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The Impact of Anthropomorphism Strategy on Green Consumption Behavior

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Abstract

Background and Aim: With the development of industrialization and urbanization, people's living standards have been continuously improving. However, this process is accompanied by significant environmental issues, as the global scale of consumption behaviors expands and resource consumption behavior levels increase, leading to increasingly severe environmental problems. Therefore, green consumption behavior has gradually gained widespread attention in academia. Research suggests that anthropomorphism is an effective information dissemination strategy, as visual information is more easily remembered and facilitates information recall compared to textual information. Previous studies have shown that providing anthropomorphism green advertisements can generate more positive attitudes toward green cause-related marketing. There are still some gaps of understanding on the boundary condition of anthropomorphism of environmental hazards. There is no research on the mechanism of how anthropomorphism of environmental hazards affects green consumption. Thus, the study wants to explore the impact mechanism of anthropomorphism of environmental hazards on green consumption behavior.

Materials and Methods: Using structured questionnaires, quantitative data on green consumption behavior are collected from urban residents aged 20 and above. SPSS and AMOS are both used to analyze the data, such as reliability, validity, fit, mediation effect, etc. The study employs Structural Equation Modelling (SEM) to test the relationships among each variable and to test hypotheses.

Results: Anthropomorphism positively impacts green consumption behavior, with perceived empathy, perceived psychological distance, perceived threat, and vulnerability as mediating variables. In terms of promoting green consumption, perceived empathy and psychological distance have the strongest promotional effect, followed by perceived vulnerability, and perceived threat has the weakest effect of all.

Conclusion: The research suggests that using anthropomorphism of environmental hazards as a marketing method for environmental protection is effective, and can be used in green marketing strategies. According to the degree of influence of the intermediary effect, in terms of shaping anthropomorphism images for more promotion effect of the anthropomorphism strategy, it is recommended to focus first on perceived empathy and psychological distance, then on perceived vulnerability, and finally on perceived threat.

Keywords: Anthropomorphism; Green Consumption Behavior; Perceived Empathy and Psychological Distance; Perceived Threat and Vulnerability

Introduction

This study defines green consumption behaviors as consumer choices (Laukkanen,2013). It encompasses purchasing green products, using green products, engaging in waste recycling, and more efficient use of scarce resources. It should be noted that the green consumption behaviors referred to in this study specifically pertain to individual consumers and do not include organizational consumption behaviors. Anthropomorphism refers to the tendency to attribute human-like characteristics, motivations, intentions, or emotions to nonhuman entities, whether real or imagined (Epley et al., 2007). Anthropomorphism guides participants to be in first-person textual narratives and imagine linguistic interactions with objects, such as "I am a washing machine" (Wen et al.,2017).

It has been found that anthropomorphism effectively promotes green consumer behavior. However, there are still limitations in terms of model innovation, and influence mechanisms. Additionally, this study identifies a deficiency in previous research where anthropomorphism is treated as a singular object of study, lacking content segmentation. This study hopes to make contributions in three aspects, such as model innovation, exploration of influence mechanisms, and anthropomorphism content segmentation. The research conclusions can provide more effective suggestions for government managers, marketers, and environmental organizations.

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Objectives

Under the innovative theoretical framework, this study aims to thoroughly explore the impact mechanisms of anthropomorphism strategies on green consumption behavior.

Literature review

In terms of theory

The Social Cognitive Theory (SCT) is a significant research framework within the field of business administration. It examines how individuals perceive, comprehend, and interpret information and events in the social world, and subsequently predicts and explains their behaviors. This theory encompasses several dimensions, including psychological distance, cognitive empathy, anthropomorphism, and regulatory focus. Research indicates that changes in psychological distance influence individuals' perception and processing of information. Greater psychological distance may lead to abstract and high-level processing of information, whereas closer psychological distance prompts individuals to focus more on details and specific information (Thomsen et al., 2016). Individuals, through their cognitive empathy capabilities, gain a better understanding of others' needs and emotions, thus being more inclined to make decisions that align with others' interests (Li, W., Li, H., & Zhang, Y., 2021).

The Protective Motivation Theory (PMT) is a significant theory of behavior change. It posits that information sources can originate from both external and internal factors, and its core revolves around cognitive mediation, which includes threat appraisal and coping appraisal. MT suggests that individuals' understanding, cognition, and coping with danger trigger protective motivation, leading to behavioral changes. The central idea is that individual behavior is essentially determined by cognitive regulation, which means the underlying mechanism and process of green consumer behavior change result from individuals' motivation to protect their safety and interests. When individuals receive information about a damaged object or entity, they tend to compensate for their moral standards through green consumption due to their emotional empathy and concern, considering their own or societal benefits (Liu & Chen, 2021). Personifying environmental hazard outcomes render information diagnostically valuable, inducing cognitive high-level processing and prompting positive behaviors (Li et al., 2021).

