Highlights in environmental psychology: Pro-environmental purchase intent

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Editorial: Highlights in environmental psychology: pro-environmental purchase intent

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Editorial on the Research Topic
Highlights in environmental psychology: pro-environmental purchase intent

Pro-environmental purchase is a topic of rising importance worldwide because it contributes to making consumption patterns more responsible (De Canio et al., 2021). Pro-environmental behavior can be defined as "behavior that harms the environment as little as possible, or even benefits the environment" (Steg and Vlek, 2009, p. 309; Ertz et al., 2016, p. 3971). Consequently, pro-environmental purchase (PEP) must be understood as a specific form of buying that harms the natural environment as little as possible and even benefits it. Products and services falling under that category are also called "green" and include, among others, energy-efficient household appliances (Nguyen et al., 2016; Teoh et al.), water-saving appliances (Wang and Tian), eco-tourism (Fennell, 2014), eco-friendly clothing (Wiederhold and Martinez, 2018), eco-designed products (Zeng et al., 2017), bioplastics-based products (Atiwesh et al., 2021), organic food products (Rodier et al., 2017), or products and services facilitating pro-environmental behaviors such as compost bags, for example. A key factor in this is consumers, who are a fundamental part of the overall consumption process and consumer society, and it is crucial to better investigate what drives them to pro-environmental purchases.

According to the selected studies, of the Research Topic, the ways to stimulate pro-environmental purchase intentions are very diverse.

The first and largest stream of papers in the Research Topic focuses on the impact of communication strategies. To Kim et al., the combination of narrative message style (storytelling) and two-sided messages increase (decrease) the perceived usefulness (skepticism) induced by pro-environmental messages on green products which in turn lead to greater behavioral intent. These results align with past results in classic marketing studies showing the effectiveness of two-sided ads in advertising,

especially among Easterners (Ertz et al., 2021). Kim et al. emphasize the benefits of message-sidedness among Westerners and for promoting pro-environmental purchases specifically. Another classic technique to instill purchase intentions is comparative advertising and Ni et al. show that under certain circumstances (i.e., egoistic appeals and consumers with lower green involvement), comparative advertising strengthens consumers' purchase intentions of green products because such advertising leads to a higher perceived diagnosticity of information. From a self-construal theory perspective, Zheng et al. demonstrate that consumers with dependent self-construal exposed to green (vs. non-green) advertising appeals perceive a higher value in the green product and are thus more likely to pay a premium for green agricultural products. Wang et al.'s use of the stimuli-organism-response (SOR) model shows that organic appeals advertisements that provide information and knowledge about organic elements of a food product (e.g., health, safety, rich nutrition, and lack of chemicals), increase consumers' intentions to purchase organic milk. Intrinsic motives play a key role in that process because organic appeals spur intrinsic or autotelic motives that lead to higher purchase intentions. These results are partly corroborated by Lee's study showing that news consumption (about circular packaging in online shopping) positively affects environmental attitudes, subjective norms, perceived behavioral control, and habits which all subsequently influence intentions and thus mediate (i.e., explain) totally the effect of news consumption on behavioral intentions. Collectively, the results of these four studies show that the more consumers are exposed to relevant information about the impact of the product under consideration on the natural environment, the likelier they are to choose the pro-environmental option.

Another stream of research explores a wider range of marketing strategies and even situational factors to influence pro-environmental purchase intentions and provides a more nuanced perspective. Teoh et al. emphasize that the more extrinsic element of product pricing exerts the strongest effect on consumer purchase intentions (CPIs), followed by brand equity, while the psychological factor of environmental awareness—an intrinsic aspect—comes only third, and after-sales services have no influence whatsoever on CPIs. From a different perspective, Son et al. show how seven residential environment elements influence place dependence and place identity—two dimensions of place attachment—and that, at least, place identity influences not only satisfaction and word-of-mouth, but also pro-environmental behavior. Place dependence does not seem to impact pro-environmental behavior though. Affective response through place identity and satisfaction thus plays a key role in spurring pro-environmental behavior.

A third stream of studies focuses more extensively on the intra-psychic variables underlying pro-environmental purchase intentions. According to Wang et al., pro-environmental values and consumption values are both important sets of variables in that they further impact green purchase attitude, perceived behavioral control, and subjective norm, which are, respectively, the strongest contributors to green car purchase intentions. Meanwhile, the study by Wang and Tian shows that consumers might perceive

some risk in pro-environmental options and that these are mainly functional, economic and psychological risks. Such perceptions have deleterious effects since they reduce consumers' quality trust and green trust in water-saving appliances, and indirectly impact willingness to buy through quality and green trust. Yet, in line with the first stream of research emphasizing the importance of knowledge (particularly Wang et al.; Lee), Wang and Tian show that consumer knowledge of water-saving appliances may weaken the negative impact of perceived risk on quality trust and green trust that indirectly inhibit purchase intentions. In sum, it is important to educate consumers with proper knowledge about the pro-environmental options so that they are better convinced about the appropriateness and benefits of those options.

In conclusion, these diverse studies illuminate further our understanding of the drivers and barriers to pro-environmental purchase intent, providing useful insights for both scholars and practitioners. The selected studies also pose a series of interesting questions that remain unanswered to further enhance pro-environmental purchase intentions, all of which could be tackled in future studies to extend the current research efforts.

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Investigating the Effects of Intrinsic Motivation and Emotional Appeals Into the Link Between Organic Appeals Advertisement and Purchase Intention Toward Organic Milk

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Consumers care about healthy food. Thus, several firms use organic appeals advertising to change consumer attitudes and persuade them to purchase organic food. Organic appeals advertisement often presents content that provides information and knowledge about organic elements of a food product (e.g., health, safety, a lack of chemicals, and rich nutrition). In contrast, non-organic appeals advertisement does not present information about organic elements of a food product. This study aims to clarify the effect of organic appeals advertisement on consumer motivations and behavior. It uses the stimuli-organism-response model and self-determination motivation theory to investigate the relationship between organic appeals advertisement and purchase intention toward organic milk considering the mediating role of intrinsic motivation and the moderating role of emotional appeals. Two experimental designs are used to test the hypotheses. Results show that consumers receiving organic appeals advertisement have a higher intention to purchase organic milk than those receiving non-organic appeals advertisement. Furthermore, intrinsic motivation is found to have a mediating role in the link between organic appeals advertisement and purchase intention. In other words, when consumers receive advertisements of an organic milk product, they have higher intrinsic motivation and hold higher intention to purchase organic milk products. Furthermore, emotional appeals have a moderating effect on the relationship between organic appeals advertisement and intrinsic motivation. The influence of organic appeals advertisement on intrinsic motivation is stronger when emotional appeals are positive and weaker when emotional appeals are negative.

Keywords: Organic advertisement, organic milk, purchase intention, intrinsic motivation, emotional appeals

INTRODUCTION

Organic food consumption has been a research focus in recent decades (Boobalan et al., 2021; van de Grint et al., 2021). With increased income and consumption knowledge, consumers are demanding more green products (Molinillo et al., 2020). Organic food is among the most demanded type of green product in today's environment. The reason is that consumers often view organic food as safer and healthier than conventional food (Suciu et al., 2019). However, organic food consumption remains low compared with conventional food because consumers lack useful information and knowledge and are unmotivated to purchase organic food (Sultan et al., 2020). Given the benefits of organic food to human health, researchers and business managers should understand factors that lead to consumers' motivation and purchase behavior toward organic food (Molinillo et al., 2020).

Organic milk is one of the most frequently consumed products (Carfora et al., 2019). Organic milk refers to several types of milk products from livestock raised according to organic farming methods. Organic milk is produced and processed without chemicals or any ingredients that harm human health (Barański et al., 2017). More and more people purchase organic milk to replace conventional milk (Scozzafava et al., 2020). However, consumption of organic milk is still largely lower than conventional milk (Carfora et al., 2019). Scozzafava et al. (2020) explained that a lack of helpful information and knowledge about organic milk is the main factor that affects consumer preferences and willingness to pay for organic milk. Thus, the authors called for more research to determine the consumption of organic milk.

Advertising is among several effective marketing strategies used to influence and persuade consumers to purchase products and services (Kotler and Armstrong, 2018). In some situations, marketers use advertising to inform and educate consumers to understand a particular product (Kim et al., 2020b). In organic milk, consumers may lack helpful information and knowledge to distinguish between organic and conventional milk. Organic appeals advertising may provide advanced information and knowledge that help consumers understand the benefits of organic milk (Rauwers et al., 2018). Organic appeals advertising refers to message content and information that explain and emphasize organic elements of a product, such as milk (Yang and Ghose, 2010). In particular, organic appeals advertising often indicates that organic milk is naturally produced with rich nutrition, is processed without chemicals, and is healthy and safe for consumers (Anghelcev et al., 2020). By contrast, non-organic appeals advertising does not present and emphasize organic elements of a milk product (Carfora et al., 2019). Organic appeals advertising may be an effective way to provide useful information and knowledge for consumers to understand organic milk products better (Anghelcev et al., 2020). Although several firms have widely used organic appeals advertising to educate and persuade consumers (Wu et al., 2019), the effect of organic appeals advertising on consumers' motivation and behavior has been unclear and lacks empirical evidence in prior literature. This research gap needs to be addressed in the current study.

Furthermore, consumers are often motivated by internal or external factors to purchase certain products (Soroka and Wojciechowska-Solis, 2019). When consumers receive a signal from the external environment, they may be internally motivated and take action toward purchasing a particular product because they find purchasing the product with their internal needs necessary (Standage et al., 2006). In organic milk, when consumers receive information from organic appeals advertisements, they understand the unique benefits and the difference between organic milk and conventional milk. Therefore, organic appeals advertisement may trigger consumers' internal motivation, leading to consumers' behavioral intention toward organic milk. In other words, intrinsic motivation may play a mediating role in the link between organic appeals advertisement and purchase intention toward organic milk. Unfortunately, the mediating mechanism of intrinsic motivation in affecting consumers' purchase behavior of organic milk has been unexplored in prior literature.

Furthermore, emotion is an important factor that influences a person's perceptions, attitudes, and behavioral outcomes (Solomon, 2018). Emotion also affects consumer decision-making (Lajante and Ladhari, 2019). Consumers who experience a negative emotion are more likely to have bad feelings and negative attitudes, leading to negative behavior (Harrison-Walker, 2019). By contrast, positive emotion makes consumers feel comfortable and pleasant and encourages consumers to shop (Septianto and Chiew, 2018). Given the importance of emotion, positive emotional appeals may increase the effectiveness of organic appeals advertising and enhance consumers' motivation toward organic milk because positive emotion often leads to consumer positive perceptions, attitudes, and behavior (Ng and Diener, 2009). However, negative emotional appeals may reduce the influence of organic appeals advertising on consumers' motivation because bad feelings and negative emotions prevent consumers from enjoying shopping (Song and Qu, 2019). The role of emotions in affecting consumers' attitudes and behavior in the shopping process is important. However, the moderating role of emotional appeals on the link between organic appeals advertising and consumers' intrinsic motivation toward organic milk has been largely ignored in prior literature.

This study fills these gaps by investigating the relationship between organic appeals advertisement and purchase intention toward organic milk, with the mediating role of intrinsic motivation and the moderating role of emotional appeals. This study contributes to the current literature in three ways. First, this study extends stimuli-organism-response (SOR) theory into the field of organic food research and uses it as a theoretical foundation to explain the direct influence of organic appeals advertisement on purchase intention toward organic milk. Second, based on self-determination motivation (SDT) theory, this study demonstrates that organic appeals advertisement increases consumers' intrinsic motivation, enhancing consumers' intention to purchase organic milk. This mediating mechanism of consumers' intrinsic motivation helps to clarify the indirect effect of organic appeals advertisement on consumer purchase intention. Thus, this study sheds new light on the direct and indirect influence of organic appeals advertisement on purchase

intention toward organic milk. Third, this study shows that positive and negative emotional appeals have different effects on the relationship between organic appeals advertisement and consumers' intrinsic motivation. This moderating mechanism of emotional appeals advances our knowledge to understand how emotional appeals influence consumer behavior in the consumption of organic milk.

THEORIES AND HYPOTHESES

SOR Theory

stimuli-organism-response has been widely applied in psychology and consumer behavior fields (Wu and Li, 2018). SOR is used to explain the relationship between environmental stimuli (S), organism (O), and behavioral response (R; Mehrabian and Russell, 1974). Specifically, environmental stimuli influence a person, eliciting a response (Kim et al., 2018). In consumer behavior research, external factors in the environment are considered as stimuli (S; e.g., advertising, brand, product, and price), the internal process when consumers receive the influence of external factors is considered the organism (O; e.g., perception, memory, recognition process), and consumers taking action toward external stimuli is considered the response (R; e.g., purchase behavior and word of mouth; Peng and Kim, 2014).

Several studies have used SOR theory to explain consumer behavior toward the consumption of food in prior literature (Kim et al., 2020a). For example, Talwar et al. (2021) adopted SOR theory. They found that food safety concerns and health consciousness positively influence openness to change and ethical self-identity, increasing consumers' willingness to buy organic food. Shah et al. (2021) used SOR and clarified the impact of different components of mobile dining on customers' perceived value, which leads to actual purchase intentions. Liang and Lim (2021) adopted the SOR model to create a comprehensive model to explain consumers' purchase decisions toward organic food. The authors found that consumer preference for natural food was the most important factor for enhancing purchase intention, followed by health consciousness, health risk, attitude toward organic food, and trust in labeling. Liu and Zheng (2019) based their study on SOR theory. They explained that consumer characteristics, food safety incidents, environmental orientation, and consumer health orientation positively relate to consumer organic cognition and purchase behavior. Given the importance of SOR in explaining the relationship between external factors and consumer responses in prior literature, this study applies SOR theory to explain the influence of organic appeals advertising on purchase intention toward organic milk.

Organic Appeals Advertisement and Purchase Intention

Advertising is a powerful promotional tool used by firms to influence consumers' perceptions, attitudes, and behavior (Kotler and Armstrong, 2018). Specifically, marketers often use advertising to change consumers' attitudes and persuade them

to purchase products and services (Shaouf et al., 2016). In general, advertising appeals can be divided into emotional and rational appeals. The former refers to advertising that can elicit consumers' negative or positive emotions (e.g., adverts that are funny, lovely, sad, or charming). In contrast, the latter refers to advertising that indicates the benefits and values of products and services for consumers (Kotler and Armstrong, 2018). Belch and Belch (2004) suggested that rational advertising focuses on consumers' real needs toward a product by emphasizing the characteristics, values, and benefits consumers would have if they bought and used a product. Rational advertising is often used to inform and persuade that the new product is superior to existing products (Kotler and Armstrong, 2018).

In the last few years, the demand for organic milk products has been gradually increasing. The reason is that consumers demand more healthy and safe milk products (Boobalan et al., 2021). However, although organic milk is superior to traditional milk in several ways, a lack of useful information and knowledge has prevented consumers from purchasing organic milk (Scozzafava et al., 2020). Several firms have used organic appeals advertising to educate and persuade consumers (Rauwers et al., 2018). However, the effect of organic appeals advertising on consumer purchase behavior has been untested and unclear in prior literature, limiting our understanding of the different effects between organic and non-organic appeals advertising. Thus, the low consumption of organic milk products must be because consumers care about their health and safety (Carfora et al., 2019; Scozzafava et al., 2020). According to SOR theory (Mehrabian and Russell, 1974), organic appeals advertising can be viewed as an external stimuli (S) that exerts an influence on consumers (O), who will take action (R) toward external stimuli. Specifically, when exposed to organic appeals advertising, consumers may notice and understand the benefits of organic milk. As a result, they may hold a high intention to purchase organic milk because they believe that consumption of organic milk brings health and hygiene (Qin et al., 2009). In other words, organic appeals advertising provides valuable information and knowledge about the benefits of organic milk for consumers. In this case, organic appeals advertising provides information to remind consumers, educates, and offers knowledge for consumers to understand and distinguish between organic and non-organic milk products. Given the information and knowledge received from advertising appeals, consumers may understand the superiority of organic milk compared with conventional milk. As a result, consumers become more likely to purchase organic milk. The reason is that consumers increasingly care about their health and safety while having enough information and rich knowledge about organic milk products obtained from advertisements (Jaeger and Weber, 2020). By contrast, when consumers watch non-organic appeals advertising, they may not fully understand the superior benefits of organic milk and the difference between organic and non-organic milk products. A lack of knowledge and information about organic milk may reduce consumers' willingness to buy organic milk because consumers cannot distinguish between organic and conventional milk (Bloksma et al., 2008). In this case, buying organic milk

is not attractive to consumers because they may believe that organic milk is not likely to differ from conventional milk. Therefore, the following hypothesis is developed.

