeling (adjusted R^2 = 0.155), and 28.6 percent of the variance in saving behavior (adjusted R^2 = 0.280). The fit of the structural model is good, with a standard root mean-square residual = 0.040, which is lower than the benchmark of 0.05.

Costly Saving Behavior as a Dependent Variable

Taking the costly saving behavior as the dependent variable of the structural equation model. Surprisingly, all the results are consistent with the costless saving behavior model except for the H5. That is, environmental self-identity marginally significantly negatively affects costly saving behavior, reflecting an opposite licensing effect compared to the first model (b = -0.139,t = 1.846, and $p < 0.1$).

The model explains 34.0 percent of the variance in environmental self-identity (adjusted R^2 = 0.337), 15.7 percent of the variance in pride feeling (adjusted R^2 = 0.155), and 4.9 percent of the variance in resource consumption (adjusted R^2 = 0.042). The fit of the structural model is good, with a standard root mean-square residual = 0.044 which is lower than the benchmark of 0.05.

Testing Recycling Cost as a Moderator

We have built on the proposed Ma et al. (2019) conceptual model by introducing recycling cost variable. Further analysis will investigate the moderating effects of this variable has on pride feeling (H7) and environmental self-identity (H6).

Recycling Cost as a Moderator of Effect of Recycling Efforts on Pride Feeling

We tested the moderating effect of recycling cost on pride feeling. The interaction between recycling efforts and recycling cost has a negative effect on pride feeling (b = -0.061, t = -3.361, and $p < 0.001$), which is the opposite of hypothesis H7. This result demonstrates that recycling cost negatively moderates the relationship between recycling efforts and pride feeling. When the cost of recycling is higher, the positive relationship between recycling effort and pride feeling is weaker, that is, the recycling effort causes less pride feeling. This means that if the individuals realized that they have spent more time, physical and mental energy in recycling activities, they may feel very troublesome rather than feel priding. On the contrary, if they don't feel any trouble at all, they will feel more proud.

Recycling Cost as a Moderator of Effect of Recycling Efforts on Environmental Self-Identity

We tested the moderating effect of recycling cost on environmental self-identity. The interaction between recycling efforts and recycling cost has no significant effect on environmental self-identity (b = -0.008, t = 0.179, and p = 0.858), which cannot support H6.This shows that the cost of recycling does not moderate the impact of recycling efforts on environmental self-identity. Whether the cost of recycling is high or low, recycling efforts have the same positive impact on environmental identity. This is not consistent with the original assumption, the possible reason is that the recycling cost is not actively accepted by the consumers, so it can not enhance environmental self-identity. **Figure 2** provides summary results for all of the hypotheses.

DISCUSSION

This survey research provides evidence that individuals' recycling efforts can increase their costless saving behaviors, while decrease their subsequent costly saving behaviors. We demonstrate that the efforts to recycle can influence subsequent resource saving by activating a positive pro-environmental self-identity, which gives individuals a license to take less costly saving behaviors, and at the same time, gives individuals a motive to take more costless saving behaviors. Research based on Construal Level Theory shows consumers save more when the saving goal is construed at a high level and tend to perceive specific goals as more difficult (Ülkümen and Cheema, 2011). Consumers usually don't care about the costless saving behaviors in their daily life, which means that their psychological distances of these saving activities are distant, so they will construal these saving activities in a more abstract way. But for costly saving behaviors, such

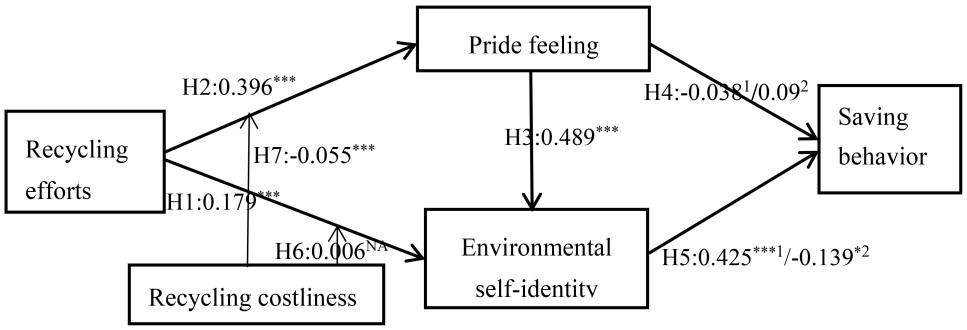

FIGURE 2 | Results of hypotheses testing. Note.*$p < 0.1$ and ***$p < 0.01$. [1]corrsponding to costless saving behavior, [2]corrsponding to costly saving behavior. The figure synthesizes the path coefficients of two structural equation models with different dependent variables. Since the same sample data is used, the path coefficients corresponding to H1, H2, and H3 are the same, while the path coefficients corresponding to H4 and H5 are different.

as those requiring some physical or mental effort, consumers will be more concerned with them and thus have a closer psychological distance, so they will construal them in a more concrete way. In one word, costliness is a key factor for individuals to make choices that are inconsistent or consistent with their prior recycling behaviors. In addition, we find that recycling cost negatively moderates the relationship between recycling efforts and pride feelings. It is worth noting that we conducted the same research on 224 college students in another university located far away, and the results still support this conclusion, which shows the robustness of the research conclusion.

Contributions

The current study builds and extends the proposed conceptual model of recycling efforts and saving behavior proposed by Ma et al. (2019). The substantial changes introduced by the current study are the two-dimensional outcome of saving behavior and the moderating variable of recycling costs. The findings of this study therefore contribute to the existing literature in four ways.

First of all, we find that resource saving behavior is not a one-dimensional construct but can be divided into two types in terms of its costliness. As far as we know, there is no research to explore the nature of behavior toward resource saving or waste, neither to develop the measures to capture such behavior. Take an example, Ma et al. (2019) only takes the average monthly consumption (livelihood expenditure) as the measure of resource consumption level. The findings of this study provide directional guidance and verified measurement methods for investigating residents' resource saving behavior.

Second, according to existing evidence (Ma et al., 2019), we assume that individuals who are highly involved in recycling activities will be less resource-efficient, that is, they will consume more resources. However, the research results show that recycling efforts promote costless saving behavior and inhibit costly saving behavior. For costly saving behaviors, individuals might feel allowed to relax moral requirements based on the moral licensing model (Mullen and Monin, 2016) due to the previous efforts on recycling activities. Therefore, their attitudes are more self-oriented in that they might have a negative appraisal of costly saving behaviors because they are unpleasant to them (Fishbein and Ajzen, 2010; Poškus, 2017). As a result, the behavior willingness toward costly saving behaviors is declined. On the contrary, costless behaviors are easy to implement, as well as comply with social norms, which resulted in a positive appraisal and stronger intentions to take. This finding reconciles existing studies on the conflicting conclusion on moral spillover effects in environmental behaviors. For example, Thøgersen (1999) and Thøgersen and Noblet (2012) suggested the positive spillover effects, i.e., continuation to engage in recycling after initial recycling activities. Other studies, however, pointed toward the negative spillover effects (Catlin and Wang, 2013; Nilsson et al., 2017; Ma et al., 2019). The results of this study explore the spillover effect of recycling and saving behavior and thus enrich the understanding of individual sustainable behavior dynamics.

Third, this study examines the impact path of recycling efforts on saving behavior. We find that both positive and negative spillovers are mediated by pride feeling and environmental self-identity, which is consistent with Ma et al. (2019). Furthermore, the pro-environmental identity can be, in fact, boosted by recycling behavior. This identity thus can result in greater engagement of costless recycling at the same time decreasing the engagement in costly saving behaviors. The opposing view of the moral licensing effect on recycling behavior (Catlin and Wang, 2013; Sun and Trudel, 2017) are more in line with the current study findings and further explores the psychological mechanism of the effect. At the same time, this study has taken a great step forward on the basis of Ma et al. (2019). Their research adopted average monthly consumption (livelihood expenditure) as the proxy variable of resource consumption and finds the positive spillover effect of recycling efforts on resource consumption. In this study, six common resource saving behaviors of college students were taken as dependent variables and revealed the divergent effects of recycling efforts on differential saving behaviors.

Forth, this study finds evidence for the moderating effect of recycling cost between recycling efforts and pride feeling. However, the direction of moderation is just opposite to our

prediction, i.e., when the cost of recycling is higher, the pride of recycling effort is lower than that of lower recycling cost. This result is also inconsistent with Sun and Trudel (2017), in whose utilitarian model it is believed that pro-environmental behaviors with high costs will bring stronger positive emotions. We have carefully examined the research data to confirm that the research results are reliable. Furthermore, we interviewed some of the respondents to understand why such unexpected results occurred. Finally, we think that an important feature of our college students' sample leads to this result, that is, they do not always take the initiative to recycle resources in their daily life, or even feel very troublesome in many situations. Because there are many social norms in China's powerful collectivism culture, even if many people are not willing to spend a lot of efforts to recycle wastes, they still have to do recycling under the social pressure. As a result, we argue that whether recycling costs enhance or weaken the positive emotions from recycling efforts depends on whether individuals actively or passively accept the recycling costs. The respondents in this study might have to implement costly recycling behavior under social pressure. Therefore, they felt troubles, reluctance and other negative emotions, which offset feeling of pride. Take the same example from Sun and Trudel (2017), putting the recycling bin farther away might produce stronger positive emotions for some people who has a society-oriented attitude, but might produce stronger negative emotions for one who who has a self-oriented attitude, therefore dislikes walking so far to recycle. For the same reason, costly recycling behavior is not able to diagnostic about oneself (Burger, 1999; Gneezy et al., 2012). Because recycling isn't an inner initiative, individuals who passively accept the higher cost of recycling cannot prove that they are a pro-environmental person, thus can not strengthening their environmental self-identity. As a result, there is no significant moderating effect of recycling cost between recycling efforts and environmental self-identity. Anywhere, this is a problem worthy of further study.

Management Implications

The above research reveals that many people want to improve their environmental identity, but are unwilling to pay the price. People are willing to take easy-to-implement environmentally sustainable behaviors in order to get a good sense of self. However, when there is a price to pay, past pro-environmental behavior such as recycling efforts may be used as a reason for self-excuse. According to the economic theory, it is human nature to maximize gains and to minimize loses (Camerer, 1997). Therefore, it is unrealistic to insist for people to be selfless and pay personal costs for the environment.

The increased use of modern technologies by government could have impacts on increasing saving behavior and decrease costs of recycling. Although high recycling cost can directly reduce current consumption, it also brings a lot of trouble to daily life. For example, in July 2019 in Shanghai, China, the first implementation of the compulsory classification policy of domestic waste greatly constrains the consumption behavior of residents. In order to avoid annoying garbage classification, many people reduce the frequency of taking-out food ordered online, or abandon some food that is difficult to classify, such as pearl milk tea. Although this policy can promote consumption reduction, it can also lead to negative emotions, which may reduce the pride feeling and environmental identity brought by recycling behavior, and then may inhibit some low-cost saving behaviors, such as saving water and electricity when staying in hotels. In order to reduce the cost of classified recycling, the government can increase training guidance on how to classify garbage and support the establishment of professional recycling intermediaries. In addition, the government should invest more in the recycling infrastructure and make it easier to recycle by using intelligent and internet-based means, such as making it easy for people to find the recycling sites of toxic waste through a mobile app.

On the other hand, the policy measures to reduce the costliness of saving can start with publicizing and popularizing the knowledge of saving, such as telling people the tips of saving resources through celebrities or web-casters, which is more persuasive. In addition, guiding people to establish the value of "I am thrifty and proud" and advocating "minimalist lifestyle" can reduce the psychological cost of some economizing behaviors, such as wearing old clothes and shoes.

Limitations and Directions for Further Research

This study provides insights into recycling and resource saving, although it inevitably has some limitations that can be addressed through future research. First, the self-report data by nature pose certain issues. We encourage future research to explore further relevant research issues using field studies or big data. Second, for understandable and common reasons, the object of this study is college students, and the conclusions should not be extended to other groups before being verified. Third, the measure of saving behavior is still a preliminary exploratory work, and it is valuable to improve it in the future. Forth, we cannot assess all the moderating variables between recycling behaviors and resource saving (e.g., social pressure, environmental values), which is a promising way for further research. Finally, since the research is carried out in the Chinese cultural context, while the conclusions obtained are instructive for the Chinese context, we need to be vigilant about the adaptability of the conclusions in any other cultural context.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Academic Committee of Center for

Behavior and Decision Shaanxi University of Technology. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

SS and SW: conceptualization. YW: data curation. JX: formal analysis. SW and SS: investigation. JX: methodology. SS: project administration. SS and YZ: supervision. YW: writing – original draft. YZ: writing – review and editing. All authors contributed to the article and approved the submitted version.

FUNDING

This study was funded by the Major Project of National Social Science Foundation of China (No. 19ZDA107), Scientific Research Project of Guizhou University of Finance and Economics (No. 2020XZD03), and Youth Innovative Talents Project of Harbin University of Commerce (No. 2020CX16).

ACKNOWLEDGMENTS

We thank Doctor Iveta Eimontaite from The University of Sheffield for her contributions in writing. We appreciate the efforts from two reviewers as well as the editor for their comments and suggestions.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

frontiers in Psychology

ORIGINAL RESEARCH
published: 19 January 2021
doi: 10.3389/fpsyg.2020.568586

Good News or Bad News? How Message Framing Influences Consumers' Willingness to Buy Green Products

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Despite the growing social interest in green products, companies often find it difficult to find effective strategies to induce consumers to purchase green products or engage in other environmentally friendly behaviors. To address this situation, we examined the favorable or unfavorable effects of positive and negative message frames on consumers' willingness to consume green products in different psychological distance contexts. Through two Studies, we found that the positive information framework played a more pronounced role in context when consumers were in closer spatial distances. More importantly, we found that the emotional factors of fear and hope were intrinsic causes of this phenomenon. Correspondingly, the negative information framework played a better facilitating role in context with farther spatial distance, while shame and pride were the emotions responsible for this effect. Finally, we discuss the theoretical and managerial implications of our work, as well as its limitations and future research directions.

Keywords: psychological distance, framing effect, willingness to buy green products, emotional mechanisms, spatial distance

OPEN ACCESS

Edited by:
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Specialty section:
This article was submitted to Environmental Psychology, a section of the journal Frontiers in Psychology

Received: *01 June 2020*
Accepted: *24 August 2020*
Published: *19 January 2021*

Citation:
Tong Z, Liu D, Ma F and Xu X (2021) Good News or Bad News? How Message Framing Influences Consumers' Willingness to Buy Green Products. Front. Psychol. 11:568586. doi: 10.3389/fpsyg.2020.568586

INTRODUCTION

Green products are those that are manufactured with care to minimize the exploitation of natural resources, use of toxic materials, or emissions of waste and pollutants (Lin and Chang, 2012; Haws et al., 2014). The data indicate that companies across industries are increasingly interested in producing and selling environmentally sustainable products (Delmas and Burbano, 2011; Romani et al., 2016). However, it is often difficult for companies to design communication strategies that increase consumers' willingness to choose these products (Kalamas et al., 2014). For this reason, one strategy often employed by firms is the use of positive or negative framing (Tversky and Kahneman, 1981; Levin et al., 1998). Through positive framing messages, firms highlight the potential environmental benefits of purchasing green products. Conversely, through positive framing messages, companies emphasize the harmful environmental consequences of consumers not purchasing sustainable products. The questions are which framing messages are better for consumers, and how different framing effects influence the consumers' willingness to buy green.

Existing green product communication research diverges on the role of different framing messages, with some studies arguing that negative information frameworks may be more effective than positive ones in promoting green procurement and other responsible behaviors (e.g., Olsen et al., 2014). Others disagree, for example, as some studies suggest that positive frames may be

more effective when it comes to promoting risk aversion/prevention behaviors (Dijkstra et al., 2011), while in many cases, environmental protection can be seen as a way to encourage people to take steps to prevent environmental damage (Loroz, 2007), and thus is likely to yield different results. Previous research has shown that the most immediate effect of different framing messages on people is not a long-term cognitive one (Such as alertness, severity judgments, etc.), but rather an immediate emotion that is triggered (McElroy and Seta, 2004). This emotion, while not necessarily long-lasting and sometimes hidden (Sun et al., 2020), has an immediate and more significant impact on consumers' willingness to purchase. We argue that different framing messages are used to influence consumers' green purchase intentions by affecting people's emotions, an effect that is far more pronounced than the cognitive pathway. Of course, the framing effect on people's emotions is not invariant; positive or negative framing affects people's emotions differently when the psychological distance, especially in the spatial dimension, varies. Specifically, we argue that when the spatial distance is close, negative information framing tends to bring fear and cause avoidance behavior, which in turn reduces consumers' willingness to make green purchases, whereas positive frames are motivated by creating a sense of hope, which in turn increases consumers' willingness to buy green. At the same time, in the case of long spatial distances, a negative message frame triggers a sense of shame and thus achieves better results than a positive message frame.

This research makes two major theoretical contributions. First, we argue that the psychological distance variable plays a significant moderating role in studies of framing effects on people's prosocial behavior (White et al., 2011); specifically, the effect of negative framing on people should not be favored when psychological distance is sufficiently close. Second, we extend the psychological distance-related theory from another perspective, that is, in addition to its significant impact on people's explanatory level cognition and thus on their behavior (Levin et al., 2002), the impact of psychological distance on people's moods and emotions should also receive attention. For example, people's attention to environmental issues tends to differ across spatial dimensions, and our Studies pave the way for an underlying mechanism that the phenomenon is most likely related to the different emotions triggered by psychological distance.

THEORETICAL BACKGROUND AND ASSUMPTIONS

The framing effect refers to the phenomenon in which a change in the way an option is described leads to a reversal of an individual's choice preferences. Tversky and Kahneman (1981) called this phenomenon a "framing effect." De Martino et al. (2006), on the other hand, argue that the "framing effect" evokes an emotional message, an emotional heuristic.

The application of framing effects to social behavior, particularly green behavior, is not uncommon, but its utility has been debated. For example, some studies have argued that negative framing messages stimulate protective mechanisms and thus have a more significant effect on pro-social behavior (Arthur and Quester, 2004). Other studies have argued that negative frames do not work better in all contexts, such as White et al. (2011) study, which showed that positive frames work better when the information given was at a high level of interpretation, or abstract, while negative frames worked better when the information given was at a low level of interpretation, or concrete. Other studies, however, have argued that positive frames give a higher perceived value and thus have better results in environmental protection behavior (Liu and Gu, 2020). Although it is true that alertness has an impact on people's environmental behavior (Sun et al., 2018; She et al., 2019), and some studies have attempted to explain the role of the framing effect in terms of level of explanation (which affects alertness and perceptions of severity) (White et al., 2011), research has shown that the framing effect only works when activated in the right half of the human brain (which primarily controls emotions and abstract perceptions) (McElroy and Seta, 2004). That is, the effects of the framing effect are not achieved through detailed processing of information (e.g., judging the severity of an event), but rather are realized through abstract perceptions such as emotions.

In order to further investigate the theoretical mechanisms responsible for this phenomenon, we first start with theories related to emotions and determine which emotions are mainly triggered by the framing effect in environmental activities. Emotion appraisal theory describes in detail the conditions under which 17 emotions arise by distinguishing four dimensions: the causality of the event, the degree of controllability, goal congruence (whether it yields positive or negative emotions), and the degree of arousal. For example, when people are confronted with an uncertain event caused by an uncontrollable cause and degree of uncertainty, if the event is inconsistent with their goals, they will primarily produce negative emotions of fear, whereas if the event is consistent with their goals, they will primarily produce positive emotions of hope. When people are confronted with an uncertain event caused by themselves, if the event is consistent with their goals, they will primarily produce positive emotions of pride, whereas if the event is inconsistent with people's goals, then they will primarily generate negative emotions of shame (Roseman, 1991, p. 193). Furthermore, the results of several studies have validated and added to this theory, particularly the idea that some emotions should also be related to the person the event affects (or is expected to affect). For example, people primarily generate emotions of hope when they believe that the event will have an expected positive effect on them and they have little control over that effect (Pekrun, 2006), and they have emotions of pride when they realize that their actions have achieved some good outcome or had a good effect on the outside world. Previous research has also shown that an important distinction between fear and shame/guilt is whether the event will have dire consequences (or punishment) for themselves (Freud, 1923/1961; Ausubel, 1955; Kemper, 1978; Higgins, 1987). To summarize, when people are confronted with an event that has an indeterminate degree of consequence, emotions of hope arise if the event will affect them and the event is consistent with their goals, emotions of fear arise if the event is not consistent

with their goals, emotions of pride arise if the event does not affect them and the event is consistent with their goals, and emotions of shame arise if the event is not consistent with their goals. And these contexts correspond to the framing effect in environmental issues.

The classical framing effect is to elicit positive/negative evaluations by describing the gains and losses of an event, while positive framing is to describe good and desirable goals, and negative framing is to describe unwanted situations (De Martino et al., 2006), in terms of goal congruence characteristics with significant differences. Since people, when getting information about environmental issues, default to the fact that the matter is not completely controllable (even if you tell them about the possible consequences of the event) (Leiserowitz et al., 2013), environmental protection situations are events that are not completely certain for the participant. At this point, based on previous inferences, when the spatial distance is close because of the impact that the environmental issue and the outcome of the environmental protection measures will have on the people themselves, they will have feelings of hope if the environmental issues they face are consistent with their goals, and feelings of fear if the environmental issues they face are not consistent with their goals. When events occur at a distance, since the governance of environmental issues is initiated by themselves and will change the situation of others, emotions of pride arise when the environmental issues are aligned with their goals, and emotions of shame arise if the environmental issues are not aligned with their goals. We therefore speculate that:

> H1a: When the spatial distance is close, positive frames elicit emotions of hope, while negative frames elicit emotions of fear.
> H1b: When the spatial distance is large, positive frames elicit feelings of pride, while negative frames elicit feelings of shame.

Afterward, we further investigate how these sentiments influence consumers' green purchase intentions. The authors of previous research have argued that positive emotions are the good feelings that arise when an individual wants to smile when things are going well or the pleasure that arises when a stimulus satisfies a physiological need, contributes to the achievement of a personally relevant goal, or progresses smoothly (Cabanac, 1971; Carver, 2003). Lazarus states that hope may arise from unsatisfactory situations such as those that are damaging, threatening, or involving poverty. Snyder argues that hope may also originate in situations that are already satisfactory but can be improved. Both situations seem plausible. In terms of the utility of hope as a component of the meaning of people's lives (Feldman and Snyder, 2005), it can help individuals establish goals that effectively overcome difficulties and find more ways to overcome them (Cheavens et al., 2006). Research on the sources of a sense of hope has also shown that hope can inspire a desire for a better situation and motivate people to work harder to achieve their goals. Therefore, we believe that eliciting feelings of hope in environmental issues can be instrumental in motivating people's environmental behaviors and evoking environmental awareness.

Pride has long been an important research topic in the field of social psychology, and Weiner (1985) earlier defined pride as a positive, self-conscious emotion that people feel because they have taken on social responsibility and brought about positive outcomes. Authentic pride is associated with a sense of accomplishment and refers to the pride that results from an individual's unstable and controlled internal attribution of success ("I did well because I personally tried"), which fosters empathy for an external group and helps people develop genuine, deep self-esteem (Williams and DeSteno, 2009; Ashton-James and Tracy, 2012). Pride plays a number of roles in marketing, for example pride has a negative effect on mass consumption (Han et al., 2007), however, this has some conflict in calling for the use of products with uniformly 'green' characteristics. In addition, pride increases consumers' self-awareness and makes them prefer practical goods (Wilcox et al., 2010), however, the price of green products is generally high, so pride has limited effect on consumers' green product intention.

Negative emotions are the basic subjective experience of an individual feeling down and trapped in an unpleasant situation and include a variety of distasteful emotions such as anger, shame, hatred, negative illness, fear, and tension (Watson et al., 1988). Negative emotions have been widely used in the social sciences and have received widespread attention in pro-social behavior, especially in environmental protection. For example, fear and shame are often associated with research on green purchasing behavior, and Witte (1992) argued that fear messages trigger fear control and danger control messages. O'Neill and Nicholson-Cole (2009) research suggests that the role of fear appeals is unstable across contexts, and that environmental protection behavior, as a typically precautionary motivated behavior, is a function of many of the fear appeals (Witte, 1992). The positive effect is not necessarily that the fear emotion plays a role but that the appeals message itself carries a certain preventive message (Ruiter et al., 2001). Conversely, for the emotion itself, fear may inhibit the establishment of preventive motivation by stimulating fear control processes and can create a desire to escape, even to flee immediately to a safe place (Roseman et al., 1994; McDonald et al., 2015). Thus, eliciting fear in environmental behavior acts as a hindrance to stimulating people's environmental awareness. Summing up the above narrative, we hypothesize that:

> *H2a: When spatial distance is close, positive information induces feelings of hope and helps to increase the willingness to purchase green products.*
> *H2b: When the spatial distance is close, negative information induces fear and impedes increasing the willingness to buy green products.*

Another very important emotion in environmental behavior is shame, which Niedenthal et al. (1994) identified as an anxiety generated by negative self-evaluation; Patrick et al. (2009) also studied that, in addition to feeling shame for something they have already done, people can also experience this emotion by

simply considering actions that may have effects on themselves, even if the actions have not yet occurred, thus creating the expected sense of shame when people imagine that they may have committed crimes. Past research has shown that people respond to shame in two important ways: by withdrawing from any action and thus avoiding further threats to their self-concept (Tangney and Dearing, 2002), or by taking actions that may restore their self-concept, such as environmental behaviors. Existing research (De Hooge et al., 2008, 2010, 2011) suggests that the tendency of individuals to engage or withdraw from environmental issues depends largely on whether the social environment offers opportunities to restore particular aspects of the "self" that are threatened. Consistent with this reasoning, we argue that if consumers are motivated to feel shame (e.g., by purchasing an environmentally unsustainable product), they will take advantage of any opportunities offered to them in their environment (e.g., by choosing an environmentally friendly product or by submitting to an environmental association, choosing an environmentally friendly product or making a donation to an environmental association) to avoid the threat of shame. We therefore argue that eliciting shame in environmental issues helps promote environmental behavior. Summing up the above narrative, we hypothesize that

> H3: When spatially distant, negative frames induce feelings of shame and help increase the willingness to purchase green products.

In general, most of the existing theories explain the interaction of the framing effect with psychological distance from a cognitive perspective, and less from an emotional perspective. Therefore, this study aims to explore the mechanisms by which the framing effect brings about emotional changes in different psychological distance contexts, and thus triggers in different consumer behaviors.

STUDY

Study 1

Study 1 used an online questionnaire designed to test the main effect of the Study, that is, whether positive and negative message frames play different roles in the context of different psychological distance spatial dimensions. In this way, Study 1 provides preliminary evidence for the moderating role of the psychological distance spatial dimension in the effect of framing on green purchase intentions.

Method

We surveyed 421 respondents by means of an online questionnaire and randomly divided them into four groups (positive frame vs. negative frame, near vs. far spatial distance) according to spatial distance and framing effects. Respondents were first told that they would be participating in a behavioral research survey on a global issue, and then they were asked to read a text and imagine themselves in the scenario presented in the text: the scenario presented an environmental pollution problem, and two groups were told that the problem occurred in their city, while the other two groups were told that the problem occurred in a city downstream from them, but that the problems were all of their own making. They were then uniformly told that there was a new battery and that it was an environmentally friendly green product (the subjects were told about the battery's function and applicability) (see in **Appendix**). However, given that sustainable products are typically more expensive than their conventional counterparts (Dale, 2008), the sustainable version of batteries is 20% more expensive than the less sustainable version (non-rechargeable) (see Van Doorn and Verhoef, 2011, for an investigation of consumer willingness to pay premium price for sustainable products). Two groups in the same scenario were told that using the battery would solve their environmental problems and the other group was told that if they did not use the battery, it would lead to an environmental collapse.

After reading the scenarios, the participants were instructed to complete a questionnaire about their willingness to purchase green products on the same screen. To ensure that the participants paid attention to the section describing spatial distance, questions were included to reinforce their focus on spatial distance (e.g., "I think this is close at hand") and to provide an initial measure of the manipulation effect of the spatial distance variable, as measured by a 7-point Likert scale.

It is worth mentioning that the use of an online questionnaire allowed us to ensure that the selection of all respondents was completely random. In addition, we informed all respondents at the beginning of the survey that all their responses were recorded anonymously, meaning that the respondents knew that their responses could not be identified to the person who responded.

Result

Since spatial distance and framing effects were used as manipulated variables in the Study, we coded them as two bicategorical grouping variables [i.e., PD (psychological distance) = 1 when spatial distance is far and PD = 0 when spatial distance is close; Framing = 1 when the participant receives positive frames and Framing = 0 when negative frames]. Then, we performed a Two-way ANOVA on the obtained data and the results showed that the interaction effect of frame effect and spatial distance had a significant effect on the green product purchase willingness ($F = 7.58$, $p < 0.01$). Therefore, we further tested the moderating effect of spatial distance. Specifically, when the spatial distance was closer, the frame effect on the green product purchase indicated willingness. There was a significant positive effect, that is, the subjects' green product purchase intention was higher in the positive information frame than in the negative information frame ($F = 3.86$, $p < 0.05$). In the spatially distant situation, consumers' purchase intention was higher in the negative information frame ($F = -3.61$, $p < 0.1$).

In general, the results of Study 1 confirm our main effect conjecture that the positive frame is more effective than the negative frame in eliciting consumers' willingness to buy green products in situations where the spatial distance is short, while the opposite is true in situations where the spatial distance is long (see in **Figure 1**). We will further investigate the underlying mechanisms in subsequent Studies.

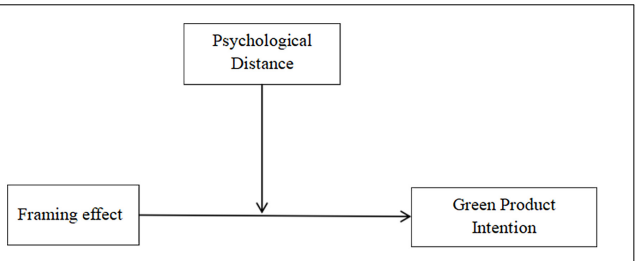

FIGURE 1 | Model of Study 1.

Study 2

Study 2 aimed to test the conjecture of H2 and H3 that, in the case of close spatial distance, negative information frames elicit respondents' feelings of fear, which in turn adversely affects their green purchase intentions, whereas positive information frames elicit respondents' feelings of hope, which in turn promotes their green purchase intentions. In the case of distant spatial distance, negative information frames elicit respondents' feelings of shame, which in turn promotes their green purchase intentions.

Method

We also took the form of a web-based survey and randomly collected 202 samples (115 males, 87 females, MAge = 28.71, SD Age = 7.07) and 212 samples (105 men, 97 women, MAge = 28.77, SD Age = 8.50) in coastal urban areas (cities in Guangdong and Zhejiang) and non-coastal cities (e.g., Beijing, some cities in Shanxi). We further divided them into two groups (positive frame vs. negative frame) in each spatial distance context, depending on the frame effect that gave them information. As in Study 1, subjects were told that they were participating in a behavioral survey on global issues, that is, they were unaware of the specific purpose of taking part in the Study. They were then asked to watch a text and imagine themselves in the situation. This time, the situation indicated that their city (vs. the coastal city of their country) was facing a huge problem, namely sea level rise due to greenhouse gases, and the participants in the negative frame group were told that if none of them took action to reduce their own carbon emissions, it would lead to an increase in sea level rise (see in **Appendix**). The survey specified the devastating environmental impacts that come with rising sea levels. Participants in the positive frame group were told that if they all took positive action to reduce their own carbon emissions, they could significantly reduce the problems they faced, and at the same time, make the environment they lived in a better place.

After reading the contextual information, they were asked to fill out a questionnaire that asked about their fears (Hoelter, 1979), their shame (Han et al., 2014), pride (Tracy and Robins, 2006), and their hope (Snyder, 1995). In addition, before answering these emotion measurement questions, they were asked to investigate their views on the matter (e.g., I would wait and see what happens, etc.) to elicit their emotional factors.

Subsequently, the participants were told that a company had introduced a new environmentally friendly air conditioner with energy-saving features, and the participants in the positive frame group were then told that if they all purchased this energy-saving air conditioner, the sea-level rise problem they were facing would be greatly alleviated and their environment would be further improved. The subjects in the negative frame group were told that if they did not switch to this air conditioner, it would cause further problems and even lead to the collapse of their environment. They were then asked about their willingness to buy this product. All the items asked above were measured using a 7-point Likert scale.

As in Study 1, the participants in Study 2 were told to fill out the questionnaire anonymously, but the difference was that the subjects in Study 2 came from locations with different characteristics (i.e., coastal or non-coastal) and thus had different perceptions of the spatial distance of coastal problems, which could trigger different emotions.

Result

First, for ease of presentation, we combined the measures via factor scores into the variables "fear" ($\alpha = 0.80$), "shame" ($\alpha = 0.84$), "pride" ($\alpha = 0.77$), and "hope" ($\alpha = 0.73$). Subsequently, we performed ANOVA analysis on the emotions elicited by the frame effect in the spatially close and spatially distant groups, respectively, and the data showed that when spatially close, the frame effect had a significant effect on fear ($F = 13.92$, $p < 0.01$) and hope ($F = 10.24$, $p < 0.01$), whereas it had a non-significant effect on shame ($F = 0.79$, $p > 0.1$) and pride ($F = 1.25$, $p > 0.1$). When spatial distance distant, the frame effect was significant for shame ($F = 5.48$, $p < 0.05$) and pride ($F = 8.73$, $p < 0.01$), but not for fear ($F = 0.108$, $p > 0.1$) and hope ($F = 1.56$, $p > 0.1$). Thus validating our H1 conjecture.

In the ANOVA test of the effect of frame on the willingness to buy, the results again confirmed the results of Study 1, that is, in the case of close spatial distance, the positive frame group was more willing to buy green products than the negative frame group ($F = 18.7$, $p < 0.01$). Subsequently, we used SPSS PROCESS Macro by Hayes (2013, model 4) to perform a mediation test between fear and hope emotions in Study 2. The results showed that the frame effect had a significant direct effect on purchase intentions ($B = 0.385$, $t = 2.81$, $p < 0.01$), while the frame effect had a significant negative effect on fear emotions ($B = -0.514$, $t = -3.73$, $p < 0.01$), and fear had a significant negative effect on consumers' green purchase intentions ($B = -0.142$, $t = -2.12$, $p < 0.05$), while the frame effect had a significant indirect effect on purchase intentions through fear ($B = 0.07$, CI 0.01, 0.17); that is, fear mediated the effect of the frame effect on purchase intentions. The frame effect had a significant positive effect on hope emotion ($B = 0.445$, $t = 3.20$, $p < 0.01$) and hope emotion had a significant positive effect on consumers' willingness to purchase green products ($B = 0.295$, $t = 4.45$, $p < 0.01$), while the frame effect was significant through the indirect effect of hope on purchase willingness ($B = 0.13$, CI [0.06, 0.23]); that is, hope and fear fully mediates the frame effect on purchase intentions (see in **Figure 2**). This result validates our H2 conjecture from the data.