In terms of anthropomorphism research

Anthropomorphism refers to the tendency to attribute human-like characteristics, motivations, intentions, or emotions to nonhuman entities, whether real or imagined (Epley et al., 2007). They found that anthropomorphism can alleviate perceived risks. In advertising, anthropomorphism typically involves the use of visual and verbal cues. Visual cues prompt viewers to perceive human-like traits in objects that lack inherent animation, such as a car grill with a smiley face (Panka et al., 2007). Verbal cues, on the other hand, encourage viewers to imagine a verbal interaction with an object through first-person narration, such as saying "I am a washing machine" (Wen Wan et al., 2017).

Previous research has explored various strategies to anthropomorphize advertised products. For instance, scholars have assigned human qualities to products, such as giving them human names (May et al., 2014). Additionally, first-person descriptions have been employed to create a sense of personal identification, such as using phrases like "I can help you" (Panka et al., 2007; Hur et al., 2015). Participants exposed to a lightbulb and a garbage bin with human-like features (eyes, nose, and mouth) and accompanied by first-person narration are more likely to support an energy conservation campaign (Ahn et al.2014). Previous studies have shown that providing anthropomorphism green advertisements can generate more positive attitudes towards green cause-related marketing (Reavey & Puzakova,2018). Individuals' propensity for anthropomorphism reflects consumers' understanding of the world and their willingness to establish connections with it (Yang et al.,2019).In research related to interpersonal relationships, individuals are more inclined to assist those whom they are familiar and close with (Zhang Chao et al., 2020). There is a significant matching effect between anthropomorphism and images and types of green products, where egoistic green products match human images, and altruistic green products match animal images, leading to better persuasive effects (Wang et al.,2020). Brand anthropomorphism promotes the co-creation of value between consumers and the brand (Yang & Wang,2020). Based on finding the impact of different types of anthropomorphism marketing cues, including impression-based and interaction-based cues, on consumer purchase behavior, with brand commitment as the mediating variable, the intrinsic mechanisms of anthropomorphism marketing's influence on consumer purchase behavior are found (Tian,2021). Connectivity is a fundamental need factor in consumer social motivation (Amoako et al., 2022), and anthropomorphism triggers a natural

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connection between people and their surroundings, thereby influencing green consumption behavior. By attributing human-like traits and characteristics to eco-friendly products, marketers can evoke feelings of empathy, trust, and loyalty among consumers, thereby increasing their inclination toward sustainable purchasing decisions (Smith & Johnson, 2023).

In summary, anthropomorphism in advertising relies on visual and verbal cues to evoke human-like qualities in nonhuman entities, aiming to enhance consumer engagement and persuasion.

In terms of green consumption behavior research

The promotion and persuasion of green consumption behaviors have already garnered significant scholarly attention in 1985, and numerous studies on ecological information dissemination have been conducted (Winett et al.1985). When people perceive themselves as caring about environmental or ecological behavior, they become more active in the field of green consumption (Cornelissen et al.,2008). Increasing individuals' sense of responsibility triggers the natural guilt associated with not purchasing green products, thereby enhancing their preference for green products (Green et al.,2014). It is validated that positive environmental attitudes positively affect the intention to engage in green consumption behavior (Zhang, J., et al., 2014). It is demonstrated that environmental concern directly influences green purchase behavior, with its effect being moderated by intentional and unintentional learning (Newton et al.,2015).In terms of environmental awareness, mainstream viewpoints suggest that environmental awareness significantly influences green consumption behavior (Suki, 2016). There have been studies exploring the relationship between individuals' self-efficacy, consumption attitudes, and green consumption behavior (Hsu & Lin, 2015; Ebru et al., 2015). Reminding individuals of their past environmental behaviors can enhance their sense of environmental responsibility and positively influence their more effective selection of green products (Wu et al.,2018). The research examined the variables influencing energy-saving behaviors and identified underlying factors, illustrating a positive association between consumers' energy-saving behavior and green promotion (Wang et al.2019). Consumer self-regard (expectation of practicing personal standards) leads to the occurrence of green consumption behavior (Testa et al.,2019). From the perspective of values, green consumption is influenced by values, beliefs, and standards. Promoting environmental values enhances consumers' attention to corresponding value information and guides them to choose environmentally friendly products (Meng et al.,2020). The research recognized education as a potent tool across various industries, enhancing society's environmental beliefs, with green communication methods serving as a guiding force in promoting green consumption behavior (Liu et al.2021). Social norms and peer influence significantly increase green consumer behavior, highlighting the importance of community and social networks in promoting sustainability (Smith, 2023). Eco-labels and certifications enhance consumer trust and willingness to purchase green products, suggesting that clear and credible labeling is crucial for encouraging sustainable consumption (Wang & Chen, 2023). Increased environmental awareness and education are directly linked to higher rates of green purchasing behaviors, indicating that informed consumers are more likely to make sustainable choices (Garcia & Lee, 2024).