> H1: Consumers receiving organic appeals advertising have greater purchase intention toward organic milk than those receiving non-organic appeals advertising.

SDT Theory

self-determination motivation is often widely used in psychology, organizational behavior, and education (Stupnisky et al., 2018). SDT refers to an individual's motivation to accomplish a specific objective. That is, motivation acts as a driving mechanism to guide an individual's behavior toward an end goal (Ryan and Deci, 2000). In SDT, two types of motivation are distinguished: extrinsic and intrinsic motivation (Welters et al., 2014). Extrinsic motivation indicates that an individual's behavior is motivated by external or instrumental reasons (e.g., rewards and punishments). In contrast, intrinsic motivation occurs when an individual engages in an activity for the enjoyment inherent in its activity (Howard et al., 2016).

self-determination motivation has been widely used to explain consumers' motivation and behavior in organic food literature. For example, Dang et al. (2021) used SDT. They found that perceived healthiness and environmental consciousness are positively related to extrinsic motivation, which positively influences purchase intention toward organic drinking products. Shamsi et al. (2020) demonstrated the predictive ability of SDT on organic food consumption behavior. Tando et al. (2020) showed a significant influence of intrinsic motivation and integrated and external regulation on consumer attitude and buying behavior of organic food. Chiu et al. (2019) found that self-determination has a positive influence on personal relevance, which positively affects customer citizenship behavior toward organic food. Schösler et al. (2014) indicated that internalized motivation is the main factor that makes a difference in the intrinsic enjoyment of cooking and eating behavior. Prior studies have provided rich evidence for the predictive ability of SDT on consumers' behavioral outcomes. Based on the evidence of SDT literature, this study examines the mediating role of intrinsic motivation in the relationship between organic appeals advertisement and purchase intention toward organic milk.

Mediating Role of Intrinsic Motivation

Intrinsic motivation often refers to individuals' internal motives that drive and guide their actions toward an objective (Ryan and Deci, 2000). When individuals receive a signal from external stimuli, their internal motivation may be triggered through a cognitive process, in which they find performing a particular task necessary. This action occurs given the willingness and inner pleasure that motivates individuals to engage voluntarily (Gagné and Deci, 2005). For example, a person watching a sports video may find engaging in sport activities necessary. This person may feel pleasant and enjoy his sports activities

because of internal motivation and not because of external rewards or punishment (Standage et al., 2006).

In the case of organic milk, organic appeals advertisement may act as an external clue that provides a signal for consumers. When consumers watch an organic appeals advertisement, they receive valuable information and knowledge about organic milk products (Xu et al., 2012). Given their understanding of organic milk, they may be triggered by their internal needs because they view organic milk as healthy products that provide more nutrition and benefits for human health (Suciu et al., 2019). Consequently, internal motivation may guide consumers' attitudes and behavior toward organic milk products because consumers may consume organic products necessary for their health and wellbeing (Kushwah et al., 2019). For example, people often enjoy a particular food because they find it delicious. Sometimes, people also enjoy the food because it is healthier and safer than other food. One specific instance is the case of McDonald's and Subway. Many consumers enjoy McDonald's food because they feel McDonald's food is delicious. However, many other consumers may internally enjoy Subway's food because it is tasty, organic, and healthy. In this case, consumers internally want Subway's food because they know that Subway's food is organic and healthy (Kotler and Armstrong, 2018). Therefore, according to SDT, consumers are internally motivated to receive helpful information and knowledge from organic appeals advertising. The reason is that consumers understand the benefits of organic milk and consuming such products necessary. Consequently, consumers tend to hold high intention to purchase organic milk because consuming organic milk is often a voluntary behavior that generates internal enjoyment and pleasure for consumers, given that consumers know the superior benefits of organic milk. In other words, organic appeals advertisement triggers consumers' intrinsic motivation, which drives consumers' behavioral intention toward purchasing organic milk. Thus, the following hypothesis is developed.

> H2: Intrinsic motivation positively mediates the relationship between organic appeals advertisement and purchase intention toward organic milk.

Moderating Role of Emotional Appeals

Emotion often plays a vital role in people's daily life because it affects their feelings, attitudes, and behavioral outcomes (Kotler and Armstrong, 2018). Negative emotions may make them feel uncomfortable, get angry, and engage in negative actions. In contrast, positive emotions elicit positive attitudes and feelings that generate positive behavior (Ng and Diener, 2009). Emotion has been a focus of research in psychology (Kobylińska et al., 2020).

In marketing and consumer behavior, emotion is often considered an important factor that affects consumer decision-making (Lajante and Ladhari, 2019). In the case of negative emotional appeals, consumers experience a negative feeling. This emotional state triggers psychological stress and uncomfortable feelings, which prevent consumers from

shopping behavior (Xu, 2020). For example, consumers who experience a negative emotion are more likely to complain and discourage engaging in purchasing behavior (Harrison-Walker, 2019). Thus, when experiencing a negative emotion, consumers may reduce their motivation toward a particular product because of their uncomfortable feeling and psychological distress (Song and Qu, 2019).

In contrast, in the case of positive emotion, consumers experience a happy and pleasant feeling. They are encouraged to engage in purchasing behavior because they find that shopping is a hedonic process (Septianto and Chiew, 2018). That is, positive emotion motivates consumers to take active action toward shopping behavior in which consumers can enjoy shopping as a comfortable and entertaining process (Das and Varshneya, 2017).

Consumers' emotional responses are often the result of emotional appeals within a marketing stimulus (e.g., advertising and music; Solomon, 2018). Emotional appeals can be either negative or positive (Kotler and Armstrong, 2018). A negative emotional appeal can trigger consumers' negative emotional response, whereas a positive emotional appeal can elicit consumers' positive emotional response (Ng and Diener, 2009). Given that emotional appeals lead to consumer emotional responses, consumers' motivation, attitudes, and behavior may be influenced by their emotional state (Solomon, 2018). Furthermore, negative and positive emotional appeals may affect the relationship between organic appeals advertisement and consumers' intrinsic motivation differently (Song and Qu, 2019).

On the one hand, the influence of organic appeals advertisement on intrinsic motivation may be decreased when consumers experience a negative emotion. The reason is that negative emotion leads to unpleasant feelings, which generate negative attitudes and reduce consumers' motivation and willingness toward organic milk products (Jin et al., 2020). For example, when a marketer uses negative emotional appeal within a marketing stimulus (e.g., a sad music stimulus) to make consumers experience a negative feeling, consumers may have low motivation to interpret the advertisement and enjoy organic milk products. Negative emotion exerts psychological distress that prevents consumers from watching and interpreting an advertising message and understanding the benefits of a milk product (Solomon, 2018). In this case, negative emotional appeals trigger consumers' negative emotional responses, which decreases their attention and motivation. That is, negative emotional appeal lessens the relationship between organic appeals advertisement and consumers' intrinsic motivation toward organic milk products.

On the other hand, the effect of organic appeals advertisement on intrinsic motivation may increase when consumers experience a positive emotion. Positive emotion motivates and encourages consumers because comfortable feelings and pleasant experiences generate positive attitudes, leading to active engagement (Septianto and Chiew, 2018). For example, when a marketer uses a positive emotional appeal within a marketing stimulus (e.g., a happy music stimulus) to make consumers experience positive emotion, consumers may be encouraged to focus more attention and interpret the message content of an organic appeals advertisement.

They are also motivated to take positive actions toward the advertised product (Kotler and Armstrong, 2018; Solomon, 2018). In this case, positive emotional appeals elicit consumers' positive emotional response, which encourages them to direct their attention and efforts to the content of organic appeals advertisement and motivates them toward organic milk products. That is, positive emotional appeal strengthens the influence of organic appeals advertisement on consumers' intrinsic motivation toward organic milk products. Therefore, emotional appeals (negative and positive emotion) influence the relationship between organic appeals advertisement and intrinsic motivation differently. Thus, the following hypothesis is developed.

H3: Emotional appeals moderate the relationship between organic appeals advertisement and intrinsic motivation toward organic milk.

Figure 1 shows the research model in this study.

METHODS AND RESULTS

Study 1
Pilot Test
We conducted a pilot test using a between-subjects design to check the initial validity of two pieces of advertisement of the same milk brand (organic vs. non-organic appeals advertisements). Fifteen respondents were divided between an organic group with eight participants and a non-organic group with seven participants.

Our research team employed the keywords "organic milk appeals advertising" and "non-organic milk appeals advertising" to find advertisements on Youku and Tencent Video, which are the two largest video channels (similar to YouTube) in China. China only has a few milk companies that have used organic appeals advertising. Only a few advertisements were found. A brand that is the largest milk company in China was selected. Our research team watched all of this brand's ads streamed in the last three years. We considered each advertisement's contents and suitability with the purpose of this study. Then, we selected one organic appeals advertisement and another non-organic appeals advertisement. The video of the organic appeals advertisement lasted approximately 1.1 min. This advertisement presented several pieces of information about the organic elements of organic milk products (e.g., this milk product is organic. It is produced naturally from an
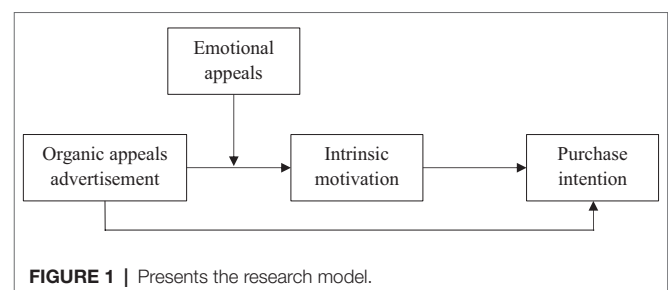

FIGURE 1 | Presents the research model.

organic farm, processed without any chemical elements, and is healthier and safer than traditional milk products). By contrast, the video of a non-organic appeals advertisement lasted approximately 1.8 min. It did not have any information about the organic elements of milk products.

Then, respondents responded to the statement "This advertisement is about an organic milk product" on a seven-point Likert-type scale (1 = strongly disagree, 7 = strongly agree) to evaluate the two advertisements. The results show that organic appeals advertisement reflects organic milk products and non-organic appeals advertisement reflects non-organic milk products ($t = 7.58$, $df = 14$, $p < 0.001$, $M_{difference} = 3.47$).

Manipulation Check

To check the validity of the pilot test, we performed a manipulation check (between-subjects design) with 44 students enrolled in an undergraduate business course. The respondents were randomly assigned: 18 students were placed in the first group and watched a non-organic appeals advertisement, and 26 students were placed in the second group and watched an organic appeals advertisement. The two advertisements were adopted from the pilot test. After watching the advertisements, the respondents responded to the statement "This advertisement is about an organic milk product" on a five-point scale (1 = strongly disagree, 5 = strongly agree). The results show a significant difference between organic appeals and non-organic appeals advertisements ($t = 14.53$, $df = 43$, $p < 0.001$, $M_{difference} = 3.68$). Thus, the manipulation of the independent variable in our experiment was effective.

Sample Data

The purpose of study 1 is to test the direct effect of organic appeals advertisement on purchase intention. The experiment was conducted in May 2020 in a large university in China. A total sample of 83 undergraduate students voluntarily participated in the experiment. The sample had 43 women (51.8%) and 40 men (48.2%). These students come from different majors, including art and literature (8 students), business administration (24 students), engineering (20 students), sport & leisure (14 students), computer & information (4 students), and medicine (13 students). The respondents also reported their frequency of drinking milk products: sometimes (8 respondents, 9.6%), usually (46 respondents, 55.4%), daily (25 respondents, 30.1%), and addiction (4 respondents, 4.8%).

Ethical Consideration

In this study, experimental design involves human activity. We complied with ethical standards and obtained approval from the Major Project of China's National Social Science Fund. The respondents were asked to participate in the experiment voluntarily and were provided with anonymity measures.

Measures

Purchase intention of organic milk was measured with three items from Prakash et al. (2018): "I am willing to buy organic milk while shopping," "I will make an effort to buy organic

milk in the near future," and "I intend to buy organic milk." The Cronbach's alpha for this measure was 0.89.

Analysis and Results

The results of ANOVA show that consumers who watched organic appeals advertisement ($M_{organic} = 4.705$, $SD = 0.314$, $N = 52$) held higher purchase intention toward organic milk than those who watched non-organic appeals advertisement ($M_{non-organic} = 2.172$, $SD = 0.564$, $N = 31$; $F = 693.231$, $df_{between} = 1$, $df_{within} = 81$, $df_{total} = 82$, $p < 0.001$). The results of study 1 support hypothesis H1.

Study 2

Pilot Test

We conducted a pilot test using a between-subjects design with 10 respondents (positive emotion group with five participants and negative emotion group with five participants) to check the initial validity of emotional appeals (happy song vs. sad song). We used the keywords "sad songs" and "happy songs" and found different songs on QQ-Music, one of China's top music apps. From a list of sad songs and a list of happy songs, we selected the saddest song and the happiest song ranked by users in the last month on QQ-Music. After listening to these two songs, we discussed their suitability with the purpose of this study. Then, we decided to use these two songs for our experiment.

The respondents responded to the statement "This song makes me happy" on a seven-point Likert-type scale (1 = strongly disagree, 7 = strongly agree) to evaluate the two songs. The results ensured that the happy song and the sad song could elicit different emotions ($t = 6.05$, $df = 9$, $p < 0.001$, $M_{difference} = 3.40$).

Manipulation Check

To check the validity of the pilot test, we performed a manipulation check (between-subjects design) with the participation of 49 consumers. The respondents were randomly assigned: 20 consumers were placed in the first group and listened to a sad song, and the other 29 consumers were placed in the second group and listened to a happy song (these two songs were adopted from the pilot test). After listening to the songs, the respondents responded to the item "This song makes me happy" on a five-point scale (1 = strongly disagree, 5 = strongly agree). The results show a significant difference between the happy song and sad songs groups ($t = 15.31$, $df = 48$, $p < 0.001$, $M_{difference} = 3.49$). Thus, the manipulation of the mediator variable in our experiment was effective.

Sample Data

In Study 2, we invited 170 consumers who shop at different superstores to join our experiment. The experiment was conducted in August 2020 in Guangzhou, China. A total of 155 consumers agreed to participate in the experiment. We announced to the respondents that their participation in this study was purely voluntary and assured them of the anonymity of their responses. We offered each respondent 20 USD after the experiment to thank them for their participation. The characteristics of respondents are present in **Table 1**.

TABLE 1 | Respondents' characteristics.

Variable	Frequency	Percent
Age		
20 and below	24	15.5%
21–30	71	45.8%
31–40	45	29.0%
41 or above	15	9.7%
Gender		
Male	80	51.6%
Female	75	48.4%
Income		
Under 100 USD	9	5.8%
100–under 200 USD	11	7.1%
200–under 300 USD	34	21.9%
300–under 400 USD	37	23.9%
400–under 500 USD	17	11.0%
500 USD or above	47	30.3%
Education		
High school or below	16	10.3%
Undergraduate	135	71.0%
Master or above	29	18.7%

n = 155.

Ethical Consideration

In Study 2, we also complied with ethical standards and obtained approval of the Major Project of China's National Social Science Fund. Respondents were asked to participate in the experiment voluntarily and were provided with anonymity measures.