Subsequently, we tested the data of the two groups with far spatial distance. In the ANOVA test for the effect of the frame effect on purchase intentions, the results were opposite to Study 2, again providing data to support Study 1 that the negative frame

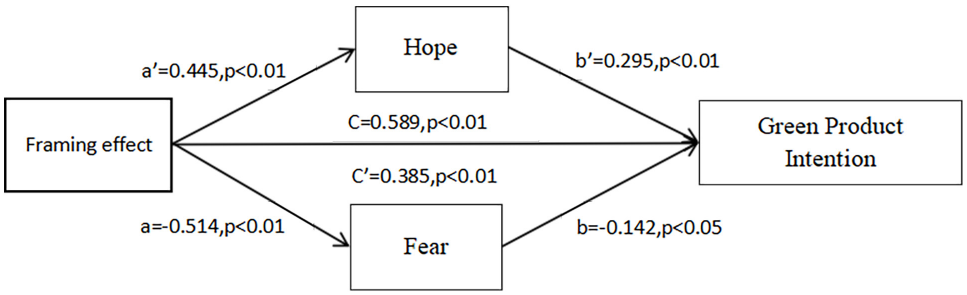

FIGURE 2 | Model of PD = 0.

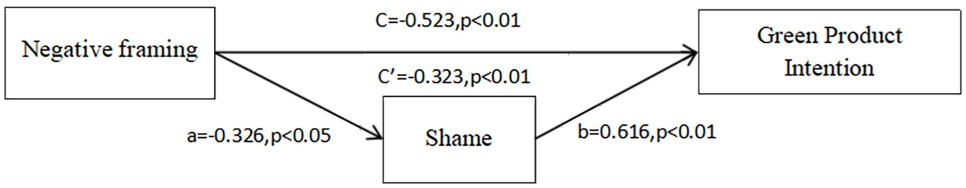

FIGURE 3 | Model of PD = 1.

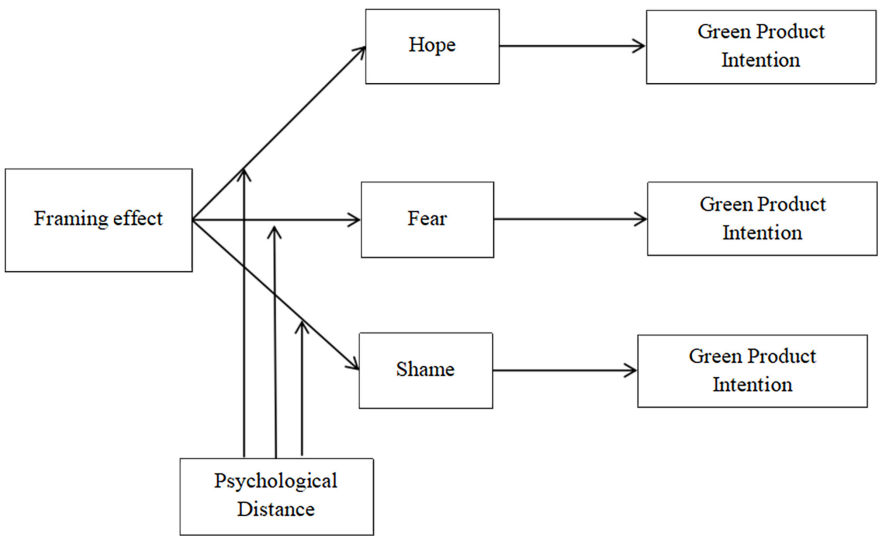

FIGURE 4 | Model of full Study.

was more likely to purchase green products than the positive frame situation (F = 13.54, p < 0.01). Subsequently, we used SPSS PROCESS Macro (Hayes, 2013, model 4) to conduct a mediation test of shame and pride in the spatially distant group, which showed a significant direct effect of framing on purchase intentions (B = −0.323, t = −2.93, p < 0.01 CI −0.54, −0.11). The frame effect has a significant negative effect on shame (B = −0.326, t = −2.34, p < 0.05), while shame has a significant positive effect on the willingness to purchase green products (B = 0.616, t = 11.18, p < 0.01), while the frame effect has a significant indirect effect on the willingness to purchase through shame (B = −0.20, CI −0.38, −0.04); that is, shame and pride mediated the frame effect on purchase intentions. However, the difference is that the effect of pride on purchase intention is not significant (p > 0.1, CI [−0.06, 0.16]), that is, pride does not significantly affect consumers' willingness to purchase green products (see in **Figure 3**). This result validates our H3 conjecture in terms of data.

Overall, Study 2 verified the mediating role of emotions, especially fear, shame, and hope, on framing effects and purchase intentions, which explains the higher effect of positive framing on people's green product purchase intentions relative to negative framing when spatial distance is close, and the better effect of negative framing on people's green purchase intentions relative to positive framing when spatial distance is far (see in **Figure 4**).

DISCUSSION

As the problem of subsistence living fades away and people put forward higher demands on health and environment, an increasing number of companies are focusing on green products, and they want to find a way to increase consumers' willingness to buy green products to increase their companies' revenues. Although companies are now more sensitive to the topic of green products, they still have limited information on how to increase their green purchasing intentions. To date, there is still much room for development in the field of research on how to increase consumers' willingness to buy green products, especially on how to interpret the influence of various messages on consumers' green behavior from an emotional point of view. In this context, we designed two Studies to investigate the effects of different information framing effects on consumers' green purchase intentions in the context of different spatial distances, and also to investigate the mediating role of emotions in this process.

In Study 1, we focus on exploring how the framing effect influences consumers' willingness to purchase green products disparately in the context of different spatial distances. In line with our hypothesis, spatial distance significantly moderates the frame effect on consumers' willingness to purchase green products. In previous studies, the effect of negative framing on social behavior has often been perceived as more pronounced because negative framing can often lead people to believe that they are making a more effective contribution (White et al., 2011). As previously mentioned, when bad things are close enough to you, people tend to try to avoid the problem because of emotions (especially fear). The results indicated that instead of people's trying to overcome the problem, this is one of the effects of negative emotions on people's behavior (Witte, 1992). The data we obtained support the above point.

In Study 2, we explored the mediating role of specific emotions in this influence based on the phenomenon of Study 1 and verified our H2 that in situations where the spatial distance is close, positive frames trigger hopeful emotions and therefore have a positive impact on purchase intentions, and negative frames trigger fears and thus weaken people's willingness to buy green products. It was then further verified that H3, that is, in the context of further emotional distance, the positive frame would trigger people's pride emotions and increase their environmental awareness, but have less influence on green product purchase behavior, while the negative frame would trigger people's shame emotions and thus increase people's willingness to purchase green products.

THEORETICAL IMPLICATIONS

This study makes an important contribution to theoretical systems that believe that emotions play an important role in sustainable development (Moons and De Pelsmacker, 2012) by exploring the role of four emotions – fear, shame, pride and hope – triggered by different framing effects, combined with the partial theory of mental distance, in influencing people's willingness to buy green products.

First, we argue that for studies of framing effects on people's pro-social behavior (White et al., 2011), the variable of psychological distance plays a significant moderating role; specifically, the effects of negative framing on people should not actually be viewed favorably when the psychological distance is close enough.

Second, we extend the psychological distance-related theory from another perspective, that is, in addition to the significant impact of psychological distance on people's cognition and by extension, on their behavior (Levin et al., 2002), including the impact of psychological distance on people's moods, emotions should also receive attention. As existing research shows, in the spatial dimension, attention to environmental issues tends to be stronger at psychological distances, and our studies laterally pave the way for the intrinsic mechanisms involved, that is, the phenomenon that is most likely related to different emotions triggered by psychological distance.

Third, we explored in detail the intrinsic mechanisms by which psychological distance plays a role in eliciting emotional factors and thus influencing people's willingness to buy green products. It has been shown that psychological distance can have a negative effect on facilitating people to solve environmental problems (McDonald et al., 2015), and we further demonstrate that emotions, especially fear, hope, and shame, play a crucial role.

MANAGERIAL IMPLICATIONS

For example, if the target market is located in a region with more environmental problems or the features of the green product to be released have a greater impact on that region, the positive effects of the product and the benefits of its use should be emphasized. In regions with less prominent environmental problems, the serious consequences of ignoring the environment should be emphasized, and the possible serious impacts of continuing to ignore green products. This maximizes sales of the product.

In addition, the study also emphasizes the important role of emotions in influencing people's green product purchasing behavior; that is, for green product manufacturers, the promotion of their products should also focus on stimulating consumer emotions. Manufacturers should explain in detail the consequences of using green products, and try to design promotional scenarios with a sense of substitution, in order to stimulate people's resonance with the promotion of product functions, while enhancing people's environmental awareness, and thus increasing consumers' green purchasing behavior.

That said, we also understand that the negative emotion of shame can be very bad for people to feel, and while it drives people to compensate for the consumption of green products, we recommend that manufacturers use negative messages wisely and do not over-amplify the effects of negative emotions, such as shame in order to pursue short-term sales results.

LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

The first point is that we are only concerned with the willingness of the participants to buy green products, and we do not define in detail whether this has significantly increased their environmental awareness, which is also an indispensable factor for environmental sustainability.

Second, in addition to emotional factors, other non-emotional factors also play an important role in promoting people's green behavior, such as the fact that different levels of detail or amounts of information that consumers may receive can also have an impact on their purchasing behavior. In this study, we tried to avoid such factors by controlling the scenario material, but we can try to observe the impact of such factors in future studies.

Third, we mainly manipulated the differences in the spatial dimensions of psychological distance, and while there are four dimensions of psychological distance itself, namely the temporal, spatial, social, and probabilistic dimensions, whether the other dimensions of psychological distance have more interesting or effective effects is also one of the directions of our further research.

Finally, it is evident from the study that sentiment has a clear impact on consumers' willingness to buy green, and that this framing effect is not the only marketing strategy that can actually do so; many other marketing tactics (e.g., hunger marketing, public buyer reviews, etc.) may also have a significant impact on consumer sentiment, and there are a number of interesting entry points that deserve further study.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent from the participants was not required to participate in this study in accordance with the national legislation and the institutional requirements. However, written informed consent was implied via completion of the survey.

AUTHOR CONTRIBUTIONS

ZT, DL, FM, and XX: topic proposed. ZT and FM: experimental design and data collection. DL: manuscript writing. ZT and XX: content proofreading. All authors: contributed to the article and approved the submitted version.

FUNDING

The authors are greateful for the financial support from the National Natural Science Foundation of China (grant number: 71772003, 71962007, and 71872184); and the Scientific Research Fund of Hainan University (kyqd[sk]1919).

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

APPENDIX

Study 1: Green Battery Ad 1

If you do not buy this new green battery, it will lead to further environmental degradation in your city, a significant increase in the safety of your water and even a serious threat to your life and health. However, this green battery is 20% more expensive than regular batteries.

Study 2: Negative Framing Information

Our country emits approximately 50 kg of carbon per person per day, and it will take a thousand trees to fully absorb it, and global warming will cause global sea levels to rise. If everyone does not take active action to reduce the amount of carbon emissions, the consequences are unimaginable. Your city will face flooding, erosion of coastal lowlands and coasts, contamination of water in coastal areas, salinization of farmland, and even the risk of an entire city being swallowed up by the sea.

Study 2: Positive Framing Information

Global warming will lead to a rise in sea-level, especially in the coastal cities. However, if we take timely action to adopt green and energy-saving lifestyles, the sea level rise problem will be alleviated, and will not bring great harm for a long time, and at the same time, we can also prevent the global ecology from being damaged, and also make a contribution to improving the living environment.

frontiers in Psychology

ORIGINAL RESEARCH
published: 22 February 2021
doi: 10.3389/fpsyg.2021.568451

Effect of Homebuyer Comment on Green Housing Purchase Intention—Mediation Role of Psychological Distance

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Green housing is a new type of building that advocates energy saving and environmental protection. How to stimulate buyers to buy green housing under the background of high cost is the key problem to guide green consumption. First of all, based on the existing literature, the comment of homebuyers was divided into comment quantity, comment quality, comment titer and evaluator credibility. The psychological distance mediation variable was introduced, and three dimensions of time distance, social distance, and space distance were selected to construct the influence model of homebuyer comment on green housing purchase intention. Meanwhile, the concept model was built, and questionnaires were adopted for empirical analysis. On this basis, considering the long-term purchase behavior of buyers, the influence model of homebuyers' second comment on green housing purchase intention with the Hotelling model was established. The results show that comment quality, comment titer, and the credit rating of the evaluator have a positive effect on green housing purchase intention while comment quantity has no significant effect. Psychological distance plays a mediation role between comment quality, comment titer, the credit rating of the evaluator, and green housing purchase intention while having a mediation effect between comment quantity and green housing purchase intention. In the long-term purchase behavior of green housing, psychological distance plays a greater role than price. At last, some suggestions were proposed.

Keywords: green housing, purchase intention, psychological distance, homebuyer comment, green building

OPEN ACCESS

Edited by:
Hong Chen,
China University of Mining and Technology, China

Reviewed by:
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Specialty section:
This article was submitted to Environmental Psychology, a section of the journal Frontiers in Psychology

Received: *01 June 2020*
Accepted: *18 January 2021*
Published: *22 February 2021*

Citation:
Feng Q, Wang Y, Chen C, Dong Z and Shi X (2021) Effect of Homebuyer Comment on Green Housing Purchase Intention—Mediation Role of Psychological Distance. Front. Psychol. 12:568451. doi: 10.3389/fpsyg.2021.568451

INTRODUCTION

Because of the increasingly serious environmental pollution in recent years, green housing has attracted much attention. People not only pursue the comfort of housing, but also prefer the housing which is green and healthy. Green housing has the advantages of energy saving and environmental protection, which is the type of building that the Chinese government strives to promote, but at the same time, it has the disadvantage of high prices, which makes the proportion of green housing in residential housing quite small. How to stimulate buyers to buy green housing and promote the growth of green building market is an important part of reducing energy consumption and protecting the environment.

When buying residential buildings, buyers mostly consider price, transportation cost and living convenience, etc., so the existing research explores the impacts of buyers' purchase behavior mainly from these factors. But with the improvement of living standards, a growing number of buyers, especially the green housing users who pursue a high quality of life, affected by environmental attitude, social influence, green house cognition, and so on, are more willing to share their living experience of green housing. Relevant research shows that homebuyer comment has an impact on green house purchase behavior, because the high price of green housing makes buyers more cautious and more willing to listen to the user experience to decide whether to buy. Some green-conscious buyers also prefer to make purchase decisions by referring to green housing users' share of whether the green houses are truly energy-efficient and environmentally friendly. However, there is a very limited amount of existing research exploring the impact of homebuyer comment on green housing purchase behavior. In fact, whether the comment of buyers can affect the purchase behavior of green housing depends on the degree of psychological recognition of the comment content of buyers. Evaluators with strong professional competence and good reputation have a greater positive impact on buyers, and the comment itself includes the content quality, the quantity, the titer, as well as the evaluator credibility will also affect the public praise and sales volume of the housing. The consumer's psychological cognition of the product will affect their processing degree of the information, and then lead to various consumption behaviors, for instance, Wang and Ding (2016) discussed the relationship between comment usefulness and psychological distance. Therefore, we introduce the theory of psychological distance to explore the impact of homebuyer comment on consumers' purchase intention to discuss how homebuyer comment influence the purchase behavior of green housing under the action of psychological distance, and considering the action of psychological distance, to explore the impact of the two-stage comment on green housing purchase behavior, thus to propose the suggestion for green housing consumption and green building development.

RESEARCH HYPOTHESES

Homebuyer Comment and Green Housing Purchase Intention

Under normal circumstances, the more the comment quantity, the stronger the consumer's purchase intention. When consumers make purchase decisions about green housing, according to Schiffman's consumption behavior pattern, the cognitive process is divided into three stages: demand recognition, pre-purchase search, and substitute comment. Wen (2012) believes that in the initial stage of housing consumption decision, consumers lack sufficient information to influence their purchase decision, and in order to collect as many product characteristics as possible about green housing, it is necessary to continuously search for the relevant information, which helps consumers break down their goals and thus increase their purchase intention and enjoy the true "value of green and low carbon." Xue (2017) finds that there is a significant positive correlation between cognitive variables and behavioral will in green housing, that is, the more comprehensive the understanding of green housing, the higher the willingness to buy. Liu (2018) finds that the active or passive information of green housing has a significant positive effect on the purchase behavior of buyers, that is, the more sufficient the green housing information obtained is, the more it can improve the purchase intention of green housing buyers.

Hung (2017) points out that online comment quality includes comment sender objectivity, description integrity, and product richness. If the comment of its own quality is high, it can provide valuable advice for consumers, thus positively affecting consumers' purchase intention. Yang et al. (2019) propose that the internalized green housing characteristic information, specific income and quality assurance information can improve the green housing purchase intention.

Comment titer refers to the direction of comment content, including three dimensions: positive, neutral, and negative. A positive comment will let consumers perceive positive emotional tendency to products or services. A negative comment lets consumers perceive negative emotional tendency, while for a neutral comment, consumers do not perceive any emotional tendency. Behavioral attitude refers to the positive or negative comment of a commodity by consumers. Xue (2017) decomposes the behavior attitude into: economy, residence attitude, and environmental protection attitude to study the influence of these three factors on the consumption behavior of green housing, and finds that there is a significant positive correlation between these three factors and behavior intention. Yang and Wu (2017) point out that cognitive psychology has a positive effect on green housing purchase decisions by studying the influencing factors of green housing choice behavior, while the theory of planning behavior holds that the individual's positive or negative comment of a certain behavior is based on the consumer's cognitive degree. When the comment titer is positive, the more significant the external stimulus, the easier it is for consumers to form a positive purchase attitude. The purchase attitude has a positive influence on the green housing purchase intention, that is, the buyers consider that the green housing purchase behavior is correct and wise, so they are willing to buy (Li, 2016).

As to the evaluator's credibility, some scholars divide it into the evaluator's professionalism and reliability. Professionalism refers to the extent of consumer's perception to the correctness of evaluator's information. Schiffman and Kanuk (1997) believe that when the comment publisher is highly professional, it will reduce the perception risk of consumers to the product and increase the sense of trust, thus affecting the consumer's purchase intention. The reliability of the evaluator refers to the consumer's perception of the evaluator's reliability, which has nothing to do with the comment content itself (Huang Q. P., 2016). In 2006, China launched the green building comment standard, the implementation of this standard has promoted the development of the green housing construction industry in China. For green housing with government certification, consumers' purchase intention is obviously higher than that of ordinary green housing (Xue, 2017). Yang et al. (2019) believe that government agencies

and third-party certification agencies have a positive impact on consumers' reception of green housing quality assurance information, which affects their value perception and changes their consumption decisions. On January 1, 2015, the Chinese government implemented the new edition of the Green Building comment Standard, which regulated the market of green housing, improved the performance of green housing, and then increased its sales. Li (2016) thinks that because of the asymmetry of information, buyers have certain pressures when choosing green housing, while the government's green housing certification logo has a certain authority and systematization, which maximizes the benefit of reference information, thus affecting the buyers' purchase intention. In summary, the following hypotheses were proposed:

H1: Homebuyer comment is divided into four dimensions: comment quantity, comment quality, comment titer, and evaluator credibility.

H1a: Comment quantity has a positive effect on green housing purchase intention.

H1b: Comment quality has a positive effect on green housing purchase intention.

H1c: When the comment titer is positive, the purchase intention of green housing increases.

H1d: Evaluator credibility has positive effect on green housing purchase intention.

Relationship Between Homebuyer Comment and Psychological Distance

Comment Quantity and Psychological Distance

Fiedler (2007) thinks that the degree of professionalism of the individual to receive information can improve the efficiency of the individual to process information. The more product information the individual understands, the higher the degree of professionalism, the less time and effort is needed to process the information. According to the interpretation level theory (Bar-Anan et al., 2007), the more information the individual understands and the more detailed it is, the theory of low interpretation level is applicable to interpretation, which means that the psychological distance will also be closer. Li (2016) concludes in the study of the influence mechanism of green housing purchase intention: the more consumers understand the product knowledge, the stronger his/her ability to identify the product, the higher the degree of cognition, the closer the psychological distance, and the more conducive to the formation of product value and to the preference emotion judgment, which will further improve the green housing purchase intention. The quantity of buyers mastering green characteristic information has an important influence on their purchase intention of green products, and the wider they master the information, the deeper the cognitive degree, the closer the psychological distance, the stronger the willingness to buy (Yang et al., 2019).

The concept of "psychological distance" studied in this paper was proposed by Liberman and Trope in his study of social psychology in 1988. It refers to the subjective experience of an event from the moment, this place, itself, and the event's possible occurrence. Trope and Liberman in 2007 proposed four dimensions of psychological distance that affect consumer decision-making, namely: time distance, social distance, spatial distance, and hypothesis (Bar-Anan et al., 2007). People have different attitudes toward things that will happen at different time distances. Individuals usually think of things that will happen in the far future as abstract, far away from themselves, and tend to show a more positive and optimistic attitude. What is going to happen in the near future is specific, close to oneself, it takes time to think, usually showing a negative and pessimistic attitude (Trope and Liberman, 2000). Social distance refers to that based on the self, the individual's perception of the distance between the subject and the self. Trope and Liberman (2008) studied the relationship between social distance and the level of interpretation, and pointed out that because psychological distance is a self-centered concept, the more similar and close to the individual, the closer the psychological distance between others and the individual; Conversely, the more obvious the difference between individuals, the lower the degree of intimacy, the greater the psychological distance between individuals. Spatial distance refers to the individual's perception of the distance between events or objects in space. Fujita et al. (2006) found that when people think about things that are far away from them in space, they are more willing to use abstract language to describe these events, corresponding to a high level of interpretation. Probability is independent of time, social and spatial distance. Its level can cause people's psychological distance to change. In a small probability situation, people's high level of interpretation is activated, which tends to lead to generalized or abstract descriptions of events. In high-probability situations, people's low level of interpretation is activated, and they tend to describe events in detail (Wakslak et al., 2006).

Four subdimensions of psychological distance: time distance, social distance, spatial distance, and hypothesis have been proved highly correlated (Zhu, 2018). So based on the above analysis, it is inferred that comment quantity has a negative effect on the psychological distance of consumers as well as on the four subdimensions of psychological distance. Based on the above research, the following hypotheses are proposed:

H2a: Comment quantity has a negative effect on time distance

H2b: Comment quantity has a negative effect on social distance

H2c: Comment quantity has a negative effect on spatial distance.

Comment Quality and Psychological Distance

Because online shopping is anonymous and virtual, that is, the physical goods cannot be touched, consumers can only perceive the quality of goods through comments, and the quality of these comments directly affects their trust in products. Especially, the more negative comments, the greater the impact (Huang L., 2016). A high-quality comment, is one which contains more explicit views, and more detailed examples and information. According to cognitive psychology, the more specific the information of things, the easier it is to improve people's perceptual sensitivity, and the closer the psychological distance perception is (Zhou et al., 2015). Zeng (2008) pointed out in his study that the quality of comment affects whether

subsequent buyers get useful information. Park et al. (2007) divided the comment quality into four indicators: relevance, comprehensibility, adequacy, objectivity. They point out that high-quality comments, with strong logic and clear persuasion, will shorten the psychological distance with consumers through sufficient and objective reasons. On the contrary, a low-quality comment has subjective and emotional color, and lacks the basis to convince consumers. Godes and Mayzlin (2004) find that comment quality also has a positive impact on product sales. Jiang et al. (2015) thinks that buyers' preference for green value and basic value of green housing have an impact on their purchase behavior, which affects consumption choice by influencing personal perception. When the green value in the comment is more than the basic value, the comment has higher quality. Wang and Liu (2018) point out that there is information asymmetry in the green housing market, and whether buyers can obtain reliable relevant information will directly affect their cognition of green housing products, and then affect the purchase decision. In summary, the following hypotheses were proposed:

H3a: Comment quality has a negative effect on time distance.

H3b: Comment quality has a negative effect on social distance.

H3c: Comment quality has a negative effect on spatial distance.

Comment Titer and Psychological Distance

Pumawirawan et al. (2012) find that the titer of a comment can be expressed as three dimensions: positive, neutral, or negative. Since a neutral comment does not have any emotional color and descriptive information on both positive and negative sides, the comment titer is directly divided into positive and negative. The theory of persuasion effect points out that a comment can cause the change of consumers' attitude toward the product, and then affect the change of psychological distance to the product, that is, the comment titer will affect the quantity of sales (Xiao, 2019). Positive comments will shorten the psychological distance between consumers and products, promoting the desire to buy, while negative comment will weaken consumers' trust in products, increase psychological distance, and thus reduce consumption motivation. Song (2008) argues that if an individual is positive about green life, then they are more likely to participate in green product purchase and consumption activities. Therefore, enterprises should spread the comment information about the positive health of green housing in propaganda to promote consumption behavior. Based on the above research, the following hypotheses were proposed:

H4a: When the titer is positive, the time distance is shortened.

H4b: When the titer is positive, the social distance is shortened.

H4c: When the titer is positive, the spatial distance is shortened.

Credibility of the Evaluator and Psychological Distance

Zhang (2016) pointed out in the study that the certification of green buildings by third-party authorities has a positive effect on the willingness to buy. The Chinese Regulation on Accreditation stipulates that the third-party certification body of green building is approved by the supervision and administration department of the State Council and has strong credibility and persuasion. Some scholars believe that the comment of green buildings by the government plays an important role in the purchase of consumers. Because the comment system of the government is specific, standardized, and systematic, and the comment content is authoritative, this will shorten the psychological distance of consumers and then affect the purchase decision. An important factor affecting the credibility of information is the source of information, thus as a source of information, the evaluator's own credibility is crucial. Zhou (2009) divides the credit rating of the evaluator into the professional ability and reliability, and points out that the credit rating of the evaluator affects the brand decision by influencing the brand comment. There is the same impact in other areas, as found in research in the film industry, where expert comment is positively correlated with film box office performance. Liu (2018) believes that there are obvious differences between green housing and traditional "brown housing," and only when buyers understand and accept this difference, can they reduce the psychological distance. The official certification of the government can strengthen the authenticity of the information and promote the interest and even the trust of buyers, thus affecting the purchase intention. Based on the above studies, the following hypotheses were proposed:

H5a: Credibility of the evaluator has a negative effect on time distance.

H5b: Credibility of the evaluator has a negative effect on social distance.

H5c: Credibility of the evaluator has a negative effect on spatial distance.

Relationship Between Psychological Distance and Green Housing Purchase Intention

Liberman and Trope first linked the concept of psychological distance to the theory of interpretation level in 1998. They proposed four dimensions of psychological distance in 2007: time distance, social distance, spatial distance, and probability of event occurrence.

Because online comment is mostly anonymous, with strong uncertainty, buyers cannot experience it personally when visiting the comment, so time distance and social distance are mostly used for the exploration of online comment in online marketing (Kang, 2017). On this basis, we add space distance to study the relationship between homebuyer comment and green housing purchase intention.

Li (2019) studies the influencing factors of green product purchase intention based on consumer value theory, and concludes that under the regulation of time distance (psychological distance), the high interpretation level of consumers is aroused, which makes them more inclined to pay attention to essential and core characteristics, and thus more willing to buy green products. Wang et al. (2017) point out that green appeal advertising in green purchase decision-making process can be divided into rational appeal and emotional appeal by studying the influence mechanism of green emotion appeal

on green purchase decision-making process, in which emotional appeal has a more significant impact. Wang (2017) pointed out that the psychological distance between consumers and green products is different in different problem situations when studying the psychological mechanism of green consumption attitude-behavior separation. This kind of psychological distance is mainly time dimension. In terms of time dimension, in attitude comment stage, the psychological distance between consumers and green products is far away.

Time Distance and Green Housing Purchase Intention

Cheng (2017) thinks that the high entry degree commodity has high capital value, and many factors need to be considered. Corresponding to the theory of high interpretation level, the farther the time distance, the higher the purchase decision, whereas the low entry degree commodity only emphasizes the feasibility demand. On the contrary, corresponding to the low interpretation level theory, the closer the time distance, the higher the purchase decision. In the case of close-time distance, price information is a representation of expenditure perception to consumers, and high price means higher money expenditure, so the purchase intention will decrease; while in the case of far-time distance, it is a representation of quality perception, and the higher price represents the better quality, and the higher purchase intention (Zhang and Zhao, 2016). Wen (2012) points out that with high house prices in the past 2 years, consumers are not willing to pay higher costs for green housing. According to traditional economic theory, green housing will bring long-term benefits to consumers.

H6a: Time distance has a positive effect on green housing purchase intention.

Social Distance, Spatial Distance, and Green Housing Purchase Intention

The explanation of behavior theory points out that the change of psychological distance will affect the change of consumer decision. The physical position of the buyer and seller will affect the buyer's purchase decision. The distance of space leads to the psychological alienation between people, which leads to long social distance and reduces the buyer's trust in the seller (Huang and Zhao, 2013). Wang et al. (2017) point out that the pride dimension has the most significant influence on green purchase behavior, that is, the closer the consumer society distance is, the more willing they are to take more responsibility for the society, and the higher the willingness to buy green products. "Space discount" is derived from the concept of spatial distance, which shows that the farther the spatial distance is, the lower the actual utility is, and the lower the actual utility is perceived by people (Ma, 2016). When buyers buy green housing, the relevant policies of the government and the support degree of family and friends have a positive relationship with the purchase intention, indicating that the closer the social distance, the higher the purchase intention (Xue, 2017).

H6b: Social distance has a negative effect on green housing purchase intention.

H6c: Spatial distance has a negative effect on green housing purchase intention.

Effect of Psychological Distance on the Relationship Between Homebuyers Comment and Green Housing Purchase Intention

In the context of online shopping, consumer comment is also called "online comment," "online word of mouth" and so on (Deng, 2018). In terms of influencing factors of consumer shopping, according to the theory of interpretation behavior, individual decision-making is vulnerable to the influence of matching information with the level of interpretation it is in, so psychological distance can play a role in decision-making results through the level of interpretation (Li and Liu, 2020). Based on the above literature analysis, it is found that when the comment titer is positive, the higher the comment quantity, the comment quality, and evaluator credibility, and the closer the consumer psychological distance. The closer the consumer psychological distance (social distance, spatial distance), the higher the green housing purchase intention. The following hypotheses were therefore proposed:

H7a: Psychological distance plays a mediation role between the comment quantity and the green housing purchase intention.

H7b: Psychological distance plays a mediation role between the comment quality and the green housing purchase intention.

H7c: Psychological distance plays a mediation role between evaluator credibility and the green housing purchase intention.

H7d: When the comment titer is positive, psychological distance plays a mediation role between comment titer and the green housing purchase intention.

To sum up, the conceptual model is shown in **Figure 1**.

QUESTIONNAIRES AND RESEARCH

Definition and Measurement of Variables

Definition of Variables

On the basis of summarizing the existing literature and the research requirement, the variable definition of the research model was carried out. As an independent variable, its four dimensions are comment quantity, comment quality, comment titer, and evaluator credibility. As a mediation variable, the three dimensions of psychological distance are time distance, social distance, and spatial distance. The dependent variable is green housing purchase intention. The definitions and references of the variables are shown in **Table 1**.

Measurement of Variables

On the basis of the mature scale, slight adjustment and modification were made to the scales according to the actual situation. The questionnaire was measured using the Likert 5 score scale to set options. "1" represents considerable disapproval, "2" represents disapproval, "3" represents neutrality, "4" represents endorsement, and "5" represents considerable endorsement.

(1) The homebuyer comment scale

According to the design of Zhang (2016), the homebuyer comment scale was designed using four dimensions: comment

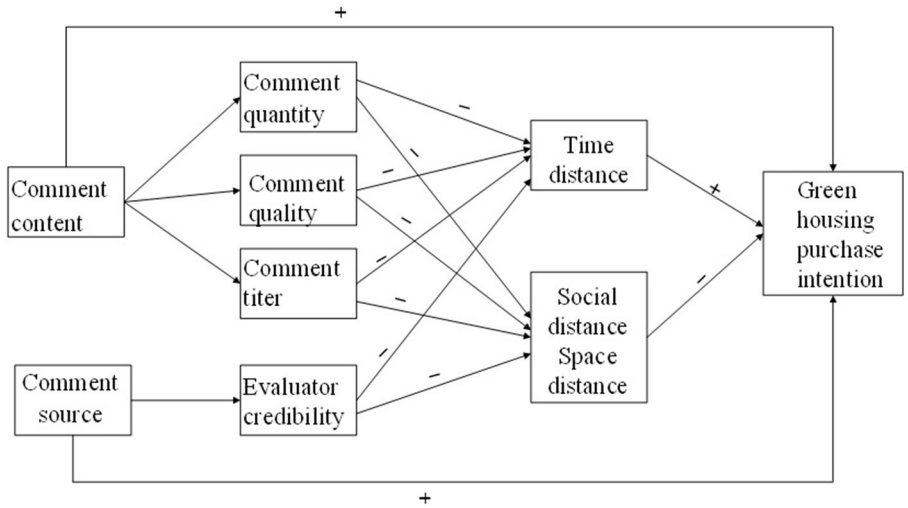

FIGURE 1 | Conceptual model.

TABLE 1 | Definition of variables.

	Variables	Definition	References
Independent variables	Comment quantity	Comment quantity can enrich the comment information and increase the total amount of information.	Liu and Tang (2016)
	Comment quality	The description integrity and product richness of the comment information, the objectivity of the comment sender, whether or not valuable information was provided	Hung (2017) and Park et al. (2007)
	Comment titer	Direction of the comment content, including positive, neutral, negative	Pumawirawan et al. (2012)
	Evaluator credibility	Evaluator's professionalism and reliability	Schiffman and Kanuk (1997)
mediation variables	Time distance	Time distance refers to people's perception of events about time.	Bar-Anan et al. (2007)
	Social distance	Based on the self, the individual's perception of the distance between the subject and the self.	Fujita et al. (2006)
	Spatial distance	It refers to an individual's spatial or geographical proximity between himself/herself and the reference object.	Ma (2016)
Dependent variable	Green housing purchase intention	Effect of the comment on the information recipient's willingness to buy	Bansal and Voyer (2000)

quantity, comment quality, comment titer, and evaluator credibility. The scale is shown in **Table 2**.

(2) Psychological distance scale

For the measurement of psychological distance, the scales of Xv and Li (2018), Huang and Zhao (2013) were referred to, and combined with the needs of practical research, the scale is designed as **Table 3**.