In summary, green consumption behavior will be affected by factors such as emotions and values. The study of these factors is of great significance for enhancing individuals' intention to engage in green consumption behavior and improving the level of green consumption behavior.

Summary of the literature review

Retracing the research achievements on green consumption behavior, research pays little attention to the influence mechanisms on green consumption behavior, with greater emphasis on communication and persuasive effects of green consumption. The existing research lacks a comprehensive understanding of persuasive mechanisms and a focus on consumers' perceptions during the consumption process. This study attempts to explore a new influencing mechanism of anthropomorphism strategies for promoting green consumption behavior through perception.

Conceptual Framework

Definitions of variables

Anthropomorphism of Environmental Hazards (AH): Anthropomorphism refers to the tendency to attribute human-like characteristics, motives, intentions, or emotions to non-human entities, either real or imagined behaviors (Epley et al.,2007). Anthropomorphism of environmental hazards is a marketing strategy, that can increase the similarities between the environment and humans, it enhances the mutual understanding between the environment and individuals (Zhang C et al.,2020).

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Perceived Empathy (PE): Empathy is an active utilization of psychological simulation, transforming the identified object into a subjectivity with psychological intentions through the process of humanization (Xie et al.,2017).

Perceived Psychological Distance (PD): Psychological distance is a judgment criterion based on people's subjective perception when comparing an event or object to a reference point, and its evaluation criterion is based on people's perception (Li Wei et al.,2021).

Perceived Three (PT) perceived threat is a concept within the realm of social psychology that represents the psychological fear and demand for harm posed by the external environment to individuals (Lu, X.M et al.,2020). Threat perception is based on the trade-off between taking no action (not engaging in risk-protective behavior) and the existing risk (Li Wei et al.,2021).

Perceived Vulnerability (PV): In this study, perceived vulnerability is defined as the potential harm or loss of life, indicating the extent to which an individual is susceptible to harm from nature or other entities (Pavlou,2004). It can also refer to the potential sensitivity of an individual or social group to losses (Shen Wang et al.,2020).

Green Consumption Behaviors (GB): This study defines green consumption behaviors as the consumer choices in the process of purchasing, using, and disposing of products or services to reduce environmental pollution or resource waste (Laufková,2013). It encompasses purchasing green products, using green products, engaging in waste recycling, and more efficient use of scarce resources.

Conception Framework

Based on Social Cognitive Theory (SCT), this study picks empathy and perceived psychological distances as the mediating variables. Based on the Protective Motivation Theory (PMT), this study picks the perceived threat and vulnerability as another two mediating variables. The relationship between them is in Table 1.

Table 1 Research Conception Framework

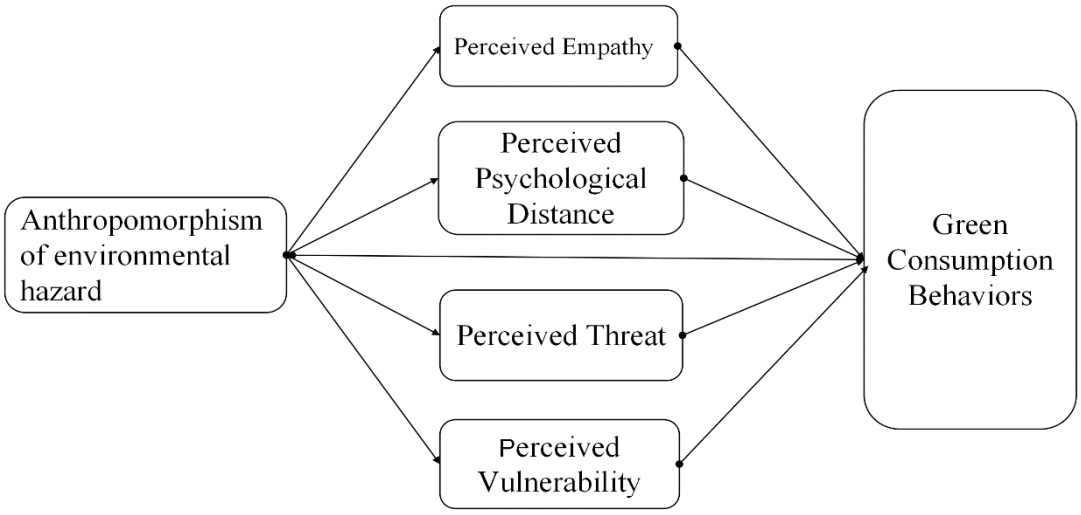

Figure 1 Conception Framework

Theoretical hypothesis

According to the research of the literature review, based on the relationship between independent variables, mediator variables, and dependent variables, the study hypothesizes as follows:

H1: Anthropomorphism of environmental hazards has a positive impact on green consumption behavior.