Experimental Procedure

We conducted a 2 (organic vs. non-organic) × 2 (positive vs. negative appeals) between-subjects design. The respondents were randomly assigned into one of the four groups. In Group 1, the respondents watched an organic milk advertisement and then listened to a happy song. In Group 2, the respondents watched a non-organic milk advertisement and then listened to a sad song. In Group 3, the respondents watched an organic milk advertisement and then listened to a sad song. In Group 4, respondents watched a non-organic milk advertisement and then listened to a happy song. After that, all respondents completed a questionnaire that measures their intrinsic motivation and purchase intention toward organic milk.

Measures

The mediating variable (i.e., intrinsic motivation) was measured using three items adapted from Lin et al. (2009). These items include "I enjoy the consumption of organic milk," "consumption of organic milk is attractive," and "consumption of organic milk is enjoyable." The Cronbach's alpha of intrinsic motivation was 0.85. Furthermore, purchase intention was measured using the same items as in Study 1. The Cronbach's alpha of purchase intention was 0.76.

Analysis and Results

We first used ANOVA to test the effect of organic appeals advertising and emotional appeals on purchase intention toward

organic milk. The results indicate that consumers who watched organic appeals advertisement ($M_{organic} = 4.246$, $SD = 0.505$, $N = 99$) held higher purchase intention toward organic milk than those who watched non-organic appeals advertisement ($M_{non\text{-}organic} = 2.750$, $SD = 0.517$, $N = 56$; $F = 308.094$, $df_{between} = 1$, $df_{within} = 153$, $df_{total} = 154$, $p < 0.001$). Thus, hypothesis H1 was further confirmed.

The results also indicate that consumers who listened to a happy song ($M_{positive} = 3.961$, $SD = 0.815$, $N = 94$) held higher purchase intention toward organic milk than those who listened to a sad song ($M_{negative} = 3.311$, $SD = 0.841$, $N = 61$; $F = 26.48$, $df_{between} = 1$, $df_{within} = 153$, $df_{total} = 154$, $p < 0.001$).

We further used structural equation modeling to test hypotheses H2 and H3. As indicated in **Figure 2**, some control variables were included in the model because of their potential effect. The results show that consumers' gender ($\beta = 0.126$, $p < 0.01$) and age ($\beta = -0.095$, $p < 0.05$) were significantly related to purchase intention. However, consumers' education and income were not significantly related to purchase intention.

Results in **Figure 2** show that organic appeals advertisement was significantly and positively related to intrinsic motivation ($\beta = 0.141$, $p < 0.01$), which in turn was significantly and positively related to purchase intention ($\beta = 0.304$, $p < 0.001$). To confirm the indirect effect of organic appeals advertisement on purchase intention through intrinsic motivation, we followed Preacher et al. (2007) and conducted a bootstrap analysis with 5,000 samples and a 95% confidence interval. The bootstrap analysis reveals that the indirect effect of organic appeals advertisement on purchase intention through intrinsic motivation was positively significant (organic appeals advertisement → intrinsic motivation → purchase intention: $\beta = 0.221$, $p < 0.001$, 95% CI = [0.076, 0.460]). Thus, hypothesis H2 was supported.

The results in **Figure 2** also show that emotional appeals were positively related to intrinsic motivation ($\beta = 0.467$, $p < 0.001$) but not related to purchase intention ($\beta = 0.050$, n.s.). Furthermore, the interaction effect between organic appeals advertisement and emotional appeals was significantly and positively associated with intrinsic motivation ($\beta = 0.604$, $p < 0.001$). To confirm this interaction effect, we performed a two-group analysis. The direct effect of organic appeals advertisement on intrinsic motivation was compared between positive and negative emotional appeals. The results indicate that organic appeals advertisement was positively related to intrinsic motivation for the positive emotional appeals group ($\beta = 0.357$, $p < 0.001$), but this relationship was not significant for the negative emotional appeals group ($\beta = 0.208$, n.s.). Furthermore, the influence of organic appeals advertisement on intrinsic motivation was significantly different between positive and negative emotional appeals ($\Delta\beta = 0.149$, $p < 0.01$). Thus, hypothesis H3 was supported.

DISCUSSION AND CONCLUSION

This study investigates the relationship between organic appeals advertising and purchase intention toward organic milk with the mediating role of intrinsic motivation and the moderating role of emotional appeals. The results show several interesting findings. Consumers receiving organic appeals advertising had
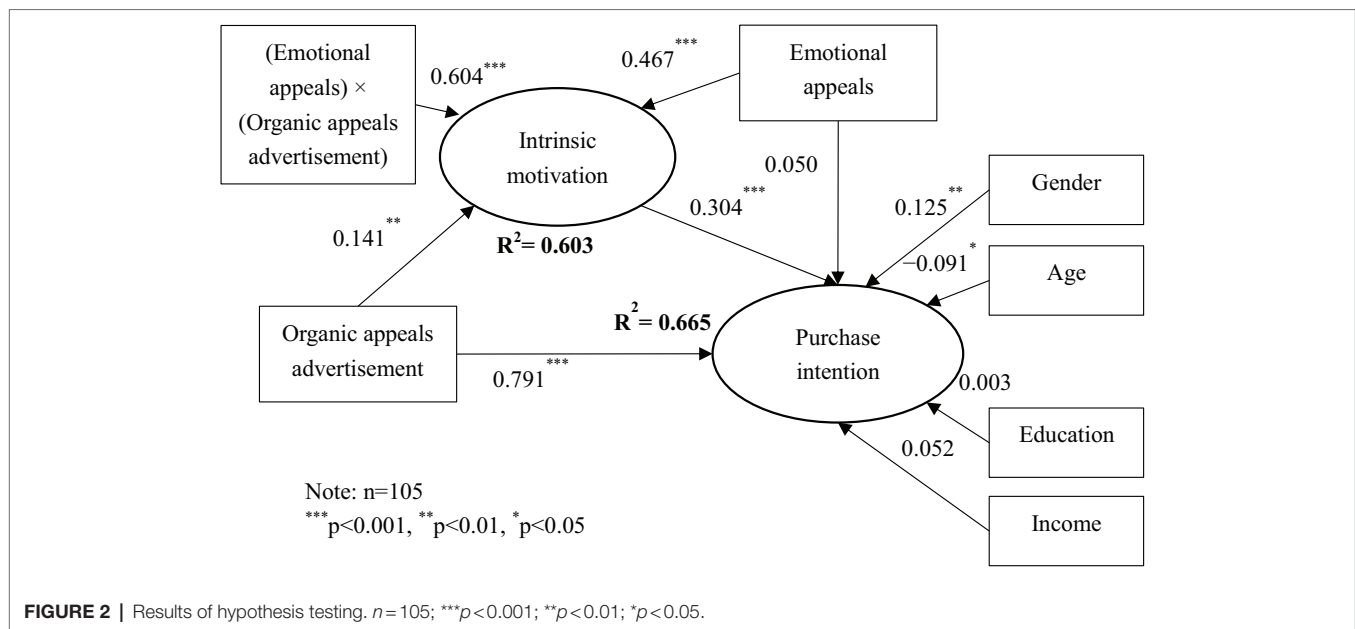
FIGURE 2 | Results of hypothesis testing. $n = 105$; ***$p < 0.001$; **$p < 0.01$; *$p < 0.05$.

greater purchase intention toward organic milk than those receiving non-organic appeals advertising. Furthermore, intrinsic motivation had a mediating effect on the relationship between organic appeals advertising and purchase intention. Furthermore, emotional appeals moderated the link between organic appeals advertising and intrinsic motivation.

Theoretical Implications

First, although organic food has received great attention from researchers and business managers in the last few years, organic food sales volume remains low compared with conventional food (Sultan et al., 2020). In organic milk, the sales volume of conventional milk is much greater than organic milk. Although price is the main concern, the other reason that organic milk is less purchased is that consumers lack helpful information and knowledge about organic milk. Consumers do not know the benefits of organic milk and cannot distinguish between organic and non-organic milk products (Scozzafava et al., 2020). Given that few studies have determined the consumption of organic milk in prior food literature, the present study investigates antecedents of purchase intention toward organic milk. Thus, this study contributes to the current food literature by providing rich knowledge that explains consumer behavior toward organic milk.

Second, advertising is an important marketing tool for firms to communicate and persuade consumers to purchase products and services (Kotler and Armstrong, 2018). Surprisingly, how advertising influences consumer purchase behavior toward organic milk has been underdetermined in prior literature. This study based on SOR theory explained the relationship between organic appeals advertisement and purchase intention toward organic milk. Findings imply that organic appeals advertisement provides information and knowledge for consumers to distinguish between organic and conventional milk (Qin et al., 2009; Jaeger and Weber, 2020). Consumers who understand

the benefits and superior quality of organic milk are more likely to purchase organic milk (Bloksma et al., 2008). Therefore, this study advances SOR theory and clarifies the relationship between organic appeals advertisement and purchase intention toward organic milk. Our findings provide implications for future researchers who may study the effect of organic appeals advertising on consumer behavior toward organic milk products.

Third, motivation often plays a vital role in affecting consumers' attitudes and behavior in purchasing decisions (Soroka and Wojciechowska-Solis, 2019). Consumers may receive a signal from the external environment, which triggers their motivation to purchase a specific product (Standage et al., 2006). In the case of organic milk, following SDT logic (Ryan and Deci, 2000), we found that organic appeals advertisement enhances consumers' intrinsic motivation, which increases their purchase intention toward organic milk. This finding indicates that organic appeals advertisement provides information and knowledge for consumers (Suciu et al., 2019). When consumers understand the benefits of organic milk, they are internally motivated toward organic milk.

Consequently, consumers may hold high intentions to purchase organic milk (Kushwah et al., 2019). Thus, the findings of this study extend SDT theory and shed new light on the mediating mechanism of intrinsic motivation, which has been absent in prior literature. Our findings provide implications for future researchers who may study the influence of motivation on purchase behavior toward organic milk products.

Finally, emotion is an important factor in consumers' decision-making (Lajante and Ladhari, 2019). In this study, emotional appeals were found to have a moderating effect on the link between organic appeals advertisement and consumers' purchase behavior toward organic milk. This finding implies that consumers who experience negative emotions often have negative feelings and unpleasant psychological states, resulting in negative attitudes and behavior (Xu, 2020). That is, negative emotion discourages consumers from receiving information and knowledge from organic

appeals advertising. They also have low motivation toward organic milk products because negative emotion exerts psychological distress and uncomfortable feelings on consumers (Harrison-Walker, 2019). By contrast, positive emotion makes consumers pleasant and happy. In this case, consumers are strongly motivated to receive information and knowledge from organic appeals advertisements and tend to take purchasing behavior toward organic milk (Septianto and Chiew, 2018). Therefore, the findings of this study provide rich knowledge and clarify the moderating mechanism of emotional appeals, which has been unexplored in prior literature. Our results offer implications for future researchers who may study the role of emotion in affecting consumer decision-making toward organic milk products.

Managerial Implications

Several implications are also provided for business managers in this study. It is suggested that business managers should plan and implement organic appeals advertising strategy to enhance consumers' purchase behavior toward organic milk. Firms should provide detailed information in such advertisements and help consumers obtain helpful knowledge about organic milk products. Information in advertisements should also help consumers understand the benefits and distinguish between organic milk and traditional milk products. Furthermore, business managers should also have different strategies to trigger and increase consumers' intrinsic motivation toward organic milk. For example, they may use a marketing campaign to persuade consumers that shopping for organic milk is a hedonic and pleasant process. This shopping behavior toward organic milk is internally necessary for consumers because consumption of organic milk brings health for consumers. Moreover, business managers should also have strategies to boost consumers' positive emotions. For example, using emotional appeals (e.g., happy and suitable music, color, and store atmosphere) can elicit consumers' positive feelings. As our experiment suggests, business managers should recruit experts to select the best emotional appeals to trigger consumers' positive emotions.

Limitations and Future Research

This study has several limitations that need to be addressed in future research. First, we conducted the experiment in Study 2, in which participants first saw the advertising and then listened to the songs. This sequence may generate a problem that the effect of the advertisement had faded away. However, if participants are exposed to the advertisement and the songs simultaneously, a compound effect between advertisement and songs may be another problem. In this case, we cannot distinguish the different effects between advertisement and emotional appeals on consumers' intrinsic

motivation and purchase intention. Thus, future research should adopt a more effective way to manipulate the independent effect (advertising) and moderating effect (emotional appeals) in this study. Second, although the experiment uses a good research design that can accurately test the causal relationship between variables, cross-sectional data of the experiment in this study may affect the accuracy of the causal relationship between variables. Thus, future research should use longitudinal data of experiments to validate the research model in this study. Third, we used two different advertisements (organic vs. non-organic) to manipulate organic appeals advertisement and two different songs (happy vs. sad songs) to manipulate emotional appeals. Although these manipulations were valid, future research should use different methods to conduct a better experiment. Finally, this study measured only the behavioral intention of consumers toward organic milk. Future research should measure real purchasing behavior better to observe consumers' purchasing decisions toward organic milk.

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 Major Project of The National Social Science Fund of China. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

JW and MZ: conceptualization and supervision. JW, MZ, HW, W-D, and QW: methodology, formal analysis, and investigation. JW, MZ, and HW: original draft preparation and review and editing. All authors contributed to the article and approved the submitted version.

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Purchase Intention for Green Cars Among Chinese Millennials: Merging the Value–Attitude–Behavior Theory and Theory of Planned Behavior

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The value–attitude–behavior and the theory of planned behavior (TPB) appear to provide limited explanation for consumer green purchase behavior. This study aims to examine the relationship between pro-environmental value, consumption value, and TPB toward green car purchasing intention among the young Chinese generation. A total of 541 student responses were collected, and the results showed that altruistic value positively influenced subjective norm (SN) and perceived behavioral control (PBC), but negatively influenced green purchase attitude (GPA). Biospheric value positively influenced GPA and PBC. Function value and emotional value positively influenced GPA, respectively, and emotional value fully mediated the relationship between function value and GPA. Furthermore, GPA, SN, PBC positively influenced intention toward green car purchasing behavior, respectively, and SN mediated the relationship between GPA and intention. This study shows how pro-environmental value and consumption value can influence components of TPB in green car purchase intention.

Keywords: green car purchasing behavior, pro-environmental value, consumption value, value–attitude–behavior, theory of planned behavior, young generation

INTRODUCTION

Resource maintenance refers to the preservation or improvement of the resources that contribute to the enhancement of wellbeing; resources that are mainly physical, such as natural resources and manufactured products that underpin economic activities (Goodwin et al., 2014). However, over-utilization and consumption of natural resources by consumers is inevitable when there is accompanying rampant economic growth (Wang, 2020). In recent years, consumers perceived problems that are caused by environmental issues, for example, water pollution, haze, global warming, etc. have a severe negative impact on their living conditions (Wang et al., 2020c). This has resulted in increased awareness in the importance of the selection of eco-friendly products or services in their purchasing decision-making processes (Teeroovengadum, 2019).

The transportation industry accounts for about 60% of the world's oil consumption and 25% of total world carbon dioxide (CO_2) emissions (Silitonga et al., 2012). Specifically, the road transportation segment contributed to about 80% of the total consumption, which accounts for approximately 10% of greenhouse gas emission for the whole transportation sector (Silitonga

et al., 2012). In China, the transportation industry accounts for 49.9% of oil consumption and 8.4% of CO_2 emission (Sajjad et al., 2020). Therefore, green cars' (e.g., electric vehicles and hybrid vehicles) policies were introduced and implemented in many countries due to the potential benefits of transforming the existing transportation industry toward a greener and cleaner future (Lim et al., 2019; Sajjad et al., 2020).