(3) Purchase intention scale

By referring to the scale of Bansal and Voyer (2000), the purchase intention scale is designed as **Table 4**.

(4) Demographic variables

Demographic variables refer to the basic elements of the questionnaire survey to distinguish the group of homebuyers, mainly gender, age, education level, professional background, and monthly income level, etc.

Structure and Empirical Analysis of the Questionnaire

The questionnaire consists of two parts, the first part is the research control variables, including the subject's gender, age, education, occupation, monthly income, etc. The second part is the survey homebuyer comment scale, psychological distance scale, and green housing purchase intention scale. There are 28 questions in the questionnaire, including 5 questions for control variables, 12 questions in homebuyer comment scale, 7 questions in psychological distance scale, and 4 questions in purchase intention scale.

The questionnaires were distributed through the website of Questionnaire Star to obtain data. A total of 368 questionnaires

TABLE 2 | The homebuyer comment scale.

Variables	Dimensions	Questions	Source
Homebuyer comment	Comment quantity	With regard to green housing, buyers have published a lot of reviews	Park and Kim (2007) and Bi (2010)
		With regard to green housing, these comments provide a great deal of information	
		A lot of people evaluate on the buying platform	
	Comment quality	The comments of green housing are basically objective	Jin (2007)
		Most comments are easy to understand	
		These comments give me a better understanding of the performance of green housing	
	Comment titer	The comments of green housing are generally positive	Park et al. (2007)
		The overall recommendation of the comment is to purchase the green housing	
		The comments are mostly positive for green housing.	
	Evaluator credibility	Some evaluators have expertise related to green housing	Bansal and Voyer (2000)
		Most evaluators have a higher level of online shopping	
		Most evaluators are credible	

TABLE 3 | Psychological distance scale.

Variables	Dimensions	Questions	Source
Psychological distance	Time distance	These comments give me specific information about green housing in a short-term	Huang and Zhao (2013)
		These comments make me want to buy green housing in the future.	
	Social distance	These comments made me feel like I was in a similar context to the evaluator	Huang and Zhao (2013)
		These comments give me a better idea of a brand of green housing	
		After reading these comments, I would like to buy green housing for others or help others to buy green housing	
	Spatial distance	These comments make me feel that the journey to a green housing is acceptable	Huang and Zhao (2013) and Xv and Li (2018)
		After reading these comments, I want to buy green housing in this city	

were collected, in which 102 invalid and repeated questionnaires were excluded, 266 valid questionnaires were adopted, and the effective rate of the questionnaires was 72.28%. The study was approved by the Ethics Review Board of Business School in University of Jinan, China. All participants provided informed consent in compliance with the Declaration of Helsinki before the survey. The SPSS23.0 software was used for analysis.

The descriptive statistics about the file survey of this paper are shown in **Table 5**.

Reliability Analysis

Reliability is used to test the stability and consistency of the questionnaire results in the measurement of the relevant variables. Reliability can reflect whether the questionnaire has credibility. The internal consistency index is used to test the reliability of the scale. The values of each scale are shown in **Table 6**.

It can be seen that the reliability of the evaluation quantity is 0.804, the reliability of the evaluation quality is 0.742, the reliability of the evaluation titer is 0.763, the reliability of evaluator credibility is 0.738, the reliability of the time distance is 0.630, the reliability of the social distance is 0.806, the reliability of the space distance is 0.718, and the reliability of the green housing purchase intention is 0.838. The results indicate that the data reliability of this questionnaire is high and can be further analyzed.

Validity Analysis

Validity is the accuracy and effectiveness of the questionnaire, that is, the correctness of measuring a certain behavior characteristic. When the scale can accurately measure the required measurement content, it shows that this measurement is effective. The statistical indexes of validity were KMO (validity) and the significance of Bartlett Spherical Test. The results are shown in **Table 7**.

Table 7 shows that the KMO value of homebuyer comment is 0.918, the KMO value of psychological distance is 0.901, and the KMO value of green housing purchase intention is 0.818. All the results are larger than 0.8, and the Sig. values of the Bartlett spherical test are all smaller than 0.05, so the structural validity of the three scales is good, and they can be further analyzed.

Correlation Analysis

Correlation analysis is to analyze the correlation between the research objects, and to explore the degree of closeness of their relationship. Pearson correlation coefficient was adopted to judge

TABLE 4 | Purchase intention scale.

Variables	Questions	Source
Purchase intention scale	After reading these comments, I would like to try to use green housing	Bansal and Voyer (2000)
	These comments affect whether I choose to buy the product	
	I would recommend green housing to others	
	I'm very likely to buy a green house in the future	

TABLE 5 | Descriptive analysis of basic information.

Basic information	Classification	Frequency	Percentage
Gender	Male	121	45.5
	Female	145	54.5
Age	Under 18	4	1.5
	Between 19 and 20	143	53.8
	Between 30 and 39	68	25.6
	Over 40	51	19.2
Education	Junior high school/high school/technical secondary school	48	18.0
	Junior college	41	15.4
	Undergraduate	153	57.5
	Master	24	9.0
Profession	College students	76	28.6
	Staff	84	31.6
	Freelance	73	27.4
	Government or public institution employees	33	12.4
Monthly income	3,000∼5,000	114	42.9
	5,000∼8,000	55	20.7
	8,000∼15,000	69	25.9
	Over 15,000	28	10.5

the correlation between each two of comment quantity, comment quality, comment titer, evaluator credibility, time distance, social distance, spatial distance, homebuyer comment, psychological distance, and green housing purchase intention. The value of the correlation coefficient "r" is [−1, and the greater the absolute value of "r," the more significant the correlation is. The correlation analysis results are shown in **Table 8**.

According to the results of the Pearson correlation analysis in **Table 8**, the pairwise correlations of comment quantity, comment quality, comment titer, evaluator credibility, time distance, social distance, spatial distance, homebuyer comment, psychological distance, and green housing purchase intention are all at the 0.001 significance level, which can be further inspected by regression test.

Regression Analysis

The impact of comment quantity, comment quality, comment titer, and evaluator credibility on time distance, social distance, spatial distance, homebuyer comment, psychological distance, and green housing purchase intention, as well as its degree were inspected by the regression analysis. The results are shown in **Table 9**.

TABLE 6 | Reliability test results.

Scales	Research variables	Cronbach α coefficients
Homebuyer comment	Comment quantity	0.804
	Comment quality	0.742
	Comment titer	0.763
	Evaluator credibility	0.738
Psychological distance	Time distance	0.630
	Social distance	0.806
	Spatial distance	0.718
Green housing purchase intention	Green housing purchase intention	0.838

TABLE 7 | KMO and Bartlett results of the questionnaires.

Homebuyer comment scale	KMO	0.918	
	Bartlett spherical test	Approximate chi-square	1389.010
		Degree of freedom	66
		Sig.	0.000
Psychological distance scale	KMO	0.901	
	Bartlett spherical test	Approximate chi-square	848.059
		Degree of freedom	21
		Sig.	0.000
Green housing purchase intention scale	KMO	0.818	
	Bartlett spherical test	Approximate chi-square	395.119
		Degree of freedom	6
		Sig.	0.000

It can be seen that in Model 1, the regression analysis of comment quantity, comment quality, comment titer, and evaluator credibility to time distance shows that the F value is 51.501, the significance is < 0.001, the regression model is significant, and the adjusted R^2 is 0.572. The influence of comment quality and evaluator credibility on time distance reach a significant level, and the regression coefficients were −0.251 and −0.507, respectively. The effect of comment quantity and comment titer on time distance is not significant. Therefore, the hypotheses H3a and H5a are valid, while H2a and H4a are not.

In Model 2, the regression analysis of comment quantity, comment quality, comment titer, and evaluator credibility to social distance shows that the F value is 63.871, the significance is less than 0.001, the regression model is significant, and the adjusted R^2 is 0.624. The influence of comment quantity, comment quality, comment titer, and evaluator credibility on social distance all reach a significant level, and the regression coefficients were −0.127, −0.115, −0.216, and −0.449, respectively. Therefore, the hypotheses H2b, H3b, H4b, and H5b are valid.

TABLE 8 | Correlation results analysis.

		Comment quantity	Comment quality	Comment titer	Evaluator credibility	Time distance	Social distance	Spatial distance	Homebuyer comment	Psychological distance	Green housing purchase intention
Comment quantity	Pearson correlation	1									
Comment quality	Pearson correlation	0.625**	1								
Comment titer	Pearson correlation	0.562**	0.604**	1							
Evaluator credibility	Pearson correlation	0.562**	0.609**	0.732**	1						
Time distance	Pearson correlation	−0.512**	−0.621**	−0.606**	−0.726**	1					
Social distance	Pearson correlation	−0.567**	−0.598**	−0.689**	−0.750**	0.707**	1				
Spatial distance	Pearson correlation	−0.503**	−0.488**	−0.623**	−0.650**	0.599**	0.743**	1			
Homebuyer comment	Pearson correlation	0.824**	0.843**	0.850**	0.857**	−0.729**	−0.769**	−0.669**	1		
Psychological distance	Pearson correlation	−0.594**	−0.640**	−0.720**	−0.797**	0.864**	0.919**	0.882**	−0.813**	1	
Green housing purchase intention	Pearson correlation	0.499**	0.528**	0.594**	0.648**	−0.666**	−0.698**	−0.774**	0.671**	−0.804**	1

*$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.

In Model 3, the regression analysis of comment quantity, comment quality, comment titer, and evaluator credibility to spatial distance shows that the F value is 34.313, the significance is < 0.001, the regression model is significant, and the adjusted R^2 is 0.468. The influence of comment quantity, comment quality, comment titer, and evaluator credibility on spatial distance reach a significant level, and the regression coefficients were −0.133, −0.271, and −0.366, respectively. The effect of comment quality on spatial distance is not significant. Therefore, the hypotheses H2c, H4c, H5c are valid, while H3c is not.

In Model 4, the regression analysis of time distance, social distance, and spatial distance to green housing purchase intention shows that the F value is 95.505, the significance is <0.001, the regression model is significant, and the adjusted R^2 is 0.682. The influence of time distance, social distance, and spatial distance on green housing purchase intention all reach a significant level, and the regression coefficients were −0.271, −0.134, and −0.511, respectively. Therefore, the hypotheses H6b and H6c are valid, but the regression analysis of time distance to green housing purchase intention shows that time distance has a negative effect on green housing purchase intention. Therefore, H6a is not valid.

Mediation Effects

The mediation effect of psychological distance is tested in this section. The premise of mediation effect is to analyze the mediation variable when the relationship between independent variable and dependent variable is significant, otherwise there will be no mediation effect. The first step: conduct regression analysis with taking comment quantity, comment quality, comment titer and evaluator credibility as independent variables, and the green housing purchase intention as a dependent variable. The second step: conduct regression analysis with taking comment quantity, comment quality, comment titer, and evaluator credibility as independent variables, and psychological distance as dependent variable. The third step: conduct regression analysis with taking comment quantity, comment quality, comment titer, evaluator credibility, and psychological distance as independent variables, and the green housing purchase intention as dependent variable, and then carry out a mediation effect test. The results are shown in **Table 10**.

According to **Table 10**, in step 1, the regression analysis of comment quantity, comment quality, comment titer, and evaluator credibility to green housing purchase intention shows that the F value is 35.381, the significance is <0.001, the regression model is significant, and the adjusted R^2 is 0.476. The influence of comment quality, comment titer, and evaluator credibility on green housing purchase intention reach a significant level, and the regression coefficients were 0.130, 0.190, and 0.370 respectively. The effect of comment quantity on green housing purchase intention is not significant. Therefore, the hypotheses H1b, H1c, and H1d are valid, while H1a is not.

In step 2, the regression analysis of comment quantity, comment quality, comment titer, and evaluator credibility to psychological distance shows that the F value is 87.348, the significance is <0.001, the regression model is significant, and the adjusted R^2 is 0.695. The influence of comment quantity, comment quality, comment titer, and evaluator credibility on psychological distance all reach a significant level, and the regression coefficients were −0.111, −0.143, −0.208, and −0.495.

In step 3, the regression analysis of comment quantity, comment quality, comment titer, evaluator credibility, and psychological distance to green housing purchase intention shows that the F value is 65.490, the significance is <0.001, the regression model is significant, and the adjusted R^2 is 0.661. The influence of psychological distance on green housing purchase intention reaches a significant level, and the regression coefficients were −0.781. With the addition of mediation variables, the influence of comment quantity, comment quality, comment titer, and evaluator credibility on green housing purchase intention all fail to reach a significant level. So, the

TABLE 9 | Regression analysis on homebuyer comment to psychological distance and on psychological distance to purchase intention.

Dependent variable	Time distance	Social distance	Spatial distance	Green housing purchase intention
	Model 1	Model 2	Model 3	Model 4
Gender	−0.013	0.023	−0.005	−0.068
Age	−0.040	−0.071	0.008	−0.135***
Profession	−0.026	0.026	−0.011	−0.028
Independent variables				
Comment quantity	−0.035	−0.127*	−0.133*	
Comment quality	−0.251***	−0.115*	−0.019	
Comment titer	−0.065	−0.216***	−0.271***	
Evaluator credibility	−0.507***	−0.449***	−0.366***	
Time distance				−0.271***
Social distance				−0.134*
Spatial distance				−0.511***
R^2	0.583	0.634	0.482	0.689
F	51.501***	63.871***	34.313***	95.505***
ΔR^2	0.572	0.624	0.468	0.682
Df	7	7	7	6

*n = 266, standardized regression coefficients are presented in the table: *P < 0.05; **P < 0.01 being significant in terms of level; ***P < 0.001.*

TABLE 10 | Mediation effect test of psychological distance on homebuyer comment and purchase intention.

Dependent variables	Green housing purchase intention	Psychological distance	Green housing purchase intention
	Model 1	Model 2	Model 3
Gender	−0.069	0.002	−0.068
Age	−0.118*	−0.038	−0.147***
Profession	−0.016	−0.004	−0.019
Independent variables			
Comment quantity	0.101	−0.111*	0.014
Comment quality	0.130*	−0.143**	0.018
Comment titer	0.190**	−0.208***	0.028
Evaluator credibility	0.370***	−0.495***	−0.016
Mediation variable			
Psychological distance			−0.781***
R^2	0.490	0.703	0.671
F	35.381***	87.348***	65.490***
ΔR^2	0.476	0.695	0.661
Df	7	7	8

*n = 266, standardized regression coefficients are presented in the table: *P < 0.05; **P < 0.01 being significant in terms of level; ***P < 0.001.*

mediation effect of psychological distance on comment quantity, comment quality, comment titer, evaluator credibility, and green housing purchase intention is complete mediation. Therefore, the hypotheses H7b, H7c, and H7d are valid, while H7a is not.

GREEN HOUSING SELECTION MODEL BASED ON HOMEBUYER COMMENT

In order to further study green housing buying behavior, this section considers the determinants of multi-stage buying behavior based on homebuyer comment from a long-term perspective.

Basic Model

(1) Homebuyers with the same income will get the same utility when they buy the satisfactory buildings.
(2) Psychological distance will increase their utility;
(3) The cost of homebuyers includes transportation costs and housing costs.

When consumers want to buy buildings, they will consider the distance to their workplace or common service areas (collectively referred to as the service area), such as hospitals and supermarkets, and the transportation costs are taken into the cost of housing. Using the Hotelling model, one green housing and one ordinary building's zi are included in the model with a distance of 1. The distance between the service area and the green housing is x, and the distance between the service area and the ordinary buildings is 1–x.

The homebuyer's utility function can be obtained:

$$U_i = V + kw_i - t|x - z_i| - p_i$$

V represents the homebuyers' utility when satisfying their basic housing needs; $\boldsymbol{w_i}$ represents the homebuyer's psychological distance; $\boldsymbol{kw_i}$ represents the utility of homebuyer's psychological distance; $\boldsymbol{t}|\boldsymbol{x}-\boldsymbol{z_i}|$ denotes the transportation cost; $\boldsymbol{p_i}$ denotes the purchase cost.

$|\boldsymbol{x}-\boldsymbol{z_i}| \in \{\tilde{\boldsymbol{x}}, \boldsymbol{1}-\tilde{\boldsymbol{x}}\}$. To simplify the model, let $\boldsymbol{k}=\boldsymbol{1}$

If homebuyers get the same utility when they buy ordinary buildings or green housings, let

$$U_1 = U_2$$
$$V + w_1 - t\tilde{x} - p_1 = V + w_2 - t(1-\tilde{x}) - p_2$$

It can be obtained:

$$\tilde{x} = \frac{t + (p_2 - p_1) + (w_2 - w_1)}{2t} = \frac{1}{2} - \frac{w_2 - w_1}{2t} - \frac{p_1 - p_2}{2t}$$

That is to say, the homebuyers who are on the left side of $\tilde{\boldsymbol{x}}$ choose the green housing, while the homebuyers on the right side of $\tilde{\boldsymbol{x}}$ choose ordinary building.

Correspondingly, the demand functions are:

$$D_1(p_1, p_2, w_1, w_2) = N\tilde{x} = \left(\frac{1}{2} - \frac{w_2 - w_1}{2t} - \frac{p_1 - p_2}{2t}\right)N$$
$$D_2(p_1, p_2, w_1, w_2) = N(1-\tilde{x}) = \left(\frac{1}{2} - \frac{w_1 - w_2}{2t} - \frac{p_2 - p_1}{2t}\right)N$$

Then the profit of the green housing market:

$$W_1 = D_1(p_1 - c_1)$$

Profit of general construction market:

$$W_2 = D_2(p_2 - c_2)$$

Let $\frac{\partial W_1}{\partial p_1}=0$, $\frac{\partial W_2}{\partial p_2}=0$, the Nash equilibrium prices are:

$$p_1^* = t + \frac{w_1 - w_2}{3} + \frac{2c_1 + c_2}{3}$$
$$p_2^* = t + \frac{w_2 - w_1}{3} + \frac{c_1 + 2c_2}{3}$$

In the equilibrium state, the number of people buying green housings and ordinary buildings are respectively:

$$D_1^* = \left(\frac{1}{2} - \frac{w_2 - w_1}{6t} - \frac{c_1 - c_2}{6t}\right)N$$
$$D_2^* = \left(\frac{1}{2} + \frac{w_2 - w_1}{6t} + \frac{c_1 - c_2}{6t}\right)N$$

The equilibrium profits are

$$(p_1^* - c_1)D_1^*(p_2^* - c_2)D_2^*.$$

The One Stage Model With Uncertainties

The basic model assumes that all house buyers have the same cost sensitivity in terms of transportation time, energy, and expenditure. However, in the actual situation, in the long run, some home buyers regret buying buildings far from the urban area, and some home buyers do not care, so they should be divided into different types. Homebuyers who are more sensitive to traffic costs use the type of high traffic costs to refer to, while those who are not sensitive to traffic costs use the type of low traffic costs to refer to. Therefore, in the one-stage model with uncertainties, it is assumed that:

(1) There are two types of homebuyers: High transportation cost type marked as $\bar{t}$, and probability is r; low transportation cost type marked as $\underline{t}$, and probability is 1–r.
(2) Homebuyers are not clear about their types, but they have prior knowledge of r, which is represented by random variable r^B, whose value range is [0,1].

Assuming r^B is the Beta distribution with parameters of (α,β), then the expectation of r^B is $E\left(r^B\right)=\frac{\alpha}{\alpha+\beta}$.

Let E(t) be the expectation of transportation cost obtained by buyers based on prior knowledge, so

$$E(t) = E\left(r^B\right)\bar{t} + \left(1 - E\left(r^B\right)\right)\underline{t} = \underline{t} + \frac{\alpha}{\alpha+\beta}\left(\bar{t} - \underline{t}\right)$$

Corresponding demand functions are:

$$D_1\left(p_1,p_2\right) = N\tilde{x} = \left(\frac{1}{2} - \frac{w_2 - w_1}{2E(t)} - \frac{p_1 - p_2}{2E(t)}\right)N$$
$$D_2\left(p_1,p_2\right) = N(1-\tilde{x}) = \left(\frac{1}{2} - \frac{w_1 - w_2}{2E(t)} - \frac{p_2 - p_1}{2E(t)}\right)N$$

The Two-Stage Model Based on Homebuyer Comment

This section considers the influence of the homebuyers' comment on the number of buyers and the stakeholders' decisions in the second stage.

After the first stage, buyers with high transportation costs who are not satisfied will choose another building in the second stage. If the number of homebuyers who change their choice in the second stage is defined in the interval $[x_{\underline{t}}, x_{\bar{t}}]$, and expectation of the transportation cost of homebuyers based on their prior knowledge is E(t), so according to the results of the above Hotelling model, the critical points can be obtained:

$$x = \frac{1}{2} - \frac{w_2 - w_1}{2\underline{t}} - \frac{p_1 - p_2}{2\underline{t}}$$
$$x_{\bar{t}} = \frac{1}{2} - \frac{w_2 - w_1}{2\bar{t}} - \frac{p_1 - p_2}{2\bar{t}}$$
$$x_{E(t)} = \frac{1}{2} - \frac{w_2 - w_1}{2E(t)} - \frac{p_1 - p_2}{2E(t)}$$

In the second stage, buyers update their understanding of their own type according to the bad comment in the first stage:

In the interval $[x_{\underline{t}}, x_{\bar{t}}]$, the expected number of buyers who change choices is:

$$M = N\left(x_{\bar{t}} - x\right) = \frac{1}{2}\left(\frac{1}{\underline{t}} - \frac{1}{\bar{t}}\right)[(w_2 - w_1) + (p_1 - p_2)]N$$

As can be seen from the above equation, the number of homebuyers who are subjected to adverse comment and change types is determined by the difference in psychological distance and price between the two kinds of buildings.

In the second stage, the prior probability is updated according to Bayesian method after the number changes:

$$t^B = \begin{cases} \bar{t} & \text{The probability is updated as } \frac{\alpha + M_1}{\alpha+\beta+M} \\ \underline{t} & \text{The probability is updated as } \frac{\beta + M - M_1}{\alpha+\beta+M} \end{cases}$$

The equilibrium of the two-stage model is solved by backward induction.

The equilibrium result of the second stage is:

(1) The profit of the green housing market is:

$$W_1'' = D_1''\left(p_1'' - c_1\right) = N\left(\frac{1}{2} - \frac{w_2 - w_1}{6E(t)''} - \frac{c_1 - c_2}{6E(t)''}\right)\left[E(t)'' + \frac{w_1 - w_2}{3} + \frac{c_2 - c_1}{3}\right]$$

(2) The profit of the ordinary construction market is:

$$W_2'' = D_2''\left(p_2'' - c_2\right) = N\left(\frac{1}{2} + \frac{w_2 - w_1}{6E(t)''} + \frac{c_1 - c_2}{6E(t)''}\right)\left[E(t)'' + \frac{w_2 - w_1}{3} + \frac{c_1 - c_2}{3}\right]$$

Thereinto $E(t)'' = \underline{t} + \frac{\alpha+Mr}{\alpha+\beta+M}(\bar{t}-\underline{t})$

Stage I equilibrium is as follows.

If the price of an ordinary building is the same as that of green housing, this means the price of an ordinary building is $p_2=E(t)$. But if the price of a green housing rises (the decrease of subsidy also means the price rising) to $p_1=E(t)+\delta,(\delta>0)$, Then the demand of the green housing market will change from $(\frac{1}{2}-\frac{w_2-w_1}{2E(t)})N$ to $(\frac{1}{2}-\frac{w_2-w_1}{2E(t)}-\frac{\delta}{2E(t)})N$ (as shown above), and the demand will decrease by $\frac{\delta}{2E(t)}N$, here $M=\frac{1}{2}\left(\frac{1}{\underline{t}}-\frac{1}{\bar{t}}\right)(w_2-w_1+\delta)N$.

The profit difference between the two stages of green housing market is calculated as:

$$W_1'' - W_1' = \left[\frac{E(t)''}{2} - \frac{(w_1-w_2)^2}{6E(t)''} - \frac{E(t)'}{2} + \frac{(w_1-w_2)^2}{6E(t)'}\right]N$$

Thereinto

$$E(t)'' = \underline{t} + \frac{\alpha+Mr}{\alpha+\beta+M}(\bar{t}-\underline{t})$$

$$E(t)' = \underline{t} + \frac{\alpha}{\alpha+\beta}(\bar{t}-\underline{t})$$

Then,

$$W_1'' - W_1' = \left[\frac{1}{2}(\bar{t}-\underline{t})\left(\frac{\alpha+Mr}{\alpha+\beta+M} - \frac{\alpha}{\alpha+\beta}\right) + \frac{(w_1-w_2)^2}{6}\left(\frac{1}{\underline{t}+\frac{\alpha}{\alpha+\beta}(\bar{t}-\underline{t})} - \frac{1}{\underline{t}+\frac{\alpha+Mr}{\alpha+\beta+M}(\bar{t}-\underline{t})}\right)\right]$$

$$\left[\frac{1}{2}(\bar{t}-\underline{t})\left(\frac{\alpha+r\cdot\frac{N}{2}\left(\frac{1}{\underline{t}}-\frac{1}{\bar{t}}\right)(w_1-w_2+\delta)}{\alpha+\beta+\frac{N}{2}\left(\frac{1}{\underline{t}}-\frac{1}{\bar{t}}\right)(w_1-w_2+\delta)} - \frac{\alpha}{\alpha+\beta}\right) + \frac{(w_1-w_2)^2}{6}\cdot \frac{(\bar{t}-\underline{t})\left(\frac{\alpha+r\cdot\frac{N}{2}\left(\frac{1}{\underline{t}}-\frac{1}{\bar{t}}\right)(w_1-w_2+\delta)}{\alpha+\beta+\frac{N}{2}\left(\frac{1}{\underline{t}}-\frac{1}{\bar{t}}\right)(w_1-w_2+\delta)} - \frac{\alpha}{\alpha+\beta}\right)}{\left(\underline{t}+\frac{\alpha}{\alpha+\beta}(\bar{t}-\underline{t})\right)\left(\underline{t}+\frac{\alpha+r\cdot\frac{N}{2}\left(\frac{1}{\underline{t}}-\frac{1}{\bar{t}}\right)(w_1-w_2+\delta)}{\alpha+\beta+\frac{N}{2}\left(\frac{1}{\underline{t}}-\frac{1}{\bar{t}}\right)(w_1-w_2+\delta)}(\bar{t}-\underline{t})\right)}\right]N$$

$$= N(\bar{t}-\underline{t})\left(\frac{\alpha+Mr}{\alpha+\beta+M} - \frac{\alpha}{\alpha+\beta}\right)\left[\frac{1}{2} + \frac{(w_1-w_2)^2}{6}\cdot \frac{1}{(\underline{t}+\frac{\alpha}{\alpha+\beta}(\bar{t}-)\,\underline{t})(\underline{t}+\frac{\alpha+Mr}{\alpha+\beta+M}(\bar{t}-\underline{t}))}\right]$$

Because $N(\bar{t}-\underline{t})\left[\frac{1}{2}+\frac{(w_1-w_2)^2}{6}\cdot\frac{1}{\left(\underline{t}+\frac{\alpha}{\alpha+\beta}(\bar{t}-\underline{t})\right)\left(\underline{t}+\frac{\alpha+Mr}{\alpha+\beta+M}(\bar{t}-\underline{t})\right)}\right] > 0$, the positive and negative of this equation depends on $\frac{\alpha+Mr}{\alpha+\beta+M} - \frac{\alpha}{\alpha+\beta}$.

If $\frac{\alpha+r\cdot\frac{N}{2}\left(\frac{1}{\underline{t}}-\frac{1}{\bar{t}}\right)(w_2-w_1+\delta)}{\alpha+\beta+\frac{N}{2}\left(\frac{1}{\underline{t}}-\frac{1}{\bar{t}}\right)(w_2-w_1+\delta)} - \frac{\alpha}{\alpha+\beta}$ is positive, in the second stage, the profit of the green housing market increases compared with that of the first stage. If it is negative, the profit decreases. According to limit theory, when $w_2 - w_1 + \delta$ is small and $r > \frac{\alpha}{\alpha+\beta}$, the profit increases, while if $r < \frac{\alpha}{\alpha+\beta}$ the profit decreases. Because $\delta > 0$, if $w_2 - w_1$ tends to $-\delta$, then the green housing market has an incentive to change the expected price. That is to say, among the buyers with a high proportion of price sensitive ones, the difference between buyers' psychological distance for green housings and their psychological distance for ordinary buildings is the same as the difference between the price of green housings and ordinary buildings. The profit of the green housing market can still increase after the price rises. This shows that the psychological distance of home buyers occupies a large proportion of motivation in the green housing consumption market. Even if the price of green housing rises, as long as the psychological distance difference of green housing is higher than that of ordinary buildings, home buyers will still choose green housing.

CONCLUSIONS

Conclusions of the Study

First, the survey data were used to verify the influence factors of green housing choice behavior, and on this basis the buyers' two-stage choice model was built. The results indicate that buyers' psychological distance plays a bigger role in the green housing market, so in the promotion of green housing, the government or the construction enterprise should increase the publicity, so that the buyers will shorten their psychological distance to green housings.

The comments of home buyers can affect the purchase intention of green housing. Combined with the actual situation, specific recommendations are proposed as follows:

(1) Management of comment quality

The quality of online comments has a significant impact on green housing purchase intention, and high-quality comments help consumers to quickly identify information and generate high credibility for products, thus improving their willingness to buy. Therefore, merchants should deal with low-quality information in time, and make efforts in feedback communication with buyers, such as providing gifts or free after-sales service to prevent malicious comments. Establish a user reporting system, merchants and buyers together supervise the network water army and report quickly to prevent them from sending malicious comments.

(2) Management of comment titer

When the comment titer is positive, the purchase intention of green housing increases, and when the comment titer is negative, the purchase intention of green housing may decrease. Merchants cannot retain positive comments for product sales and massively delete negative comments. We should strengthen the diffusion of positive comments, express gratitude to buyers who publish positive comments in time through gifts and so on. Meanwhile, respond to buyers who publish negative comments quickly, as problem analysis and solutions are more necessary.

(3) Management of evaluator credibility

Establish a complete user comment system to ensure the reliability of information sources. Raise the registration threshold of evaluators, prevent a malicious water army; establish a relevant legal system, if malicious comments damage the reputation of merchants and result in economic losses, the legal

responsibility can be investigated; set the rating of evaluators, users can judge the reliability of the comments according to the rating of evaluators, merchants can also give priority to the recommendations of senior evaluators to achieve the effect of product sales increasing.

(4) Suggestion from homebuyer perspective

Before visiting the comments, buyers should improve their awareness of green housing, so as to be able to screen useful information more quickly and efficiently and improve their ability to judge and reduce blind consumption; reasonably use comments to make correct purchase decisions and improve satisfaction.

(5) Suggestion from a government perspective

Enhance the popularization of green housing knowledge and improve the national cognition. Consumer's psychological distance is an important factor in green housing choice behavior. The citizens have too little an understanding of green housing, and cannot clearly understand the concept and advantages of green housing, which will affect the development of the green housing industry. The government and construction enterprise need to take measures to strengthen the publicity of green housing, improve its popularity, and make the citizens clearly understand the environmental protection of green housing and the necessity of its development, such as advertising and representative green housing development.

Limitations of the Study

This article categorizes the evaluation of home buyers based on previous scholars' research, and divides them into four dimensions: comment quantity, comment quality, comment titer, and evaluator credibility as independent variables, but there are also studies showing that the dimensions of online evaluation are more than these. Therefore, in the future, we will continue to select other variables to study the influence mechanism of home buyers' evaluation on green housing purchase intention.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethics Review Board of Business School in University of Jinan, China. Participants provided their written informed consent to participate in the study.

AUTHOR CONTRIBUTIONS

QF: conceptualization, resources, methodology, writing—original draft preparation, and supervision. XS: project administration, formal analysis, funding acquisition, and supervision. CC: data curation, writing—reviewing and editing. ZD: software, visualization, and investigation. YW: combing the literature, data recalculation, and writing—reviewing and editing. All authors contributed to the article and approved the submitted version.

FUNDING

This work was supported by the National Natural Science Funding of China (71502071), China postdoctoral foundation project (2019M652420), the Natural Science Foundation of Shandong Province (ZR201911160079 and ZR201709220278), Social Science Planning and Research Project of Shandong Province (19CGLJ05), and the Research Foundation of the University (19YY08 and 2020YQ15).

ACKNOWLEDGMENTS

Thanks to the construction users who provided help in the questionnaire survey, and thanks to the editors and reviewers of the journal.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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ORIGINAL RESEARCH
published: 01 April 2021
doi: 10.3389/fpsyg.2021.569115

Psychological Distance Toward Air Pollution and Purchase Intention for New Energy Vehicles: An Investigation in China

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Air pollution in China has been drawing considerable attention in recent years. The emergence of new energy vehicles (NEVs) provides hope to reduce air pollutant emission. However, consumers' recognition and acceptance of NEVs remain at the early stage. This research aims to explore how consumers' environmental concern influences their NEV purchase intention. Specifically, this research conducted an online survey and an experiment to address the following issues: (1) how consumers' psychological distance (PD) toward air pollution influences their purchase intention for NEVs, and does their risk perception of the consequences of air pollution mediate this influence; (2) whether consumers' perceived price level of NEVs plays a moderating role in the relationship between risk perception and purchase intention; and (3) whether the construal level of stimulus can be manipulated to influence consumers' PD toward air pollution to increase their purchase intention for NEVs. The results of study 1, based on a total of 293 valid samples, show that consumers' PD toward air pollution significantly affects their purchase intention for NEVs, and risk perception of the consequences of air pollution plays a considerable mediating role. Meanwhile, consumers' perceived price level of NEVs has a significant negative moderating effect on the relationship between risk perception and purchase intention. The results of study 2, based on an online experiment, show that the construal level of stimulus can influence consumers' PD toward air pollution, which in turn affects their purchase intention for NEVs. The findings of this research have implications for businesses' promotional strategies and governments' policies. For instance, low-construal-level promotional materials can be developed to arouse consumers' environmental concern, thereby facilitating their eco-friendly consumption behavior. Governmental financial assistance and other policies can also increase consumers' willingness to purchase NEVs.

Keywords: psychological distance, air pollution, risk perception, perceived price, purchase intention, new energy vehicle

OPEN ACCESS

Edited by:
Yan Sun,
Chinese Academy of Sciences, China

Reviewed by:
Jia Wei,
Xi'an Jiaotong University, China
Hong Chen,
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Specialty section:
This article was submitted to Environmental Psychology, a section of the journal Frontiers in Psychology

Received: *03 June 2020*
Accepted: *24 February 2021*
Published: *01 April 2021*

Citation:
Liu W, Zeng L and Wang Q (2021) Psychological Distance Toward Air Pollution and Purchase Intention for New Energy Vehicles: An Investigation in China. Front. Psychol. 12:569115. doi: 10.3389/fpsyg.2021.569115

HIGHLIGHTS

- Consumers' psychological distance (PD) toward air pollution significantly affects their purchase intention for new energy vehicles (NEVs).
- Consumers' risk perception of the consequences of air pollution plays a considerable mediating role between their PD toward air pollution and their intention to purchase NEVs.
- Consumers' perceived price level of NEVs has a significant negative moderating effect on the relationship between risk perception of the consequences of air pollution and purchase intention.
- According to construal level theory and the experimental results of this research, low-construal-level stimuli can reduce consumers' PD toward air pollution.