H2a: Anthropomorphism of environmental hazards has a positive impact on empathy.

H2b: Perceived empathy has a positive impact on green consumption behavior.

H3a: Anthropomorphism of environmental hazards has a positive impact on perceived psychological distance.

H3b: Perceived psychological distance has a positive impact on green consumption behavior.

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H4a: Anthropomorphism of environmental hazards has a positive impact on perceived threat.

H4b: Perceived threat has a positive impact on green consumption behavior.

H5a: Anthropomorphism of environmental hazards has a positive impact on perceived vulnerability.

H5b: Perceived vulnerability has a positive impact on green consumption behavior.

Methodology

Establishment of anthropomorphism of environmental hazards

There are various kinds of environmental hazards, such as car exhaust, harmful gases, noise, pesticides, electromagnetic radiation, etc. Because pesticides are familiar to most people, to reduce misunderstandings, this study selected pesticides as the basis for anthropomorphism of environmental hazards image.

The description for the anthropomorphism pesticides is as follows: "Hello, everyone! I am a powerful pesticide capable. I can eradicate pathogens and kill insects easily. I'm quite impressed! However, I can also hide in fruits and vegetables, leaving pesticide residues. I can reside in the soil, leading to soil degradation and pollution. I can even evaporate into the air; I can roam around as I please. My human friends, please be cautious of me and protect the environment!"

The anthropomorphism scale used in this study is adapted from the scale developed by Panka et al. (2007). The measurement items are modified using the back-translation (Brislin, R. W.,1970). Back-translation is widely used in fields such as cross-cultural research and questionnaire surveys. After four steps of initial translation, back-translation, proofreading, and revision, the accuracy of information transmission in different languages and cultural backgrounds is ensured. Finally, the anthropomorphism scale includes four items: "This representation looks similar to a human," "This representation has human-like thoughts," "This representation has some emotions," and "This representation can communicate like a human."

Collect samples

The research uses a constructed survey questionnaire to collect the data from the samples. The primary research method employed was a questionnaire survey passed STIU-HREC037/2024 certified.The questionnaire has two parts. The first part includes the screening questions and demographic questions. This part comprises 6 choice questions, encompassing gender, age, place of residence, personal monthly income, and educational level. The age and place of residence are the screening questions because the sample requirement stipulates individuals who are urban residents aged 20 and above. The second part is about the impact of anthropomorphism of environmental hazards on green consumption behavior, including the measurement of four intermediary variables. Maturity scales are selected for all variables. The questionnaire consists of 26 items, following the 7-point Likert scale (Likert, 1932). The questions ask respondents to express their attitudes from 1 (strongly disagree) to 7 (strongly agree). The larger the value, the more agreement, the smaller the value, the more disagreement.

A field survey and the data collection method with the snowball sampling technique are both used to collect the data. Field survey offers in-depth understanding and detailed insights, suitable for research requiring a profound exploration of audience perspectives and experiences. After designing the survey questionnaire, the research team will go to the urban residential communities, parks, supermarkets, and similar places with high foot traffic, because it is easy to find the target audience of urban residents aged 20 and above in these places. The survey's purpose and procedure are first introduced to participants, and after obtaining consent, the questionnaires are distributed. After collecting the questionnaires, a keychain is given to the participant as a token of thankless. Snowball sampling is suitable to the research which is focused on connections and the spread of information within a community. To reduce the time and resources to find participants, snowball sampling can enable initial participants to vouch for the researcher, making subsequent participants more willing to participate (Goodman, L. A. (1961). The process of data collection through snowball sampling is as follows. The questionnaires will be initially distributed to the research team's families, friends, and colleagues who meet the sample criteria. After completing the survey, they are asked to distribute and collect the questionnaires with their families, friends, or colleagues who meet the requirements.

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Within a one-month timeframe, a total of 446 samples answers the questionnaire. After excluding questionnaires, mainly due to issues such as consecutive identical responses, contradictory options, and missing items, a total of 394 usable questionnaires were obtained. The effective questionnaire rate is 88.34%.

Reliability & Validity Analysis

This study involves Cronbach's Alpha reliability tests. If α is above 0.8, it indicates high reliability; if α is between 0.7 and 0.8, it suggests good reliability; if α is between 0.6 and 0.7, it indicates acceptable reliability; if α is below 0.6, it suggests poor reliability. The results are presented in Table 2.