However, there has been a widely acknowledged gap between the attitudes and behaviors of consumers with respect to eco-friendly consumption (Kumar and Sreen, 2020). Despite consumers' claims of their concerns for environmental issues and displaying positive attitudes, the claims have not been translated into green purchase behavior (GPB; Wang, 2020). The sales of green cars are still far behind traditional engine-powered cars (Lim et al., 2019). Hybrid cars only occupied 2.2% of the total new vehicle market in US market (Hur et al., 2013), and green cars make up only around 2% of vehicles sold annually in Malaysia (Lim et al., 2019). Even in the largest vehicle market, China, green cars only accounted for 4.82% of total vehicles sold in 2019 (Forward Business Information, 2020). This shows the lack of a deeper understanding on consumers' green car purchasing behavior, due to the lack of a standardized definition and a solid foundation in research on GPB (Wang and Wong, 2021).

Prior studies applied the theory of planned behavior (TPB) to understand how antecedents influence intention in the context of green marketing (Wang and Wong, 2021). Certain studies adopted TPB as the underpinning theory and other studies included some of the components of TPB as a part of the research constructs (Elhoushy and Jang, 2020; Wang et al., 2020b). However, most of these studies often gave inconclusive or even controversial outcomes (Wang et al., 2019, 2020c). As TPB is a behavioral theory based on a causal process, it ignores other essential factors (Ulker-Demirel and Ciftci, 2020), such as impulse factors, feelings, private standards (Sniehotta et al., 2014); unconscious motives and spontaneous choices (Yuzhanin and Fisher, 2016); and personal decision criteria (Ulker-Demirel and Ciftci, 2020). This leads to the identification of the attitude–intention/behavior gap by some researchers who argue that factors influencing the magnitude of this gap have not been systematically investigated (Jacobs et al., 2018). Specifically, Wang et al. (2021b) indicated that the possible mediation effect of attitude between SN and green purchase intention (GPI) cannot be ignored in green marketing. However, how SN is linked to consumers' attitude toward green cars purchasing behavior has been underexplored.

Apart from the impact of extending psychological predictors on GPB, values play a significant role in consumer's pro-environmental decision-making (Tamar et al., 2020). Values are considered a trans-situational goal which varies in degree of importance and serve as a guiding principle in one's life (Tamar et al., 2020), and are also relatively stable in the course of time (Jacobs et al., 2018). It has been recognized as an important driver of consumers' product evaluations and future purchase decisions (Hur et al., 2013), and is considered as one of the critical antecedents for GPB (Tamar

et al., 2020). However, the value–attitude–behavior models seem to be unable to explain behavior comprehensively (Jacobs et al., 2018).

Indeed, consumers' pro-environmental value (i.e., altruistic value, biospheric value, and egoistic value) has frequently applied to measure one's value toward GPB in some value-related theories (e.g., value–attitude–behavior model and value-belief-norm theory; Rahman and Reynolds, 2016). But compared to conventional studies, there is a lack of understanding how altruistic value influence on consumers' GPB (Wang et al., 2020a). Meanwhile, previous studies have not distinguished biospheric value from altruistic value orientation, thus, leading to confusing results (Wang et al., 2020a). Indeed, past studies demonstrated the negative relationship between egoism and GPB might be less appropriate in eastern societies with high collectivistic value, such as China, Japan, and Korea (Wang et al., 2021b). Also, certain studies indicated that consumers' consumption value (i.e., functional value, emotional value, and social value) significantly influenced their decision-making processes (Hur et al., 2013; Rasoolimanesh et al., 2020). However, few studies attempt to pursue a deeper understanding of the inter-relationship among sub-dimensions of consumption value which influence consumer purchase behavior (Rasoolimanesh et al., 2020), such as green cars purchasing behavior. Therefore, it is necessary to understand how various values influence the younger Chinese generation's GPB toward green cars purchasing behavior.

The current study had assessed the influence of consumers' values on the attitude component of TPB, specifically on how a merged value–attitude–behavior hierarchy (VAB) and TPB model influence consumers' GPI of green cars in China. Most of the existing conceptual and empirical studies, and literature on TPB were focused on Western societies (Wang and Wong, 2021), and a small handful of studies discussed values in the context of green products in relation to green purchase attitude (GPA) and GPB (Jan et al., 2019). As yet, it is still unclear whether previous studies' findings relating to values can be applied to more collectivistic countries (Wang et al., 2021d). Therefore, this study seeks to extend the existing knowledge of the influence of pro-environmental values and consumption values on GPB and the influence of GPA, subjective norm (SN), perceived behavioral control (PBC) and GPI on the purchasing behavior of green cars among Chinese millennials.

CONCEPTUAL MODEL AND HYPOTHESES DEVELOPMENT

The Value–Attitude–Behavior Model

Value–attitude–behavior (VAB) model is a classical model in the literature of social psychology, which investigates the relationship between value and behavior through attitude (Jan et al., 2019). Specifically, the VAB model summarizes specific extant literature on natural food consumption and leads to the development of corresponding hypotheses (Jacobs et al., 2018). Since then, researchers have employed the VAB model

in different contexts, such as local food consumption (Zhang et al., 2020), green customer loyalty (Hur et al., 2013), green hotel patronage (Rahman and Reynolds, 2019), and pro-environmental behavior (Tamar et al., 2020).

The Influence of Pro-environmental Values on GPB

An individual's preference of GPB is affected by environmental values (Bautista et al., 2020) which play a vital role in influencing pro-environmental behavior (Rahman and Reynolds, 2016) and it is used as a predictor of consumer attitude and behavior toward green products (Bautista et al., 2020). Environmental values represent an individual's principles on the importance of pro-environmentalism and sustainability (Barboza and Filho, 2019) and it can explain the individual's motivation to engage in green campaigns (Bautista et al., 2020). This corresponds with the TPB model which posits that environmental beliefs shape attitude, which is then translated into GPI (Rahman and Reynolds, 2016).

Altruistic Value

The classical value-belief-norm theory which supports the moral norm activation theory of altruism (Schwartz, 1977) argued that an individual who exhibits altruistic behavior is able to help others because he/she responds to the activation of his/her personal moral norms, when particular conditions pose threats to others; and believes his/her actions might lead to the avoidance of negative consequences (Wang et al., 2020a). This theory has been applied by (Stern, 2000) to support his proposed value-belief-norm theory of environmentalism (VBN) in green marketing. Based on Stern (2000)'s theory, individuals who act altruistically are able to relate to pro-environmentalism due to their beliefs that when certain conditions pose threats to others' living situations, the actions they could perform might help others to avoid negative outcomes (Wang et al., 2020a).

Accordingly, altruistic value refers to a desire to benefit others instead of looking after oneself's interest (Bautista et al., 2020). An individual's feeling of what is ethically right is composed of his/her commitment to creating the best outcome for others (Teng et al., 2015), irrespective of what others individuals think (Wang et al., 2020a). Meanwhile, altruistic value includes the demonstration of accomplishing something good for others without expecting anything in return (Rahman and Reynolds, 2019). Altruistic value has been found to be stronger among individuals who partake in certain GPBs for the welfare of others considering their own interests (Rahman and Reynolds, 2016; Bautista et al., 2020; Li et al., 2020). As such, altruistic value can be considered an antecedent for GPB (Kaufmann et al., 2012).

Certain studies have highlighted a significant causative path from altruistic value to components of TPB on GPB. For example, Birch et al. (2018) found that altruistic value positively and directly affected one's attitude of opting for green products. Likewise, Wang et al. (2020a) extended the value-belief-norm theory model to predict consumer GPB and indicated that altruistic value is the most important value dimension significantly

influenced traveler's GPA. Meanwhile, Eid et al. (2020) revealed the significant positive effect of altruistic value on consumers' norms toward green hotels visitation, while Obrenovic et al. (2020) investigated an individual's knowledge-sharing behavior and demonstrated the high explanatory power of altruistic value as a determinant of SN in Croatia. Additionally, Rahman and Reynolds (2016) found that altruism value positively influenced consumers' PBC in terms of willing to sacrifice for green products and willingness to pay a premium. Likewise, Teng et al. (2015) adopted the TPB model and found that altruistic value positively affected PBC in the selection of green hotels in Taiwan, China. However, studies on altruistic value are scarce when compared to conventional studies (Wang et al., 2020a). Hence, this study postulates the following hypotheses:

H1: Altruistic value positively influences GPA.

H2: Altruistic value positively influences SN.

H3: Altruistic value positively influences PBC.

Biospheric Value

The main drawback of moral norm activation theory of altruism is it focus mainly on GPB in the private sector (Stern, 2000), for example on consumers' personal GPB related to household and disposable products practices that have a negative environmental impact (Wang et al., 2020a). This theory ignores non-activist GPB in extant literature (Stern, 2000), as most of previous studies have not differentiated biospheric value from altruism orientation (Rahman and Reynolds, 2016). According to Stern (2000), GPB can reasonably be characterized by concerns on the effect of materials or energy production on the ecosystems or the biosphere itself. Hence, the biospheric value provides a distinct support for preserving the environment (Wang et al., 2020a), which emphasizes the welfare of the environment only (Rahman and Reynolds, 2016). Therefore, individuals who possess biospheric values exhibit more concern for animals, plants, and other natural resources, and can be regarded as pro-environmentalists (Hughner et al., 2007; Wang et al., 2020a).

Biospheric value should be considered as the most important principle leading to GPB (Wang et al., 2020a), and it should provide better explanatory power when compared to altruistic value in GPB predictions (Rahman and Reynolds, 2016). However, the concept of biospheric value in green literature is still new and remains unresolved empirically (Wang et al., 2020a). Certain studies on GPBs have demonstrated how biospheric value positively influences attitude, SN, and PBC. Rahman and Reynolds (2019) indicated that biospheric value represents an inherent concern for the nature and environment, thus, biospheric value positively influenced consumers' GPA toward green products. Meanwhile, Wang et al. (2020a) reported a positive relationship between biospheric value and GPA among 248 Chinese tourists. Furthermore, Bamberg (2003) found that consumers who are more concerned about environment more likely to display higher SN toward GPB, while Paul et al. (2016) reported similar results that consumers who are concerned about environment are more likely to be influenced in their SN toward GPB in India. In

addition, Rahman and Reynolds (2016)'s findings that biospheric value positively influenced consumers' PBC in visiting green hotels, and Rahman and Reynolds (2019) revealed a positive direct effect of biospheric value on consumers' PBC in terms of willingness to pay more for green products. To lend further support to the importance of biospheric value in GPB literature, the following hypotheses are proposed:

H4: Biospheric value positively influences GPA.

H5: Biospheric value positively influences SN.

H6: Biospheric value positively influences PBC.

Collectivistic Value

Egoism is another value that can significantly influences one's GPB (Rahman and Reynolds, 2016). This value focus on maximizing individual outcomes based on self-interests (Wang et al., 2020a), and involves values, such as obedience, self-discipline, and family security, and they can negatively influenced pro-environmental norms and behaviors (Stern, 2000). Egoistic values may provide an important basis for principled opposition by some individuals to environmental movement objectives, but the ways egoistic values affect behavior are not well understood (Wang et al., 2020a). Past studies affirmed egoistic value is connected to environmental beliefs and behaviors (Stern, 2000; Rahman and Reynolds, 2019), as GPB generally entails a clash between short-term personal benefits and long-term collective concerns (Rahman and Reynolds, 2019). Therefore, collectivism and individualism are at two opposing ends of this value spectrum in green marketing (Kumar and Sreen, 2020; Wang et al., 2020a).

Accordingly, collectivistic value refers to a collective need to protect the environment in order for all society to prosper (Chen, 2013), as well as emphasizing interdependence, group-orientation goals, cooperation, and minimal competition (Wang et al., 2020a). In contrast, individualistic value refers to the moral stance, political philosophy, ideology, or social outlook that stresses "the moral worth of the individual" (Gagnier, 2010). It is characterized by independence, self-reliance, freedom of choice, and a high level of competition (Wang et al., 2020a). Thus, individuals who have a strong, selfish and competitive orientation are less likely to perform pro-environmental behavior, and individuals who have satisfied their own needs are more likely to perform GPBs and are more focused on pro-environmental issues (Wang et al., 2020a).

Previous studies conducted in individualistic countries, demonstrated that egoistic value negatively influences consumers perceptions to reduce car use in Czech Republic (De Groot and Steg, 2007), while Bouman and Steg (2019) reported similar results in the Netherlands. It is yet unclear whether those findings also apply to more collectivistic countries (Wang et al., 2021d). Specifically, Wang et al. (2020a) argued that applying egoistic/individualistic value for consumers who reside in certain Eastern nations (e.g., China, Korea, and Japan) is not appropriate, due to the highly collectivistic values practiced in these societies when compared to most Western countries. Thus, a single

measurement of egoistic or individualistic value may not suit all settings, but applying a reliable measurement of collectivistic value seems to overcome such problems (Wang et al., 2020a).

Certain studies revealed how collectivistic value significantly influences consumers' GPA, SN, PBC and GPB. For example, Wang et al. (2020a) applied the value-belief-norm theory to consumers' green visit intention in China using an online sampling indicated a positive direct effect of collectivistic value on consumers' attitude. Wang et al. (2021b) further explored the relationship between value and consumers' GPI showed that collectivistic value had a significantly positive relationship with GPA. Kumar and Sreen (2020) explored the relationship between internal/external value and GPB found that collectivistic value positively correlated with Indians consumers' attitude, SN and PBC. Tsen et al. (2006) investigated the relationship between consumers' collectivistic value and control beliefs in Malaysia and demonstrated that collectivistic value positively influenced one's willingness to pay for green products. Based on above considerations, the following hypotheses were proposed for testing:

H7: Collectivistic value positively influences GPA.

H8: Collectivistic value positively influences SN.

H9: Collectivistic value positively influences PBC.

The Influence of Consumption Values on GPB

Consumer value is considered a crucial factor for determining a product or service's attractiveness (Hur et al., 2013). As consumer value is inherent to the experience in the use of a product or a service, a consumer's perceived value cannot be determined objectively by the providers (Hur et al., 2013). A number of marketing related studies have examined and confirmed the significant effect of consumer value on different aspects of one's purchasing behavior (Zaidi et al., 2019; Rasoolimanesh et al., 2020).

The theory of consumption values demonstrated that functional, social, emotional, epistemic and conditional values as key dimensions of an individual's perceived values that affect one's purchasing behavior (Sheth et al., 1991). However, researchers have generally omitted epistemic and conditional values as being too transient (Rasoolimanesh et al., 2020), and it is not always practical for researchers to include all five values when the choice situation might be driven by a smaller set (Sheth et al., 1991). Most previous studies take conditional value into account with other value dimensions; however, conditional value is not a value itself, but it reflects the effect of a product's utility in the particular situations and circumstance (Caber et al., 2020). Meanwhile, epistemic value can be incorporated into emotional value, since this value is related to curiosity, novelty, and cognition obtained from the products or service (Caber et al., 2020; Rasoolimanesh et al., 2020). Overall, a parsimonious explanation of consumption value indicates that consumers assess a product or service, not just in functional terms of

expected performance, but also in terms of the enjoyment of pleasure derived from emotional value and the social consequences of what it communicates about other consumers (Sweeney and Soutar, 2001). This multidimensions scale has been found to be reliable and valid in a variety of purchase situations (Hur et al., 2013), which provides a suitable framework to explore the effect of consumption value on green cars purchase intentions.

Functional Value

Functional value refers to the rational and economic evaluations made by consumers (Carlson et al., 2019), because it is associated with the practical or technical benefits consumers can obtain by using a product or service (Hur et al., 2013). Individuals perceived functional value or economic utility of a product or service which is derived from the product attributes, such as durability, reliability, price (Jan et al., 2019), and quality (Zaidi et al., 2019). Thus, functional value is associated with the perceived benefits of a product or service's functional, utilitarian, and physical performance (Caber et al., 2020) and was thought to be generated by a product or service's salient attributes (Zaidi et al., 2019). Overall, the functional value of the product or service refers to the net utility that is derived from the perceived quality attributes and more importantly, the price of the product (Jan et al., 2019).