INTRODUCTION

Private vehicles in China have been increasing yearly along with the economic growth and the improvement of people's living standards. Despite the convenience they provide to our life, they have also caused many problems, such as continuous decline in air quality and increase in pollutant emissions, which are harmful to public health. Studies have shown that greenhouse gases and air pollutants resulting from the fuel consumption of traditional motor vehicles are among the main reasons for climate change (Wu et al., 2012). The emergence of new energy vehicles (NEVs) has brought hope to alleviate these environmental problems. NEVs are automobiles that use non-fossil fuels or partially use fossil fuels. Compared with traditional diesel locomotives, NEVs have a higher energy conversion rate, lower dependence on petroleum fuels, and lower emissions during driving (Wu et al., 2007). From the perspective of environmental protection, the promotion of NEVs is important in reducing air pollution problems, curbing global warming trends, and solving energy security issues. From the perspective of industry development, due to the importance of the automobile industry in China, strong policy support has been given to the development of NEVs, and industrialization and market promotion have good prospects. However, the quest for the NEV market just begun and most consumers have low recognition and acceptance of NEVs. The main barriers to the diffusion of NEVs are high prices, limited driving range and coverage of charging infrastructure, and long charging time, as well as the low level of knowledge of the NEV performances that consumers have (Williander and Stålstad, 2013; Cecere et al., 2018). Psychological approaches combined with the important contributions from the marketing literature can help identify consumers' attitudes toward NEVs and purchase intention (Sun and Morwitz, 2010; Arts et al., 2011; Cecere et al., 2018).

Scholars have introduced theories such as psychological distance (PD), construal level, and risk perception to understand individuals' environment-related attitudes and behaviors. PD usually refers to the perceiver's set of subjective or direct experiences of the distance from a stimulus (Trope and Liberman, 2010). PD can make individuals perceive an issue as less relevant and thus influence their behaviors. For example, farther PD toward environmental pollution may reduce consumers' intention to act environmentally friendly (Jäger and Weber, 2020). By contrast, closer PD toward environmental pollution can positively affect people's support and participation in environmental protection policies; PD toward environmental pollution can also affect people's choice of mode of transportation (Mir et al., 2016). On the basis of previous studies, consumers' PD from objects or risks can be changed by altering the construal level of stimulus (Trope and Liberman, 2003, 2010; Trope et al., 2007; White et al., 2011; Wang et al., 2019). Stimuli with low construal level are suggested to result in a higher concern for climate changes and higher willingness to act accordingly compared with stimuli with high construal level (Spence et al., 2012; Jones et al., 2017). Therefore, applying low construal stimulus is appropriate when communicating sustainable consumption issues toward consumers (Jäger and Weber, 2020). However, few studies have considered the relationship among construal level, PD toward air pollution, and the purchase intention for NEVs.

Risk perception can also explain people's psychology and behavior. For instance, studies have shown that investors' risk perceptions can drive market asset prices (Huber et al., 2019); risk perception of natural disasters can affect farmers' attitudes toward coping with risks (Hasibuan et al., 2020; and risk perception of climate change can affect environmental psychology and behavior (Bradley et al., 2020). The objects of risk perception are often diseases, natural disasters, safety accidents, or dangerous behaviors, but few studies consider risk perception of the consequences of air pollution. Risk perception can effectively influence consumers' purchase intention and behavior. Specifically, PD can affect individuals' risk perception of the consequence of climate change, which, in turn, influences their behaviors (Azadi et al., 2019).

Perceived price is always an important factor that affects consumer decisions (Lee et al., 2013; El-Said, 2020). Related research focuses on the difference between the effect of objective price and perceived price on consumers' purchase intention and the role of perceived price in purchasing decisions. For instance, some scholars have studied the impact of perceived prices and trust on purchasing behavior in online shopping (Kim et al., 2012). Customers' perceived prices for mobile services can significantly predict customers' price sensitivity levels (Liu and Lee, 2016). In view of sustainable consumption, high price may reduce consumers' intention to adopt environmentally friendly products (Best and Burke, 2018).

Based on the PD theory, this study explores the relationship between consumers' PD toward air pollution and their purchase intention for NEVs and verifies the mediating role of risk perception and the moderating role of perceived price level. The key problems solved in this study are as follows:

(1) How consumers' PD toward air pollution influences their purchase intention for NEVs, and does their risk perception of the consequences of air pollution mediate this influence;
(2) Whether perceived price level plays a moderating role in the relationship between risk perception

of the consequences of air pollution and purchase intention; and

(3) Whether the construal level of stimulus can be manipulated to influence consumers' PD toward air pollution, thereby affecting consumers' purchase intention for NEVs.

This research implemented two studies to address the abovementioned questions. The remaining sections of this paper are organized as follows. First, the literature on PD, the risk perception of the consequences of air pollution, and perceived price level is reviewed. The hypotheses of this research are proposed on the basis of the literature. Second, the measures used in the investigation and the data collection and analysis procedures of the two studies are introduced. The theoretical and practical implications are generated on the basis of our findings. In the section Conclusion, the limitations of this research and our future work are disclosed.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

PD and Purchase Intention for NEVs

PD and construal level theory are widely used to analyze consumer psychology and behavior and are important to predict and guide consumer behavior. PD is a person's perception of the distance between an object, a risk, or an event and the person him/herself, thereby affecting the person's motivation and preference for action (Trope et al., 2007). Objects are scattered in psychological space according to various dimensions, thereby forming different types of PD. Many discussions on the dimensions of PD have been conducted in academe. Among them, the most widely accepted theory is that PD includes four dimensions: temporal distance, spatial distance, social distance, and hypothetical distance (also called uncertainty) (Liberman et al., 2007; Liberman and Trope, 2008).

With regard to the correlation between PD and construal level, Mir et al. (2016) explored the influence of PD on people's choice of travel modes under different result frameworks. Chung and Park (2017) found that when a company's contradiction in social media is related to its morality, consumers who believe that the PD between them and the company is closer are more likely to conduct favorable evaluation of the company, and a similar pattern of purchase intention is observed. Azadi et al. (2019) studied the role of PD and risk perception in promoting farmers' adaptive behavior in climate change (Azadi et al., 2019). Loy and Spence (2020) found that reducing the PD from climate change can stimulate people's participation in environment-friendly behavior.

Construal level theory assumes that individuals perceive objects or topics as either rather concrete and detailed or abstract and holistic (Trope et al., 2007; Carmi and Kimhi, 2015). In essence, construal level refers to the differences of information expression and interpretation (Trope and Liberman, 2010). For instance, pictures are concrete representations that bear a physical resemblance to the referent objects, whereas words are abstract representations that carry the essence of the objects (Amit et al., 2009a,b). Therefore, words comprise a higher level of construal than do pictures. Construal level is one of the primary devices used to alter psychological distance (Soderberg et al., 2015). That is, more abstract (higher) construal will increase psychological distance, whereas more concrete (lower) construal will reduce psychological distance (Wang et al., 2019). Environmental pollution is generally described as an abstract topic and thereby as rather psychologically distant (Lorenzoni and Pidgeon, 2006; Jäger and Weber, 2020). However, previous studies have suggested that appropriate low construal stimuli might be an effective means for increasing environmentally friendly behavior to reduce individuals' PD to environmental pollution (Bashir et al., 2014; Jones et al., 2017). Air pollution is the most common form of environmental pollution worldwide. However, individuals generally perceive air pollution as a distant event, thinking that air pollution usually occurs far from their area (Bickerstaff, 2004). Using messages with low construal level may reduce people's PD to air pollution (Jäger and Weber, 2020). Reducing PD via communicating air pollution appropriately can increase individuals' willingness to be environmentally friendly, such as adopting a low-carbon transportation mode or purchasing green products (Mir et al., 2016; Jäger and Weber, 2020).

Based on the PD and construal level theory in past research, this paper proposes the following hypotheses:

H1. The closer consumers' PD is to air pollution, the stronger is their purchase intention for NEVs.

H2. Manipulating the construal level can affect consumers' PD, thereby influencing their purchase intention for NEVs. That is, the lower the construal level of the stimulus is, the closer the consumers' PD toward air pollution is and, thus, the stronger is their purchase intention for NEVs.

Risk Perception of the Consequences of Air Pollution

Risk perception refers to an individual's feelings and understanding of various objective risks that exist in the outside world and emphasizes the effect of the individual's experience on intuitive perception and subjective experience (Starr, 1969; Slovic, 1987). Stone and Grønhaug (1993) proposes that the six-dimensional model of perceived risk is a widely used theoretical model, that is, perceived risk includes physical risk, financial risk, social risk, functional risk, temporal risk, and psychological risk. The study by Pu et al. (2019) on air pollution risk perception also divides it into six dimensions: risk benefit, environmental awareness, attention and knowledge, perceived risk, personal protection trust, and government control trust.

In related studies, most of the research objects are concentrated in fields such as natural disasters, diseases, safety accidents, and climate change. Ngo et al. (2017) found that personally participating in air quality research can improve the residents' awareness of the health risks of air pollution in informal settlements and help to increase their environmental awareness. Ban et al. (2019) explored health risk perception and its mediating role in heat wave protection behavior adaptation. Dinh et al. (2020) found that traffic risk perception is related to pedestrian safety behavior. Marshall (2020) believes that a

complementary role exists between risk perception and safety culture. Xie et al. (2019) found that predictive factors of risk perception can also predict behavior and willingness. Castilho et al. (2015) studied consumer behaviors and factors that influence consumer satisfaction and risk perception of buying own brand food (Castilho et al., 2015). Lopes et al. (2020) use perceived social risk as a mediator to analyze the role of brand ethical issues in the purchase decision process. In the field of air pollution, PD to climate change can directly affect individuals' behavior and work indirectly through risk perception (Azadi et al., 2019). That is to say, if people perceive a close distance to air pollution, then they will have a high risk perception and thus behave environmentally friendly. Based on the above literatures, this study proposes the following hypotheses:

H3. The closer the consumers' PD toward air pollution, the higher their risk perception of the consequences of air pollution.
H4. Consumers' higher risk perception of the consequences of air pollution results in a stronger purchase intention for NEVs.
H5. Consumers' risk perception of the consequences of air pollution has a mediating role in the relationship between PD and purchase intention.

Perceived Price Level

Price has always been considered as one of the important factors that affect consumer decision making. Consumers make different purchase decisions based on price perception and actual price comparison (Zeng et al., 2012). In general, the price is considered as the cost that consumers must pay to obtain the product or as the quality characteristics of the product itself.

Perceived prices are consumers' subjective feelings toward prices at a certain time (Kim et al., 2012). Jacoby and Olson (1997) distinguished between the objective price of a product and the consumer's psychologically encoded price. Compared with the objective price, the consumer's price coding of the product is relatively strict. For example, consumers compare the objective price of the product (the price set by the manufacturer) with reference prices (prices set by other manufacturers), and then the product price is coded to be higher or lower than the reference price; these results drive consumers' perception of the price while affecting consumer decisions (Jacoby and Olson, 1997). For NEVs, the perceived price can be defined as the consumer's perceived price level compared with those of traditional fuel vehicles.

Perceived price is often used to analyze and predict consumers' intentions and behaviors. Fecher et al. (2019) found that an unreasonable unit price would affect consumers' perception of price and purchase intention. Kim et al. (2012) studied the influence of perceived price and trust on purchasing behavior in online shopping. As a moderator, high price can weaken the effect of positive word of mouth on consumers' purchasing intention (El-Said, 2020). Specifically, despite the positive environmental result via adopting clean energy, such as solar and wind energies, the perceived price compared with carbon will reduce customers' intention to use (Best and Burke, 2018). Moreover, the decision making of purchase of NEVs is different from that of relatively low-cost green product. According to Diekmann and Preisendörfer (2003) and Cecere et al. (2018), when evaluating the purchase of relatively expensive goods, consumers will still attempt to optimize their utility while attributing a lower importance to environmental issues. For instance, an environmentally conscious consumer may easily reach a decision on paying \$2 to buy a paper bag rather than to pay \$1 to buy a plastic bag, but they may not that easily decide to buy a traditional fuel vehicle at \$10,000 or to buy a NEV at \$20,000. That is, despite the perception of the environmental risks, perceived price will play an important role in the adoption of NEVs. Similarly, according to Egbue and Long (2012) and Oliver and Rosen (2010), environmental risk perceptions influence the adoption of NEVs, but they are limited by the trade-off between environmental concerns and price. On the basis of these studies, we explore the moderating role of perceived price on the relationship between risk perception of air pollution and NEV purchase intention and propose the following hypothesis:

H6. Consumers' perceived price level for NEVs plays a moderating role in the relationship between their risk perception of the consequences of air pollution and purchase intention for NEVs.

RESEARCH DESIGN AND METHODOLOGY

Study 1: Relationship Between Consumers' PD, Their Risk Perception of the Consequences of Air Pollution, and Their Purchase Intention for NEVs

Measurement

Figure 1 shows the conceptual model of study 1. To verify H1 and H3–H6, this study designed an online questionnaire (shown in **Appendix 1**) to investigate and measure the consumers' PD to air pollution, risk perception of the consequences of air pollution, perceived price level of NEVs, and purchase intention for NEVs, as well as to analyze and verify the relationship between different variables. The measurement of variables in this study is based on the scales used in related researches, combined with the actual context and the domestic environment, which are necessary to adjust and compile the final scale, and generate a formal questionnaire.

The questionnaire consists of five parts with a total of 32 questions. The first part presents the measurement of consumers' PD toward air pollution with a total of eight items. The items are derived from the work of Spence et al. (2012) and Wang et al. (2019) on the PD toward climate change. Consumers' PD toward air pollution is measured from four dimensions, namely, spatial distance, social distance, temporal distance, and uncertainty, using a five-point Likert scale. When measuring each dimension of PD, we used different scales and labels (positive and negative alternating approach) adopted from the study of Wang et al. (2019). For example, when measuring spatial distance, the participants were asked to rate statements, such as "My area may be affected by air pollution," with 1 as strongly disagree (psychologically distant) and 5 as strongly agree (psychologically

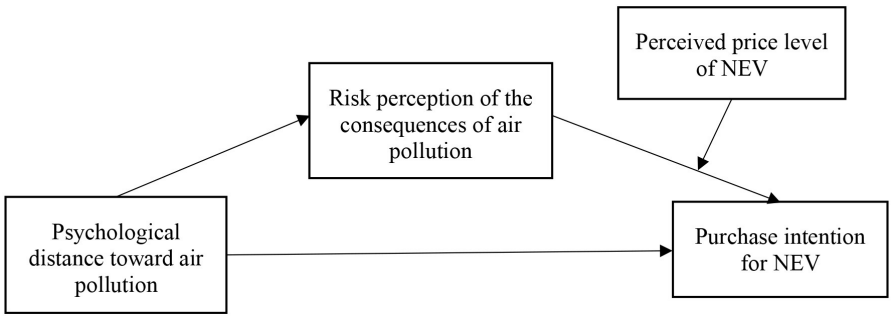

FIGURE 1 | Conceptual model of study 1.

TABLE 1 | Items for PD, risk perception, and purchase intention.

Variable		Item	Source
PD toward air pollution	a. Spatial distance	a1. My area may be affected by air pollution.	Spence et al., 2012; Wang et al., 2019
		a2. Air pollution mainly affects areas far from me.	
	b. Uncertainty	b1. I am not sure if air pollution is indeed happening.	
		b2. The severity of the consequences of air pollution is exaggerated.	
	c. Social distance	c1. Air pollution mainly affects developed countries.	
		c2. Air pollution has a greater impact on me and my family.	
	d. Temporal distance	d1. Air pollution has already occurred or is happening.	
		d2. If anything, air pollution will occur in the very distant future.	
Risk perception of the consequences of air pollution	e. Attention and knowledge	e1. I am very interested in air pollution and want to learn more about past air pollution incidents.	Fischhoff et al., 1978; Pu et al., 2019
		e2. I often obtain information about air pollution through the Internet, TV, newspapers, and other media.	
	f. Perceived risk	f1. I know the causes of air pollution and their impact on health.	
		f2. Air pollution incidents that cause damage to the environment and human health occur from time to time.	
		f3. I am worried that air pollution will occur in the place where I live, causing damage to the environment and human health.	
	g. Government protection trust	g1. The government's environmental policy on air pollution control is trustworthy.	
		g2. The government provides the public with real information about air pollution.	
	h. Environmental awareness	h1. I am willing to reduce the use of private cars to protect air quality.	
		h2. I am willing to reduce the use of air-conditioner, elevators, microwave ovens, and other equipment to protect the air quality.	
	i. Personal protection trust	i1. I can rely on my own ability to avoid the harm caused by air pollution.	
		i2. I have the knowledge to protect me from air pollution.	
	j. Risk benefit	j1. It is acceptable to sacrifice some air quality to develop the economy and increase people's income.	
		j2. Although some local pillar industries such as thermal power, steel, chemical, construction, and other industries cause serious pollution, they still need to exist.	
Perceived price level		m1. New energy vehicles are more expensive than traditional fuel vehicles.	Kim et al., 2012; El-Said, 2020
		m2. Buying a traditional fuel car may enjoy a bigger discount than buying a new energy car.	
		m3. The maintenance cost of new energy vehicles may be higher than that of traditional fuel vehicles.	
Purchase intention for new energy vehicles		n1. When you consider buying a car, consider how likely it is to buy a new energy vehicle.	Dodds et al., 1991; Armstrong et al., 2000; Cecere et al., 2018
		n2. When you decide to buy a car, how likely is it to choose a new energy vehicle?	
		n3. How likely are you to recommend new energy vehicles to others?	

close), and "Air pollution mainly affects areas far away from me," with 1 as strongly agree (psychologically distant) and 5 as strongly disagree (psychologically close). The second part presents the measurement of consumers' risk perception of the consequences of air pollution. The items are adopted from Fischhoff et al. (1978), Pu et al. (2019), and other studies on risk perception of technology and air pollution. Thirteen questions are asked about consumers' risk perception of the consequences of air pollution from six dimensions: risk benefit, environmental awareness, attention and knowledge, perceived risk, personal protection trust, and government control trust, using a five-point Likert scale. When measuring each dimension of risk perception, we used different scales and labels and handled them by using the same approach used in the first part. The third part presents the measurement of the perceived price level of new energy vehicles with a total of three items. The items are adopted from related studies by Kim et al. (2012) and El-Said (2020), also using a five-point Likert scale. The fourth part provides the measurement of consumers' purchase intention for NEVs, which consist of three items. The items are from Dodds et al. (1991), Cecere et al. (2018), and Armstrong et al. (2000). The last part presents a demographic variable that consists of five questions. Items of constructs are shown in **Table 1**.

Data Collection and Analysis

Descriptive Statistics

In this study, a total of 356 questionnaires were collected through an online-based survey from January 2020 to March 2020, among which 42 data were removed because the time spent on filling this questionnaire was <1 min. Another 21 responses were excluded because the participants already owned NEVs. Finally, 293 valid samples were used in the analysis. The demographic information distribution of the participants is shown in **Table 2**. Among the participants, 145 are males, accounting for 49.5% of the total samples; the other 148 are females, accounting for 50.5%. In terms of age, 106 participants are under 25 years old (36.2%), 135 participants are between 25 and 40 years old (46%), and the other 52 are over 40 years old. In terms of geographical distribution, the most participants are from East ($N = 67$) and Southwest ($N = 49$) China, and only 23 are from Northeast China. As for education level, most participants have undergraduate or higher educational background, accounting for 61.2%. In terms of income level, 75.4% of the participants have a monthly income below 10,000 RMB.

TABLE 2 | Result of demographic statistics analysis ($N = 293$).

Variable	Category	Number of people	Percentage (%)
Gender	Male	145	49.5
	Female	148	50.5
Age	Under 25	106	36.2
	25–40 years old	135	46.0
	Over 40 years old	52	17.8
Area	East China	67	22.9
	North China	33	11.3
	Northeast China	23	7.9
	Central China	42	14.3
	South China	37	12.6
	Southwest China	49	16.7
	Northwest China	42	14.4
Education level	Below undergraduate	114	38.9
	Undergraduate	91	31.1
	Master's degree and above	88	30.1
Monthly income level	Under 5,000	142	48.5
	5,000–10,000	79	26.9
	Over 10,000	72	24.6

TABLE 3 | Summary of Cronbach's α of each construct ($N = 293$).

Constructs	Number of items	Cronbach's α
PD toward air pollution	8	0.916
Risk perception of the consequences of air pollution	13	0.961
Perceived price level	3	0.905
NEV purchase intention	3	0.925

Measurement Model

In order to measure the proposed model, this study used SmartPLS 3.0 to test the reliability and validity based on the obtained data. PD and risk perception are modeled as second-order constructs with reflective–reflective approach: the first-order constructs are reflectively defined and the second-order constructs are also reflectively defined. As introduced in the section Measurement, consumers' PD toward air pollution includes four first-order constructs, namely, spatial distance, social distance, temporal distance, and uncertainty. Meanwhile, consumers' risk perception of the consequences of air pollution includes six first-order constructs, namely, risk benefit, environmental awareness, attention and knowledge, perceived risk, personal protection trust, and government protection trust. The reliabilities of all constructs were examined using two criteria: Cronbach's α and composite reliability (Straub et al., 2004). According to the results shown in **Tables 3**, **4**, all the values of Cronbach's α and composite reliability are above the commonly acceptable level of 0.7.

Convergent validity was also examined using two criteria (Fornell and Larker, 1981): indicator loadings and average variance extracted (AVE). According to **Table 4**, all of the items exhibit a loading higher than 0.7 on their respective construct, and all the AVEs are also higher than 0.7, thereby satisfying both criteria of convergent validity. Meanwhile, the square root of AVE of each construct is greater than the correlations between the construct and all other constructs (shown in **Table 5**) in the model, demonstrating sufficient discriminant validity (Fornell and Larker, 1981).

Structural Model

To test the structural model, a structural equation modeling (SEM) method based on SmartPLS 3.0 was used. As shown in **Figure 2**, all the factor loadings for reflective measures of the second-order constructs are >0.7. The path coefficient values

TABLE 4 | Results of convergent validity analysis.

	Variable	Item	Factor loading	Composite reliability	AVE	Mean (standard deviation)
PD	a. Spatial distance	a1	0.844	0.886	0.795	3.780 (1.010)
		a2	0.772			
	b. Uncertainty	b1	0.842	0.915	0.843	3.666 (1.021)
		b2	0.840			
	c. Social distance	c1	0.795	0.880	0.786	3.609 (1.028)
		c2	0.737			
	d. Temporal distance	d1	0.782	0.914	0.842	3.823 (0.983)
		d2	0.735			
Risk perception	e. Attention and knowledge	e1	0.853	0.919	0.850	3.672 (0.963)
		e2	0.828			
	f. Perceived risk	f1	0.852	0.934	0.824	3.618 (1.032)
		f2	0.841			
		f3	0.802			
	g. Government protection trust	g1	0.832	0.934	0.876	3.575 (1.004)
		g2	0.834			
	h. Environmental awareness	h1	0.816	0.930	0.868	3.684 (1.007)
		h2	0.838			
	i. Personal protection trust	i1	0.772	0.894	0.808	3.503 (0.904)
		i2	0.764			
	j. Risk benefit	j1	0.867	0.937	0.881	3.522 (1.008)
		j2	0.836			
Perceived price level		m1	0.916	0.940	0.840	2.830 (1.040)
		m2	0.907			
		m3	0.928			
Purchase intention		n1	0.940	0.953	0.870	3.710 (1.120)
		n2	0.923			
		n3	0.936			

TABLE 5 | Correlations among constructs and the square root of AVE.

	1	2	3	4	5	6	7	8	9	10	11	12
Spatial distance	**0.892**											
Uncertainty	0.790	**0.918**										
Social distance	0.770	0.706	**0.886**									
Temporal distance	0.628	0.704	0.584	**0.918**								
Attention and knowledge	0.795	0.801	0.768	0.689	**0.922**							
Perceived risk	0.756	0.760	0.709	0.665	0.732	**0.899**						
Government control trust	0.752	0.797	0.712	0.703	0.824	0.725	**0.908**					
Environmental awareness	0.747	0.816	0.720	0.746	0.752	0.752	0.739	**0.936**				
Personal protection trust	0.782	0.785	0.747	0.764	0.795	0.706	0.733	0.802	**0.932**			
Risk benefit	0.727	0.780	0.741	0.719	0.794	0.725	0.821	0.764	0.762	**0.939**		
Perceived price level	−0.514	−0.50	−0.414	−0.371	−0.338	−0.379	−0.332	−0.360	−0.350	−0.361	**0.917**	
Purchase intention	0.876	0.887	0.809	0.764	0.837	0.799	0.817	0.817	0.825	0.830	−0.690	**0.933**

Diagonal elements are the square root of AVEs.

shown in **Figure 2** are exhibiting significant relationships among constructs with all *P*-values <0.05. Specifically, the closer the consumers' PD from air pollution, the higher intention they have to purchase NEV ($\beta = 0.352$, $p < 0.001$). Meanwhile, psychological closeness to air pollution will lead to high risk perception toward the consequences of air pollution ($\beta = 0.951$, $p < 0.001$). High risk perception eventually results in high NEV purchase intention ($\beta = 0.465$, $p < 0.001$). In accordance with Chin (1998), a bootstrapping with 5,000 resamples and 95% confidence interval was run to examine the mediating effect

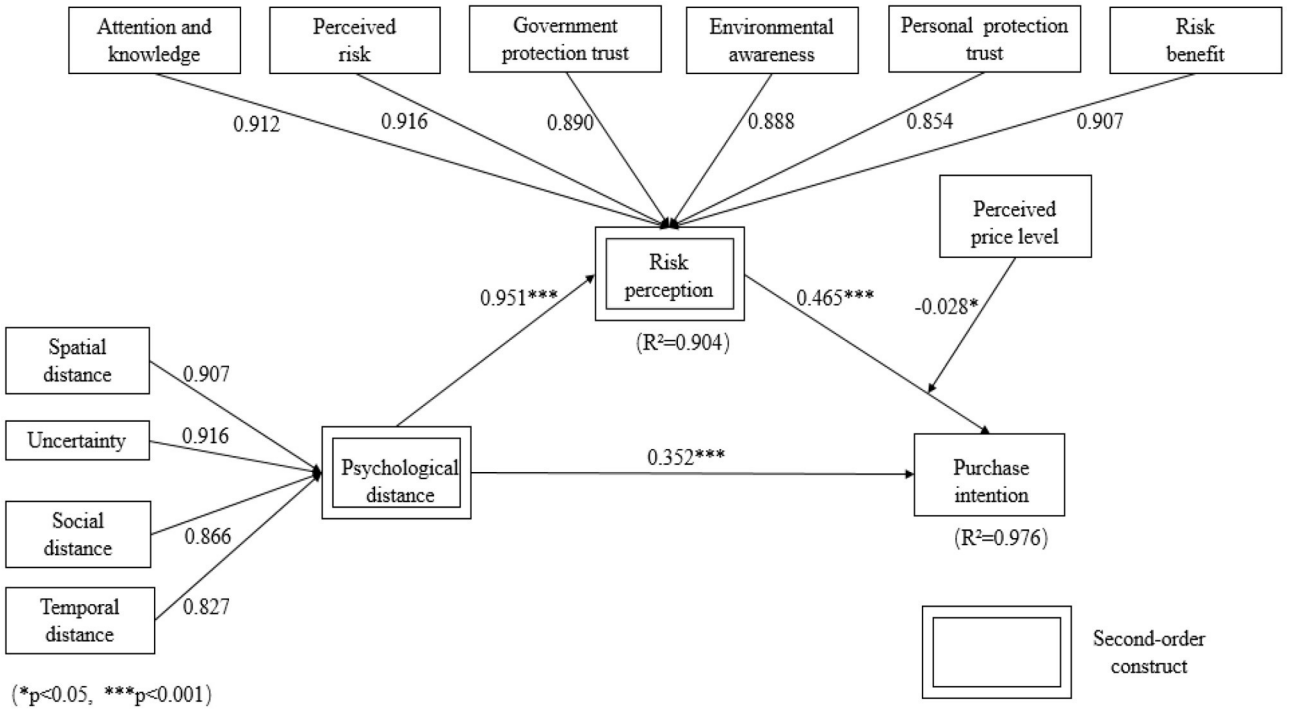

FIGURE 2 | SEM analysis results of the structural model. Five-point Likert scales are used to measure constructs. The greater the values are, the closer the psychological distance, the higher the risk perception, and the stronger the purchase intention.

TABLE 6 | Mediating effect of risk perception.

	β	Standard deviation	*t*	Sig.	Lower pound	Upper bound
PD → risk perception → purchase intention	0.441	0.028	15.574	0.000	0.386	0.497

Five-point Likert scales are used to measure constructs. The greater the values are, the closer the PD, the higher the risk perception, and the stronger the purchase intention.

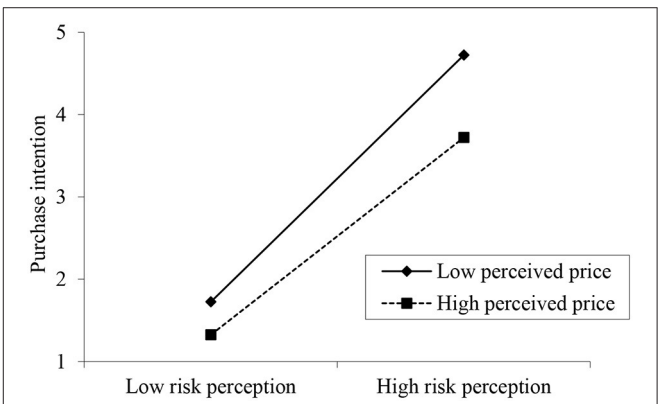

FIGURE 3 | Moderating effect of perceived price level.

of risk perception toward the consequences of air pollution. **Table 6** shows that there exists indirect effect between PD and NEV purchase intention via risk perception. Perceived price level moderates the relationship between risk perception of the consequences of air pollution and NEV purchase intention ($\beta = -0.028$, $p < 0.05$). As shown in **Figure 3**, perceived high price will weaken the effect of consumers' risk perception on their NEV purchase intention. According to the above results, H1 and H3–H6 are supported.

Study 2: PD Toward Air Pollution and Purchase Intention for NEVs Under Different Construal Levels

Experiment Design

The purpose of study 2 is to investigate whether consumers' PD toward air pollution can be influenced by manipulating the construal level, thereby influencing consumers' purchase intention for NEVs. The participants were assigned into two groups. After reading the materials with high and low construal levels of stimuli, respectively, the PD toward air pollution and purchase intention for NEVs were measured. Specifically, previous studies have shown that pictures are more specific/concrete than textual descriptions and have a lower construal level (Amit et al., 2009b). That is to say, objects that are closer are associated with a lower construal level (Fujita et al., 2008). Therefore, the participants in the high construal

level group read a text related to air pollution from a report by the World Health Organization, which briefly introduced related information on global air pollution. The participants in the low construal level group watched a group of pictures related to air pollution corresponding to the text that the first group read. We borrowed pictures from news.ifeng.com and acquired permission from their office to use them in the experiment. As shown in **Appendix 2**, the question "By viewing the above text (pictures), I have a general/intuitive understanding of the current air pollution (1 for general and 7 for intuitive)" was used to test the manipulation of construal level (Trope and Liberman, 2010). The measurement scales and question items related to PD, risk perception, and purchase intention of NEVs are the same as those in study 1.

Data Collection and Analysis

Descriptive Statistics

In this study, a total of 132 valid samples were collected through a web-based experimental questionnaire survey. Specifically, 64 of the participants were assigned to the high-construal-level group, and the other 68 participants were assigned to the low-construal-level group. The demographic information distribution of participants is presented in **Table 7**, which shows that males and females account for 49.2 and 50.8% of the total samples, respectively. In terms of age, 32.6% of the participants ($N = 43$) are under 25 years old, 39.4% ($N = 52$) are between 25 and 40 years old, and the other 28% ($N = 37$) are over 40 years old. In terms of geographical distribution, the majority of the participants come from Northeast ($N = 33$), Southwest ($N = 30$), and East ($N = 22$) China, and only eight are from North China. In terms of education level, 68.9% of the participants have a bachelor or higher educational background. In terms of income level, participants with a monthly income of <10,000 RMB account for 83.3% of the total.

TABLE 7 | Result of demographic statistics analysis ($N = 132$).

Variable	Category	Number of people	Percentage
Gender	Male	65	49.2
	Female	67	50.8
Age	Under 25	43	32.6
	25–40 years old	52	39.4
	Over 40 years old	37	28.0
Area	East China	22	16.7
	North China	8	6.1
	Northeast China	33	25.0
	Central China	12	9.1
	South China	14	10.6
	Southwest China	30	22.7
	Northwest China	13	9.8
Education level	Below undergraduate	41	31.1
	Undergraduate	71	53.8
	Master's or above	20	15.1
Monthly income level	Under 5,000	77	58.3
	5000–10,000	33	25.0
	Over 10,000	22	16.7

Construal Level Manipulation Test

To test the manipulation of the construal level, this study used SPSS 25 to conduct an independent sample *t*-test, with the dummy variable of the construal level (0 = high construal level, 1 = low construal level) as the grouping variable. As introduced in the experimental design, the lower the value is, the higher the construal level that participants perceive. The results shown in **Table 8** indicate that group 0 perceives a higher construal level than group 1 does ($t = -13.785$, $p < 0.001$). Therefore, our manipulation is successful.

TABLE 8 | Manipulation test result of the construal level.

Test variable	Group	Cases	Mean	Standard deviation	*t*	Sig.
Construal level	0	64	2.61	1.658	−13.785	0.000
	1	68	6.04	1.177		

TABLE 9 | PD and purchase intention under different construal levels.

Test variable	Group	Cases	Mean	Standard deviation	*t*	Sig.
PD	0	64	2.758	0.853	−10.604	0.000
	1	68	4.048	0.513		
Purchase intention	0	64	2.526	1.0023	−12.974	0.000
	1	68	4.446	0.676		

Five-point Likert scales are used to measure constructs. The greater the values are, the closer the PD and the stronger the purchase intention.