Table 1 Reliability results

Variable	Item	Cronbach's α
Anthropomorphism of environmental hazards	4	0.854
Perceived empathy	5	0.900
Perceived psychological distance	5	0.894
Perceived threat	3	0.822
Perceived vulnerability	3	0.833
Green consumption behavior	6	0.904

Anthropomorphism of environmental hazards, consisting of 4 items, obtains a Cronbach's α value of 0.854. Perceived empathy, consisting of 5 items, obtains a Cronbach's α value of 0.900. Perceived psychological distance, consisting of 5 items, obtains a Cronbach's α value of 0.894. The perceived threat, consisting of 3 items, obtains a Cronbach's α value of 0.822. Perceived vulnerability, consisting of 3 items, obtains a Cronbach's α value of 0.833. Green consumption behavior, consisting of 6 items, obtains a Cronbach's α value of 0.904. Cronbach's α values of all items have exceeded 0.8, indicating that the data have excellent reliability.

Table 2 Results of KMO and Bartlett's spherical test

Variable	KMO	Bartlett's spherical test	
		Approximate Chi-square	P
Anthropomorphism of environmental hazards	0.818	667.846	0.000
Perceived Empathy	0.891	1125.863	0.000
Perceived Psychological Distance	0.887	1071.726	0.000
Perceived Threat	0.720	419.476	0.000
Perceived Vulnerability	0.717	455.596	0.000
Green Consumption Behavior	0.913	1310.805	0.000

The KMO value for anthropomorphism of environmental hazards is 0.818, the KMO value for perceived empathy is 0.891, the KMO value for perceived psychological distance is 0.887, the KMO value for perceived threat is 0.720, the KMO value for perceived vulnerability is 0.717, and the KMO value for green consumption behavior is 0.913. The KMO values (Table 3) are above 0.7, indicating good applicability of the data for each dimension. The results have supported the validity of the scale.

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This indicates that the data are suitable for the confirmatory factor analysis.

Confirmatory Factor Analysis

Confirmatory Factor Analysis (CFA) is a statistical method used to analyze survey data. It is employed to test whether the relationship between variables and their corresponding measurement items aligns with the theoretical relationships involved in the study. In the analysis of confirmatory factors, the commonly used reliability index factor loading λ, reliability coefficient, measurement error, combined reliability (CR value), and commonly used validity index are convergence validity (AVE) and discrimination validity. The reliability and validity results are shown in Table 4.

Table 4 Reliability and validity results

Item	Factor Loading λ	λ^2	Measurement Error	AVE	CR
AH1	0.814	0.663	-		
AH2	0.785	0.616	0.059	0.595	0.854
AH3	0.723	0.523	0.059		
AH4	0.761	0.579	0.061		
PE1	0.766	0.587	-		
PE2	0.838	0.702	0.066		
PE3	0.795	0.632	0.063	0.629	0.894
PE4	0.807	0.651	0.062		
PE5	0.757	0.573	0.062		
PD1	0.787	0.619	-		
PD2	0.812	0.659	0.059		
PD3	0.84	0.706	0.058	0.644	0.900
PD4	0.775	0.601	0.057		
PD5	0.797	0.635	0.058		
PT1	0.767	0.588	-		
PT2	0.806	0.650	0.072	0.607	0.822
PT3	0.762	0.581	0.067		
PV1	0.832	0.692	-		
PV2	0.774	0.599	0.060	0.627	0.834
PV3	0.768	0.590	0.061		
GB1	0.782	0.612	-		
GB2	0.788	0.621	0.058		
GB3	0.788	0.621	0.057	0.610	0.904
GB4	0.778	0.605	0.058		
GB5	0.769	0.591	0.058		
GB6	0.782	0.612	0.060		

Notice: '-' represents the default path set by Amos, and does not display data.

For anthropomorphism of environmental hazards (AH), the factor loadings range from 0.723 to 0.814, surpassing the standard of 0.5. The average variance extracted (AVE) is 0.595, surpassing the standard of 0.5, and the composite reliability (CR) value is 0.845, surpassing the standard of 0.6. The data indicates good convergent validity for the anthropomorphism of environmental hazards.

For perceived empathy (PE), the factor loadings range from 0.757 to 0.838, surpassing the standard of 0.5. The average variance extracted (AVE) is 0.629, surpassing the standard of 0.5, and the composite reliability (CR) value is 0.894, surpassing the standard of 0.6. The data results indicate good

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convergent validity for perceived empathy.

For perceived psychological distance (PD), the factor loadings range from 0.775 to 0.840, surpassing the standard of 0.5. The average variance extracted (AVE) is 0.644, surpassing the standard of 0.5, and the composite reliability (CR) value is 0.900, surpassing the standard of 0.6. The results suggest good convergent validity for perceived psychological distance.