According to Hur et al. (2013), the fuel-efficiency of green cars can be very attractive to some consumers, because similar to the economic value, the functional value of green cars refers to perceived economic utility of purchasing that is derived from the attributes (e.g., reduce energy usage and saving natural resources) of green cars (Jan et al., 2019). Bjerkan et al. (2016) explored the incentives influence promoting battery electric vehicle choice in Norway and indicated that functional value attributes, for example, value-added tax exemption, purchase tax exemption, free vehicle license, and free parking, significantly influenced potential consumers' attitude, perceptions, and purchase behavior. Similarly, Sierzchula et al. (2014) explored the consumers' attitude–action gap related to green cars in US and demonstrated that functional value significantly influences consumers' purchase attitude and behavior. Thus, the following hypothesis was proposed:

H10: Functional value positively influences GPA.

Emotional Value

The emotional value refers to the utility derived from affective feelings or states that a product or service generates (Rasoolimanesh et al., 2020). It aims to meet an individual's mental or psychological needs of a product or service (Hur et al., 2013). The buying process of product or service itself will bring about positive or negative affective feelings (Caber et al., 2020). Emotional value can be considered as the most important predictor of behavioral intention in literature because although an individual may not seek emotional benefits intentionally during the consumption experience, positive/negative feelings aroused unintentionally from the experience play an important role in further decision-making

at a subconscious level (Hur et al., 2013). According to Rasoolimanesh et al. (2016), emotional value can be categorized under hedonic orientation and novelty. For instance, consumers with increased environmental concerns may feel optimistic about using green cars rather than conventional cars because they feel they are doing the right thing to solve environmental issues (Hur et al., 2013). Meanwhile, consumers could also receive positive feelings because of the perception they are adopting some novel innovations when they are driving green cars compared to conventional cars.

Hur et al. (2013)'s study results indicated that both dimensions of emotional value positively influenced consumers to buy hybrid cars, and Rasoolimanesh et al. (2020) found similar results among hotels' consumers to visit guesthouses. Moons and De Pelsmacker (2012) investigated antecedents influence electric car usage intention in Belgium using a snowball sampling with a sample of 1,202 respondents. It resulted in a significant relationship between emotional value and purchase of innovative products behavior as emotional value can be perceived as an important cognitive consideration in the usage intention formation process. A recent study by Joshi et al. (2021), who applied the TPB to predict consumers' GPI that involved a sample of 387 respondents, showed that emotional value had a significant positive relationship with GPA, and consequently, GPI. Thus, the following hypothesis is proposed:

H11: Emotional value positively influences GPA.

Although the functional and emotional values are conceptually related, however, previous studies' models tend to ignore the correlation between these two values (Rasoolimanesh et al., 2020). Theoretically, the cognitive appraisal theory of emotions stresses that the evaluation of the outcomes of product or service usage causes an emotional or affective response (Ladhari et al., 2017). According to Lee et al. (2010), the emotional value can promote one's satisfaction and intention as of satisfying his/her needs in terms of emotions. In other words, the emotional value is connected to functional attributes of the product or service and emotional consequences are raised from adopting a product or service (Hur et al., 2013). Thus, achieving good quality functional services are expected by individuals, providing high-quality product or services and meeting their expectations result in positive feelings (Rasoolimanesh et al., 2020). An individual's emotions are evoked by his/her rational and economic evaluation of the product or service, and the greater functional value triggers one's emotional value perception, subsequently, enhances the level of his/her perception and intention (Rasoolimanesh et al., 2020).

Certain studies demonstrated how emotions are evoked by the consumers' rational and economic evaluation of the product or services; for example, Ladhari et al. (2017) indicated that perceived service performance positively influenced emotions, which then influence consumers' perception and intention on products. Babin et al. (2004) explored the cognitive and affective determinants of retail patronage and demonstrated that functional value attributes (i.e., utilitarian values) positively effect on

hedonic shopping values and service quality is positively correlated with emotional value (Amin et al., 2013). Thus, considering the above findings, the following hypothesis is proposed:

> *H12*: Emotional value mediates the relationship between functional value and GPA.

Social Value

Social value is derived from the ability of the product or service to reinforce or improve the consumer's social self-concept (Rasoolimanesh et al., 2020). According to Sheth et al. (1991), social value refers to "perceived utility acquired from an association with one or more specific social group, that is, it was measured through the product's association with various reference groups of customers." Thus, social value can be obtained when consumers feel they are connected to others by using certain products or services (Hur et al., 2013). Social value is considered to be connected to self-image (Bautista et al., 2020), since interactions between consumers/staffs/consumer/employees can have a profound effect on ones' purchasing experiences (Rasoolimanesh et al., 2020).

Hur et al. (2013) argued that consumers may feel connected and belonging to an environmentally conscious group *via* purchasing hybrid cars, and thus, benefit others. Another study by Zaidi et al. (2019) found that social value positively influence consumers' perceptions toward GPI. In addition, Caniëls et al. (2021) extended the theory of consumption value to youths GPB in Poland which showed that social value had a significantly positive relationship with GPA. Hence, the following hypothesis was developed:

> *H13*: Social value positively influences GPA.

Although certain marketing literature have successfully highlighted the relationship between social value and emotional value (Nkaabu et al., 2017; Rasoolimanesh et al., 2020), the tendency in green marketing studies has been to regard these concepts as independent of each other. In contrast with emotional value which always plays a significant role in determining consumers' attitude and behavior (Eid, 2015), social value seems to have a weak effect on consumers' feelings and behavior (Kim et al., 2019). Rasoolimanesh et al. (2020) concluded that researchers should consider emotional value be treated as mediator between social value and one's attitude/behavior, because socialization and communication may enhance consumers' self-esteem and social status as reasons for the positive influence of social value on emotional value (Kazakevičiūtė and Banyte, 2012).

Few studies performed in-depth analyses on the effect of social value on emotional value in consumer GPB, but certain studies demonstrated that emotional value mediates the relationship between social value and consumers' attitude or behavior. For example, Nkaabu et al. (2017) indicated that social value has a positive effect on consumers' hedonic value toward purchase intention. Rasoolimanesh et al. (2020) demonstrated that social value positively influenced consumers' evaluation of emotional value generated on traditional

guesthouses satisfaction. In addition, Wu et al. (2018) found that social value positively affected intention of social online shopping. Hence, considering the above, the following hypothesis was proposed:

> *H14*: Emotional value mediates the relationship between social value and GPA.

The Theory of Planned Behavior

Similarly, TPB is another popular theory in the literature of the consumer decision-making process (Wang et al., 2021c), which was extended from theory of reasoned action (TRA). The main difference between TRA and TPB is that TPB consider one's behavior cannot to be purely based on volitional factors (Wang et al., 2020b). Thus, non-volitional factors, such as those identified in the perceived behavioral control (PBC) variable of TPB, were included as an added predictor that extended TRA boundaries (Wang, 2020). The TPB model comprises of four constructs, namely, attitude, subjective norm (SN), PBC and intention, and eventually the behavior (Wang et al., 2021a). Many researchers applied TPB to estimate consumer's green/purchase behavior, such as green hotel selection (Wang et al., 2019), destination choice (Wang et al., 2021c), and eco-label food consumption (Ateş, 2021).

Attitude or GPA is the most important predictor in TPB that influence consumers' GPBs due to its stability and consistency (Wang et al., 2019). GPA refers to an individual's positive/negative and favorable/unfavorable evaluation of a given behavior (Wang and Wong, 2021). GPA incorporates the judgment on whether the given behavior under consideration is good, bad, or indifferent, regardless of whether or not the consumer wants to perform the behavior that they are environmentally concerned about (Wang and Wong, 2021). Individuals may recognize the seriousness of environmental issues are actually caused by excessive use of natural resources and thus, their environmental awareness can instill positive attitudes toward GPB (Wang and Zhang, 2021). Many studies on green marketing have shown how GPA positively influences GPI (Wang et al., 2020a,c). Therefore, the following hypothesis was proposed:

> *H15*: GPA positively influences GPI.

Subjective norm refers to the cognizant social pressure to perform or not to perform a specific behavior (Ajzen, 1991). In other words, the subjective norm is the perceived opinions of the significant others who are close to an individual and who influence his/her decision-making process (e.g., relatives, close friends, business partners, or co-workers/colleagues; Wang and Wong, 2021). Fundamentally, SN is the feeling or moral obligation of consumers, and it is a powerful motivator of environmental caring behavior (Wang et al., 2019). The social dynamic in which individuals associate with other individuals is by sharing the same values, thoughts, and beliefs (Sinnappan and Rahman, 2011). Thus, individuals are generally concerned about whether significant others would approve or disapprove of the given behavior (Wang et al., 2019). Certain studies have

highlighted a significant causative path from SN to intention (Paul et al., 2016; Liu et al., 2020). Hence, the following hypothesis was proposed:

H16: SN positively influences GPI.

Nevertheless, Han and Stoel (2017) demonstrated that the SN seems to be the weakest component of TPB in previous studies. For instance, SN has been employed in some previous studies as a predictor for consumer GPB, resulting in an insignificant correlation with GPI (Sutikno and Indarini, 2020; Wang and Wong, 2021). In addition, previous studies showed that there is a complicated relationship between SN, GPA, and intention. Certain studies revealed that there is a positive relationship between SN, GPA, and GPI in green marketing; for example, Wang et al. (2019) indicated that there is an insignificant relationship between SN and GPI, however, SN had a significant influence on GPA, subsequently, GPI. While Wang and Wong (2021) demonstrated that SN had no role in determining GPI, but SN had a significant influence on GPI *via* GPA. In other words, GPA plays a mediating role in the relationship between the SN and GPI. Thus, the following hypothesis was developed for testing:

H17: GPA mediates the relationship between SN and GPI.

Perceived behavioral control refers to the perception of how difficult or challenging it is to perform a certain behavior (Wang et al., 2019). It depends on both motive and ability aspects, which incorporates previous experiences and anticipated hindrances (Paul et al., 2016). It also involves the perception of how well individuals can control non-rationale factors that may encourage or oblige specific activities (Wang and Wong, 2021). PBC should be considered as an important predictor in TPB model, due to its high explanatory capacity in a situation with perceived constrains compared to normative orientation theories (e.g., norm activation model and value-belief-norm theory of environmentalism; Steg and Vlek, 2009). Certain studies on GPB have demonstrated how PBC positively influences GPI/GPB (Teeroovengadum, 2019; Wang and Wong, 2021). However, other researchers have utilized PBC to predict consumer GPB, which resulted in ineffective PBC for consumer GPI (Eid et al., 2020; Sutikno and Indarini, 2020). Thus, the following hypothesis was proposed for testing, and the theoretical research model (**Figure 1**) for this study was established based on above mentioned literature.

H18: PBC positively influences GPI.

MATERIALS AND METHODS

Data Collection

In social science, researchers generally cannot easily acquire an accurate sampling frame from companies or locate appropriate respondents to answer the research questions (Saunders et al., 2011). Thus, the non-probability sampling is often used as an alternative technique to select samples based on subjective researcher judgment (Sekaran, 2006). A convenience sampling method was utilized to collect samples in this study due to the well-known advantages, such as easy accessibility, availability at a given time, geographical proximity, and higher willingness to participate (Dörnyei, 2007). More specifically, this method allows researchers to have easier access with potential research subjects of the population (Etikan et al., 2015).

The target respondents were the younger generation in China, specifically young Chinese generations that showed robust market purchasing power. According to Bahl and Kumar (2019), the younger generations play a significant role in determining forthcoming market segmentation as they will shape a different consumption pattern in the future. Wang et al. (2021b) indicated that 42% of Chinese young generation (i.e., aged between 18 and 25) expressed high intention to purchase novel products and services in the future, which is higher than the Americans, Europeans and Japanese. This phenomenon also exists in new energy vehicles industry. Based on J. D. Power (2021), generation Z has the highest purchase intention among all age groups. Consumer purchase intention of new energy vehicles increase to an all-time high of 16% in 2018, specifically, generation Z has the highest intention (J. D. Power, 2021). Moreover, young generations are better educated and are more concerned and knowledgeable about environmental issues (Varah et al., 2020), and they like sustainable lifestyles and are often ready to adopt innovative and green technology and green products and services (Jaiswal and Kant, 2018). In addition, the household decision for purchasing a new car or the second is increasingly influenced by young and educated adults in their family (Jaiswal et al., 2021).

A convenience sampling method was used to collect data at six undergraduate universities in Xuzhou, Jiangsu province, China. The total number of undergraduate students in Jiangsu is more than 1.1 million which ranks the third highest in China, and Xuzhou occupied almost one-fifth of the total (Wang et al., 2021c). A network of contacts at universities throughout Xuzhou cooperated in distributing and returning the questionnaires. All of the contacts were university lecturers, assistant professors, and associated professors. Each contact received a packet containing between 100 and 200 questionnaires, depending on the number of students with whom they interacted. Questionnaires were distributed between March and May to students through an online system who completed them in the classroom, and participation was voluntary and were not compensated for their participation. The students were from diverse departments (e.g., education, hospitality and tourism, marketing, global business, English language, literature, sports, and economics). A total of 541 usable questionnaires were collected which exceeded Hair et al. (2010) which states that sample size of more than 200 have been found to provide an acceptable margin of error. This also corresponds with Kline (2015) suggestion that a minimum sample size of 200 respondents and between 10 and 20 cases per parameter is required for structural equation modeling,

FIGURE 1 | Theoretical research model.
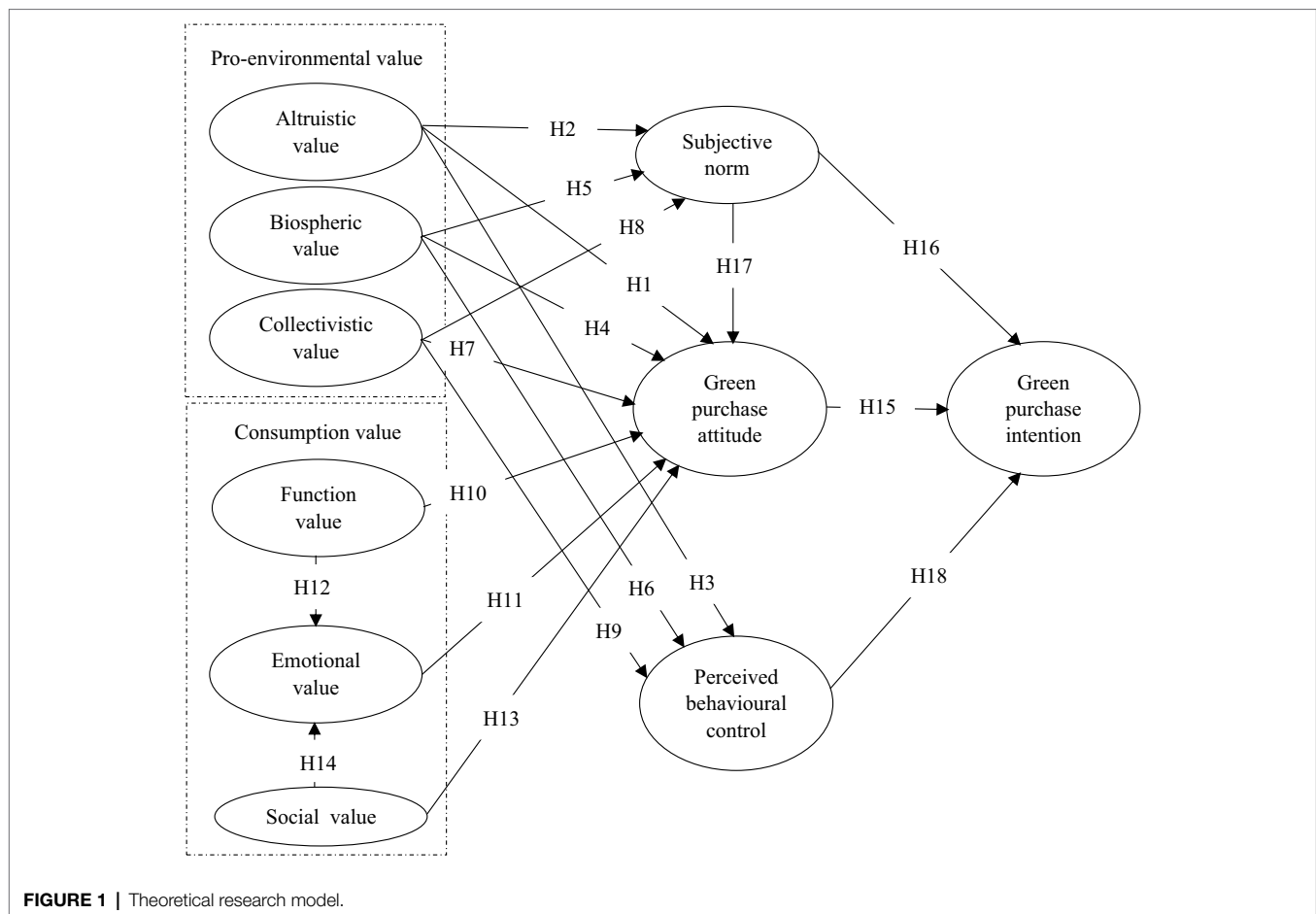
as well as Cochran's formula that determined a minimum of 384 sample size is recommended for target population which is unknown (Sarmah et al., 2013).