Influence of Construal Level on PD Toward Air Pollution and NEV Purchase Intention

To verify H2, that is, whether different construal levels can affect the PD, thereby influencing consumers' purchase intention for NEVs, study 2 used SPSS 25 to conduct independent sample *t*-tests on the two sets of experimental data. The differences between the average PD of consumers toward air pollution ($PD_{highCL} = 2.758$, $PD_{lowCL} = 4.048$, $p < 0.001$) and the average purchase intention for NEVs ($PI_{highCL} = 2.526$, $PI_{lowCL} = 4.446$, $p < 0.001$) under different construal levels are shown in **Table 9** and **Figure 4**, which show that different construal levels of stimulus in this experiment can significantly affect consumers' PD toward air pollution and NEV purchase intention. With considering the significant effect of PD on purchase intention in study 1 and the significant differences of PD and purchase intention caused by low and high construal level shown in **Figure 4**, it can be concluded that low construal level of stimulus can reduce consumers' PD toward air pollution, thereby enhancing their intention to purchase NEV. Therefore, H2 is supported.

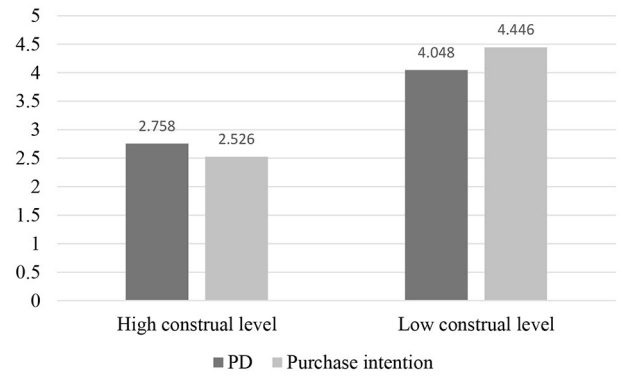

FIGURE 4 | PD and purchase intention (PI) under different construal levels (CL). The greater the values are, the closer the PD and the stronger the purchase intention.

DISCUSSION

In study 1, H1 and H3–H6 are verified. The results of the study indicate that the PD of consumers toward air pollution has a significant effect on the risk perception of consequences of air pollution and the purchase intention for NEVs. In other words, the closer the PD of consumers to air pollution, the stronger is the risk perception of the consequences of air pollution and the stronger is the purchase intention for NEVs. At the same time, the data results of study 1 also show that consumers' risk perception of the consequences of air pollution plays a mediating role in the relationship between PD and purchase intention. For H6, the data analysis results of study 1 verify that the perceived price level plays a significant negative moderating role in the relationship between risk perception of the consequences of air pollution and purchase intention, that is, if the consumer's perceived price level for NEVs is higher at this time, then the impact of risk perception on purchase intention is reduced. Study 2 has verified H2, which posits that according to the theory of construal level, manipulation of the construal level of stimulus can affect the PD, thereby affecting consumers' purchase intention for NEVs. That is, the higher the construal level is, the farther consumers' PD toward air pollution is and the weaker is their purchase intention for NEVs. In other words, consumers under a low construal level of stimuli, compared with a high construal level, have a closer PD toward air pollution and a stronger purchase intention for NEVs.

Theoretical Implications

According to past research conclusions about PD, PD can explain consumers' wishes and decisions to a certain extent, and the PD toward environmental issues can affect consumers' attitudes to green products and purchase decisions (Spence et al., 2012). This study supports this view through empirical analysis. Consumers have a close PD toward air pollution, indicating that they have a stronger perception of air pollution and a higher level of environmental awareness, which in turn lead to a stronger purchase intention for NEVs.

Studies have shown that risk perception can effectively affect consumer behavior, and some researchers have verified that risk perception can play a mediating role between consumers' purchase intention and influencing factors (Castilho et al., 2015). In this study, consumers' PD of air pollution can be considered as influencing factors that affect consumers' purchase intention for NEVs, and the results of the study verify that the risk perception of the consequences of air pollution plays a mediating role between them, which is consistent with previous research theories. Furthermore, the construal level of stimulus is verified to be able to change consumers' PD, thereby influencing their purchase intention toward NEV. This finding provides a new perspective in studying consumers' PD toward environmental pollution and sustainable consumption-related decision making.

Previous studies on perceived price levels have shown that consumers make different purchase decisions by comparing perceived prices (Zeng et al., 2012). High perceived price levels tend to weaken consumers' purchase intention (Kim et al., 2012). The results of this study show that consumers' perceived price level of NEVs has a significant negative moderating effect on the relationship between risk perception of the consequences of air pollution and purchase intention. This result emphasizes the consideration of consumers' perceived price when studying their attitude and behavioral intention to environmentally friendly products.

Practical Implications

The results of this study show that the closer the PD of consumers toward air pollution is, the greater is their cognition and feeling of air pollution, which then result in the stronger risk perception of the consequences of air pollution. The PD and risk perception will eventually influence their purchase intention for new energy vehicles. From a marketing point of view, reducing consumers' PD toward air pollution and improving consumers' risk perception of the consequences of air pollution should be considered among the main tasks in the promotion of NEVs. To realize these tasks, businesses should utilize mass media, such as websites, social media, and TV, rather than highly rely on promotional personnel. Businesses cannot only advertise their products but also exhibit stimuli with low construal level of air pollution in their commercial advertisements, such as pictures and videos showing the situation of air pollution, to arouse consumers' environmental concern, thereby improving their intention to purchase NEVs.

The research results show that the perceived price level has a negative moderating effect on risk perception of the consequences of air pollution and purchase intention. When promoting NEVs, marketers should highlight the advantages of the vehicles for their price, such as the energy saving of NEVs compared with that of traditional fuel vehicles; hence, consumers can perceive an acceptable price of NEVs. Meanwhile, NEV producer and retailers should provide warranties and guarantees for the high quality of after-sales service and disposal and recycling policies for used vehicles. This approach may help reduce consumers' perceived cost of purchasing NEVs, especially the non-monetary cost caused by the excellent service throughout the entire product life cycle.

Moreover, the results of this study also provide some implications for the government. Governments play an important role both by making regulations and by offering purchase incentives on the promotion of NEVs (Cecere et al., 2018). Especially, when making publicity materials related to environmental protection, low construal level stimulus, such as pictures or videos, rather than documents those with only words, should be adopted to reduce citizens' PD from environmental pollution and, in turn, motivate them to pursue environmentally friendly consumption behavior. Moreover, Oltra and Saint-Jean (2009) argue that market forces alone would provide insufficient incentives for environmental innovations and that consumers' willingness to pay for environmental improvements would be low. Specifically, the relatively high price of NEVs may, to some extent, weaken individuals' purchase intention. Accordingly, authorities should make policies to encourage citizens to purchase NEVs. For instance, governments should further improve their financial assistance and tax policy for eco-friendly product consumption and advertise this policy to ensure citizens' knowledge about it. The governments should also establish an entire society-scale reward system to facilitate citizens' environment-friendly behaviors.

CONCLUSION

Based on the theory of PD and construal level, this study explores the relationship between consumers' PD toward air pollution and their purchase intention for NEVs. This study also verifies the mediating role of air pollution risk perception in this relationship. Based on the two studies, the following conclusions are drawn. First, consumers' PD toward air pollution has a significant effect on the purchase intention for NEVs. The risk perception of the consequences of air pollution can play a mediating role, that is, the closer is the PD of consumers toward air pollution, the higher is the risk perception of the consequences of air pollution and the stronger is the purchase intention for NEVs. Second, perceived price level has a significant negative moderating effect between risk perception of the consequences of air pollution and purchase intention. Third, when the construal level is manipulated, consumers' PD from air pollution can be affected, which in turn influences their purchase intention of NEVs. In other words, at a low construal level, consumers have a closer PD from air pollution and a stronger desire to buy NEVs.

Along with its contributions, this study has certain limitations. First, the high–low construal level grouping experiment in this study adopts the online experiment approach, so the degree of control over the experimental process needs to be strengthened. Moreover, picture and text presentations differ on various dimensions other than in their effect of construal level. For instance, either the font type or size of the text or the color or quality of the picture may affect individuals' understanding of the stimuli as well as the perception of the severity of environmental pollution. Thus, future work should explore more rigorous approaches to test the effect of construal level. Second, the sample sizes for the two studies are, to some extent, small. This condition may limit the significance of the results. In our next research, we will try to implement a relatively larger-scale investigation. Third, consumers' purchase intention for NEVs is affected by many factors, such as consumers' acceptance of related new technologies, available policy subsidies, and awareness of NEVs. This study only explored the influences of consumers' psychological factors, namely, PD and perceived risk of air pollution, on purchase intention. The effects of other factors remain to be further discussed. In our follow-up study, we will explore the interaction effect of consumers' intrinsic and extrinsic motivations on NEV purchasing intention. Specifically, we will first identify consumers' intrinsic motivators, such as PD to air pollution that was discussed in this research, environmental concern, and social responsibility, and extrinsic motivators, such as government policy, social norm, and promotional marketing. On this basis, we will examine what intrinsic and extrinsic motivators influence consumers' intention to purchase NEVs.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by The Ethics Review Board of the College of Economics and Management of Nanjing University of Aeronautics & Astronautics. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements. However, written informed consent was implied via completion of the questionnaire.

AUTHOR CONTRIBUTIONS

WL, LZ, and QW designed the study. LZ collected the data. WL and LZ analyzed the data and drafted the manuscript. All authors contributed to manuscript revision and read and approved the submitted version.

ACKNOWLEDGMENTS

This work was supported by the National Natural Science Foundation of China (71922013).

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2021.569115/full#supplementary-material

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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ORIGINAL RESEARCH
published: 31 August 2021
doi: 10.3389/fpsyg.2021.568189

A Study on Green Advertising Effectiveness in the Perspective of Image Proximity

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Based on the construal level theory (CLT), this study discusses the effects of congruence between image proximity and product type on advertising attitude and product attitude from the perspective of spatial distance and investigates the mediating role of mental imagery. Data are collected using two laboratory experiments and one online experiment. A two-way ANOVA is used to test the interaction between image proximity and product type, and a bootstrap analysis is used to test the mediating role of mental imagery. The result shows that: (1) For search products, compared with full-length shots, the close-up shots of environmental information can enable consumers to generate more positive advertising attitude and product attitude. For experience products, the full-length shots of environmental information can enable consumers to generate more positive advertising attitude and product attitude than the close-up shots. (2) The congruence effect of image proximity and product type has an impact on advertising attitude and product attitude through mental imagery. This research uses different kinds of image proximity to express environmental information about green products and tries to interpret the effectiveness of green advertisements from a new perspective.

Keywords: image proximity, spatial distance, mental imagery, experience product, search product, advertising attitude, product attitude

OPEN ACCESS

Edited by:
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Specialty section:
This article was submitted to Environmental Psychology, a section of the journal Frontiers in Psychology

Received: *31 May 2020*
Accepted: *26 July 2021*
Published: *31 August 2021*

Citation:
Sheng G, Xia Q, Yue B and Li Y (2021) A Study on Green Advertising Effectiveness in the Perspective of Image Proximity. Front. Psychol. 12:568189. doi: 10.3389/fpsyg.2021.568189

INTRODUCTION

As corporate social responsibility increases on sustainable development, the green advertising strategy has become an important tool to enhance the green corporate image in green marketing (Dangelico and Vocalelli, 2017). Many studies tend to explore how to increase the persuasion of green advertising (Nyilasy et al., 2013; Chang, 2015). In the field of print advertisement, picture and text are well-known to be two essential tools for advertising to deliver product information effectively, and previous studies further indicate that the picture can be more impressive instead of the text (MacInnis and Price, 1987; Scott, 1994; Pieters and Wedel, 2004; Kergoat et al., 2017). Past studies on advertising pictures are mainly divided into two categories: realistic images and unrealistic images (Kim B. K. et al., 2019). Realistic images are defined as actual images of products which are consistent with the real item that people see, such as the suitable layout of visual elements, the key attributes, and the attractive color, etc. (Pieters and Wedel, 2004; Amit et al., 2009). Unrealistic images are defined as those seem similar to the real product images, but do not exist in the real world, for example, the organic food depiction by digital illustrations looks less attractive than the real organic food (Scott, 1994; Septianto et al., 2019). Although previous studies suggest that visual imagery is crucial to achieving effective advertising goal (Pieters and Wedel, 2004; Kergoat et al., 2017), limited studies have paid attention to visual imagery in green advertising.

The existing studies on the visual imagery of green advertising mostly focused on "what to express" (Chang, 2015; Septianto et al., 2019; Lim et al., 2020), that is, the content of visual imagery. For example, Septianto et al. (2019) argued that different advertising visuals (photographs vs. illustrations) may differ in conveying information; furthermore, compared to photographs, illustrations with altruistic appeals are able to increase the effectiveness of green advertisement. Meanwhile, Lim et al. (2020) demonstrated that the color of visual images influenced the advertising efficiency, and the results showed that the green visual images were more effective than gray visual images inactivating the pro-environmental awareness of an individual, thereby generating more positive attitude toward green advertising. Wang et al. (2020) found that the types of anthropomorphic images (people vs. animals) influence green advertising effectiveness differently. Aforementioned researches cannot address questions about the way to deliver content in visual imagery of green advertising. That is, how to highlight and deliver the green attributes information of products, such as healthy, energy-efficient, and eco-friendly, has not been fully investigated.

In general, advertising, to better attract the attention of the consumers on information of visual imagery, current studies mainly focus on the way of picture presentation, such as the picture order of the model and the product (Aydinoglu and Cian, 2014), the proper layout of visual elements (Cavallo and Piqueras-Fiszman, 2017), and visual metaphor (Delbaere et al., 2011), while neglecting the differences in the visual angle which is also a good way to influence picture presentation. Different visual angles of picture presentation will trigger different image elaboration process of the consumers and ultimately form different perception and preference of advertisements. Rooney and Balint (2018) investigated that close-up shots (vs. full-length shots) of sad expressions can attract more attention from individuals. Compared to a camera in the distance, a nearby camera will catch a smaller viewing area and more product details which make the consumers perceive the product as spatially close, thereby generating more positive advertising and brand attitude to rational appeals rather than emotional appeals (Kim K. et al., 2019). Further, Kim K. et al. (2019) proposed the concept of image proximity, which referred to different image distances (far vs. near) due to image angles and can be categorized as a full-length shot with larger viewing area and a close-up shot with more image details. However, the mechanism by which image proximity affects advertising attitude is still unanswered. In addition, research on image proximity has yet to be extended to green advertising. Consequently, this study will investigate the influence mechanism of image proximity on the reactions of the consumers to advertising, including advertising attitude and product attitude.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Image Proximity

When mentioned about advertising pictures, the distinctive point of this paper should be the discussion over the spatial distance, namely image proximity. Image proximity refers to different image distances (far vs. near) due to image angles, which reflects the degree of image spatial distance perceived by consumers due to the visual angle, and can be categorized as a full-length shot and a close-up shot (Kim K. et al., 2019). The full-length shot with a longer spatial distance means a complete display of the whole product, while a close-up shot with a shorter spatial distance means a display of the concrete details of the product.

Construal level theory (CLT) offers insight into reasons why consumer response ranges from two types of image proximity. CLT has been used to explain decision-making and judgment of people by construing objects as psychologically distant or near. The theory assumed that the psychological distance (spatial, temporal, and social) between people and cognitive objects can affect the construal level (Fujita et al., 2006; Mi et al., 2020). That is, compared to low construal levels, high construal levels are viewed as more abstract, coherent, and decontextualized. When the psychological (spatial, temporal, and social) distance is far vs. near, the object can be construed as more abstract vs. concrete (Amit et al., 2009; Trope and Liberman, 2010). As psychological distance increases, people construe objects as more abstract, which are associated with high construal levels (Trope et al., 2007). Some studies have found that, compared to a short-distance location, people are more willing to believe that typical events will happen in a longer distance (Boroditsky, 2000; Henderson et al., 2006; Trope and Liberman, 2010). Bar-Anan et al. (2007) also argued that people construe the same persuasive information differently depending on the psychological distance. According to the theory, when people view the visual imagery of a full-length shot, they will describe the picture with more abstract words, which are associated with a high construal level. Conversely, when people view the visual imagery of a close-up shot, they will describe the picture with more specific and concrete words, which are associated with a low construal level.

In the field of advertising, CLT, as a theoretical support or research construct, has been widely used (Chang et al., 2015; Kim K. et al., 2019). Chang et al. (2015) argued that there was a congruence effect between framed messages (gain vs. loss) and construal levels (high vs. low), in which emphasizing the positive consequences of buying green products with a high construal level can generate more positive green advertising attitude. Kim K. et al. (2019) found that the effect of congruity between spatial distance (far vs. near) and advertising appeals (rational vs. emotional) was significant, and compared with the closer spatial distance, the far spatial distance was positively associated with emotional appeal rather than rational appeal. In this study, we thought different image proximity in green advertisements can evoke the emotional response of consumers through different paths and methods. When viewing product advertisements with full-length shots, consumers focus on the product as a whole, thereby perceiving the farther spatial distance. Under the circumstances, the abstract motive is playing a dominant role and a high construal level is activated to evoke a positive emotional response. When viewing product advertisements with close-up shots, consumers focus on the specific details of the product, thereby perceiving the closer spatial distance, in which the situations of the concrete motive plays a dominant role and starts with a low construal level to evoke a positive emotional response.

The Congruence Effect Between Image Proximity and Product Type

It is extremely important to clarify the boundaries of product type for a marketing strategy of a company. Existing research has divided product types into various types, such as utilitarian and hedonic products, durable and non-durable products, and tangible and intangible products (Abreu et al., 2020; Zhou et al., 2021). According to information characteristics, the literature has identified two types of product type, search and experience products (Nelson, 1970). The distinction happens in the stage of evaluating information about quality, if consumers have the ability to evaluate information about quality in this period before purchasing products, which is called search product, resembling electronic products, computers, etc. (Mudambi and Schuff, 2010; Kim E. et al., 2019). For instance, they can search the function parameters, such as the processor, camera pixels, and running memory of smart phones in advance (Bei et al., 2004). Otherwise, the products are called experience products, which are evaluated after buying or using the products, such as milk, perfume, etc. (Mudambi and Schuff, 2010; Kim E. et al., 2019). For example, for the same organic milk, different consumers have different tastes (Bei et al., 2004). Attributes, such as health, safety, energy-saving, and low-carbon are key attribute features of green products, and are also the information that consumers focus on during the information search phase and product experience in the process of purchasing green products (Schmuck et al., 2018; Sun et al., 2018). Therefore, it becomes crucial for companies to better present the environmentally friendly information of different categories of green products in green advertising.

Previous studies found that the congruence effect can effectively improve the speed and accuracy of information dissemination, giving consumers intuitive feelings and then have a positive impact on the consumer attitude (Reber et al., 2004; Habitzreuter and Koenigstorfer, 2021). Academia has done much work on the congruence effect between advertising picture and product type. Existing research has investigated that there is a congruence effect between advertising visuals (photograph vs. illustrations) and food type (organic food vs. traditional food) because of the different information processing modes (Septianto et al., 2019). The organic food matches with the illustrations, starting with a high construal level, whereas the traditional food matches the photograph, starting with a low construal level, which can generate positive attitude toward advertising. Other researchers verified that there was also a matching effect between advertising message format and product type. For a durable product, the textual message will make consumers to possess higher purchase intention, while for nondurable products, the pictorial message is much better (Kim and Song, 2019). Further studies show that different picture types (person or product) can generate different attitudes for consumers with high (vs. low) self-esteem (Aydinoglu and Cian, 2014). Kim K. et al. (2019) discussed the congruence effect between advertising pictures with different spatial distance and advertising appeals, demonstrating that positive consumer response can be formed when emotional advertising appeals matches with farther spatial distance. Although the existing research has discussed the congruence effect of advertisement picture and product type from diverse angles (Kim K. et al., 2019), research on the congruence effect between advertisement picture and product type from the perspective of spatial distance is still insufficient.

As mentioned above, for the search product, its quality depends on the objective attributes; consumers can develop a certain understanding of the product attributes by searching for relevant product information in advance, then quantifying the relevant quality parameters of the product. For example, they can search the function parameters, such as the processor, camera pixels, and running memory of smart phones in advance (Bei et al., 2004). The information of search product is relatively specific, which can evoke the low construal level of the consumers. Under such condition of low construal level, people usually pay attention to more specific and standardized information from the perspective of minor details (Trope and Liberman, 2003, 2010). When green advertising picture of the product uses close-up shots, consumers will perceive the close spatial distance, starting the low construal level to process specific environmental information, such as carbon labels and packaging color in the green product. At the same time, the search product highlights more specific, partial, and unorganized environmental information, such as energy consumption signs on energy-efficient refrigerators which can be more easily expressed by product pictures with a closer space distance. Therefore, comparing to full-length shots with a higher abstract level, search products are more closely matched with close-up shots, and are more able to generate positive advertising attitude and product attitude.

For the experience product, its quality depends on the subjective attributes which can be found only after purchasing or using; different consumers have different perceptions about the same product quality so they cannot quantify their related quality parameters. For example, for the same organic milk, different consumers have different tastes (Bei et al., 2004). The information of experience product is relatively abstract which launches with a high construal level by consumers. In the case of high construal level, people usually focus on more abstract and non-standardized information from the main and core perspectives (Trope and Liberman, 2003, 2010). When the green advertising picture of the product uses full-length shots, consumers will perceive the far spatial distance, starting the high construal level to process the overall perception of green products and other environmental information. At the same time, as the experience product highlights more abstract, integral, and structured environmental information, for example, the health concept conveyed by organic milk, it is easier to be expressed by product pictures with a longer distance in space. Therefore, compared to the specific close-up shots, experience products are more closely matched with full-length shots, and are more able to generate advertising attitude and product attitude. Hence, it is hypothesized:

H1a: Consumers will have more positive advertising attitude in response to the close-up shots (vs. full-length shots) of environmental information for the search product.

H1b: Consumers will have more positive product attitude in response to the close-up shots (vs. full-length shots) of environmental information for the search product.

H1c: Consumers will have more positive advertising attitude in response to the full-length shots (vs. close-up shots) of environmental information for the experience product.

H1d: Consumers will have more positive product attitude in response to the full-length shots (vs. close-up shots) of environmental information for the experience product.

The Mediating Role of Mental Imagery

The concept of mental imagery refers to the sensory information stored in working memory, such as sound, smell, taste, and touch (MacInnis and Price, 1987). Some studies revealed that many external stimuli will act on the sensory organs of the people and generate different sensory information through mental imagery (Bone and Ellen, 1992; Babin and Burns, 1997; Lien and Chen, 2013); so consumers are able to make the product visualization after touching or seeing it. Research of related scholars verified that three external stimulations, namely words, instructions to imagine and pictures can effectively evoke the mental imagery of consumers (Unnava and Burnkrant, 1991). Miller and Stoica (2004) found that the pictures of beach scene can evoke positive mental imagery. Research on tourism advertising pictures confirmed that the advertising pictures of tourist destinations (such as the majestic mountains and rivers) will enable consumers to combine their previous experiences to form a vacation experience, which can effectively evoke the mental imagery of the consumers regarding the tourist destination (Walters et al., 2007). There could be a conclusion that the external stimulation, especially visual images, is an important source of mental imagery. So pictures in green advertising can generate mental imagery, whether it is a full-length shot that can show the overall green product or a close-up shot that can show details of the product.

Mental imagery is generally measured in two dimensions: elaboration and quality. Elaboration refers to the amounts of images in working memory and quality refers to the degree of vividness, clarity, firmness, and profundity in imagery (Walters et al., 2007). For green products, there will be more vivid and clear imagery if visual pictures can provide a large number of vivid environmental information, especially the two dimensions of elaboration and quality. When the search product with high standardization matches with close-up shots, it can better express the information of the product due to the specific and standardized visual environmental information delivering by shots, so consumers will evoke greater elaboration and quality in mental imagery. When experience products with low standardization match with full-length shots, it can better express the information of the product owing to abstract and non-standardized visual environmental information delivered by shots, so consumers will evoke greater elaboration and quality in mental imagery. Therefore, when the image proximity matches the product type, consumers will evoke greater mental imagery.

In real life, people can determine the characteristics of products by the imagination because of similarities between mental imagery and realistic stimulus, so people could associate characteristics of apples, pineapples, and bananas with the color, fragrance, and taste. Similarly, sensory information stored in working memory can not only estimate the characteristics of the products but also make associations with different emotional responses (Yoo and Kim, 2014). Consumers are able to reflect on their personal preferences by mental imagery of the products. Previous studies have shown that mental imagery can affect the behavior and attitude of the consumers by stimulating their positive emotional responses (Bone and Ellen, 1992; Miller et al., 2000). The clearer you are in your thoughts, the higher level of elaboration and quality of mental imagery, the more purchase intention you will do (Yoo and Kim, 2014). Mental imagery activated by green advertising pictures will enable consumers to have a clear understanding of the safety, health, and environmentally friendly attributes of green products, then will further associate and judge the positive impact on consumers themselves and the environment, thus forming a positive advertising attitude and product attitude. Mental imagery plays a mediating role in multiple situations (Walters et al., 2007; Bambauer-Sachse and Gierl, 2009; Krishna et al., 2016; Lee and Shin, 2020). Walters et al. (2007) suggested that mental imagery played a mediating role between advertising pictures of tourist destinations and travel intentions. Bambauer-Sachse and Gierl (2009) also found that mental imagery was the mediating variable between nostalgic advertisements and advertisement attitude. Krishna et al. (2016) demonstrated that mental imagery also played a mediating role between advertising visuals and advertising attitude in sensory marketing. Lee and Shin (2020) argued that mental imagery played a mediating role in the relationship between apparel names and product attitude. Based on the above discussion, it is hypothesized:

H2a: Mental imagery plays a mediating role in the congruence effect between the image proximity and product type on advertising attitude.

H2b: Mental imagery plays a mediating role in the congruence effect between the image proximity and product type on product attitude.

Based on the above, this paper proposed the congruence effect between image proximity and product type on product attitude and advertising attitude, and the mediating role of mental imagery in the above relationship. The research framework of this study is shown in **Figure 1**.

METHODS AND RESULTS

Pretest

Prior to the main experiment, we conducted two pretests to determine the search and experience products used in the main experiment. Based on previous studies (Bei et al., 2004; Kim K. et al., 2019), eight green products that might be distinctively perceived as search or experience product were picked, namely energy-efficient refrigerator, energy-efficient air conditioners, solar water heaters, new energy vehicles, environmentally friendly laundry detergent, organic milk, bamboo pulp tissue, and environmentally friendly shampoos. Sixty MBA students (M_{age} = 32.62, SD = 5.93; 36 women) with purchase experience and skills participated in the first pretest recruited from a university

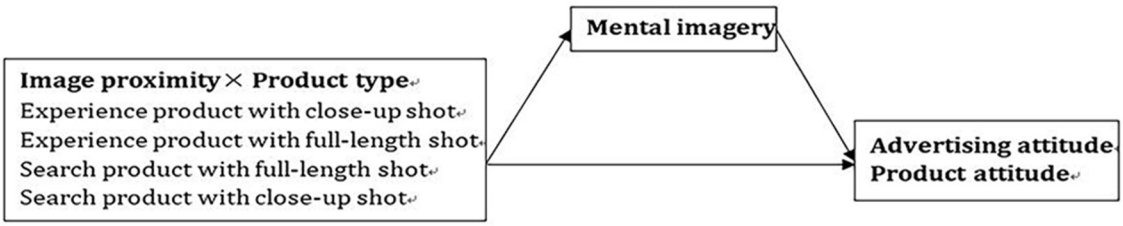

FIGURE 1 | Research framework.

in China. Participants were asked to score above eight kinds of green products, respectively, on a 7-point scale (1 = search product, 7 = experience product), to identify which product has more search or experience attributes. Participants perceived organic milk (M = 5.65, SD = 1.117) to be the experience product, followed by bamboo pulp tissue (M = 5.50, SD = 1.000), and new energy vehicles (M = 2.25, SD = 0.773) to be the search product, followed by energy-efficient refrigerator (M = 2.60, SD = 0.906). Thus, we selected organic milk as experience product and new energy vehicles as search product for the main experiment. Meanwhile, bamboo pulp tissue and energy- efficient refrigerator were selected as alternative experimental products.

To determine the specific brand of organic milk and new energy vehicles, we selected the top five organic milk brands and new energy vehicle brands with average monthly sales on the respective industry portals websites. Among them, the top five in the organic milk industry were Milk Deluxe, Satine, Organic, Bright Dairy, and Anchor, and the top five in the new energy vehicle industry are BYD, Tesla, Chery, KIA and BAIC Motor. Forty MBA students (M_{age} = 30.43, SD = 4.914; 20 women) recruited from a university in China participated in the second pretest. Participants were required to rate the brand familiarity of organic milk brands and new energy vehicle brands, on a 7-point scale ranging from 1 (very unfamiliar) to 7 (very familiar). Participants perceived Milk Deluxe (M = 6.33, SD = 0.829) and Tesla (M = 6.00, SD = 0.877), respectively, to be the most familiar brands. Thus, we selected Milk Deluxe as the brand of experience product and Tesla as the brand of search product.

Experiment 1

Experiment 1 aimed to provide an initial investigation of H1, that is, the congruence effect between product type and image proximity. In advertising, the picture is one of the determinants of the evaluations and preference of consumers, and stimulates their subjective feelings and judgments (Aydinoglu and Cian, 2014). Thus, we used pictures as the stimulus material to reflect the image proximity and product type of advertising context.

Participants and Procedure

To test the proposed hypotheses, a 2 × 2 (image proximity: full-length shot vs. close-up shot) (product type: search product vs. experience product) between-subjects design was used. According to a prior study on the influence of image proximity on advertising effectiveness (Kim K. et al., 2019), the number of subjects in each group was controlled at about 50–60. Thus, we chose a sample size of 50 participants per group and adjusted the number of subjects according to the size of the laboratory. A total of 220 MBA students from business schools with rich work and life experience in a university in China were invited to participate in this study, and 20 participants who did not complete the experiment as required were excluded. Eventually, 200 participants (M_{age} = 31.83, SD = 5.424; 124 women) completed the experiment. At the beginning of the experiment, participants were randomly assigned to view one of the four versions of advertising picture depicted different product types and image proximity. In experience product and full-length shot condition, the advertising picture showed a panoramic view of Milk Deluxe, depicting an overall packaging image of a crate of organic milk and two cartons of organic milk (**Figure 2A**). In experience product and close-up shot condition, the advertising picture showed a partial view of Milk Deluxe, depicting a packaging image of a carton of organic milk and nutrition ingredient list was posted on the left side of the packaging (**Figure 2B**). In search product and full-length shot condition, the advertising picture showed a Tesla car running on the road, and the charging pile conveyed environmentally friendly information about new energy vehicles on the left side of the picture (**Figure 2C**). In search product and close-up shot condition, the advertising picture showed a Tesla car was being charged, and the charging port connected to the charging pile highlighted environmentally friendly information on the left side of the picture (**Figure 2D**). All the product pictures used in the experiment materials, from free websites (https://image.baidu.com), have received permission.

After viewing the advertising picture, participants indicated their perceived spatial distance of the picture on a 7-point-Likert scale: 1 = very near to 7 = very far, to check whether the manipulation of image proximity in advertising pictures worked as intended. Then, participants were asked to fill out the 7-point-Likert scale of advertising attitude and product attitude, and complete personal information (e.g., age, gender). The advertising attitude (Cronbach's α = 0.882) was assessed by four items adapted from MacKenzie et al. (1986) and Kim K. et al. (2019): (1) I think the advertisement is interesting; (2) The advertisement is favorable; (3) I feel positive toward the advertisement; (4) I like the advertisement (1 = strongly disagree; 7 = strongly agree). The product attitude referred to the scale developed by Lee and Ang (2003): (1) The product is attractive; (2) I feel positive toward the product; (3) I react favorably to the

FIGURE 2 | Organic milk used with full-length shot **(A)** and close-up shot **(B)**; New energy vehicles used with full-length shot **(C)** and close-up shot **(D)** (Image source: https://image.baidu.com).

product (1 = strongly disagree; 7 = strongly agree). Finally, each participant received a shopping coupon as a token of gratitude.

Results

Manipulation Checks

An independent sample *t*-test was conducted to examine whether respondents had different spatial distance of the close-up and full-length picture. In experience product condition, compared to close-up shot ($M = 2.74$, $SD = 1.03$, $n = 47$), full-length shot showed a higher mean spatial distance [$M = 5.04$, $SD = 1.48$, $n = 50$, $t_{(95)} = 8.792$, $p < 0.001$]. And again, in search product condition, compared to close-up shot ($M = 2.96$, $SD = 1.13$, $n = 51$), full-length shot showed a higher mean spatial distance [$M = 5.02$, $SD = 1.44$, $n = 52$, $t_{(101)} = 8.077$, $p < 0.001$].The results confirmed that respondents perceived the close-up picture as near and the full-length shot picture as far.

Main Effect Analysis

A two-way ANOVA included image proximity (full-length shot vs. close-up shot) and product type (search product vs. experience product) as independent variables and advertising attitude and product attitude as a dependent variable, respectively. For advertising attitude, no main effects were identified for either image proximity [$F_{(1, 196)} = 0.033$, $p = 0.857$] or product type [$F_{(1, 196)} = 0.345$, $p = 0.558$]. Likewise, for product attitude, no main effects were identified for either image proximity [$F_{(1, 196)} = 0.106$, $p = 0.745$] or product type [$F_{(1, 196)} = 0.226$, $p = 0.635$]. But there existed significant interaction effects between image proximity and product type on advertising

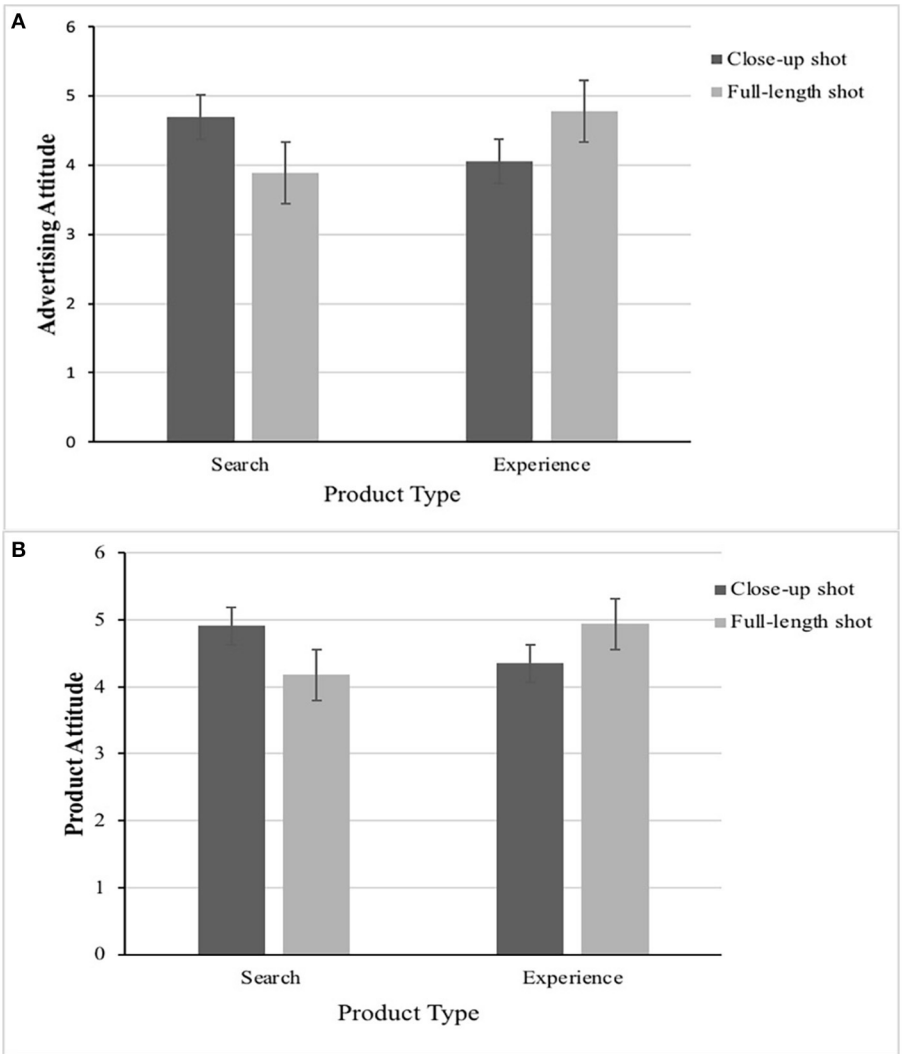

FIGURE 3 | The congruence effect between image proximity (close-up vs. full-length) and product type (search vs. experience) on advertising attitude **(A)** and product attitude **(B)** in Experiment 1.

attitude [$F_{(1, 196)}$ =13.731, $p < 0.001$] and product attitude [$F_{(1, 196)} = 9.919, p < 0.01$].