For perceived threat (PT), the factor loadings range from 0.762 to 0.806, surpassing the standard of 0.5. The average variance extracted (AVE) is 0.607, surpassing the standard of 0.5, and the composite reliability (CR) value is 0.822, surpassing the standard of 0.6. The data results indicate good convergent validity for perceived threat.

For perceived vulnerability (PV), the factor loadings range from 0.768 to 0.832, surpassing the standard of 0.5. The average variance extracted (AVE) is 0.627, surpassing the standard of 0.5, and the composite reliability (CR) value is 0.834, surpassing the standard of 0.6. The data results indicate good convergent validity for perceived notability.

For green consumption behavior (GB), the factor loadings range from 0.769 to 0.788, surpassing the standard of 0.5. The average variance extracted (AVE) is 0.610, surpassing the standard of 0.5, and the composite reliability (CR) value is 0.904, surpassing the standard of 0.6. The results suggest good convergent validity for green consumption behavior.

The results (in Table 5) of factor loadings, AVE, and CR value of the 6 variables make sure that the data have a good convergence validity.

Table 4 Discriminative validity

	AH	PD	PE	PT	PV	GB
AH	**0.771**					
PD	0.493	**0.793**				
PE	0.458	0.447	**0.803**			
PT	0.451	0.449	0.432	**0.779**		
PV	0.445	0.389	0.408	0.392	**0.792**	
GB	0.531	0.509	0.510	0.487	0.471	**0.781**

The analysis for discrimination validity is shown in Table 5.

For anthropomorphism of environmental hazards (AH), the AVE square root value is 0.771, which is greater than the maximum value (0.531) of the absolute correlation coefficient between factors. Such results indicate that the data have good discriminatory validity.

For perceived psychological distance (PD), the AVE square root value is 0.793, which is greater than the maximum value (0.509) of the absolute correlation coefficient between factors. Such results indicate that the data have good discriminatory validity.

For perceived empathy (PE), the AVE square root value is 0.803, which is greater than the maximum value (0.510) of the absolute correlation coefficient between factors. Such results indicate that the data have good discriminatory validity.

For perceived threat (PT), the AVE square root value is 0.779, which is greater than the maximum value (0.487) of the absolute correlation coefficient between factors. Such results indicate that the data have good discriminatory validity.

For perceived vulnerability (PV), the AVE square root value is 0.792, which is greater than the maximum value (0.471) of the absolute correlation coefficient between factors. Such results indicate that the data have good discriminatory validity.

For green consumption behavior (GB), the AVE square root value is 0.781, which is greater than the maximum value (0.531) of the absolute correlation coefficient between factors. Such results indicate that the data have good discriminatory validity.

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Table 5 Results of the model-fit index

Common index	$\chi 2$	*df*	$\chi 2/df$	GFI	RMSEA	CFI
Judging standard	-	-	<3	>0.9	<0.05	>0.9
value	419.736	284	1.478	0.926	0.035	0.977

The results of model fit are shown in Table 5.

The value of χ^2 / df is 1.478, meeting the judging standard of less than 3, indicating a good fit of the model to the observed data.

The value of GFI is 0.926, meeting the judging standard of greater than 0.9, indicating a good fit of the model to the observed data.

The value of RMSEA is 0.035, meeting the judging standard of less than 0.05, indicating a good fit of the model to the observed data.

The value of CFI is 0.977, meeting the judging standard of greater than 0.9, indicating a good fit of the model to the observed data.

Considering these indicators comprehensively, we can conclude that the model has a good fit degree, which is more consistent with the observed data.

Hypothesis Testing

The structural equation model is built based on the conceptual framework. From the relationships among anthropomorphism of environmental hazards, empathy, perceived psychological distance, perceived threat, perceived vulnerability, and green consumption behavior, the results of path coefficients and hypothesis testing are shown in Table 6.

Table 6 Results of path coefficients and hypothesis testing

Hypothesis	Y	←	X	Standardized Regression Coefficient	SE	z (CR)	p	conclusion
1	GB	←	AH	0.221	0.098	2.301	0.021	Accepted
2a	PE	←	AH	0.588	0.063	10.064	0.000	Accepted
2b	GB	←	PE	0.198	0.053	3.522	0.000	Accepted
3a	PD	←	AH	0.624	0.061	10.459	0.000	Accepted
3b	GB	←	PD	0.186	0.058	3.160	0.002	Accepted
4a	PT	←	AH	0.608	0.063	9.777	0.000	Accepted
4b	GB	←	PT	0.177	0.061	2.900	0.004	Accepted
5a	PV	←	AH	0.573	0.067	9.645	0.000	Accepted
5b	GB	←	PV	0.172	0.052	2.973	0.003	Accepted

The standardized regression coefficient of anthropomorphism environmental hazards is 0.221 with a z-value of 2.301 and a p-value of 0.021. It represents that when consumers face the anthropomorphism of environmental hazards, their green consumption behavior will significantly increase. Anthropomorphism of environmental hazards has a positive impact on green consumption behavior. Therefore, hypothesis 1 is accepted.