Measures

The research instrument adopted was the self-administered questionnaire. The questionnaire was designed in four sections. The first section included pro-environmental values: altruistic, biospheric and collectivistic value. Six items belonging to altruistic value were adapted from Mas'od and Chin (2014); six items used to measure biospheric value were adapted from Teng et al. (2015) and Rahman and Reynolds (2016); six items belonging to collectivistic value were adapted from Wang et al. (2020a). The second section included the consumption values: function, emotional and social value. Ten items belonging to function value and five items used to measure emotional value were adapted from Hur et al. (2013) and Rasoolimanesh et al. (2020); six items related to social value were adapted from Hur et al. (2013), Caber et al. (2020), and Rasoolimanesh et al. (2020). Third section items were used to assess the TPB's components: SN, GPA, PBC and GPI. Three items used to measure SN and three items belonging to PBC were adapted from Wang and Wong (2021), four items used to assess GPA and three items used to measure GPI were adapted from

Wang et al. (2020a). Lastly, the fourth section elicited relevant demographic characteristics. All of measurement items were evaluated using a five-point Likert scale, ranging from "strongly disagree" to "strongly agree." All questionnaire items were translated into Chinese using the back-translation method by three bilingual experts to ensure translation accuracy. A pretest was conducted involving 40 respondents to ensure the usability and validity of the developed instrument and to prevent any problems that may affect the quality of the collected data.

Common Method Bias Issues

Lastly, the Common Method Bias (CMB) is considered as another major concern in survey studies (Hulland et al., 2018). In this study, all respondents from different majors completed the questionnaires to reduce CMB impact from homogeneous issues; second, the measures used multiple scale types, containing differential, bipolar, semantic, and Likert. Podsakoff et al. (2003) indicated that a common latent factor can be used to examine CMB. During CFA process, a latent variable was included in model by connecting it to all observable factors, and the standardized regression evaluated the new model before comparing it with the original model showed similar results after comparison. Finally, Harman's single factor test was performed to determine the existence of CMB in influencing

results. The results showed that single factor score obtained a variance of 40.526%, indicating CMB is not a pervasive issue for this study.

Data Analysis and Results

The Statistic Package for Social Science (SPSS) provides a vast array for programs for univariate, bivariate and multivariate statistical analysis and it is considered the most widely available and used comprehensive statistic calculation software for marketing (Malhotra and Birks, 2007; Green and Salkind, 2010). Thus, the SPSS 19 version was utilized for the descriptive statistics for this study. The next step performed was a confirmatory factor analysis (CFA) and structural equation modeling (SEM) test with AMOS. According to Risher and Hair (2017), covariance-based application (e.g., CB-SEM or LISREL) is based on the common factor model, indicating the analysis is based on the common variance derived from the covariances between all variables in the structural model, determines how well the model can estimate the covariance matrix for the sample data with the ultimate goal of confirming theory (Hair et al., 2014). In contrast, variance-based application (e.g., PLS-SEM) uses a composite model, in which optimum solutions are based on the total variance of all indicators in the model (Risher and Hair, 2017). The main objective of variance-based application is to minimize unexplained variance in the dependent variables, thus, it is well suited for analyzing predictive, complex models with a large number of variables and relationships (Hair et al., 2019). Therefore, the CB-based CFA and SEM were adopted for this study as this study attempts to explore the effect of various dimensions of pro-environmental value and consumption value on youth green car purchase intention based on VAB model and TPB model.

Descriptive Statistics

SPSS version 19 was employed for the descriptive statistics and **Table 1** displays the segmentation for the demographic characteristics of the samples. Of the 541 valid questionnaires returned, 83.2% were female, 50.5% respondents reported that they were junior candidates. 32.3% of the respondents are 20 years old, and most students' monthly living expenses are between 1,501–2,000 yuan (36.8%).

Confirmatory Factor Analysis

In the measurement model, researchers should accept items with loadings more than 0.5 (Hair et al., 2010). Thus, factor loadings below 0.5 were dropped (i.e., BV5, BV6, CV6, SV5, and SV6) before finalizing the validity and reliability of the remaining items. Besides, to test convergent validity of the model, the composite reliability (CR) for each variable were higher than the thresholds of 0.7, and the average variance extracted (AVE) were higher than the minimum criteria of 0.5 as suggested by Hair et al. (2010) (See **Table 2**). Moreover, to assess discriminate validity, heterotrait–monotrait ratio of correlations (HTMT) was considered. As shown in **Table 3**, the threshold value for HTMT should less than 0.9 or even

TABLE 1 | Sample characteristics ($N = 541$).

Items	Characteristic	Frequency	Percentage (%)
Age	Below 18	18	3.3
	18	20	3.7
	19	76	14.0
	20	174	32.3
	21	154	28.5
	22	56	10.4
	23	30	5.5
	Above 23	13	2.4
Gender	Female	450	83.2
	Male	91	16.8
Education level	Freshman	223	41.2
	Sophomore	5	0.9
	Junior	273	50.5
	Senior	22	4.1
	Master and above	18	3.3
Living expenses	Below 1,000	46	8.5
	1,000–1,500	189	34.9
	1,501–2000	199	36.8
	2001–2,500	69	12.8
	2,501–3,000	12	2.2
	Above 3,001	26	4.8

less than 0.85 (Henseler et al., 2015), thus indicating that discriminant validity exist according to HTMT test.

The model fit indices showed that the measurement model contained an adequate fit to the data: $X^2 = 3070.803$, DF $= 979$, $p < 0.001$, CMIN/DF $= 3.137$ (below guidelines of 2–5), RMR $= 0.068$, CFI $= 0.915$, IFI $= 0.915$, TLI $= 0.906$, PGFI $= 0.697$, PNFI $= 0.797$, PCFI $= 0.829$, RMSEA $= 0.063$, PCLPSE < 0.001.

Structural Model Estimation

Structural equation modeling (SEM) was performed to test the hypotheses of this study. Indeed, for mediation test, the bias-corrected percentile method (BC) was considered as it is still the most accurate method implemented in the software package (Carpenter and Bithell, 2000). Thus, the results of mediational relationships will be observed based on direct and indirect values from two-tailed significance under bootstrap confidence, and the test turned out to be significant at the $p < 0.05$ level. In the model fit summary, $X^2 = 3241.270$, DF $= 990$, $p < 0.001$, CMIN/DF $= 3.274$, CFI $= 0.909$, IFI $= 0.909$, TLI $= 0.900$, PGFI $= 0.703$, PNFI $= 0.800$, PCFI $= 0.832$, RMSEA $= 0.065$, PCLPSE < 0.001. Details about the structural model evaluation results are illustrated in **Figure 2** and **Table 4**, accordingly.

CONCLUSION AND DISCUSSION

This study focused on the both the pro-environmental value and the consumption value on the belief-related aspects (i.e., SN, PBC, and GPA) and behavioral aspect (i.e., GPI) toward green car purchasing behavior. An integrated value–attitude–behavior model and TPB model that incorporated altruistic value, biospheric value, collectivistic value, function value, emotional value and social value, SN, GPA, PBC and GPI was developed and empirically tested.

TABLE 2 | Construct validity.

Variables (Cronbach's alpha)	Items	Item loadings	CR	AVE
Biospheric (α=0.909)	1. Respecting the earth	0.907	0.918	0.737
	2. Unity with nature	0.785		
	3. Protecting the environment	0.922		
	4. Preventing pollution	0.813		
Altruistic (α=0.846)	1. I have given directions to a stranger	0.666	0.860	0.508
	2. I have given money or donated goods to a charity	0.748		
	3. I have given money to a stranger who needed it	0.796		
	4. I have pointed out a clerk's error in under charging me for an item	0.661		
	5. I have let a neighbor whom I did not know too well borrow an item of some value to me	0.681		
	6. I have offered my seat on a bus or train to a stranger who was standing	0.713		
Collectivistic (α=0.924)	1. I like to work hard for the accomplishment of goals of my group	0.845	0.927	0.719
	2. I like to help others in a time of need	0.884		
	3. I like to maintain good relationships with others	0.902		
	4. To do well in life, the help of friends is crucial	0.832		
	5. One of the pleasures in life is to be interdependently related to others	0.770		
GPA (α=0.947)	For me, purchasing a green car is –	0.867	0.936	0.785
	1. Good	0.851		
	2. Desirable	0.908		
	3. Pleasant	0.917		
	4. Wise			
Subjective norm (α=0.961)	1. Most people who are important to me think I should purchase a green car	0.960	0.963	0.895
	2. Most people who are important to me would want me to purchase a green car	0.965		
	3. People whose opinions I value would prefer that I purchase a green car	0.913		
PBC (α=0.815)	1. Whether or not I purchase a green car is entirely up to me	0.740	0.832	0.624
	2. I am confident that if I want, I can purchase a green car	0.853		
	3. I have resources, time and opportunities to purchase a green car	0.772		
GPI (α=0.932)	1. I am willing to purchase a green car in future	0.925	0.933	0.824
	2. I will make an effort to purchase a green car in future	0.922		
	3. I plan to purchase a green car	0.875		
Function value (α=0.948)	1. Green car is cozy and comfortable	0.699	0.943	0.623
	2. Green car is technically innovative	0.674		
	3. Green car is environmentally friendly	0.694		
	4. Green car gets good mileage	0.833		
	5. Green car preserved some traditional facets	0.858		
	6. The overall green car experience is value for money	0.779		
	7. Green car was accessible	0.866		
	8. The green car staff were friendly and courteous	0.756		
	9. The green car staff were able to converse well	0.858		
	10. The green car program is an economical car-using package	0.846		
Emotional value (α=0.885)	1. There is a feeling of individuality about take/drive green cars	0.928	0.902	0.660
	2. Take/drive green car is exciting	0.957		
	3. Take/drive green cars make me funny and enjoyable	0.948		
	4. Green car was something new and different	0.533		
	5. My experience take/drive green car was something special and relaxing	0.585		
Social value (α=0.815)	1. I will feel proud of my green car	0.777	0.812	0.529
	2. Purchasing green car was a smart choice	0.881		
	3. Purchasing green car helps me to feel acceptable to others	0.698		
	4. Purchasing green car enables me to impress others	0.501		

S. No.	Items	1	2	3	4	5	6	7	8	9	10
1.	BV	*1.000*									
2.	AV	0.401	*1.000*								
3.	CV	0.612	0.694	*1.000*							
4.	GPA	0.602	0.436	0.546	*1.000*						
5.	PBC	0.414	0.490	0.446	0.625	*1.000*					
6.	SN	0.243	0.486	0.376	0.638	0.763	*1.000*				
7.	GPI	0.472	0.539	0.566	0.806	0.732	0.740	*1.000*			
8.	FV	0.482	0.638	0.663	0.610	0.576	0.601	0.665	*1.000*		
9.	EV	0.543	0.601	0.678	0.771	0.641	0.673	0.842	0.779	*1.000*	
10.	SV	0.106	0.118	0.126	0.209	0.176	0.222	0.229	0.229	0.177	*1.000*

EV, Emotion value; BV, Biospheric value; AV, Altruistic value; CV, Collectivistic value; GPA, Green purchase attitude; PBC, Perceived behavioral control; SN, Subjective norm; GPI, Green purchase intention; FV, Function value; SV, Social value.
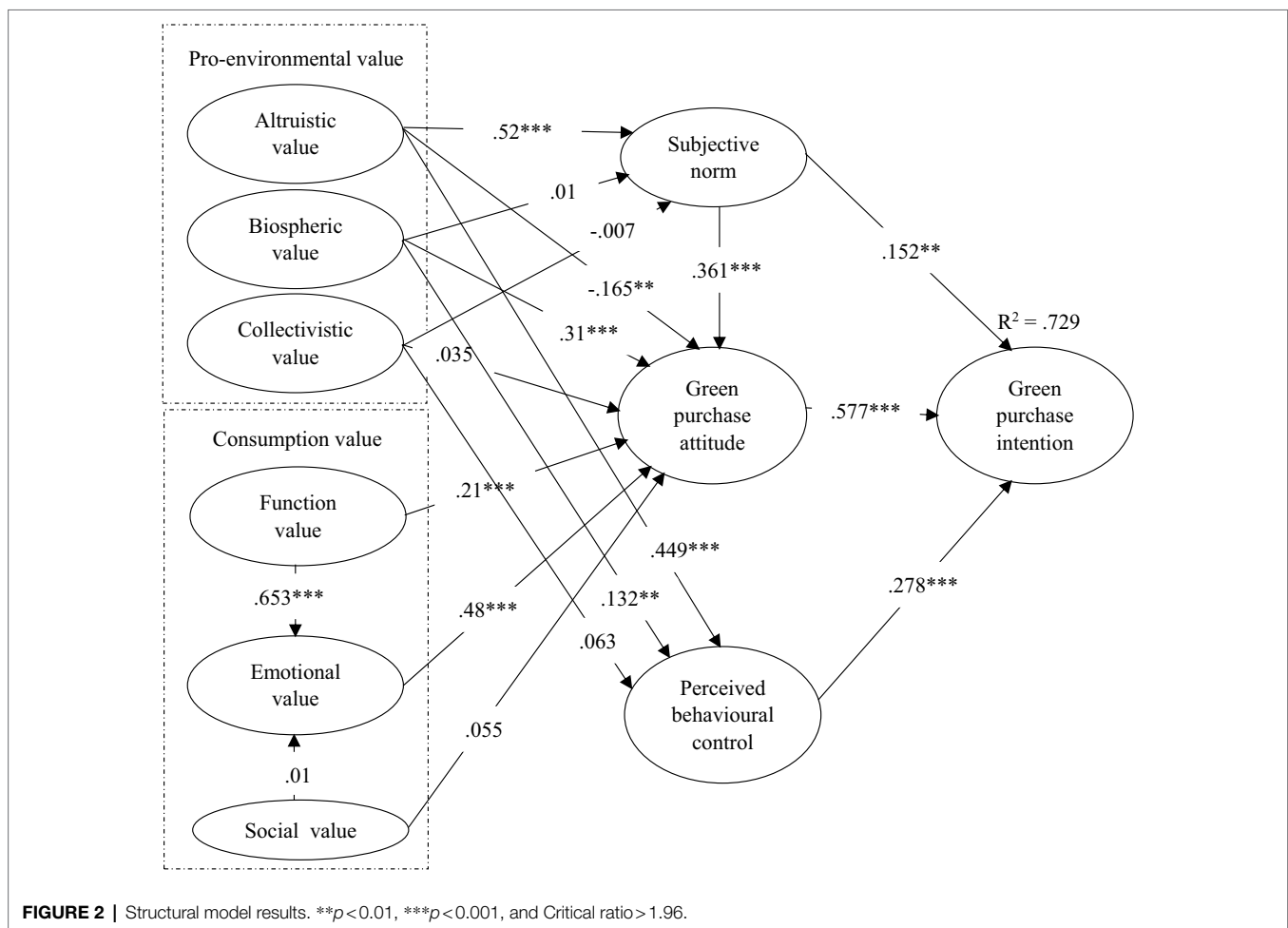
FIGURE 2 | Structural model results. **$p < 0.01$, ***$p < 0.001$, and Critical ratio > 1.96.