Particularly, participants who viewed search product expressed more positive attitude toward advertising in a close-up shot than a full-length shot ($M_{\text{close-up}}$ =4.69 vs. $M_{\text{full-length}}$ =3.89, $t_{(101)} = 2.786$, $p < 0.01$), in support of H1a. In contrast, participants who viewed experience product expressed more positive advertising attitude [$M_{\text{close-up}} = 4.05$ vs. $M_{\text{full-length}} = 4.78$, $t_{(95)}$ =2.460, $p < 0.05$] in a full-length shot than a close-up shot, which supported H1c. When participants viewed search product, a close-up shot generated more favorable attitude toward the product than did a full-length shot [$M_{\text{close-up}} = 4.91$ vs. $M_{\text{full-length}} = 4.18$, $t_{(101)} = 2.433$, $p < 0.05$], in support of H1b. Contrary to the close-up shot, participants who viewed experience product expressed more positive product attitude [$M_{\text{close-up}} = 4.35$ vs. $M_{\text{full-length}} = 4.94$, $t_{(95)} = 2.024$, $p < 0.05$] in a full-length shot, which supported H1d. Thus, H1a, H1b, H1c, and H1d were supported. The result is as shown in **Figures 3A,B**.

Discussion

Hypothesis 1 predicted a congruence effect between product type and image proximity, such that participants who viewed search product would express more favorable attitude toward the close-up shot ad than the full-length shot ad, whereas participants who viewed experience product would express more favorable attitude toward the full-length shot advertisement than the close-up shot advertisement. The current study successfully verified this hypothesis using advertising picture of authentic brands. However, the internal mechanism, that the effects of congruity between image proximity and product type affect attitude toward advertising and product has not been explored. In addition, previous studies have shown that consumers may have certain established preferences for an authentic brand, that is, authentic

FIGURE 4 | Bamboo pulp tissue used with full-length shot **(A)** and close-up shot **(B)**, Energy efficient refrigerator with full-length shot **(C)** and close-up shot **(D)** (Image source: https://image.baidu.com).

brand may affect the response of consumers toward advertising pictures (Velasco Vizcaíno and Velasco, 2019). Thus, the next study was conducted to provide an explanation using advertising picture of fictitious brands.

Experiment 2

Experiment 2 was conducted to explain how mental imagery can mediate the congruence effect between image proximity and product type on advertising and product attitude, and further investigate Hypothesis 1. As mentioned earlier, we utilized fictitious brands in Experiment 2 to eliminate the interference of brand preference. Furthermore, we replaced experimental products, which were able to examine the generalizability of the experimental results.

Participants and Procedure

A total of 240 MBA students recruited from business schools of a university in China were randomly assigned to a 2 × 2 (image proximity: full-length shot vs. close-up shot) (product type: search product vs. experience product) between-subjects design. All participants were exposed to the similar experimental stimuli as in Study 1, except that we used different products and fictitious brands. Alternative products determined by the first pretest, bamboo pulp tissue, and energy-efficient refrigerators, respectively, were selected as experience product and search product for the main experiment. In experience product and full-length shot condition, the advertising picture showed a panoramic view of Kamihiki, a fictitious face tissue brand, and the image of bamboo as the raw material shown on the top right corner of the picture conveyed environmentally friendly information (**Figure 4A**). In experience product and close-up shot condition, the advertising picture showed a partial view of Kamihiki, a fictitious face tissue brand, and the image of bamboo as the raw material shown on the top right corner of the picture conveyed environmentally friendly information (see **Figure 4B**). In search product and full-length shot condition, the advertising picture showed the stereoscopic image of energy-efficient refrigerator of the fictitious brand Perto, and the best energy conservation certification was posted on the upper right corner of the refrigerator conveyed the environmentally friendly information about the product (**Figure 4C**). In search product and close-up shot condition, the advertising picture showed a partial image of energy-efficient refrigerator of the fictitious brand Perto, and the best energy conservation certification conveyed environmentally friendly information about the product was enlarged (see **Figure 4D**).

After viewing the advertising pictures, the participants were first asked to answer the perceived spatial distance on a 7-point-Likert scale and then to fill in the scale of advertising attitude (Cronbach's $\alpha = 0.866$) and product attitude (Cronbach's $\alpha = 0.812$). As in Experiment 1, all subjects reported the measurements of advertising attitude developed by MacKenzie et al. (1986) and Kim K. et al. (2019) and product attitude developed by Lee and Ang (2003). Subsequently, participants were asked to fill in the 7-point-Likert scale of mental imagery (Cronbach's $\alpha = 0.897$). The mental imagery was measured by nine items adapted from Walters et al. (2007) and Yoo and Kim (2014), in which the first five items measured the elaborate processing level of mental imagery, and the last four items measured the quality level of mental imagery: (1) The mental images that came to mind formed a series of events in my mind in which I was a part of; (2) I could easily construct a story about myself and the featured product based on the mental images that came to mind; (3) Whilst reviewing the advertisement many images came to mind; (4)The images that came to mind acted as a source of information about the featured product; (5)The mental images that came to mind were very clear and specific; (6) Overall, the images that came to mind while we examined the advertisement were sharp; (7) Overall the images that came to mind while we examined the advertisement were intense; (8) Overall the images that came to mind while we examined the advertisement were clear; (9) Overall the images that came to mind while we examined the advertisement were vivid. Finally, they were asked to complete personal information (i.e., age and gender). Upon completion, each participant received a shopping coupon as a token of gratitude. After excluding the subjects without completing the experiment, a total of 216 valid samples ($M_{age} = 32.24$, $SD = 4.683$; 117 women) were used for data analysis.

Results

Manipulation Checks

An independent sample *t*-test was conducted to examine whether the respondents had different spatial distance of the close-up and full-length picture. In experience product condition, compared to close-up shot ($M = 3.12$, $SD = 1.166$, $n = 52$), full-length shot showed a higher mean spatial distance [$M = 4.77$, $SD = 1.262$, $n = 52$, $t_{(102)} = 4.085$, $p < 0.001$]. And again, in search product condition, compared to close-up shot ($M = 2.89$, $SD = 1.139$, $n = 56$), full-length shot showed a higher mean spatial distance [$M = 4.55$, $SD = 1.264$, $n = 56$, $t_{(110)} = 7.305$, $p < 0.001$]. The results confirmed that respondents perceived the close-up picture as near and the full-length picture as far.

Main Effect Analysis

An analysis of variance (ANOVA) was conducted to test two-way interaction effects of image proximity and product type on advertising attitude and product attitude. The results indicated the single main effect of the image proximity and product type was not significant, that was, neither advertising attitude [$F_{(1, 212)\text{image proximity}} = 0.610$, $p = 0.435$; $F_{(1, 212)\text{product type}} = 1.178$, $p = 0.279$] nor product attitude [$F_{(1, 212)\text{image proximity}} = 0.414$, $p = 0.520$; $F_{(1, 212)\text{product type}} = 0.761$, $p = 0.384$] were significant; But image proximity and product type had significant interaction effects on advertising attitude [$F_{(1, 212)} = 25.928$, $p < 0.001$] and product attitude [$F_{(1, 212)} = 20.305$, $p < 0.001$].

Particularly, participants who viewed search product expressed more positive advertising attitude [$M_{close-up} = 4.67$ vs. $M_{full-length} = 3.87$, $t_{(110)} = 3.101$, $p < 0.01$] and product attitude [$M_{close-up} = 4.91$ vs. $M_{full-length} = 4.16$, $t_{(110)} = 2.719$, $p < 0.01$] in a close-up shot than a full-length shot, which supported H1a and H1b again. In contrast, participants who viewed experience product expressed more positive advertising attitude [$M_{close-up} = 3.92$ vs. $M_{full-length} = 5.02$, $t_{(102)} = 4.085$,

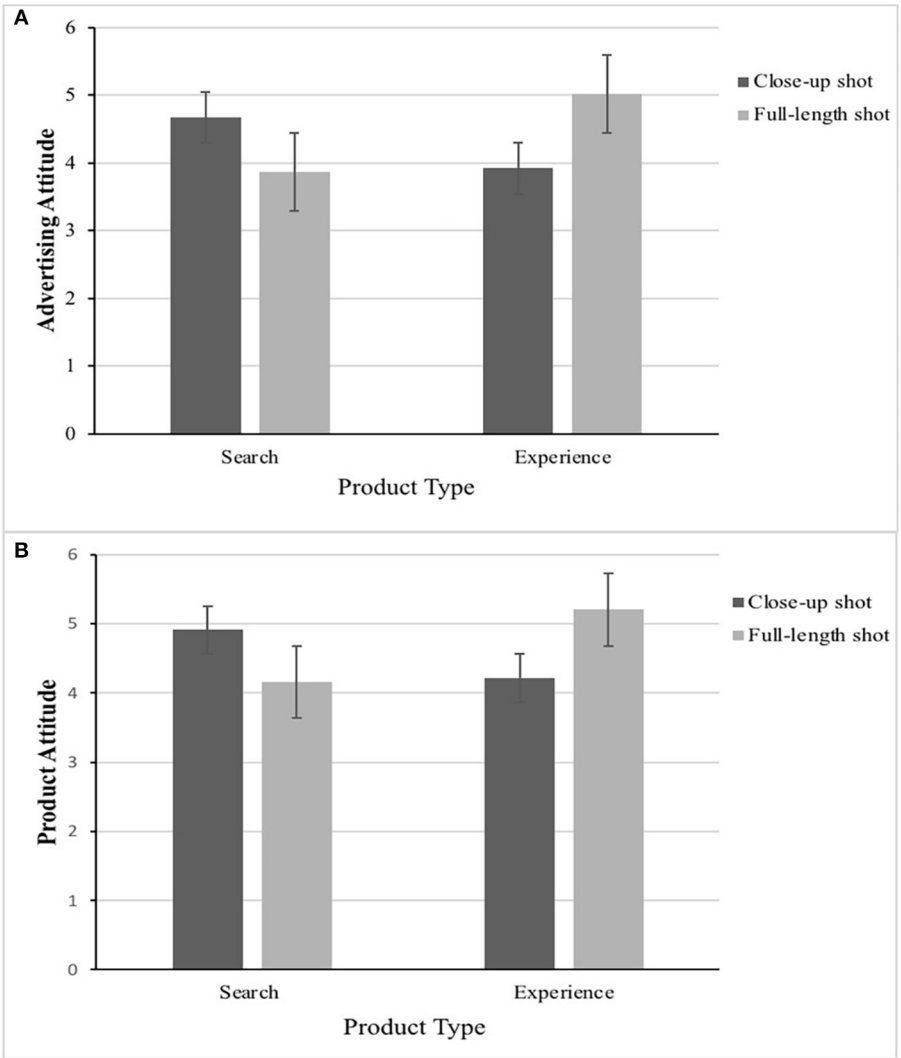

FIGURE 5 | The congruence effect between image proximity (close-up vs. full-length) and product type (search vs. experience) on advertising attitude **(A)** and product attitude **(B)** in Experiment 2.

$p < 0.001$] and product attitude [$M_{\text{close-up}} = 4.21$ vs. $M_{\text{full-length}} = 5.21$, $t_{(102)} = 3.672$, $p < 0.001$] in a full-length shot than a close-up shot, which supported H1c and H1d again (as shown in **Figures 5A,B**).

Mediating Effect Analysis

To test whether the effects of congruity between image proximity and product type generated more favorable attitude toward the advertising and product by mental imagery, a mediation analysis was conducted using the PROCESS macro for SPSS (Model 4, $N_{\text{bias-corrected bootstraps}} = 5{,}000$; Hayes, 2013). Four purpose-designed experimental conditions were firstly coded as following: 1 = experience product with close-up shot; 2 = experience product with full-length shot; 3= search product with full-length shot; 4 = search product with close-up shot. In Model 4, we entered advertising attitude and product attitude, respectively, as the outcome variable (Y), four conditions (the interaction between image proximity and product type) as the independent variable (X), and mental imagery as the mediating variable (M). In the PROCESS macro of SPSS, experience product with close-up shot was set as the benchmark automatically (dummy coded as 0), experience product with full-length shot condition was dummy coded as 1 (D1), search product with full-length shot condition was dummy coded as 2 (D2), and search product with close-up shot condition was dummy coded as 3 (D3).

The summary of mediating analysis is depicted in **Table 1**. When advertising attitude was entered as outcome variable, the result showed that the mediating effect of mental imagery was significant (indirect effect $_{D1} = 0.5499$; indirect effect $_{D3} = 0.4055$) under experience product with full-length shot condition (D1) and search product with close-up shot condition (D3), with the confidence interval for both that did not include zero (95% $CI_{D1} = 0.1683$–0.9997; 95% $CI_{D3} = 0.0698$–0.8077), which supported H2a. Similarly, when product attitude was entered as

TABLE 1 | The mediation effect of mental imagery in Experiment 2.

	IV	Effect	SE (boot)	LLCI	ULCI
DV:	D1	0.5499	0.2092	0.1683	0.9997
Advertising attitude	D3	0.4055	0.1900	0.0698	0.8077
DV:	D1	0.5476	0.2063	0.1550	0.9567
Product attitude	D3	0.4038	0.1955	0.0461	0.8145

outcome variable, the mediating effect of mental imagery was also significant (indirect effect$_{D1} = 0.5476$; indirect effect$_{D3} = 0.4038$) under experience product with full-length shot condition (D1) and search product with close-up shot condition (D3), with the confidence intervals for both did not contain zero (95% CI$_{D1}$ = 0.1550–0.9567; 95% CI$_{D3}$ = 0.0461–0.8145), which supported H2b. As expected, mental imagery played a mediating role in the two matching situations of experience product with full-length shot and search product with close-up shot.

Discussion

Experiment 2 aimed to provide an explanation for the effects of congruity between image proximity and product type observed in Experiment 1. Consistent with the findings from Experiment 1, the results again suggested that differences between the close-up shot and the full-length shot may in fact depend on the product type (experience or search). Pictures with the close-up shot would fit better with search product, whereas pictures with the full-length shot would fit better with experience product. The result of the mediating effect further indicated that differences in attitude toward advertising and product might stem from the extent to mental imagery, and the extent to which varied across different image proximity and product type. Therefore, mental imagery played a mediating role, which supports H2. To further verify the robustness of the results, the next experiment changed the participants to verify all the proposed hypotheses.

Experiment 3

The purpose of Experiment 3 was to further verify the robustness of the results. As in Experiment 2, we continued to utilize fictitious brands, but replaced the subject in Experiment 3.

Participants and Procedure

Participants were recruited from Credamo (https://www.credamo.com), a Chinese professional online survey platform, which has had 2 million respondents across China. We sent 220 individuals a link that included the experimental materials and the measurements of variables through this platform. The platform supported two-factor randomized trials, in which the participants were randomly assigned to one group and could not participate in the experiment repeatedly. Experimental stimuli of online Experiment 3 were exactly the same as Experiment 2, as shown in **Figures 4A–D**. Firstly, participants were randomly assigned to view one of the four versions of advertising picture depicting different product types and image proximity. And then, the participants were asked to report the perceived spatial distance, advertising attitude (Cronbach's $\alpha = 0.869$), product attitude (Cronbach's $\alpha = 0.832$), and mental imagery (Cronbach's $\alpha = 0.893$) on a 7-point-Likert scale. As in Experiment 2, the advertising attitude was measured by three items adapted from MacKenzie et al. (1986) and Kim K. et al. (2019), and product attitude was measured by three items developed by Lee and Ang (2003), and the mental imagery was measured by nine items adapted from Walters et al. (2007) and Yoo and Kim (2014). After excluding the subjects who failed an attention check or complete the experiment with too long or too short time, 206 valid subjects ($M_{age} = 35.29$, $SD = 9.918$; 122 women) received monetary compensation for their participation.

Results

Manipulation Checks

An independent sample *t*-test was conducted to examine whether the respondents had different spatial distance of the close-up and full-length picture. In experience product condition, compared to close-up shot ($M = 2.75$, $SD = 1.007$, $n = 52$), full-length shot showed a higher mean spatial distance [$M = 4.53$, $SD = 1.102$, $n = 51$, $t_{(101)} = 8.557$, $p < 0.001$]. And again, in search product condition, compared to close-up shot ($M = 2.96$, $SD = 1.148$, $n = 51$), full-length shot showed a higher mean spatial distance [$M = 4.85$, $SD = 1.161$, $n = 52$, $t_{(101)} = 8.284$, $p < 0.001$]. The results confirmed that respondents perceived the close-up picture as near and the full-length picture as far.

Main Effect Analysis

An ANOVA was conducted to test the two-way interaction effects of image proximity and product type on advertising attitude and product attitude. The results indicated the single main effect of the image proximity and product type was not significant, that was, neither advertising attitude [$F_{(1, 202)\text{image proximity}} = 0.038$, $p = 0.846$; $F_{(1, 202)\text{product type}} = 0.004$, $p = 0.947$] nor product attitude [$F_{(1, 202)\text{image proximity}} = 0.121$, $p = 0.728$; $F_{(1, 202)\text{product type}} = 0.083$, $p = 0.773$] were significant; But image proximity and product type had significant interaction effects on the advertising attitude [$F_{(1, 202)} = 16.903$, $p < 0.001$] and product attitude [$F_{(1, 202)} = 15.391$, $p < 0.001$].

Particularly, participants who viewed search product expressed more positive advertising attitude [$M_{close-up} = 4.51$ vs. $M_{full-length} = 3.62$, $t_{(101)} = 2.769$, $p < 0.01$] and product attitude [$M_{close-up} = 4.70$ vs. $M_{full-length} = 3.93$, $t_{(101)} = 2.527$, $p < 0.05$] in a close-up shot than a full-length shot, in support of H1a and H1b again. In contrast, participants who viewed experience product expressed more positive advertising attitude [$M_{close-up} = 3.60$ vs. $M_{full-length} = 4.57$, $t_{(101)} = 3.045$, $p < 0.01$] and product attitude [$M_{close-up} = 3.92$ vs. $M_{full-length} = 4.84$, $t_{(101)} = 3.022$, $p < 0.001$] in a full-length shot than a close-up shot, in support of H1c and H1d again.

Mediating Effect Analysis

As in Experiment 2, to test whether the effects of congruity between image proximity and product type generated more favorable attitude toward the advertising and product by mental imagery, a mediation analysis was conducted using the PROCESS macro for SPSS (Model 4, $N_{bias-corrected\ bootstraps} = 5{,}000$; Hayes, 2013). Four purpose-designed experimental conditions were firstly coded as following: 1 = experience product with close-up shot; 2 = experience product with full-length shot; 3= search product with full-length shot; 4= search product with

TABLE 2 | The mediation effect of mental imagery in Experiment 3.

	IV	Effect	SE (boot)	LLCI	ULCI
DV:	D1	0.9742	0.3235	0.3503	1.6311
Advertising attitude	D3	0.8680	0.3238	0.2017	1.4831
DV:	D1	0.9072	0.2973	0.3183	1.4782
Product attitude	D3	0.8083	0.3022	0.2176	1.3919

close-up shot. In the Model 4, we entered advertising attitude and product attitude as the outcome variable (Y) respectively, four conditions (the interaction between image proximity and product type) as the independent variable (X), and mental imagery as the mediating variable (M). In the PROCESS macro of SPSS, experience product with close-up shot was set as the benchmark automatically (dummy coded as 0), experience product with full-length shot condition was dummy coded as 1 (D1), search product with full-length shot condition was dummy coded as 2 (D2), and search product with close-up shot condition was dummy coded as 3 (D3).

As shown in **Table 2**, when advertising attitude was entered as the outcome variable, the result showed that the mediating effect of mental imagery was significant (indirect effect$_{D1}$ = 0.9742; indirect effect$_{D3}$ = 0.8680) under experience product with full-length shot condition (D1) and search product with close-up shot condition (D3), with the confidence interval for both that did not include zero (95% CI$_{D1}$ = 0.3503–1.6311; 95% CI$_{D3}$ = 0.2017–1.4831), in support of H2a again. Similarly, when product attitude was entered as the outcome variable, the mediating effect of mental imagery was also significant (indirect effect$_{D1}$ = 0.9072; indirect effect$_{D3}$ = 0.8083) under experience product with full-length shot condition (D1) and search product with close-up shot condition (D3), with the confidence intervals for both did not contain zero (95% CI$_{D1}$ = 0.3183–1.4782; 95% CI$_{D3}$ = 0.2176–1.3919), in support of H2b again.

Discussion

In Experiments 1 and 2, the subjects in the study mainly were MBA students, with life experience and skills to a certain extent. However, it is necessary to investigate whether the conclusions are general and applicable to the other consumer groups. Thus, in Experiment 3, the subjects were replaced with ordinary consumers with different educational backgrounds. Ultimately, Experiment 3 replicated the findings in Experiments 1 and 2 using different experimental materials and subjects, which enhanced the robustness of the results.

CONCLUSION AND DISCUSSION

This study explored the influence mechanism of image proximity and product type on advertising attitude and product attitude through three experiments in green advertising context, and examined the mediating role of mental imagery. In the three experiments, the participants were randomly assigned to a 2 × 2 (image proximity: a full-length shot vs. a close-up shot) (product type: search product vs. experience product) between-subjects design. Experiment 1 demonstrated that the participants who viewed a search product (vs. experience product) expressed more positive advertising attitude and product attitude in a close-up shot (vs. a full-length shot). Experiment 2 demonstrated that the congruence effect of image proximity and product type enhances advertising attitude and product attitude through mediation of mental imagery. Experiment 3 replicated the findings in Experiments 1 and 2 by replacing different experimental materials and subjects. The contributions of this study to the existing theory can be divided into three parts. First, this study embeds spatial distance in green advertising picture context naturally, and demonstrates that an effective green advertising goal needs to apply different spatial distance in green advertising to present the environmental information. Previous study on green advertising pictures focused on the size, visualization, and presentation order of advertising pictures (Aydinoglu and Cian, 2014; Cavallo and Piqueras-Fiszman, 2017), mainly focusing on the characteristics of advertising pictures themselves (Rao et al., 2017), and rarely discussing from the perspective of the spatial distance of green advertising pictures. Limited study has shed some light on the impact of image proximity on advertising attitude and brand attitude (Kim K. et al., 2019), which has not been well validated and widely used in green advertisement, and it remains unclear how image proximity influences the attitude of the individuals. This study expands image proximity to the green advertisement that conveys environmentally friendly information, explores the impact of image proximity to consumer advertising attitude and product attitude, and enriched image proximity in the field of green consumption behavior. Second, this study demonstrates that mental imagery is the advanced cognitive process in green advertising persuasion mechanism which reveals how the image proximity and product type affect advertising attitude and product attitude. Previous study on the influence mechanism of green advertising basically revolved around simple cognitive variables, such as perceived value (Hyun et al., 2011). While past study has demonstrated that mental imagery played a vital mediation role in nostalgic advertisement and tourism advertisement (Walters et al., 2007; Bambauer-Sachse and Gierl, 2009), the mediating effect of mental imagery in green advertisement has not been fully discussed. Third, this study expands the application of CLT in green advertising context, which interprets the internal psychological mechanism between the spatial distance of the advertisement picture and attitude toward advertising and product. Despite prior researchers have applied CLT in the field of advertisement (Zhang et al., 2014; Chang et al., 2015; Septianto et al., 2019), most of which merely have focused on the explained influence mechanism of advertising appeal ("what to say") on the persuasive effectiveness of advertising through the theory, and rarely applied the theory to understand "how to say" in green advertising, that is, how to express environmental friendly information.

In addition, this study offers two key implications for enterprises to develop advertising strategies in green marketing. One implication of this is the possibility that develops different advertising picture presentation strategies for different product types. When an enterprise pushes out a green product with search quality (or experience quality), it can use a close-up shot (or a full-length shot) in advertising marketing to express the

specific (or abstract) environmentally friendly information, so as to activate the mental imagery of the consumers and thus improving their advertising and product attitudes. For example, displaying various performance parameters of new energy vehicle charging piles with a close-up shot or displaying natural pastures that produce organic milk with a full-length shot can enable consumers to understand the environmental characteristics of different products more clearly. Another implication of this is the possibility that utilizes advertising pictures as a visual expression way to develop a green advertising communication strategy. Since mental imagery depends on the amount and degree of the conscious images stored in the long-term memory, enterprises should not only focus on the amount of environmentally friendly information, but also highlight the vitality and attractiveness of visual image in the process of advertising design, to awaken the mental imagery of the consumers and strengthen their advertising and product attitude.

There are still some issues to further discuss. Firstly, the four conditions were compared with each other in the design of the experiment without a control group, resulting in the lack of a control condition which prevented using the control condition as the benchmark for the dummy coding. Secondly, this study explores the congruence effect of image proximity and product type (search products and experience products). Future studies can investigate whether this congruence effect can appear in other product types, such as utilitarian and hedonic products, high-involved products, and low-involved products. In addition, we can use field experiments to investigate consumer preferences for green advertising. Thirdly, future research can continue to expand the application of construal level theory in advertising strategy. In addition to considering the advertising pictures of different spatial distance, it can also explore the impact of social media of different social distance on the persuasive effectiveness of advertising.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Human Ethics Committees at Business School, Jilin University. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

GS involved in all steps of the study and provided critical revisions. GS, QX, and BY designed the study. QX and BY collected the data, analyzed the data, and write the manuscript. QX, BY, and YL revised the manuscript. All authors approved the final version of the article for submission.

FUNDING

This study was funded by the Major Project of National Social Science Foundation of China (No. 19ZDA107), the Project of Jilin Province Social Science Thirteen-Five Planning (No. JJKH20201145SK), and the Fundamental Research Funds for the Central Universities (No. 2020SZQH02).

ACKNOWLEDGMENTS

We thank the reviewer for all precious time spent on this paper and in particular those comments which have helped the paper improved and become better.

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Conflict of Interest: YL was employed by company AVIC Securities, Aviation Industry Corporation of China.

The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

frontiers in Psychology

BRIEF RESEARCH REPORT
published: 03 September 2021
doi: 10.3389/fpsyg.2021.692404

Influence of Wearing Surgical Mask on Interpersonal Space Perception Between Mainland Chinese and Taiwanese People

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Wearing face masks and maintaining social distancing of 1.5 m are two common preventive measures against the spread of COVID-19. However, the interaction of these preventive measures in interpersonal space (IPS) perception remains unknown. This study evaluated the effects of wearing surgical masks, sex dyads, and approaching patterns on IPS judgment. Data were collected from participants from Mainland China ($n = 100$) and Taiwan ($n = 100$) through an online survey. Therefore, the regional differences were also examined. A smaller IPS was observed when participants faced confederates wearing surgical masks than in the no-mask condition. Female dyads tended to maintain a smaller IPS than did both male and mixed-sex dyads, and Taiwanese participants maintained a significantly larger IPS than did Mainland Chinese participants. No significant difference was observed between the active and passive pattern. Moreover, the interaction between region and mask had a significant influence on IPS perception. Among all test combinations, only the IPS perceived by Taiwanese participants facing confederates without surgical masks exceeded 1.5 m. This study revealed that the wearing of surgical masks for health protection during the pandemic influences IPS perception in different regions. The current findings may provide useful information for social interaction and environmental design during the COVID-19 pandemic.

Keywords: COVID-19, interpersonal space, face mask, social distancing, proximity

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Edited by:
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Specialty section:
This article was submitted to Environmental Psychology, a section of the journal Frontiers in Psychology

Received: *08 April 2021*
Accepted: *06 August 2021*
Published: *03 September 2021*

Citation:
Lee Y-C and Chen Y-L (2021) Influence of Wearing Surgical Mask on Interpersonal Space Perception Between Mainland Chinese and Taiwanese People. Front. Psychol. 12:692404. doi: 10.3389/fpsyg.2021.692404

INTRODUCTION

As of the beginning of 2021, more than 100 million confirmed COVID-19 cases have been recorded worldwide. To combat the pandemic, the WHO recommends several methods to prevent the spread of COVID-19, including washing hands frequently and correctly, maintaining social distancing of approximately 1.5 m and 1.0 m indoors and outdoors, respectively, and wearing a face mask when going out and staying indoor environments (Khosronejad et al., 2020). Among these preventive measures, maintaining a distance of 1.5 m from others has been mandated in many public areas. This rule was imposed because respiratory viruses, such as coronaviruses and influenza, infect people through droplet inhalation (Sajed and Amgain, 2020) and aerosol transmissions (Santarpia et al., 2020; Tang et al., 2020).

With regard to social distancing, Chu et al. (2020) conducted a meta-analysis and reported that maintaining a larger distance (>1 m) could effectively improve self-protection and reduce the risk of infection. Another recommended measure for self-protection is to wear a surgical mask (Johnson et al., 2009). Studies that have assessed the effect of face mask wearing on the spread of COVID-19 in the clinical and medical fields have consistently found that using face masks is an effective method to contain the spread of the virus (Bae et al., 2020; Matuschek et al., 2020). Chu et al. (2020) reported that wearing a face mask, especially N95 masks, can significantly reduce the risk of infection. Although the aforementioned preventive measures seem to be effective, their implementation has resulted in changes to people's lifestyles and habits. People's facial expressions are covered when they use a face mask, which in turn, affects their feelings and cognitions during social interaction (Cartaud et al., 2020a). In the context of widespread COVID-19 infections, people have become accustomed to wearing face masks and maintaining a 1.5-m social distance in daily life. The changed behaviors led to discomfort, heightened arousal, and limited social signaling (Welsch et al., 2020), as well as affected to the interpersonal space (IPS) perception (Cartaud et al., 2020a; Coello and Cartaud, 2021; Iachini et al., 2021).

The concept of IPS, which was first proposed by Hall (1966), refers to the limit of comfortable distance between people and has been widely studied in the field of psychology, environmental design, and human–machine interaction. IPS perception is mainly affected by visual cues. Factors influencing IPS can be roughly classified into three categories, namely, participant characteristics, confederate features, and environmental conditions. Regarding participant characteristics, studies have indicated that women maintain a greater IPS than males do (Remland et al., 1995; Uzzell and Horne, 2006; Iachini et al., 2016; Yu et al., 2020). Furthermore, participants' feelings (Iachini et al., 2015) and type of gaze (Ioannou et al., 2014; Sicorello et al., 2019) affect IPS measurements. The IPS maintained by participants with autism spectrum disorders or restrictive-type anorexia has also been studied (Gessaroli et al., 2013; Nandrino et al., 2017) and used for further treatment and prediction. Confederate features, such as sex (Uzzell and Horne, 2006; Ruggiero et al., 2019), facial expression (Cartaud et al., 2018), height (D'Angelo et al., 2019), age (Iachini et al., 2016), body shape (Bailenson et al., 2003), and occupation (Aliakbari et al., 2011), have also been investigated. Moreover, research has examined environmental factors, such as approaching direction (Hecht et al., 2019; Yu et al., 2020; Candini et al., 2021) and pattern (Iachini et al., 2014; Yu et al., 2020), music type (Tajadura-Jiménez et al., 2011), temperature (Ruggiero et al., 2019), virtual environment (Iachini et al., 2014, 2016), and culture (Remland et al., 1995). The results of these studies have contributed substantially to clarifying the effects of human psychology, interaction, and environmental factors on IPS. Coello and Cartaud (2021) also proposed a theory to express the relationship between the degree of threat and IPS based on psychophysiological evidence. When people feel threatened or insecure, they maintain a larger IPS as a self-protection mechanism. When a face mask is worn, the confederate presents a risky, dangerous, and negative impression (Abney, 2018) that leads to psychological barriers (Burgess and Horii, 2012). Because people are expected to comply with WHO guidelines regarding the wearing of surgical masks during the COVID-19 pandemic, atypical behaviors may influence IPS. Research on the impact of wearing surgical masks on perceptual IPS is scarce.

Cartaud et al. (2020b) first employed online interviews to evaluate the effects of wearing face masks and the consequent facial expressions on the IPS of 457 French participants; the results showed that IPS was significantly reduced when confederates were wearing a face mask, as the participants were perceived as more trustworthy compared to the other conditions. Calbi et al. (2021) conducted an online survey on face covering on a sample of 96 Italians and found that people react to various types of protective face covering in different manners. Generally, cultural norms are a crucial factor affecting IPS (Hall, 1966), and contact cultures typically exhibit a smaller IPS than do noncontact culture (Hall, 1966; Baldassare and Feller, 1975). IPS perceptions also differ by ethnicity (Beaulieu, 2004; Sorokowska et al., 2017; Sicorello et al., 2019). People who live in Mainland China and Taiwan have the same ethnic background and belong to noncontact cultures. The lifestyle, risk cognition, and culture for both groups still differ. This motivated us to examine the regional differences in the behavioral changes (IPS in the study) under the threatening environments, particularly the pandemic first outbreak in Mainland China.

Even though factors influencing IPS have been identified, uncertainty remains regarding the impact of wearing surgical masks on IPS judgment. Therefore, this study examined the effects of region, surgical mask wearing, sex dyads, and approaching pattern on IPS perception. Understanding the changes in IPS on the basis of these variables may provide useful information on human interaction during the COVID-19 pandemic.