The standardized regression coefficient of perceived empathy is 0.588 with a z-value of 10.064 and a p-value of 0.000. It represents that when consumers are faced with the anthropomorphism of environmental hazards, their perceived empathy for the environment will significantly increase.

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Anthropomorphism of environmental hazards has a positive impact on empathy. Therefore, hypothesis 2a is accepted.

The standardized regression coefficient of perceived empathy is 0.198 with a z-value of 3.522 and a p-value of 0.000. It represents that when consumers perceive empathy, their green consumption behavior will significantly increase. Perceived empathy has a positive impact on green consumption behavior. Therefore, hypothesis 2b is accepted.

The standardized regression coefficient of perceived psychological distance is 0.624 with a z-value of 10.459 and a p-value of 0.000. It represents that when consumers face with the anthropomorphism of environmental hazards, their perceived psychological distance from the environment will significantly increase. Anthropomorphism of environmental hazards has a positive impact on perceived psychological distance. Therefore, hypothesis 3a is accepted.

The standardized regression coefficient of perceived psychological distance is 0.186 with a z-value of 3.160 and a p-value of 0.002. It represents that when consumers perceive psychological distance, their green consumption behavior will significantly increase. Perceived psychological distance has a positive impact on green consumption behavior. Therefore, hypothesis 3b is accepted.

The standardized regression coefficient of perceived threat is 0.608 with a z-value of 9.777 and a p-value of 0.000. It represents that when consumers face the anthropomorphism of environmental hazards, their perceived threat to the environment will significantly increase. Anthropomorphism of environmental hazards has a positive impact on perceived threat. Therefore, hypothesis 4a is accepted.

The standardized regression coefficient of perceived threat is 0.177 with a z-value of 2.900 and a p-value of 0.004. It represents that when consumers perceive a threat, their green consumption behavior will significantly increase. A perceived threat has a positive impact on green consumption behavior. Therefore, hypothesis 4b is accepted.

The standardized regression coefficient of perceived vulnerability is 0.573 with a z-value of 9.645 and a p-value of 0.000. It represents that when consumers face the anthropomorphism of environmental hazards, their perceived vulnerability to the environment will significantly increase. Anthropomorphism of environmental hazards has a positive impact on perceived durability. Therefore, hypothesis 5a is accepted.

The standardized regression coefficient of perceived vulnerability is 0.172 with a z-value of 2.973 and a p-value of 0.003. It represents that when consumers perceive vulnerability, their green consumption behavior will significantly increase. Perceived notability has a positive impact on green consumption behavior. Therefore, hypothesis 5b is accepted.

Mediating Effect testing

This study followed the Bootstrap mediation effect testing method by Amos software. Referring to the parallel multiple mediation testing process (Fang et al.2014) and utilizing the bias-corrected Bootstrap method, 5000 Bootstrap samples are randomly drawn. Based on a 95% confidence level, confidence intervals are estimated using the 97.5th and 2.5th percentiles. The results of the mediation effect analysis are shown in Table 7.

Table 7 Results of the mediation effect

	Influence path	Standard indirect effect values	Standard direct affect value	Boot standard error	The 95% confidence intervals of the effect values	
					lower limit	upper limit
1	AH→PE→GB	0.116	0.221	0.030	0.070	0.195
2	AH→PD→GB	0.116	0.221	0.029	0.071	0.189
3	AH→PT→GB	0.108	0.221	0.033	0.057	0.194
4	AH→PV→GB	0.099	0.221	0.033	0.051	0.188

In the first path, the standard indirect effect value is 0.116, and the direct effect value is 0.221, with a standard error of 0.030 and a 95% confidence interval of [0.070,0.195] (did not contain 0). The results indicate that perceived empathy has directly affected green consumption behavior. It suggests that perceived empathy plays a significant mediating role between the anthropomorphism of hazard sources and green consumption behavior.

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In the second path, the standard indirect effect value is 0.116, the direct effect value is 0.221, with the standard error is 0.029, and the 95% confidence interval [0.071,0.189] (did not include 0). The results indicate that part of the perceived psychological distance also directly affects green consumption behavior. It suggests that perceived psychological distance plays a significant mediating role between the anthropomorphism of environmental hazards and green consumption behavior.

In the third path, the standard indirect effect value is 0.108, and the direct effect value is 0.221, with a standard error of 0.033 and a 95% confidence interval [0.057,0.194] (did not include 0). The results indicate that part of the perceived threat also directly affects green consumption behavior. It suggests that perceived threat plays a significant mediating role between the anthropomorphism of environmental hazard sources and green consumption behavior.