According to Wang and Wong (2021), a path coefficient of below 0.1 means a small effect; a path coefficient of about 0.3 indicates moderate effect; and a path coefficient of 0.5 and above shows a large effect. Previous studies showed that there is a positive relationship between altruistic value and GPA (Birch et al., 2018; Wang et al., 2020a). However, the results

indicated that altruistic value moderately and negatively influenced GPA ($\beta = -0.165$, $p < 0.01$). This means that the young Chinese generation's GPA toward purchasing a green car was generated without considering the benefits of the purchase to others. Individuals may look for self-interest in advance of desire to benefit to others *via* purchasing green

TABLE 4 | Results of the structural model.

Hypothesized paths	β	C.R.	Sig.	Decision
H1: Altruistic value → GPA	−0.165	−2.670	0.008	Not supported
H2: Altruistic value → SN	0.520	7.612	***[c]	Supported
H3: Altruistic value → PBC	0.449	5.913	***[c]	Supported
H4: Biospheric value → GPA	0.310	8.177	***[c]	Supported
H5: Biospheric value → SN	0.010	0.221	0.825	Not supported
H6: Biospheric value → PBC	0.132	2.630	0.009	Supported
H7: Collectivistic value → GPA	0.035	0.653	0.513	Not supported
H8: Collectivistic value → SN	−0.007	−0.109	0.913	Not supported
H9: Collectivistic value → PBC	0.063	0.869	0.385	Not supported
H10: Function value → GPA	0.210	3.642	***[c]	Supported
H11: Emotional value → GPA	0.480	10.743	***[c]	Supported
H12: Function value/emotional value/GPA			0.019[a] 0.000[b]	Supported
H13: Social value → GPA	0.055	1.669	0.095	Not supported
H14: Social value/emotional value/GPA			0.059[a] 0.715[b]	Not supported
H15: Green purchase attitude → GPI	0.577	14.639	***[c]	Supported
H16: Subjective norm → GPI	0.152	2.760	0.006	Supported
H17: Subjective norm/GPA/GPI			0.108[a] 0.001[b]	Supported
H18: Perceived behavioral control → GPI	0.278	4.474	***[c]	Supported

[a]Denotes standardized direct effect with bootstrapping method (two-tailed significance).
[b]Denotes standardized indirect effect with bootstrapping method (two-tailed significance).
[c]Denotes $p < 0.001$.

cars. According to Wang et al. (2020a), studies on the effect of altruistic value in green marketing are scarce when compared to conventional studies. This study may conclude that young consumers GPA will be negatively connected with their altruistic value exceed other values when they purchase high-interest products. Thus, H1 was not supported. However, altruistic value positively influenced SN ($\beta = 0.52$, $p < 0.001$) and PBC ($\beta = 0.449$, $p < 0.001$) respectively. It can be said that the Chinese young generation is generally more concerned about their significant referents' opinions and their perceived ability to purchase green cars which is highly influenced by their concern about other (environmental) benefit. This result is supported by Obrenovic et al. (2020) and Teng et al. (2015) who argued that altruistic value has statistical impact on GPA and PBC, respectively. Hence, H2 and H3 were supported.

Based on previous studies, the biospheric value has been proven to have a significant positive influence on GPA in green marketing (Rahman and Reynolds, 2016; Wang et al., 2021b), and in some circumstance, individuals concern about environment played the most important role in determining one's green purchase propositions (Jaiswal and Kant, 2018; Wang, 2020). The results of this study show that there is a positive significant relationship between biospheric value and GPA ($\beta = 0.31$, $p < 0.001$). This means that the young generation who is more concerned about the environment will possess a higher positive attitude to purchase green cars in future. Young consumers concern about physical environment dominated in their GPA compared to other type of environmental values toward purchasing green cars, and thus, H4 was supported. The result of the study also suggests that the biospheric value positively influences PBC ($\beta = 0.132$, $p < 0.01$). This result also stands in line with some studies showing that the biospheric value positively influences PBC (Rahman and Reynolds, 2016, 2019). It can, therefore, be claimed here that individuals' concern about ecosystem will lead to a stronger perception of their abilities to overcome barriers to purchase green cars. This shows that they may spend more time, information, and resources on looking for green cars as they would like to preserve natural resources. Thus, H6 was supported. However, the results of this study also indicate that the biospheric value non-significantly influence SN. This result stands in contrast to some studies showing that the biospheric value positively influence on SN (Bamberg, 2003; Paul et al., 2016). This means that the Chinese young generation are not particularly concerned about their significant referents' opinions' influence on their own biospheric value. It can be said that individuals' environmental concern and awareness were shaped by their environmental beliefs, and this not easily can be influenced from their significant others' suggestions or word of mouth. Hence, H5 was not supported.

Furthermore, it is a surprise that collectivistic value has no role in this study as it did not influence GPA, SN, or PBC. These results differ from previous studies (Kumar and Sreen, 2020; Wang et al., 2020a; Wang and Wong, 2021) which showed that collectivistic value should play a significant role in determining pro-environmental behaviors, specifically in eastern countries (e.g., China). One reason may due to the fact that the young generation is becoming more individualistic when compared to their older counterparts (Wiratno et al., 2020). Another reason may be that product-related attributes (e.g., function value and emotional value) play a more significant role in determining their green car purchasing behavior over collectivistic value due to the results showed that consumption values had more influence compared to pro-environmental values. Thus, H7, H8, and H9 were not supported.

In prior studies, function value has been proven to be an important predictor that led to positive attitude and intention in green marketing (Sierzchula et al., 2014; Bjerkan et al., 2016). This study also revealed a moderately significant positive relationship between function value and GPA ($\beta = 0.21$, $p < 0.001$). The Chinese young generation concerns about green cars' functional, utilitarian, and physical performance attributes greatly

influenced their attitudes toward purchase green cars. Hence, H10 was supported. This study also demonstrated a moderate significantly positive correlation between emotional value and GPA. These results are consistent with those reported in previous studies that suggest emotional value is an important predictor for consumers' GPA and behavior (Rasoolimanesh et al., 2020; Joshi et al., 2021). It means that individuals' experience and feeling about owning green cars (e.g., hedonic orientation, exciting, and novelty) compared to conventional cars can lead to positive responses, thus, significantly influencing their GPA. Hence, H11 was supported. According to Hur et al. (2013), consumers may feel connected and belonging to an environmentally conscious group *via* purchasing hybrid cars, and thus, benefit others. Nevertheless, this study did not show any significant relationship between social value and GPA toward green car purchase intention. It can be explained that the Chinese young generation did not feel that they belong to any environmentally conscious groups *via* purchasing green cars, thus, social value is not a significant predictor for their green car purchasing attitude. This result was also somewhat reflective of the earlier finding that collectivistic value did not influence the Chinese young generation's green car purchase attitude. The social pressure on environmental protection and group goal for preserving natural resources *via* purchasing green cars cannot influence young Chinese consumers to make decisions for high-interest products (i.e., green cars). Hence, H13 was rejected.

Babin et al. (2004) mentioned that consumers' functional value attributes positive effects on hedonic shopping values and service quality is positively correlated with emotional value. The results of this study show that the direct link between function value and GPA ($p < 0.05$), and the indirect relationship between function value and GPA through emotional value ($p < 0.001$) was found to be statistically significant. This result suggests that emotional value plays a partially mediating role in the relationship between functional value and GPA. Therefore, H12 was supported. Furthermore, Nkaabu et al. (2017) argued that social value positively influenced consumers' evaluation of emotional value generated toward purchase intention. However, findings from this study indicated that the direct relationship between social value and GPA ($p > 0.05$) and the indirect relationship between social value and GPA *via* emotional value ($p > 0.05$) were found to be statistically insignificant. This is reflective of earlier results which revealed that there is an insignificant relationship between social value and GPA. Hence, emotional value has no role in mediating the relationship between social value and GPA, and H14 was rejected.

The results showed that GPA has a major influence on intention ($\beta = 0.577$, $p < 0.001$). This result is consistent with those reported in previous studies that GPA is the most important variable that influenced intention and behavior (Jaiswal and Kant, 2018; Wang et al., 2019). This means that the Chinese young generation who have more positive attitude toward green cars will possibly select a green car as their transportation tool in future. Therefore, H15 was supported. In prior studies, SN has been proven to be an unstable predictor of GPI even though certain studies showed SN positively influenced GPI

(Bahl and Kumar, 2019; Liu et al., 2020), a number of other studies demonstrated that SN has a non-significant relationship with GPI (Patharia et al., 2020; Wang and Wong, 2021). The current study's results indicated that SN has a moderate significant ($\beta = 0.152$, $p < 0.01$) influence on GPI. This shows that when Chinese young generation receive important opinions about green cars from significant others, it can positively influence their green car purchasing intention. Hence, H16 was supported. In some circumstances, PBC may play the most important role in determining GPI in TPB (Zhou et al., 2013). In addition, certain studies showed that GPI is positively influenced by consumers' PBC (Ateş, 2021; Lin et al., 2021). In other words, the more confident the consumers have in overcoming barriers (e.g., resources, money, and time) in their quest to purchase green cars, the more likely they will engage in such purchasing behavior. This study confirms that there is a moderate significant relationship between PBC and GPI ($\beta = 0.278$, $p < 0.001$). Hence, H18 was supported. Furthermore, Wang et al. (2021b) indicated that the significant other's views on the GPB performance can influence one's attitude, and subsequently on their intention among eastern cultures. Researchers should consider the significant causative path from SN to attitude in eastern nations (Wang and Wong, 2021). This study subsequently confirms the direct relationship between SN and GPI was statistically insignificant ($p > 0.05$), while the indirect link between SN and GPI *via* GPA was found to be significant ($p < 0.01$); which denotes GPA fully mediates the relationship between SN and GPI. Thus, H17 was supported.

Theoretical Contributions

First, this study is among the first that empirically tested and validated the significant relationships of altruistic value, biospheric value, collectivistic value, functional value, emotional value, social value, SN, GPA, PBC, and intention toward green car purchase behavior based on a merged VAB and TPB models. TPB model assumes that self-interests, including weighted expected cost and benefits of alternatives (e.g., time, money, opportunities, and social approval) motivates individuals (Lindenberg and Steg, 2007). Thus, TPB had more explanatory power in high behavioral cost or strong constraints situations when compared to value orientation theories (e.g., value-belief-norm theory; Wang et al., 2021b). But at the same time, the nature of TPB is its focus on rational reasoning and it lacks consideration on personal decision criteria, such as subconscious, feelings, and private standards (Ulker-Demirel and Ciftci, 2020). In fact, the nature of the relationship between values, beliefs, attitude and behavior is complex (Wang and Wong, 2021). Tamar et al. (2020) showed value is considered as a stable trans-situational goal which varies in degree of importance and serve as a guiding principle in one's life, and as one of the critical antecedent for GPB (Wang et al., 2021b). However, compared to TPB model, such theories (e.g., value-belief-norm theory, VAB) were found to have less explanatory power in explaining high-cost GPB (Wang et al., 2021b). By investigating the influence of various aspects of pro-environmental values (i.e., collectivistic value, altruistic value, and biospheric value), consumption values (i.e., functional value, emotional value,

and social value) and components of TPB (i.e., attitude, SN, and PBC) on GPI toward green cars purchasing, this study offers a more comprehensive perspective on the green cars purchasing behavior among young generations.

Second, although consumption values have been adopted in various studies in the literature (Jan et al., 2019; Zaidi et al., 2019; Caber et al., 2020), the link between consumption values and behavior does not seem to explain behavior comprehensively in green marketing (Jacobs et al., 2018). This study enriches the understanding of how function value, emotional value, and social value influence GPA, and ultimately the effect of GPI toward green car purchase behavior in China. Previous studies indicated that in some circumstances, consumers' emotional value can be influenced by their functional value or social value (Ladhari et al., 2017; Rasoolimanesh et al., 2020). The results from this study confirmed that emotional value plays a full mediation role between function value and GPA. This lends support to the argument that function value has a significant effect on attitude *via* emotional value toward certain purchasing behavior (Ladhari et al., 2017; Rasoolimanesh et al., 2020). Nevertheless, the results of this study did not confirm that emotional value mediates the relationship between social value and attitude.

Third, this study provides an exhaustive understanding of the influence of pro-environmental values on attitude, SN, and PBC. Although the VBN model successfully applied altruistic value, biospheric value, and egoistic value in predicting GPB in previous studies (Wang et al., 2020a, 2021d), there were certain gaps that need to be addressed. First, studies on altruistic value are scarce compared to conventional studies (Wang et al., 2020a); second, most previous studies related to GPB have not distinguished biospheric value from altruistic value (Rahman and Reynolds, 2016); and third, egoism does not seem to be a suitable predictor for consumers in eastern cultures with collectivistic values (Wang et al., 2020a). The results from the current study indicated that altruistic value positively influenced SN and PBC, but negatively influenced GPA; biospheric value positively influenced GPA and PBC; meanwhile, collectivistic value had no influence on GPA, SN, and PBC toward green cars purchasing. The obtained results offer an alternative perspective on the consumers' pro-environmental values and green cars' purchase intention and offers valuable insights on the influence of altruistic value, biospheric value, and collectivistic value on GPA in an eastern country.

Last, the TPB model is prevalently applied in green marketing studies. However, there is a lack of understanding of Chinese consumers' GPB in studies using western samples (Ulker-Demirel and Ciftci, 2020). The results of this study showed that the components of TPB (SN, GPA, PBC) undoubtedly played a significant role in determining GPB toward green car purchasing behavior. In addition, certain studies demonstrated that the possible mediation effect of SN in the TPB model cannot be ignored (Bashir et al., 2019; Wang and Wong, 2021). This study confirmed that GPA played a mediation role between SN and GPI. More importantly, the obtained results confirmed the existence of certain relationships between individuals' pro-environmental values, consumption values, SN, GPA, PBC,

and GPI toward green car purchasing behavior. This study offers an alternative perspective on the individual's values and beliefs toward green car purchasing intention among the young generation.

Practical Implications

The results of this study indicated that altruistic value, collectivistic value, and social value had negative or no influence on consumers' GPA. In contrast, biospheric value, functional value, and emotional value had positive influence on their GPA. Young generations are becoming more individualistic and independent in marking decisions to purchase some novel products and services. When they purchase high-cost products (i.e., green cars), they are not unduly concerned about benefits to others *via* their green car purchase; they do not feel that they are connected to others who have the same goal of protecting the environment by purchasing or using green cars.

Meanwhile, they are more concerned about the green cars' applicable attributes (e.g., innovation, cost-saving, good mileage, and comfortable), and on the feelings of using/driving green cars (e.g., exciting, enjoyable, and uniqueness). Thus, the green car industry should pay more attention on its products; for example, they can promote key characteristics of their green cars: how they can save money compared to traditional cars, and they can disseminate information on the latest innovations they have adopted in green car technology (e.g., energy recovery, noiseless, short-charging time, non-maintenance, affordable, and cozy). At the same time, they can educate the consumers on how they can protect the environment *via* purchasing green cars (e.g., non-pollution and non-greenhouse gas emissions). Finally, highlighting the emotions of driving a green car (pleasure, excitement, thrill, trendy) is vital for green car manufacturers, as emotional value has a significant impact on consumers' GPA, followed by biospheric value and functional value.

Second, this study shows that collectivistic value had no influence on consumers' SN and PBC in a highly collectivistic society (i.e., China). It means that consumers' intention to purchase green cars is not influenced by group goals to protect environment. In addition, biospheric value had no influence on SN. This means that young Chinese consumers are becoming more individualistic and less concerned about the opinions of others on environmental consciousness. Meanwhile, altruistic value positively influenced one's SN and PBC, and biospheric value positively influenced PBC. This means that consumers are more concerned about how purchasing green cars can lead to positive feedback from their significant others. Thus, by highlighting the green functional attributes of green cars and how they can benefit the consumers' referent groups *via* purchasing green cars can lead to greater environmental awareness among the youth market. Evoking consumers' environmental concerns and benevolence to others is another strategy for the green car industry to promote their products.