MATERIALS AND METHODS

Participants

Two hundred participants were recruited in the study. Among them, 100 participants were Mainland Chinese (50 women), and their age and height were 23.38 ± 1.47 years and 175.30 ± 3.76 cm for male participants and 22.42 ± 1.73 years and 162.82 ± 5.39 cm for female participants. The remaining 100 male and female participants (50 each) were Taiwanese, and their age and height were 22.96 ± 2.13 years and 174.10 ± 6.50 cm for male participants and 22.44 ± 1.63 years and 161.30 ± 5.42 cm for female participants. To evaluate the differences in age and height between Mainland Chinese and Taiwanese participants, the independent *t*-test was applied. The results showed that no significant differences in age ($t = 0.790$, degree of freedom = 198, $p = 0.430$) and height ($t = 1.160$, degree of freedom = 198, $p = 0.248$) between the two groups were found. The data were collected from June to November, 2020. All participants reported normal vision and no cognitive or mental problems. Furthermore, all participants were right-handed and not familiar with the confederates in the experiment. Participants were fully informed

of the testing procedure and were asked to sign a consent form before the data collection. The South China University of Technology Institutional Ethics Committee approved the experimental procedures. These two groups were selected for comparison because COVID-19 first appeared in Mainland China and the pandemic situation in Taiwan was relatively stable in terms of epidemic control.

Experimental Setting

Because of the COVID-19 pandemic, the study was forced to use an online survey to collect data on IPS to avoid human-to-human transmission (Ruggiero et al., 2019; Calbi et al., 2021). The online survey was adapted from the paper-and-pencil test utilized in the research of Hayduk (1983) and Xiong et al. (2020). An online survey is an effective method for collecting data on IPS in different countries and is widely used in clinical and practical investigations (Iachini et al., 2016). The paper-and-pencil test was regarded as a projective measurement in which participants were instructed to imagine that they were the people on the paper, as illustrated in **Figure 1**. A computer with the Axure RP rapid prototyping tool (Axure Software Solutions, Inc., San Diego, CA, United States) was used to conduct the survey. Moreover, an experimenter used video conference system and remote desktop connection software to execute the online test. All the materials were shown on the desktop of the experimenter's computer. Each participant was asked to use the remote desktop connection to control the experimenter's computer. The video conference system was used for communication, and the remote desktop connection software was applied for monitoring. The above two technologies were employed to guide the participants one-by-one to minimize the testing bias. During the test, participants were instructed to use the mouse cursor to move the virtual subject (avatar) to approach the confederate in the active pattern and to move the digital confederate to approach the digital participant in the passive pattern (**Figure 1**). When a participant started to move the avatar, the arrow guiding the movement direction between the two avatars was hidden to avoid affecting the participant's distance judgment. That is, no reference was provided for the distance between the two avatars during the IPS determination, except for the changes in spatial perception caused by moving the avatar. The participants

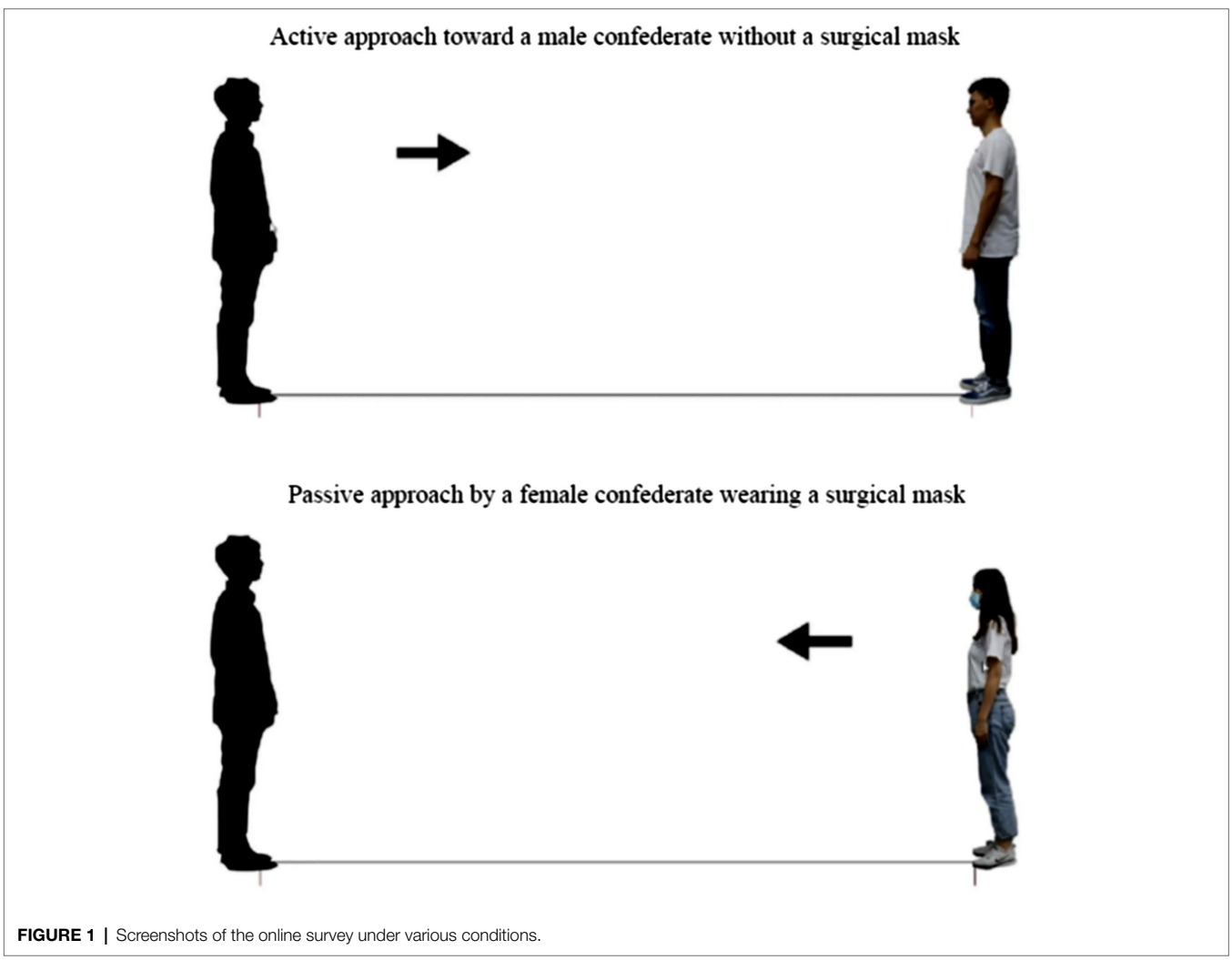

FIGURE 1 | Screenshots of the online survey under various conditions.

were asked to imagine and then determine the IPS by moving the avatar to a position that still felt comfortable but had just started to feel uncomfortable. The IPS was defined as in previous studies (Hayduk, 1983; Adams and Zuckerman, 1991; Nandrino et al., 2017; Yu et al., 2020). Subsequently, the distance between the two avatars was transformed at a 1:30 ratio to obtain the psychological interpersonal distance (Sorokowska et al., 2017). The distance between the two avatars was originally set at 13.33 cm, which means that the initial distance between the participant and the confederate was approximately 4 m in the real world (Yu et al., 2020). Prior to the test, the experimenter confirmed the experimental settings (e.g., voice quality, mouse cursor controls, and displays) with each participant because the remote desktop connection software was applied in the test. The reliability of the measurement used in the test was examined through a pilot study. The intraclass correlation coefficients (ICC) estimates and their 95% confident intervals were calculated using SPSS statistical package version 23 (SPSS Inc., Chicago, IL, United States) based on a single-measure, absolute-agreement, and 2-way mixed-effects model ICC (3,1) as indicated by Koo and Li (2016). The results reported that the ICCs between the repetitions were 0.85 and 0.79 in the active and passive patterns, respectively. According to the standard proposed by Koo and Li (2016), an ICC value ranging from 0.75 to 0.90 indicates good reliability. Thus, the measurement used in the study had satisfactory reliability.

Confederates

A man and a woman aged 23 years with typical Chinese appearance were selected as confederates. The heights of the male and female confederates were 174.3 and 161.7 cm, respectively. The confederates were dressed in casual clothing (jeans and a white t-shirt) without any accessories. A digital camera (Sony HDR-XR260; Sony Corporation, Minato, Tokyo, Japan) was used to capture the sagittal view of the two confederates under two conditions: with and without surgical mask wearing. The sagittal images were served as digital confederates in the online survey. The confederates were requested to maintain a neutral expression during the image capture and were not known to the participants. The heights of the digital male and female confederates on the screen were scaled down to 58.1 mm and 53.9 mm, respectively. The surgical mask used in the test was blue and without any decoration, which represents the type of face mask commonly recommended during the COVID-19 pandemic.

Procedure

Before the test, the experimenter explained the survey procedure to the participants. A 2-min video produced by Stanford Medicine was used to introduce the COVID-19 pandemic to the participants to enable them to recall how they felt during the pandemic. Furthermore, the sagittal view of the confederates with and without a surgical mask was displayed for the corresponding condition when the participants made the perceptual distance judgment. The images were used to help the participants imagine the feeling of facing the confederates under various situations to ensure IPS data quality. Each participant was requested to complete three repetitions, and the average value of the trials was calculated for the analysis. A minimum 3-min rest period was provided to each participant between the trials. The trials were presented one-by-one for IPS judgment and were randomly arranged. For the IPS judgment, the participants used the mouse to move the avatar to a position where they psychologically felt close to uncomfortable but still comfortable. Each participant had the opportunity to make slight adjustments to the position of their avatar to confirm the perceived distance. Once the participant determined the IPS, the computer automatically calculated and recorded the distance between the chins of the two avatars (Yu et al., 2020). The same procedures and materials were used to perform the tests on Mainland Chinese and Taiwanese participants. As a result, 1,600 data samples (200 participants × 2 confederates × 2 mask conditions × 2 approach patterns) were collected in the study for subsequent analysis.

Statistical Analysis

The independent variables in the study were region (Mainland Chinese or Taiwanese), sex dyads (male–male, mixed sex, and female–female), face mask (with or without), and approach patterns (active or passive). The dependent variable was the IPS distance in centimeters. Data were analyzed using SPSS 23.0 (SPSS Inc., Chicago, IL, United States) and the significance level (α) was set at 0.05. Four-way ANOVA was conducted to evaluate the effect of independent variables, and the Scheffé method was used for post-hoc comparisons. The effect size was determined using η^2 value for each significant effect. Beforehand, the Kolomogorov-Smimov test was used to verify the compliance of numerical variables with the normal distribution, while the Levene's test was used to verify the homogeneity of variances.

RESULTS

Through Kolmogorov–Smirnov test, the IPS data collected in the study were normally distributed ($D_{(1600)} = 0.009$, $p = 0.052$) meanwhile Levene's test showed the data were homogenous ($F_{(23,1,576)} = 1.238$, $p = 0.201$). **Table 1** presents the four-way ANOVA results of the IPS measurements. Region ($F_{(1,1,576)} = 27.210$, $p < 0.001$, $\eta^2 = 0.017$), sex dyads ($F_{(2,1,576)} = 8.126$, $p < 0.001$, $\eta^2 = 0.010$), and face mask wearing ($F_{(1,1,576)} = 316.483$, $p < 0.001$, $\eta^2 = 0.167$) significantly influenced the IPS, whereas the approach variable (active or passive pattern) did not result in a difference in IPS. The Taiwanese participants exhibited a significantly larger IPS than did the Mainland Chinese participants (**Figure 2A**). The Taiwanese and Mainland Chinese IPS were 139.24 ± 58.28 cm and 123.95 ± 71.86 cm, respectively. The difference in IPS between the two regions was 15.25 ± 2.9 cm (95%CI: 9.53–20.97, $p < 0.001$) for both sexes. Participants maintained a significantly longer distance when facing a confederate who was not wearing a surgical mask (156.32 ± 60.7 cm) than when the surgical mask was worn (106.83 ± 44.79 cm), with a difference of 49.49 ± 2.67 cm

(95%CI: 44.26–54.72, $p < 0.001$; **Figure 2B**). For the post-hoc test results, female dyads maintained a significantly smaller IPS (122.67 ± 59.17 cm) than the male dyads (136.64 ± 55.65 cm, with a difference of 13.97 ± 3.72 cm, 95%CI: 4.86–23.07, $p < 0.01$) and the mixed dyads (133.50 ± 59.71 cm, with a difference of 10.82 ± 3.22 cm, 95%CI: 2.94–18.71, $p < 0.01$; **Figure 2C**). No significant difference in IPS was observed between the male dyads and the mixed dyads.

No significant interaction effect was observed, except for region × face mask ($F_{(1, 1,576)} = 5.892$, $p < 0.05$, $\eta^2 = 0.004$; **Table 1**). The largest IPS was noted in the condition of Taiwanese participants facing confederates without a surgical mask (167.50 ± 57.17 cm), followed by Mainland Chinese participants facing confederates without a surgical mask (145.13 ± 62.11 cm), Taiwanese participants facing confederates with a surgical mask (110.90 ± 44.05 cm), and Mainland Chinese participants facing confederates with a surgical mask (102.76 ± 45.20 cm; **Figure 3**). No significant difference was observed between the two groups when facing confederates wearing a surgical mask.

TABLE 1 | Four-way ANOVA results on interpersonal distance.

Variables	Degrees of freedom	*F*-value	Significance	η^2
Region	1	27.210	$p < 0.001$	0.017
Sex dyads	2	8.126	$p < 0.001$	0.010
Face mask	1	316.483	$p < 0.001$	0.167
Approach	1	0.103	$p = 0.748$	–
Region × Sex dyads	2	2.265	$p = 0.104$	–
Region × Face mask	1	5.892	$p < 0.05$	0.004
Region × Approach	1	1.812	$p = 0.178$	–
Sex dyads × Face mask	2	0.720	$p = 0.487$	–
Sex dyads × Approach	2	0.311	$p = 0.733$	–
Face mask × Approach	1	0.001	$p = 0.980$	–
Region × Sex dyads × Face mask	2	1.031	$p = 0.357$	–
Region × Sex dyads × Approach	2	0.230	$p = 0.794$	–
Region × Face mask × Approach	1	0.081	$p = 0.776$	–
Sex dyads × Face mask × Approach	2	0.484	$p = 0.616$	–
Region × Sex dyads × Face mask × Approach	2	0.219	$p = 0.803$	–
Error	1576			

DISCUSSION

During the COVID-19 pandemic, in addition to frequent hand washing, wearing face masks and maintaining social distance (1.5 m) have become the two main self-protection methods; these measures were suggested from the perspectives of physical and individual hygiene. Even though the spread of COVID-19 has slowed with the development of vaccines, these preventive measures may continue to change people's lifestyle and work. IPS plays a vital role in influencing the behaviors pertaining to human communication and interaction. Although people's lifestyles and working conditions have changed, comprehensive information on IPS remains scarce. Therefore, this study conducted online surveys to evaluate the effects of factors influencing IPS perception during the COVID-19 pandemic.

In the research of Hall (1966) and Baldassare and Feller (1975), cultural norms (contact and noncontact) are a crucial factor affecting IPS. Moreover, significant differences have been observed in IPS perception among regions and ethnicities (Beaulieu, 2004; Sorokowska et al., 2017; Sicorello et al., 2019). Although people in Mainland China and Taiwan have the same ethnic background and belong to noncontact cultures, this study found that the Taiwanese participants preferred maintaining a significantly larger IPS than did the Mainland Chinese participants. On average, the difference in IPS observed between these two regional participant groups was approximately 15 cm. Yu et al. (2020) compared the IPS maintained by ethnic

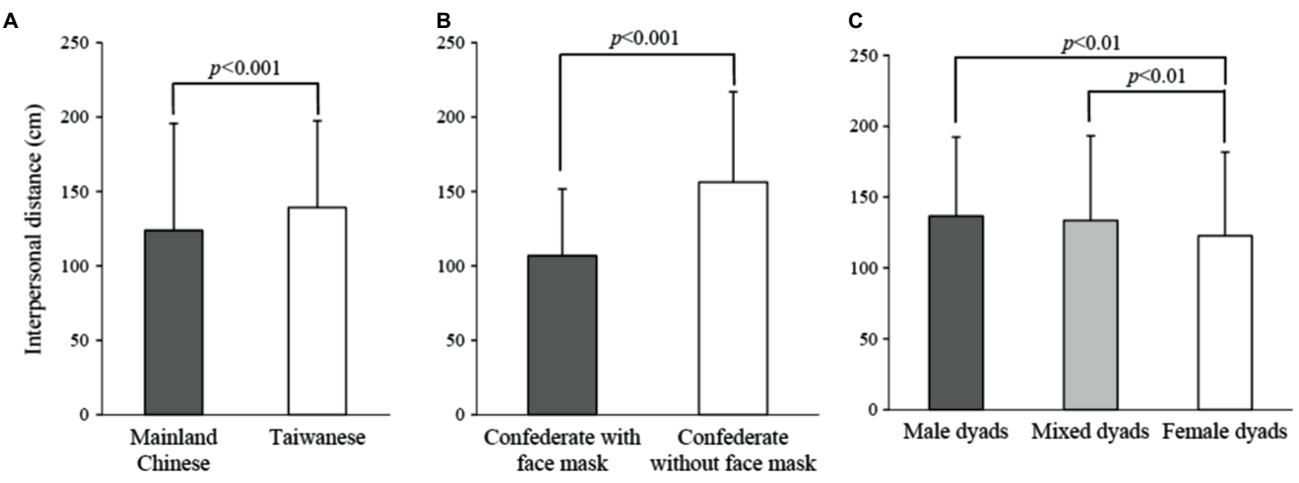

FIGURE 2 | Mean interpersonal distance with the standard deviations under each main effect including **(A)** region, **(B)** face mask, and **(C)** sex dyads compared using the Scheffé's method.

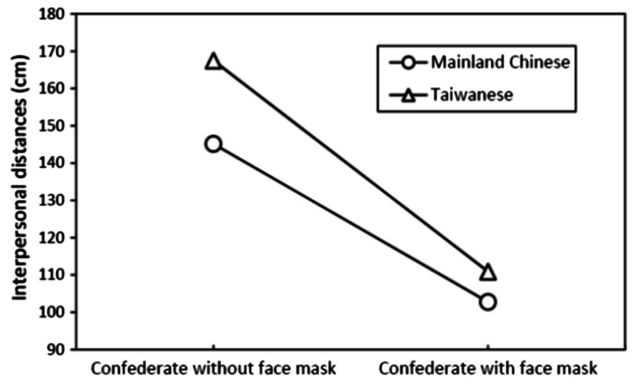

FIGURE 3 | Interaction effect of region and face mask on interpersonal space perceptions.

Chinese people with that maintained by other ethnicities and reported that external environmental factors and lifestyle are potential factors affecting IPS. Compared with Taiwanese participants, the Mainland Chinese participants were more accustomed to crowds because of the large number of people in some public areas. Therefore, they were used to maintaining a shorter distance from strangers in public (e.g., on busses, in queues, and on the subway). This is one of the possible reasons for the difference in IPS between these two groups. However, Welsch et al. (2020) indicated that people have tended to maintain a larger IPS during the COVID-19 pandemic. This pandemic first appeared in Mainland China in December 2019, and after a few months, it gradually subsided in both Mainland China and Taiwan. The data collection period of this study was June–November 2020. The current results highlight a considerable region effect on IPS (i.e., Taiwanese IPS > Mainland Chinese IPS), indicating that the Taiwanese participants tended to be more conservative in terms of IPS during the COVID-19 pandemic than the Mainland Chinese participants. IPS data from before and during the COVID-19 pandemic should be further compared in order to obtain a more comprehensive understanding of the changes in human behaviors.

Previous studies have investigated the effect of sex dyads on IPS but no consistent results have been obtained. Consistent with previous research (Caplan and Goldman, 1981; Aliakbari et al., 2011), Yu et al. (2020) reported that male dyads maintained the largest IPS and female dyads maintained the smallest one. By contrast, Baxter (1970) and Evans and Howard (1973) revealed that the smallest IPS was observed in mixed-sex dyads. Furthermore, Hecht et al. (2019) found that the IPS maintained by mixed-sex dyads was no significant difference to that maintained by same-sex dyads. Zhou et al. (2019) reported that the social interaction distance between people was related to perceptual judgments concerning social grouping; Chinese participants tended to maintain a longer distance in mixed-sex dyads because they felt insecure and shy (Yang, 1988). The results of the current study are in line with related findings that participants maintained greater distance when they are in mixed-sex dyads and that the shortest distance was maintained in female dyads.

When people feel threatened, such as facing the confederates with angry or invisible facial expressions, they subconsciously adjust their IPS to feel psychologically comfortable (Ruggiero et al., 2017, 2021; Cartaud et al., 2018, 2020a). Feeling comfortable and safe by increasing IPS are a psychological adjustment mechanism (Coello and Cartaud, 2021). For example, a larger IPS was reported when participants faced confederates with a gaze (Sicorello et al., 2019), negative expressions (Iachini et al., 2015), aggressive emotions (Tajadura-Jiménez et al., 2011), tall stature (D'Angelo et al., 2019), and large body size (Bailenson et al., 2003). The social impression cast by face masks was investigated by Abney (2018) and Burgess and Horii (2012). Their results indicated that people wearing face masks generated feelings of risk, danger, and harm; that is, negative emotions may cause people to maintain a greater IPS. Among relevant investigations, Cartaud et al. (2020b), employing a questionnaire, were the first to report that wearing a face mask as a preventive measure against COVID-19 resulted in a reduction of IPS distance among French participants. Similarly, the present study results indicate that confederates with or without a surgical mask significantly influenced IPS judgments, regardless of the region variable. Notably, participants facing the confederate without a surgical mask reported a significantly larger IPS, with an increment of 50% (with/without surgical mask: 106.83 cm/156.32 cm). Most participants in this study reported that they experienced a strong sense of aggression and insecurity when facing the confederate without a surgical mask, which resulted in a larger IPS. The results could be attributed to the disease-avoidance mechanisms. There is a unique system composed of various cognitive and affective processes and behaviors with the main goal of protecting the organism from coming into contact with the infectious disease in the first place. Such as the behavioral immune system, as defined by Schaller (2006), plays a unique role in shaping a variety of human behaviors, from basic avoidance of rotten food to social cognitions. By contrast, participants tended to maintain a shorter social distance from the confederate wearing a surgical mask. This means that the use of surgical masks may provide a sense of safety to people (Cartaud et al., 2020a) due to the emotion of the confederate might be less detected (Carbon, 2020). Notably, the psychological feelings and impressions generated by the wearing of a face mask during the COVID-19 pandemic are the exact opposite of past experience. These findings imply that the external environment, social atmosphere, and health knowledge may induce changes in humans' perception of specific products, in turn altering human behavior.

Iachini et al. (2014, 2016) conducted simulations in a virtual reality environment and reported that the comfortable distance in the passive pattern was larger than that in the active pattern. In the present study, however, no significant difference in IPS was noted between the patterns. The use of different measurement methods may have caused the inconsistent results. In the passive pattern, participants were generally requested to say "stop" to make the confederate stand at the point at which the participants started to feel uncomfortable. The participants were immobile and passive when determining their IPS in a given situation. A feeling of insecurity and pressure was thus induced, which affected

IPS perceptions (Ruggiero et al., 2017). In our study, avatars were used to represent the participants according to their sex, and sagittal view images of real confederates were used for evaluation (**Figure 1**). Participants were asked to use their imagination to determine their IPS when moving the avatar toward the confederate's image in the active pattern and when moving the confederate's image toward the avatar in the passive pattern. The use of a questionnaire to collect data on IPS has been widely employed in related investigations (Hayduk, 1983; Iachini et al., 2016; Xiong et al., 2020) and our measurement was reliable (ICC = 0.82); thus, the absence of visual cues, body somatosensory information, and interactivity may explain the inconsistent results. Nevertheless, the current findings are consistent with those of Hecht et al. (2019), who indicated that the approach patterns had no effect on IPS perception when participants were facing a simplified avatar. Notably, diverse measurement methods may produce different results when determining the psychologically comfortable distance. To compare the present study's IPS results with those of previous studies, the measurement of IPS should be considered. Clarifying the differences among the measurements of IPS judgment is thus essential.

This study has some limitations. Because of the pandemic, an online survey was employed for the evaluation. The IPS data obtained under this situation may thus be inconsistent with those obtained in real-world measurement. In addition, only blue surgical masks were used in the study. The effects of face masks of various types and colors on IPS perception should be further investigated to provide more information pertaining to social distancing assessment, social interaction enhancement, and environmental design improvement.

CONCLUSION

The effects of region, presence or absence of a face mask, sex dyads, and approach pattern on IPS were evaluated in this study. All main effects had a significant influence on IPS determination, except the approach pattern. The Taiwanese participants required a greater distance for psychological comfort than the Mainland Chinese participants did. When facing a confederate who did not wear a face mask, the participants tended to maintain a larger IPS. Female dyads maintained a shorter distance than did male and mixed-sex dyads. The results of the interaction of region and face mask demonstrated that Taiwanese participants maintained the longest distance from a confederate without a face mask, whereas the Mainland Chinese participants maintained the shortest distance when encountering a masked confederate. People's lifestyles and habits have undeniably been affected by the COVID-19 pandemic. Changes in behavior may affect people's performance pertaining to psychological, physiological, and social interaction. More in-depth and extensive investigations will be practically valuable for clarifying the differences in and the application of human behaviors during the COVID-19 pandemic.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the South China University of Technology Institutional Ethics Committee (May 1, 2020). Participants provided written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

AUTHOR CONTRIBUTIONS

All authors listed have made substantial, direct, and intellectual contributions to this research and approved it for publication.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

frontiers in Psychology

ORIGINAL RESEARCH
published: 05 November 2021
doi: 10.3389/fpsyg.2021.699180

Understanding the Emotion Coping Strategies During Public Emergencies – From the Perspective of Psychological Distance

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Research has investigated behavioral coping strategies for the negative emotions that public emergencies elicit. Accordingly, our current research explored how people coped with negative emotions in response to the coronavirus disease (COVID-19) outbreak, from a cognitive perspective. Building on the theory of psychological distance and self-construal, we proposed that people who experienced fear, sadness and anxiety responded with independent-self construal, focusing on information that related to themselves and the novel virus (independent information). On the other hand, people who experienced fear, sadness and anger responded with interdependent-self construal, focusing on information that pertained to "us", the virus and nature (interdependent information). We collected data from 1,142 participants at both the initial peak of the outbreak and when its spread had subsided. Based on this longitudinal data, we examined the effectiveness of these strategies, and our findings suggested that independent information was effective in decreasing fear and anxiety, while interdependent information effectively mitigated sadness. The findings could help researchers, practitioners, governments, and organizations to implement appropriate information strategies to regulate individuals' negative emotions during and after the COVID-19 pandemic.

Keywords: psychological distance, negative emotion, COVID-19 outbreak, copying strategies, self-construal

OPEN ACCESS

Edited by:
Claudio Lucchiari, University of Milan, Italy

Reviewed by:
Ilaria Cutica, University of Milan, Italy
Long Huang, Jiangxi Normal University, China

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Specialty section:
This article was submitted to Cognitive Science, a section of the journal Frontiers in Psychology

Received: *23 April 2021*
Accepted: *15 October 2021*
Published: *05 November 2021*

Citation:
Sun Y, Li Y, Wang Y and Li F (2021) Understanding the Emotion Coping Strategies During Public Emergencies – From the Perspective of Psychological Distance. Front. Psychol. 12:699180. doi: 10.3389/fpsyg.2021.699180

INTRODUCTION

Scholars have focused on the negative emotions that disasters elicit (Folkman, 2008; Yiend, 2010), since the negative emotions may trigger mental health issues in the long-term (Kiecolt-Glaser et al., 2002). Existing literature has confirmed that people have suffered increasing negative emotions during the novel coronavirus (COVID-19) pandemic (Elhai et al., 2020; Li W. et al., 2020), and were still exploring ways to cope with these emotions. Unfortunately, the authorities implemented lockdown measures, requiring people to remain at home, which obviously limited behavioral coping strategies. Thus, we could not reliably measure the efficacy of these coping strategies. Our research addresses these difficulties by examining the effectiveness of cognitive coping strategies, using longitudinal data.

People tend to regulate their emotions when facing adverse situations (Waugh, 2020), but the approaches employed to cope with negative emotions vary accordingly (Piff et al., 2012). Researchers have investigated how people recovered from social emergencies, such as bushfires

(Eriksen, 2019), hurricanes (Morrice, 2012), and Severe Acute Respiratory Syndrome (SARS) (Maunder et al., 2003). However, the COVID-19 pandemic is different since, in many countries, authorities have required people to stay at home for extended periods. The lockdown has proven to be effective in slowing the spread of the virus (Kupferschmidt, 2020), but the associated psychological cost cannot be ignored (Rubin and Wessely, 2020). Hence, it is imperative to identify ways to cope with the negative emotions that the pandemic has prompted.

According to the transactional model of coping (Lazarus and Folkman, 1984), people tend to employ various approaches to address negative emotions (Folkman, 2008). In general, there are two ways of coping—the direct way to solve the problems that elicit negative emotions (problem-focused coping), or the indirect way that people use to distance themselves from negative emotions (emotion-focused coping). These coping strategies depend on the domain of threat; a mortal threat, like the COVID-19 pandemic, would more likely activate problem-focused coping (Han et al., 2015). With this approach, people would actively search for solutions to the current situation.

The coping strategies that people use to regulate their emotions could be either behavioral or cognitive efforts (Gross, 1998; Gross and John, 2003). Due to the limitation and inflexibility of behavioral approaches during the outbreak of COVID-19, our research discusses coping strategies at the cognitive level. Specifically, we examine the information that individuals associated with different negative emotions. Based on the connection between negative emotions and information searching, we propose that people with certain negative emotions will only pay attention to relevant information (Kustubayeva et al., 2012; Tamir, 2016).

We classified two kinds of information based on the theory of self-construal (Markus and Kitayama, 1991). Since individuals focus on themselves either independently or interdependently, we proposed that they would consider themselves as "me" or as "a part of the human collective (us)" during the pandemic. People who understood the situation from the perspective of the independent-self focused more on the threats to individuals and attempted to solve the "me" problems. Hence, they searched for updated information that related to the status of the virus and the ways they could protect themselves. In this paper, we defined these kinds of information as "independent information." Alternatively, people who understood the situation in terms of the interdependent-self paid more attention to the threats to a collective "us." Thus, they intended to solve the problems of "the human collective," to decrease the possibility of such disasters in the future. Therefore, they considered the relationship between humans and wildlife, or the harmony of nature. In this paper, we named these kinds of information as "interdependent information." Markus and Kitayama (1991) stated that emotions that people were experiencing would foster either independent-self or interdependent-self construal.

Taken together, we examined five negative emotions (fear, sadness, anxiety, anger, and disgust) that the outbreak of COVID-19 visibly induced (Bao et al., 2020; Li W. et al., 2020; Limcaoco et al., 2020). We proposed that people searched for independent and interdependent information to regulate negative emotions, and the effectiveness of the coping strategies employed would vary according to the emotion. We conducted a longitudinal study to compare emotional intensity and the relevant coping strategies at different times. We collected the first round of data at the initial peak of the number of infections in China (T_1). We then obtained the second round of data when there were no new reported cases of infections (T_2).

To the best of our knowledge, this study is the first to examine the coping strategies that address negative emotions during the COVID-19 pandemic, based on longitudinal data. This is meaningful for the following reasons. First, this study discusses coping strategies from the cognitive rather than behavioral perspective. Changes in social behaviors would bring immediate effect, for example, social connection could promptly decrease anxiety caused by social distancing (Williams et al., 2018). However, it remains imprudent for individuals from severely infected areas to return immediately to normal physical interactions. Therefore, cognitive coping strategies were more influential during the pandemic. Second, our novel study distinguishes problem-focused coping, building on the theory of psychological distance and self-construal. We classify independent information (related to the status of virus) and interdependent information (related to relationship between human beings and nature). This is significant for future research to understand how people think and what kinds of information they need during major public emergencies. Third, we examine the effectiveness of the two coping strategies in reducing negative emotions based on the data from T_1 to T_2. The findings may provide solid support for future studies on the mitigation of negative emotions during major public emergencies.

Extensive literature has confirmed that public emergencies can induce negative emotions (Maunder et al., 2003; Morrice, 2012; Eriksen, 2019), while the uncertainty and unpredictability of public health crises would prompt such responses more intensely (Slovic, 1987). However, countries, communities, and individuals all need time to recover from such crises. For individuals, one of the critical processes during recovery is to regulate the emotions prompted by negative events (Eriksen, 2019). Negative emotion regulation is a series of coping strategies that individuals use to alleviate their emotional states (Gross, 1998), and it varies with individual characteristics and situations (Dunkley et al., 2003; Piff et al., 2012; Bonanno and Burton, 2013). Scholars have explored abundant coping strategies to deal with negative emotions. These include the reversal of negative emotions to positive emotions (Folkman and Moskowitz, 2000; Tugade and Fredrickson, 2004), forgetting about negative emotions (e.g., diverting attention to other things) (Shimazu and Schaufeli, 2007; Cameron and Payne, 2011), reappraising the meaning of negative events (Park and Folkman, 1997; Knoll et al., 2009), and finding solutions to resolve current problems (Witte and Allen, 2000).

In summary, there are two kinds of coping strategies: problem-focused and emotion-focused coping (Lazarus and Folkman, 1984; Folkman, 2008, 2009) and both of them involve behavioral or cognitive efforts to alleviate negative emotions (Duhachek, 2008). At the cognitive level, emotional regulation could be a goal-oriented process (Tamir, 2016), and people tend to focus on different information that corresponds to their emotions.

Peters et al. (2006) stated that individuals heeded emotional information rather than neutral information after the induction of a particular emotion. However, attention would shift if provided with information that alleviated negative emotions (Vogt et al., 2011; Vogt and De Houwer, 2014). A similar pattern emerged during the COVID-19 outbreak; individuals increasingly consumed negative information after the prompting of negative emotions (Van Bavel et al., 2020). In terms of information depth, previous literature suggested that various emotions would induce different depths of information focus (Wang et al., 2017), which in turn bring a distant perspective (Bruehlman-Senecal and Ayduk, 2015).