In the fourth path, the standard indirect effect value is 0.108, and the direct effect value is 0.221, with a standard error of 0.033 and a 95% confidence interval [0.051,0.188] (did not include 0). The results indicate that part of the perceived threat also directly affects green consumption behavior. This suggests that perceived vulnerability plays a significant mediating role between the anthropomorphism of environmental hazard sources and green consumption behavior.

In summary, these results show that the mediation effect obtained by Bootstrap repeated sampling analysis is statistically significant. The results verify the mediation effect of perceived empathy, perceived psychological distance, perceived threat, and vulnerability in the research model.

Discussion

Theoretical innovation is achieved. By integrating social cognitive theory (SCT) and protective motivation theory (PMT), the study is among the first to research the impact of anthropomorphic strategies on green consumption behavior. The study develops an innovative framework, which helps us to fully understand the impact of anthropomorphic strategies on green consumption behavior.

Hypotheses are verified to be accepted. The anthropomorphism strategy of environmental hazards can actively promote green consumption behavior. Perceived empathy, perceived psychological distance, perceived threat, and perceived vulnerability can play a mediating role in promoting green consumption behavior. They can significantly promote green consumption behavior.

A new influence mechanism is established. Anthropomorphic marketing strategies can increase the occurrence of green consumption behaviors by increasing consumers' perceived empathy, perceived psychological distance, perceived threat, and vulnerability.

Conclusion

Anthropomorphism strategy can significantly promote green consumption behavior. The research results indicate that the anthropomorphism of environmental hazards has a positive impact on green consumption behavior. This suggests that using anthropomorphism of environmental hazards as a marketing method is effective for green consumption behavior.

Enhanced perception can improve the marketing effect of anthropomorphism. The research indicates that perceived empathy, perceived psychological distance, perceived threat, and vulnerability can more effectively promote green consumption behavior. It shows that an anthropomorphism marketing strategy should emphasize anthropomorphism characteristics from the four aspects. This approach can more significantly promote green consumption behavior.

Different anthropomorphic characteristics produce different impacts. In terms of promoting green consumption, perceived empathy and psychological distance exhibit the most significant influence, followed by perceived vulnerability, and perceived threat has the least significant influence. Positive emotions generated through empathy are more likely to lead to positive behaviors, while negative emotions such as threat and vulnerability may appear to affect positive behaviors. It is a new area that requires in-depth research, most likely involving the field of psychology.

There are limitations in this study. The first is the data collection method. To improve the quality of data, this study used the snowball sampling method. However, it will reduce the randomness and representation of the sample. It will cause the sample characteristics not well reflect the

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characteristics of the survey population. Future research can use probability sampling methods to further improve the representation of the sample. The second is the moderator variable. Consumption behavior will be affected by personal factors, such as self-efficacy, regulatory focus, etc. Therefore, to enrich research results, it is suggested to consider adding moderator variables to enrich research results in future research.

Recommendation

For Marketing professionals. By incorporating anthropomorphism elements in marketing activities, such as adding eyes, nose, mouth, etc. on the product, marketers can enhance consumers' emotional connection, leading to buying more green products. For example, they can print a mouth on an environmental bag, and let the "mouth" say "I am made of 30 recyclable plastic bottles and no trees are used." This kind of marketing method first clears the environmental features of the bag. Then it can increase sales of bags. At the same time allows consumers to witness that plastics can indeed be recycled and reused. It affirms the environmentally friendly practice of recycling and reuse and continues to call for more green consumption behaviors. It needs to be emphasized that ethical issues must be considered, such as belief, personal privacy, etc.

For policymakers. To enhance governance, anthropomorphism can be elemental in policy development. For example, post anthropomorphic images on public walls, such as the blue sea with a big smile, the closed faucet with a thumbs up, inspirational stairs and empty elevators, etc. These images can create more empathy among people. Such government advocacy can encourage more green consumption behaviors, and finally improve the governance capabilities. It needs to be emphasized that ethical issues must be taken into consideration, such as race issues, customs, protection of minors, etc.

For environmental protection organization. They can use anthropomorphism to highlight the importance of environmental issues and encourage sustainable green consumption behaviors, thereby fostering greater public engagement and support for environmental initiatives. For example, they can produce some public charity products and badges, and then distribute them to people. The shape of public charity products can be anthropomorphic images, such as waving trash cans, thriving trees, swimming fish, free-flying birds, etc. It can shorten the psychological distance between the environment and people, and it also can enhance people's awareness of environmental protection. At the same time, such an approach is good not only for promoting green consumption but also for contributing to broader environmental and societal goals, such as social stability, peace, economic development, etc.

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