When discussing emotion regulation from the theory of psychological distance and self-construal, the emotions could reinforce an independent or interdependent construal of the self (Markus and Kitayama, 1991). Specifically, the ways (construal) in which people consider their situations vary according to their emotions and affects their information focus. Individuals who recognized their particular vulnerability during the COVID-19 outbreak would focus more on information that closely related to status of the virus and the associated protective measures. These kinds of information could help solve the present problems of "me" and our current research defined it as "independent information." In contrast, when individuals recognized themselves as part of a human collective, they would focus more on the relationship between humans and wildlife, or the harmonious development of nature. Such information would be helpful to solve the future problems of "us," decreasing the possibility of future outbreaks. We defined this as "interdependent information." Accordingly, we can reasonably assume that independent information can elucidate some perspective for the short-term, while interdependent information can do so for the long-term. However, few studies have connected information focus with the approaches that help cope with negative emotions, and there is a lack of evidence to demonstrate the link between cognitive coping strategies and relevant emotions.

To date, some scholars have studied the negative emotions elicited by the COVID-19 pandemic, such as fear, anxiety, depression, and anger (Bao et al., 2020; Li W. et al., 2020; Limcaoco et al., 2020), but the majority of these studies focused either on one emotion or regarded negative emotions as a whole rather than discussing them separately. Psychologists have emphasized the necessity of distinguishing negative emotions, stating that different emotions prime distinct goals for decision-makers (Raghunathan and Pham, 1999), and highlighted the importance of matching the regulation strategies with specific emotions (Labroo and Rucker, 2010). Grounded on previous research, our study suggested that individuals used their information focus (thinking) to regulate their negative emotions during the COVID-19 outbreak. However, the types of negative emotions (fear, sadness, anxiety, anger, and disgust) prompt distinct construal of thinking, which in turn work differently for each negative emotion. We believe that the causes of each emotion could explain this difference.

Specifically, fear and anxiety are two frequently mentioned emotions since uncertainty is likely to be their source (Raghunathan and Pham, 1999; Griskevicius et al., 2009). The pandemic has elicited these emotions due to the uncertainty resulting from lack of knowledge about the virus (Bao et al., 2020). Hence, fear and anxiety have more internal attributes and experiencing these kinds of emotions prompts the independent-self perspective. Consequently, individuals searched for independent information to regulate their fear and anxiety. As their knowledge increased, their fear and anxiety decreased. In addition, their search for independent information about self-protection prompted them to make further risk-averse choices (Lerner and Keltner, 2001).

Individuals feel sadness often because of their own or others' misfortunes (Cryder et al., 2008; Labroo and Rucker, 2010). In other words, they have both internal and external attributes, and they relate to themselves and others at the same time. Therefore, experiencing sadness motivates either an independent-self or an interdependent-self view. The independent construal motivates, for example, a search for information about the status of the virus, the number of new infections and cured cases. Conversely, the interdependent construal motivates a search for information such as the relationship between humans and nature. Compared to the information directly related to the virus, interdependent information would work better in reducing sadness because the former cannot change the current facts. The latter, however, changes individuals' perception of the negative event (McRae et al., 2012) and elicit the hope that humanity could mobilize its resources and actually mitigate future threats. Therefore, focus on interdependent information induces a reappraisal of the pandemic and regard it as motivation to interact with nature more responsibly, eradicating pandemic-induced sadness in the long-term.

Anger and disgust tend to be the result of others' misbehaviors (Lerner and Keltner, 2001; Lerner et al., 2008). During the outbreak, individuals felt anger and disgust because authorities linked the advent of COVID-19 to the consumption of wildlife (Lu et al., 2020; Zhou et al., 2020). As they deemed this consumption as one of the main routes for transmitting the virus to humans, individuals became aware of the effects of others' behaviors. However, this interdependent perspective could not decrease their anger or disgust since they could not find solutions to change others' perceived misbehaviors.

Therefore, we propose that individuals focused on information that related to the status of the virus (independent information focus) to regulate their fear (H_{1a}), sadness (H_{1b}), and anxiety (H_{1c}), while searching for "distant" information related to the relationship between humans and nature (interdependent information focus) to regulate their fear (H_{2a}), sadness (H_{2b}), anger (H_{2c}), and disgust (H_{2d}). Meanwhile, we posit that focus on independent information could significantly reduce fear (H_{3a}) and anxiety (H_{3b}), while interdependent information could prominently decrease sadness (H_4).

The novelty of our study lies in the distinction of "close" and "distant" coping strategies for five kinds of negative emotions: fear, sadness, anxiety, indignation, and disgust. We are also the first to examine the effectiveness of coping strategies based on longitudinal data during the COVID-19 outbreak. We discuss coping strategies from the cognitive level rather than the

behavioral level since behaviors would vary with the situations, countries, policies, cultures, or habits; however, there is little limitation on the development of cognition. Therefore, our findings are flexible, whose implementation would be appropriate in China and other countries.

MATERIALS AND METHODS

We conducted a longitudinal survey in China through the professional data collection platform, Credamo, in 2020. We delivered the first round of questionnaires on February 24, 2020 (T_1), when the number of infected cases peaked in China. We delivered the second round on March 30 (T_2), when the number of reported new infections had returned to zero. In the first round, we obtained 500 valid samples from Hubei province, the most severely affected area, and 1000 valid samples from other provinces of China. In the second round, we delivered the questionnaires to the same participants and received 1,142 valid responses. To guarantee data consistency, we only used paired samples.

Participants

Of the participants, 565 were male (49%). All subjects were Chinese, ranging from 18 to 65 in age ($M_{age} = 29$), with a range of occupational backgrounds: university students (22%), employees of enterprises (44%), staff of the government and institutions (11%), which included doctors (9%), self-employed individuals (14%), farmers (8%), and other occupations (1%). A total of 73% of participants held a Bachelor's degree while 7% held a Master's degree.

Measures

We measured the negative emotions using five items on a seven-point scale, including fear, sadness, anxiety, anger, and disgust (Cronbach's $\alpha = 0.893$). We measured the focus on independent information using two items on a seven-point scale ("amount of time spent on thinking or reading information about the virus, including the number of infected cases, the means of protection and other relevant policies" and "number of times you discuss the virus with others, including the number of infected cases, the means of protection and other relevant policies") (Cronbach's $\alpha = 0.793$). The original measure consisted of three items and we deleted one item that did not relate closely to the concept ("number of times that you share information about virus with others").

We measured focus on interdependent information using five items on a seven-point scale ("thinking or reading about the relationship between the virus and the consumption of wildlife," "thinking or reading about the relationship between human beings and nature," "thinking or reading about the relationship between human beings and wildlife," "the depth of thinking about the above questions," and "the time spent on thinking or reading about the above information" (Cronbach's $\alpha = 0.872$).

All above three variables have high reliability (Hair, 1998) as their Cronbach's alpha values were above 0.6 (negative emotion 0.893, focus on independent information 0.793, and focus on interdependent information 0.872). Moreover, the measurement has high convergent validity with all square roots of AVE above 0.8 (negative emotion 0.948, focus on independent information 0.86, and focus on interdependent information 0.947) (Fornell and Larcker, 1981).

RESULTS

Our study explores two questions: (1) How did people cope with their negative emotions during the COVID-19 outbreak, and (2) how effective was each coping strategy? For the first question, we examined the relationship between negative emotions and these coping strategies. To address the second question, we tested the relationship between the coping strategies and the change in each negative emotion.

Emotional Intensity

First, we compared the emotional intensity between T_1 and T_2 (**Figure 1**). The emotions of fear ($M_{fear\ T1} = 4.87$, $M_{fear\ T2} = 4.50$, $t_{fear} = 8.005$, $p < 0.001$), sadness ($M_{sadnessT1} = 5.08$, $M_{sadnessT2} = 4.51$, $t_{sadness} = 11.932$, $p < 0.001$), anxiety ($M_{anxiety\ T1} = 4.72$, $M_{anxiety\ T2} = 4.35$, $t_{anxiety} = 7.795$, $p < 0.001$), anger ($M_{anger\ T1} = 4.69$, $M_{anger\ T2} = 4.23$, $t_{anger} = 9.134$, $p < 0.001$) and disgust ($M_{disgustT1} = 4.41$, $M_{disgustT2} = 4.07$, $t_{disgust} = 6.853$; $p < 0.001$) all decreased significantly from T_1 to T_2. The change in sadness ($M_{sadness\ change} = 0.57$) and anger ($M_{angerchange} = 0.46$) significantly exceeded that of the other three emotions ($M_{fearchange} = 0.37$, $M_{anxiety\ change} = 0.37$, $M_{disgust\ change} = 0.34$).

Negative Emotions and Coping Strategies

To examine the relationship between the negative emotions and coping strategies at two time periods, we established a Hierarchical Linear Model (HLM) with a random intercept. The follows:

$$\begin{cases} Y_{ij} = \beta_{0ij} + \beta_{1ij} C_j + \beta_{2ij} E_{ij} + \varepsilon_i \\ \beta_{0ij} = \gamma_{00i} + \alpha_{ij} P + \mu_{0j} \end{cases} \quad (1)$$

$$\rightarrow Y_{ij} = \gamma_{00i} + \alpha_{ij} P + \beta_{1ij} C_j + \beta_{2ij} E_{ij} + (\mu_{0j} + \varepsilon_i) \quad (2)$$

Y_1 represents the focus on independent information, while Y_2 represents the focus on independent information. C_j is a vector of control variables for the j consumer, consisting of his or her demographic information: such as the gender (male is coded 1 and female is coded 0), age and income. P represents the different pandemic periods (0 is the peak of the pandemic, 1 is the point where the number of reported new infections dropped to zero). Eij represents the five different kinds of negative emotions for the consumer j, ($i = 1$ sadness, $i = 2$ disgust, $i = 3$ anger, $i = 4$ anxiety, $i = 5$ fear).

Based on the 1,142 paired samples, we estimated two HLM models to test the influence factors on the cognitive coping strategies. **Tables 1**, **2** summarized these results.

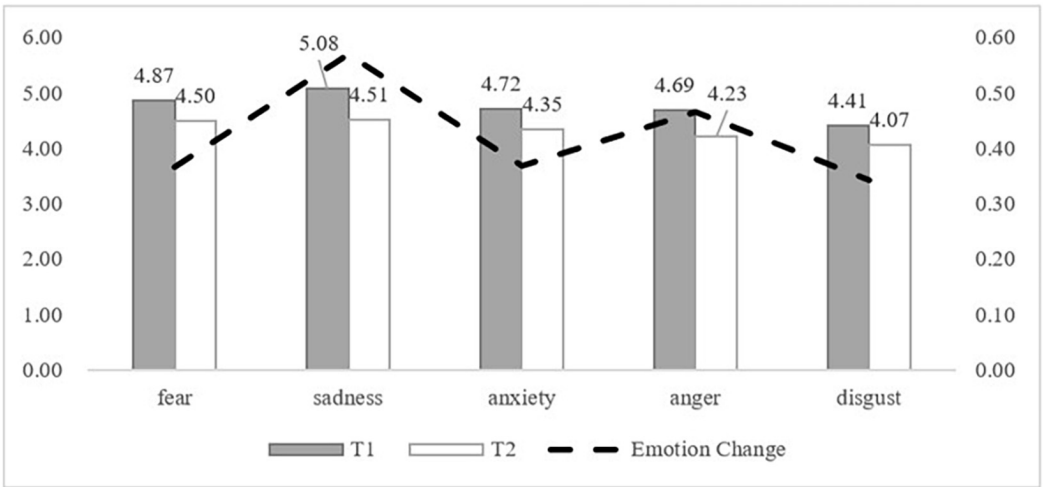

FIGURE 1 | Emotional strength between T1 and T2.

TABLE 1 | Effects of emotions on coping strategy of independent information focus.

Fix effects	F	Sig	Fix coefficients	B	t	sig.
Corrected Model	36.276	0.000	Intercept	3.885	29.821	0.000
Gender	0.778	0.378	Gender	0.041	0.882	0.378
Age	6.666	0.010	Age	0.009	2.582	0.010
Income	9.777	0.002	Income	0.085	3.127	0.002
Period	73.802	0.000	Period	0.400	8.591	0.000
Sadness	24.276	0.000	Sadness	0.096	4.927	0.000
Disgust	0.155	0.694	Disgust	0.007	0.394	0.694
Anger	0.602	0.438	Anger	0.015	0.776	0.438
Anxiety	7.143	0.008	Anxiety	0.062	2.673	0.008
Fear	5.017	0.025	Fear	0.052	2.240	0.025
			Random effects	B	z	Sig
			Var(period = 0)	0.991	23.792	0.000
			Var(period = 1)	1.407	23.810	0.000

TABLE 2 | Effects of emotions on coping strategy of interdependent information focus.

Fix effects	F	Sig	Fix coefficients	B	t	sig.
Corrected Model	22.662	0.000	Intercept	4.144	38.150	0.000
Gender	0.208	0.649	Gender	−0.018	−0.456	0.649
Age	19.918	0.000	Age	0.013	4.463	0.000
Income	40.752	0.000	Income	0.145	6.384	0.000
Period	0.671	0.413	Period	−0.032	−0.819	0.413
Sadness	18.835	0.000	Sadness	0.071	4.340	0.000
Disgust	0.502	0.479	Disgust	−0.011	−0.709	0.479
Anger	6.526	0.011	Anger	0.041	2.555	0.011
Anxiety	0.234	0.628	Anxiety	0.009	0.484	0.628
Fear	4.169	0.041	Fear	0.040	2.042	0.041
			Random effects	*B*	*z*	Sig
			Var (Period = 0)	0.791	23.824	0.000
			Var (Period = 1)	0.847	23.829	0.000

TABLE 3 | Effects of coping strategies on the change of each emotion.

A. Fear	**Model 1**			**Model 2**		
	β	**T**		**β**	**T**	
Gender	0.005	0.171		0.007	0.238	
Age	−0.030	−0.899		−0.026	−0.789	
Income	−0.053	−1.527		−0.047	−1.353	
Education	−0.016	−0.500		−0.020	−0.644	
Place	−0.028	−0.915		−0.026	−0.847	
Independent information focus				−0.078	−2.390	**
Interdependent information focus				0.001	0.042	
R2		0.006			0.011	
F for change in R2		1.267			3.737	**
F for Model Fit		1.104			1.771	*
B. Sadness	**Model 1**			**Model 2**		
	β	**T**		**β**	**T**	
Gender	−0.035	−1.158		−0.032	−1.066	
Age	−0.068	−2.067	**	−0.058	−1.737	*
Income	−0.074	−2.151	**	−0.057	−1.664	*
Education	0.044	1.400		0.033	1.062	
Place	−0.069	−2.254	**	−0.071	−2.319	**
Independent information focus				−0.025	−0.761	
Interdependent information focus				−0.087	−2.646	***
R2		0.017			0.026	
F for change in R2		3.917	***		5.523	***
F for Model Fit		2.942	***		3.642	***
C. Anxiety	**Model 1**			**Model 2**		
	β	**T**		**β**	**T**	
Gender	−0.016	−0.522		−0.014	−0.467	
Age	−0.064	−1.933	*	−0.062	−1.842	*
Income	−0.043	−1.261		−0.039	−1.124	
Education	−0.018	−0.557		−0.021	−0.670	
Place	−0.031	−0.996		−0.029	−0.935	
Independent information focus				−0.066	−2.037	**
Interdependent information focus				0.004	0.110	
R2		0.008			0.012	
F for change in R2		1.851			2.384	*
F for Model Fit		1.923	*		2.063	**
D. Anger	**Model 1**			**Model 2**		
	β	**T**		**β**	**T**	
Gender	−0.004	−0.138		−0.002	−0.077	
Age	−0.011	−0.321		−0.005	−0.152	
Income	−0.046	−1.333		−0.037	−1.076	
Education	0.011	0.355		0.005	0.170	
Place	−0.076	−2.463	**	−0.076	−2.462	**
Independent information focus				−0.036	−1.112	
Interdependent information focus				−0.035	−1.045	
R2		0.007			0.011	
F for change in R2		1.648			1.963	
F for Model Fit		1.549			1.682	

(Continued)

TABLE 3 | (Continued)

E. Disgust	**Model 1**		**Model 2**	
	β	**T**	**β**	**T**
Gender	0.011	0.365	0.012	0.393
Age	−0.014	−0.414	−0.012	−0.369
Income	−0.046	−1.331	−0.044	−1.252
Education	0.039	1.239	0.037	1.173
Place	−0.037	−1.207	−0.036	−1.175
Independent information focus			−0.033	−1.013
Interdependent information focus			0.001	0.042
R2		0.005		0.006
F for change in R2		1.203		0.595
F for Model Fit		1.022		0.906

$^*p < 0.10$. $^{**}p < 0.05$. $^{***}p < 0.01$.

For the strategy focusing on independent information, the model is significant ($F = 36.276$, $p < 0.001$). Specifically, the coefficients of sadness ($B = 0.096$, $t = 4.927$, $p < 0.001$), anxiety ($B = 0.062$, $t = 2.673$, $p = 0.008$) and fear ($B = 0.052$, $t = 2.240$, $p = 0.025$) are significant, but the coefficients of disgust and anger are insignificant. Hence, H_{1a}, H_{1b}, and H_{1c} are valid. For the strategy focusing on interdependent information, the HLM model is also well-established ($F = 22.662$, $p < 0.001$). The coefficients of sadness ($B = 0.071$, $t = 4.430$, $p < 0.001$), anger ($B = 0.041$, $t = 2.555$, $p = 0.011$) and fear ($B = 0.040$, $t = 2.042$, $p = 0.041$) are prominent, but the coefficients of disgust and anger are not significant. Hence, H_{2a}, H_{2b} and H_{2c} are valid, but H_{2d} is yet unproven.

Therefore, individuals focused on information that related to the status of the virus when they experienced fear, sadness, and anxiety, while considering the relationship between human beings and nature to regulate their fear, sadness, and anger. However, the effectiveness of each coping strategy in reducing negative emotions was still unknown. Accordingly, we examined the effectiveness through checking the change in each emotion during T_1 and T_2.

Coping Strategies and Emotional Change

We constructed a linear regression model (Equation 3) to test the relationship between coping strategies and the change in each negative emotion. Y_3 represents the change in each negative emotion (T_2–T_1). S_1 represents the consideration of questions pertaining to the status of the virus at the first time point (T_1). S_2 represents the consideration questions pertaining to the cause of the virus at the first time point (T_1). Ci is a vector of control variables consisting of participants' demographic information: gender, age, income, education background, and place of residence.

$$Y_3 = \beta_{13}S_1 + \beta_{14}S_2 + \beta_{15}Ci \quad (3)$$

We estimated Equation 3 with the change of each negative emotion. The results (see **Table 3A–E**) indicate that the coefficient of independent information focus was significant when the

demographic information was controlled, and if we estimated Equation 3 with the change of fear ($\beta_{13fear} = -0.078$, $t = 2.390$, $p = 0.017$) and anxiety ($\beta_{13\ anxiety} = -0.066$, $t = -2.037$, $p = 0.042$). Thus, we confirmed H_{3a} and H_{3b}. The coefficient of interdependent information became significant based on the change in sadness ($\beta_{14sadness} = -0.087$, $t = -2.646$, $p = 0.008$). Thus, we validated H_4.

To better illustrate the mediation role of the two coping strategies, we used the bootstrap technique. We set the number of bootstrap samples for bias-corrected bootstrap confidence intervals at 5,000 and the confidence level for all confidence intervals in output at 95% and selected the fourth model. We inputted each "negative emotion" at T_2 as the dependent variable; "negative emotion" at T_1 as the independent variable; and "independent information focus" and "interdependent information focus" as mediating variables. **Table 4** illustrated these results. The data further confirmed the role of independent information in reducing fear [0.0112, 0.0414] (excluding zero) and anxiety [0.0157, 0.0471] (excluding zero), and the role of interdependent information in decreasing sadness [0.0120, 0.0413] (excluding zero).

Figures 2–4 clearly show the relationship between the coping strategies and emotions in question. According to the results, independent information significantly reduces individuals' fear and anxiety, while interdependent information contributes to relieving sadness.

DISCUSSION

Outbreaks of viruses are one of the most significant threats to humanity. Hence, we need to learn from the COVID-19 pandemic to prepare for future public health crises. Our research provides insight on the management of individuals' negative emotions during crises from a cognitive perspective. We mainly discussed problem-focused coping strategies since they are the more obvious reaction to mortal threats (Han et al., 2015). Building on the theory of psychological distance and self-construal, we proposed two coping strategies (independent vs. interdependent information focus) which were effective in reducing negative emotions elicited by the COVID-19 pandemic. It is important to note that at both instances of data collection, the lockdown was still in effect in China. Yet, all negative emotions subsided in Hubei and other provinces. Addressing previous concerns about quarantine during the initial outbreak (Rubin and Wessely, 2020), the results proved that negative emotions decreased when the severity of the situation lessened, even though the lockdown measures were still in effect.

Specifically, individuals felt fear and anxiety if they could not obtain sufficient information about the virus during the pandemic. As a result, they understood the situation from an independent-self standpoint and actively searched for independent information to increase their knowledge about the virus. This, in turn, relieved their fear and anxiety. In addition, individuals experiencing sadness also sought after information pertaining to the virus to relieve their emotional state. However, independent information alone would not have a significant effect because it could not change the fact that people were suffering. However, interdependent information provided another perspective for sad individuals to find solutions in the long-term. Moreover, those experiencing anger tended to understand the virus from the interdependent-self view. They sought after information about the relationship between humans and wildlife/nature. Unfortunately, this interdependent information could not change others' behaviors, such as eating wildlife. Hence, it could not effectively reduce anger.

Our research confirmed the existence of disgust during the COVID-19 pandemic, while demonstrating the simultaneous decreasing trends of this emotion and the decreasing severity of the outbreak. However, we failed to identify the coping approach for disgust at the cognitive level. We believe that this failure owed to the complexity of this emotion, which related more to the threat of shame. According to Han et al. (2015), coping for shame is more emotion-focused. Hence, we assumed that disgust required emotion-focused coping rather than problem-focused coping in its regulation.

We have proposed two novel concepts, independent information and interdependent information, and further improvement and testing of the constructs of these two concepts is necessary in future studies. In addition, longitudinal data,

TABLE 4 | Mediation Role of independent information focus and interdependent information focus.

Mediation path	Effect	Boot SE	Boot LLCI	Boot ULCI
Fear T_1 - Independent information focus - Fear T_2	0.0232	0.0075	0.0112	0.0414
Fear T_1 - Interdependent information focus - Fear T_2	0.0019	0.0042	−0.0008	0.0181
Anxiety T_1 - Independent information focus - Anxiety T_2	0.0286	0.0078	0.0157	0.0471
Anxiety T_1 - Interdependent information focus - Anxiety T_2	0.0022	0.0041	−0.0050	0.0111
Sadness T_1 - Independent information focus - Sadness T_2	0.005	0.0053	−0.0043	0.0164
Sadness T1 - Interdependent information focus - Sadness T_2	0.024	0.0073	0.0120	0.0413
Anger T_1 - Independent information focus - Anger T_2	0.0032	0.0048	−0.0061	0.0131
Anger T_1 - Interdependent information focus - Anger T_2	0.0026	0.0046	−0.0060	0.0125
Disgust T_1 - Independent information focus - Disgust T_2	0.0026	0.0039	−0.0042	0.0115
Disgust T_1 - Interdependent information focus - Disgust T_2	0.0036	0.0039	−0.0034	0.0124

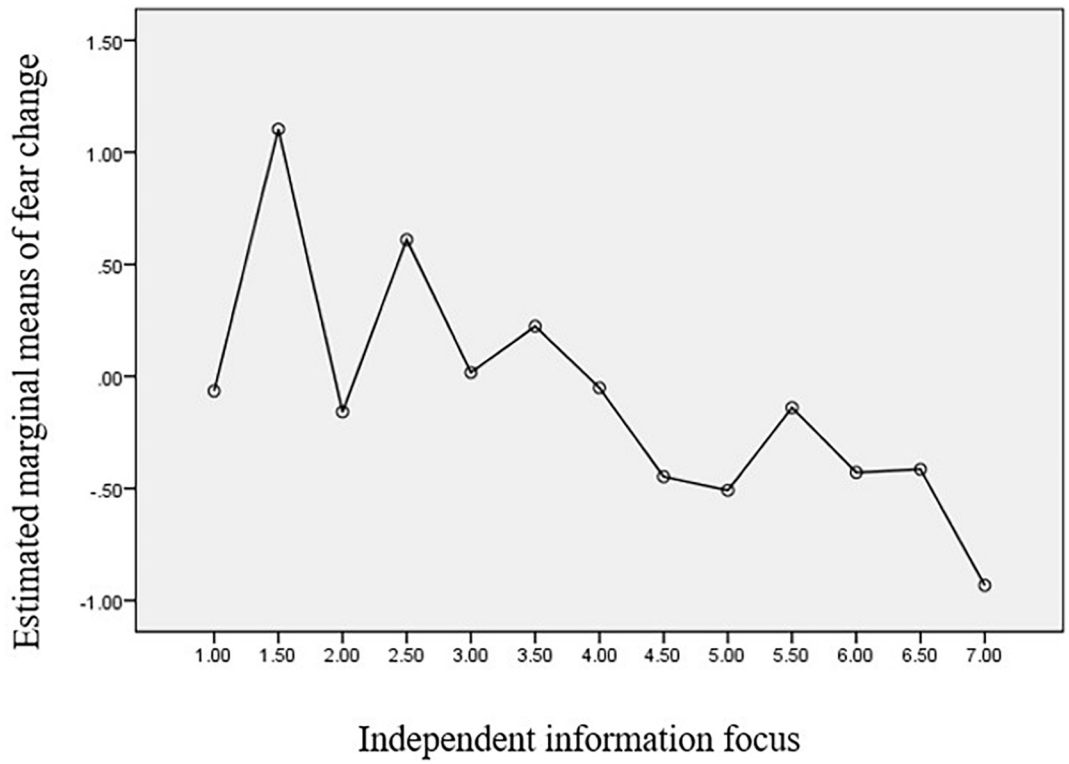

FIGURE 2 | Estimated Marginal Means of Fear Change.

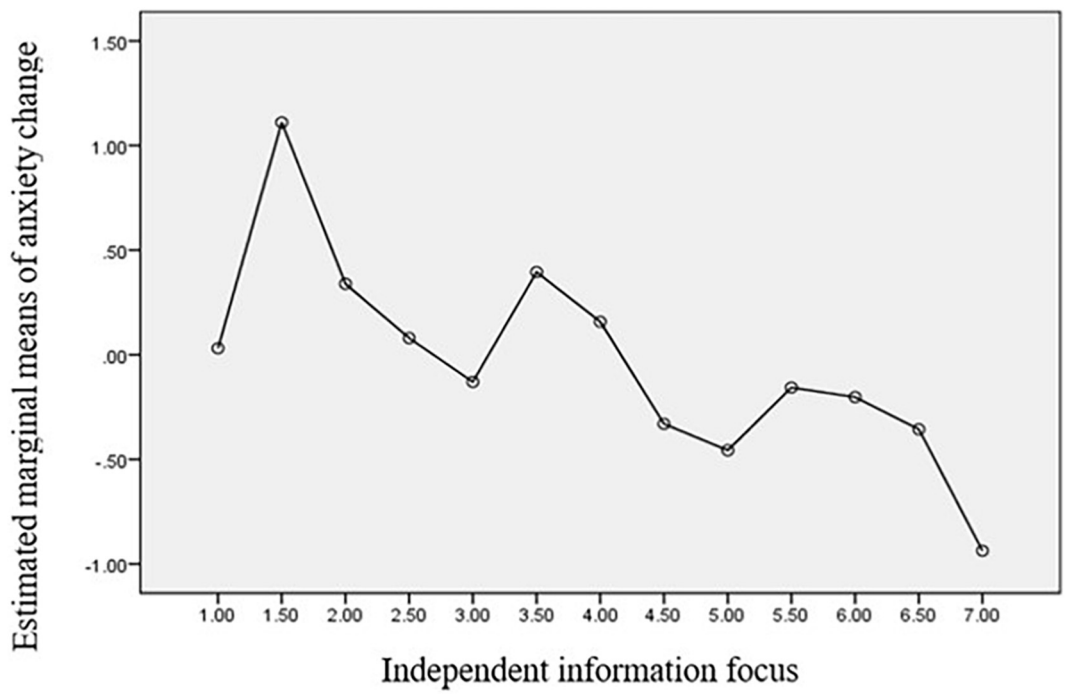

FIGURE 3 | Estimated marginal means of anxiety Change.

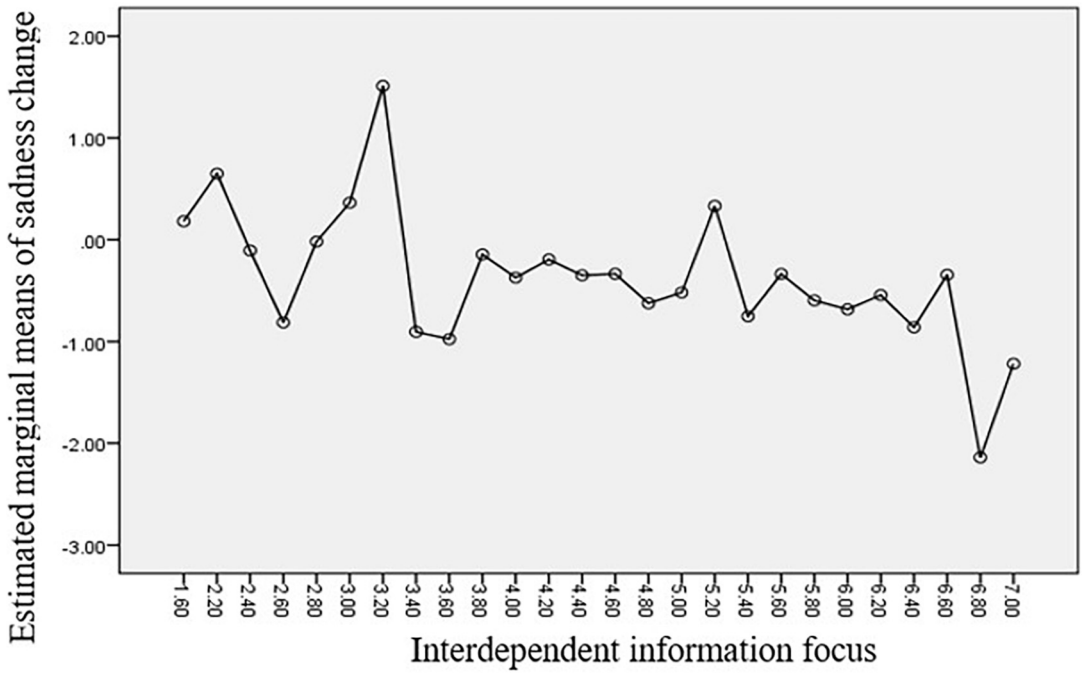

FIGURE 4 | Estimated marginal means of sadness Change.

rather than laboratory data, investigated the effectiveness of these coping strategies. However, longitudinal data may include some potential confounding effects, therefore, continuous laboratory studies in the future could be beneficial in excluding confounding factors.

Future Research

Van Bavel et al. (2020) emphasized the importance for the social and behavioral sciences to contribute to the management of the COVID-19 pandemic and its effects. Scholars have also underlined how the central recovery tasks should include a framework for coping with negative emotions (Li W. et al., 2020). Aiming to provide insights into emotion regulation during and after the outbreak, our study compared the effectiveness of coping strategies based on longitudinal data. Many scholars have already proposed the regulation of negative emotions, but there is scant evidence to support the actual effectiveness of such strategies during the COVID-19 pandemic. Hence, our research on these coping strategies, and the findings thereof could also apply to future public health crises.

While social distancing became the predominant measure to slow the spread of the virus thus far, individuals could only regulate negative emotions through limited actions. There is, therefore, an urgent need to explore coping strategies that authorities can implement flexibly and globally. Compared to behaviors, a cognitive approach is easier to guide. However, most available research has discussed coping strategies from a behavioral approach rather than a cognitive one. Some scholars have demonstrated that individuals would focus on negative (vs. positive) information when they felt certain emotions (Yiend, 2010; Tamir, 2016). However, only a few studies identified information attention as a coping strategy. Hence, to the best of our knowledge, this is the first study to discuss the cognitive coping strategies of negative emotions. Moreover, we proved the effectiveness of independent and interdependent information focus strategies in mitigating the negative emotions in question. This novel way of information classification provides insight for researchers to understand individuals' thought processes and the kinds of information they would need during disasters.

Another limitation of previous research on emotion regulation during public emergencies was the lack of emotional distinction. The majority of studies either focused on one of the negative emotions or treated as a whole. Continuing the discussion about their differences (e.g., Raghunathan and Pham, 1999; Lerner and Keltner, 2001), our research focused on five negative emotions elicited by the COVID-19 outbreak and matched effective coping strategies to each emotion. The findings highlighted the importance of distinguishing each negative emotion and its relevant coping strategy in major public emergencies in future studies.

Policy Suggestions

As previously mentioned, our study emphasized the significance of distinguishing negative emotions during the pandemic and confirmed that individuals sought after different information to cope with these emotions. The findings should prompt governments to attach importance to identifying the pervasive sentiment during each stage of the outbreak, in accordance with the severity of given areas, and to implement tailor-made

intervention strategies to alleviate individuals' negative emotions effectively.

In terms of communication, governments need to release relevant information based on a scientific and programmatic plan. Specifically, for individuals experiencing fear and anxiety, governments could provide the following information: (1) accurate and timely data about the current situation, such as the number of new infections and recoveries, (2) government's efforts to control the spread of the virus, and (3) professional suggestions regarding protection, such as how to appropriate masks. For individuals experiencing sadness or anger, governments can communicate information about: (1) the role that humans play in the ecosystem, (2) the relationship between humans and wildlife, and (3) the measures taken to protect wildlife.

Moreover, we collected our second round of data when the national number of new infected cases was zero, before the government's official termination of the lockdown measures. Despite this, all five negative emotions significantly subsided in both Hubei and other provinces. The data indicated that the severity of the situation had a higher possibility of inducing negative emotions in the public than the lockdown measures did. Hence, we highly recommend policymakers to implement measures to control the outbreak and reduce the number of new infections, rather than focusing on tightening or loosening restrictions.

CONCLUSION

Building on the longitudinal data gathered during the COVID-19 outbreak, we found that individuals tended to view the pandemic from an independent-self standpoint and focus on "immediate" information related to the current status of the virus (independent information focus) if they felt fear, sadness, and anxiety. Conversely, they would view it from the interdependent-self standpoint and focus on information about the relationship between humans and nature (interdependent information focus) to cope with fear, sadness, and anger. However, independent information was only effective in decreasing fear and anxiety, while interdependent information significantly reduced sadness. We attributed this difference to the causes of each emotion. This finding could contribute to the recovery management of the COVID-19 pandemic and apply to future public emergencies.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

YS and YL performed material preparation, data collection, and analysis. YW and FL assisted in data collection and analysis. YL wrote the first draft of the manuscript. All authors commented on previous versions of the manuscript, read and approved the final manuscript, and contributed to the study conception and design.

FUNDING

This work was supported by the National Natural Science Foundation of China – 71902005.

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