Third, as GPA, PBC and SN were found to significantly influence GPI, it is important to recognize that positive attitudes,

significant others' opinions, as well as a high level of confidence to overcome obstacles were important influencing factor for young potential consumers to purchase green cars. Green car manufacturers should convey the message that green cars purchase can help protect the environment for themselves and others, and at the same time, highlighting the ease of owning green cars (such as saving money in the long run due to reduced fuel costs and ease of charging); thus, eliminating some of the perceived barriers to purchase green cars. The young generation have never lived without the internet (Kusumawati et al., 2019), therefore it is imperative that both online (e.g., web-based advertisings) and traditional media are used in promotional campaigns for green car manufacturers to effectively reach this target segment.

Last but not least, as GPB awareness is still at its infancy stage in China (Wang and Wong, 2021), pro-environmental education needs to be provided by the green car industry and should be targeted to the young generation as they are more receptive and concerned about environmental issues. Information that should be disseminated to these potential consumers can include information on how the adoption of green vehicles in the transportation section can lead to a significant reduction in the emission of greenhouse gases and CO_2 emissions, which subsequently, will lead to an increase in the young generation's biospheric value and environmental awareness.

Limitation and Future Recommendations

First, as this is a cross-sectional study, no definite conclusions can be drawn on the causality of the relationships in this research. Second, the sample for this study was selected from young university students, which is not representative of the entire Chinese population and therefore the results are not generalizable. Indeed, certain studies demonstrated that specific student samples could be detected showing a variety of environmental attitude and dispositions (Lambrechts et al., 2018; Caniëls et al., 2021), and replicating student results on non-students could be a huge challenge for researchers in any disciplines (Henry, 2008). Future research should examine

the effect of pro-environmental value and consumption value from divergent populations on GPB. Lastly, although intention may be robust in certain behavioral studies, an individual's actual behavior is not always reflective of one's stated behavioral intention (Wang et al., 2021c). Hence, the influence of behavioral intention on Chinese young consumers' actual green cars purchasing/GPB should be further investigated 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 Business School, Xuzhou University of Technology. Written informed consent from the participants' legal guardian/ next of kin was not required to participate in this study in accordance with the national legislation and the institutional requirements. Written informed consent was not obtained from the individual(s), nor the minor(s)' legal guardian/next of kin, for the publication of any potentially identifiable images or data included in this article.

AUTHOR CONTRIBUTIONS

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Factors Influencing Consumers' Purchase Intention Towards Green Home Appliances

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The main purpose of this study is to investigate the effect of after sales service (ASS), brand equity (BE), environmental awareness (EA), and product pricing (PP) towards consumer purchase intention (CPI) of green home appliance. Data were collected from 150 Penang, Malaysia citizen who were age from 18 to 60 *via* convenient sampling method analysed using partial least square structure equation modelling (SmartPLS). Results indicated that BE, EA, and PP has significant effect on CPI of green home appliance. However, ASS do not have significant effect on CPI on green home appliance brand. This research helps home appliance manufacturer to better design marketing promotions, considering the consumers focus on BE, EA, and pricing. In addition, this study provides consumer insight for the government agency to construct better policy in order to increase the green home appliance penetration rate among citizens.

Keywords: consumer purchase intention, after sales service, brand equity, environmental awareness, green home appliance

INTRODUCTION

The term green home appliance generally is used to describe any energy-efficient home appliance, they are designed to increase energy efficiency of the electric device and reduce utility bills. There is a wide array of green household appliances such as air-conditioning, water heater, lighting, washing machine, refrigerators, oven, television, and many more. The more efficient the appliance, the less energy it will use. Air conditioning, for example, with inverter and remote sensor technologies, it reduces electricity by 25–30% (King and Perry, 2017). There are different factors to take into consideration, including efficiency, price, and energy labelling by local authority. Green product has become a market mainstream contemporarily in developed and developing countries. The level of awareness in the society highly depends on initiative by the government and non-government bodies *via* education system and social campaign. World energy consumption is growing exponentially, and energy conservation become a huge initiative by government and business stake holders to keep the environment sustain (Singhal et al., 2019). All energy consumption comes with an environmental cost, especially fossil fuel generation (Al-Marri et al., 2018). Among all sector, residential energy consumption has an important role to play in the entire energy consumption outcomes and it is intricately linked with consumer behavioural, especially the buying intention of green home appliance. Consumer intention is hard to predict as it involves comprehensive psychological processes. During a purchasing process, a consumer will initiate with recognizing the needs, finding way to resolve, interpret information, evaluating multiple choice, and

finally making the decision to purchase a specify product (Singh and Verma, 2017). Various studies attempt to understand the determinants or stimuli associate to the purchase intention behaviour. Subsequently, help the company to frame out effective marketing strategies and plans.

From a marketing perspective, by understand the consumer intention underlying the decision to purchase green home appliance, it helps to facilitate the promotion and sales of the product. As the price of green home appliance is always higher relatively compare to traditional home appliance, individual which buy the green home appliance need to have the perceived values rather than the product primary functions. This derive that the contemporary green values of the products are more than their fundamental functions (Jan et al., 2019). Generally, environmental impacts are an inherent part of electricity production and energy use. Therefore, green home appliance plays an essential role in helping to reduce the use of electricity, and subsequently contribute towards the environment sustainability. Zhang et al. (2020) revealed that household appliances such as air conditioners, washing machines, and refrigerators are responsible for high household energy consumption and carbon emission in China. The use of energy-efficient appliances has an important positive impact on reducing household energy consumption and household carbon emissions (Zhang et al., 2020).

In the context of Malaysia, the utilization of green home appliance among Malaysia consumer is not promising (Tan et al., 2019). Their study reveals that only 30% of the respondents has the experience of purchasing green product. This deduces that other determinants have influenced the consumers for not purchasing green home product, for example, product pricing (PP), product quality, and product branding. In most Malaysians perspective, they assumed that green products as highly priced goods, even with additional attributes comparison with non-green products (Khor and Mah, 2020). According to Malaysia Energy Commission (2017), in the period of 1990–2016, more than 90% of electricity generated for Peninsular Malaysia was fossil fuel. In 2016 alone, for example, coal provided up to 52% of the energy generation while gas contributed 44%, these methods have significant impact on the environment.

Study show that by increasing the willingness to purchase energy-efficient appliances is vital to reduce household energy consumption and carbon emissions resulting from this daily consumption (Li et al., 2019). Energy-efficient home appliances produced an annual electricity savings of about 10 billion kWh, which was equivalent to a reduction of carbon emissions by 6.5 million tons (Li et al., 2021). Back to the context of Malaysia, the penetration of green home appliance among Malaysia consumer are less than 30% (Tan et al., 2019), while the electricity generation in Peninsular Malaysia are origin from fossil. Thus, it denotes the huge potential in Malaysia for the energy and environment conservation. This can be achieved if we manage to enhance consumer environment awareness to utilize energy saving appliance in their daily lifestyle. In Iran, the local home appliance brands failed to compete with the foreign brands, even Iran manufacturers has the similar production technology and capacity (Esmaeilpour, 2014). The citizens in Iran prefer to buy home appliance origin from foreign country like Japan and Europe. The research reveals that undesirable after sales service (ASS) has reduced the interest Iran citizen to purchase a local product and decided to shift to other foreign brand. In the context of Malaysia, similar scenario in automobile industry. Proton, once the leading car seller in Malaysia market has a cliff fall since early 2000, one of the reasons is due to the poor ASS which hinder existing customer to continue support the automobile company (Saidin et al., 2015). Poor ASS by Proton, followed by criticism in social media by existing customer has result in the tendency of potential customer swing to other choice. Two scenarios above show that poor ASS is an impediment to the purchase of product. Meanwhile, the price for green home appliance is relatively high compare to normal home appliance. This could be another hurdles and barrels to increase the penetration of green home appliance product among consumers as the purchase power has significant correlation with income per capital. If the research able to overcome the price gap, there was a huge potential market among low (B40) and medium-income (M40) customers, who represent 80% of Malaysia population (Ng et al., 2018).

The variables focused in this study are the core marketing processes such as ASSs, brand equity (BE), EA, and PP where research previously published is not extensive in Malaysia (Surianshah, 2021). Therefore, this study aims to answer the research question, "What are the factors influencing on consumer purchase intention (CPI) of green home appliance?" Answering this question will help home appliance manufacturer to better design marketing promotions. In addition, it is hoped that the findings from this study will provide consumer insight for the government agency to construct better policy in order to increase the green home appliance penetration rate among citizens.

THEORETICAL UNDERPINNINGS

The foundation for the study is theory of planned behaviour (TPB). The attitude, subjective norm, and perceived behavioural control are three core components in TPB, which together devise an individual's behavioural intentions (Ajzen, 2015). Many studies generally assume the intentions are good predictors of behaviour and fully mediate the impact of attitude and subjective norm towards the behaviour (Ashraf, 2021). In addition, Hutahaean and Kurnia (2020) declared that intention is still accepted as the best available predictor of behaviour. Additionally, attitude, subjective norms, and behaviour control both have significantly positive impacts on consumer intention (Lin and Guan, 2021). It helps reader to understand how the behaviour of consumer can change by their beliefs how a certain green product could satisfy their needs. Superficially, the TPB is widely applied behavioural model in green marketing research (Stavros et al., 1999; Prigita and Alversia, 2022). However, as asserted by Harun et al. (2022), the literature on green purchasing behaviour is still in infancy in the context of South East Asian countries especially in Malaysia; furthermore, researchers have just begun to adopt TPB in green purchase intention of green home appliance in recent years. Therefore, the current study aims to fill in the research gap by directly enriching the literatures.

Studies denote that TPB reconciling the relationship between environment concern and green product buying intention (Afridi et al., 2021). They also concluded that TPB demonstrate higher utility in predicting consumer green purchase intention. These include green hotel and restaurant (Han, 2020); and green organic food (Pacho, 2020). In addition, findings indicated that the subjective norm was found to have the highest direct influence on purchase intention of green apparel in United States and China. Individuals may feel more pressure from their relevant groups when they conduct environmental behaviours, such as green consumption, recycling, and eco activities that may require ethical and socially responsible responses (Ko and Jin, 2017). Hence, the fundamental theory and conceptual framework for this research were devised based on the TPB.

LITERATURE REVIEW

The Influence of After Sales Service on Consumers' Purchase Intention

After sales service can be define as activities occur after the purchased of a particular product, and the devotion of the seller to the customer to assure the functionality of the product (Murali et al., 2016). Besides, ASS may be defined as the various processes with the main objective is to make sure customers are satisfied with the products and services of the organization (Domazet et al., 2018). In other words, ASS are important part of total customer satisfaction. Service quality is a measure of how well the service level delivered matches customer expectations and also a vital indicator for satisfaction (Yadav, 2019). Customers of green home appliances are more demanding nowadays and expecting impeccable ASS support. Especially, when they need some emergency services after the sale, the service would be fast and the costs are fairly accessible (Murali et al., 2016). Due to the fact that literatures on the influence of ASS on green purchase intention is scarce, it is difficult for the researcher to discussed based on green marketing perspective. Nevertheless, previous studies have revealed that consumers always consider the functionality and durability of the home appliance in their purchase intention, durability is evidenced has correlation with ASS (Esmaeilpour, 2014). Past research identified warranty accessibility and support as a key dimension of ASS as warranty provides assurance of quality of the purchased green home appliance, where longer warranty period assures a higher quality and reliability the product (Wickramasinghe and Mathusinghe, 2016). Irrefutably, household appliances are relatively expensive products and plenty consumers are obliged financial consequences during the purchase of home appliance like refrigerator, washing machine, and air conditioning.

According to Seth et al. (2005), ASS are recognised as a primary determinant which impact the CPI. In long term, it contributes to the revenue, profit, and competitive advantage for many industries. However, most of the business organizations are not aware about the ASS factors. Failing to understand the pivotal of ASS can lead to a disastrous to the business organization. The negative word-of-mouth effect will cause a potential customer switch to other competitor during the selection of green home appliance and vice versa (Wickramasinghe and Mathusinghe, 2016). Company should know the objective and importance of having ASS and implement it to satisfy customers, retain them and enhance their loyalty in next purchase. Becoming similar in term of attributes for green home appliance product, the ASS reputation can effect on consumers' way of choice (Abdullah and Hilmi, 2014). It represents a significant source of competitive advantage for the companies that operate in the same market. Similar thoughts presented by Posselt and Gerstner (2005) that the repurchase intention has significantly influence by the ASS, especially consideration on the spare part availability, optimization of warranty period and scope of work during warranty period.

After sales service attributes have significant impact in building customer trust and satisfaction, subsequently result in customer upcoming purchase intention (Murali et al., 2016). On the meta-analysis study of the purchase intention of the consumers towards remanufactured products conducted by Singhal et al. (2019), they revealed that ASS is moderately affecting the consumer buying intention. A structural empirical analysis done in Beijing on the factors influencing Electrical Vehicle (EV) purchasing intention. The findings reported that ASS is one of the consideration of CPI during the selection of EV (Huang and Ge, 2019). An investigation on the importance of ASS on three leading home appliances manufacturing firms in South India revealed that the ASS practices has a positive effect on the household appliances industry (Murali et al., 2016). While in Serbia, the warranty coverage period and the ASS accessibility are recognised as critical criterion which will define the customer purchase intention on particular appliance product especially washing machine, refrigerator, and air conditioning (Domazet et al., 2018). Furthermore, Vanniarajan (2011) revealed that the ASS quality attributes have significant influence on the repurchase intention of customer in electronic good market in India. Hence, this research would like to examine if the ASS is substantial factor influencing CPI towards green home appliance in Malaysia. specifically, we hypothesised that:

> H1: After sales service positively affects the purchase intention of green home appliance brand.

The Influence of Brand Equity on Consumers' Purchase Intention

Brand equity is exhibit an added value to a brand and product and such a value is made of customer's positive feelings, thinking, and acting towards purchasing a brand (Senthilnathan and Tharmi, 2012). Branding is a very practical strategy for differentiating product or service in the specify industries. It is a special value given to a product through its name. Successful brands allow company to gain competitive advantage including the opportunity for successful extensions, resilience against competitors' pricing strategies, and the ability to create barriers to rivalry entry (Seitz et al., 2010). In addition, a powerful brand influences attitudes of customers and makes a strong product association through the brand. Consumer will demonstrate different reaction toward a main brand and a product without a brand even both have the same features

and functionality (Khan et al., 2015). According to Aaker (1996), the BE is a multi-dimensional concept which include brand awareness, perceived quality, brand association, and brand loyalty. Understanding consumers' purchasing behaviour enable the company to attract and retain customers. Research reveal that strong brand awareness and association has significant impact on CPI (Gautam and Shrestha, 2018). By paying more attention to BE, it helps to increase the purchase intention of consumer.

Research indicates that the higher the BE the stronger consumers' preferences and purchase intentions (Moreira et al., 2017) to obtain the product or service. Aaker (1996) has proven that the benefit of BE in creating positive attitude among consumers, generating their interest to buy the product by distinguishing the brand within the same sector. This statement is further strengthened by the research in automobile industry where the brand perceived quality, brand loyalty and brand awareness have strong correlation with consumer buying intention (Jalilvand et al., 2011). A study in the United States argued that BE is not a main consideration during CPI on air conditioning, as quality of product is their primary choice of criterion (Seitz et al., 2010). The study in smartphone industry found that BE has positive association with the purchase intention as the signage of specify brand, for example, Apple provide user the status in society (Akkucuk and Esmaeili, 2016). Whereas in food industries, investment in BE enable marketer to elevate the consumer buying intention (Roozy et al., 2014).

Besides, the findings in Malaysia fashion industry reveal that the is casual relationship among four dimensions of BE to CPI. Brand loyalty has stronger impact on purchase intention among the four segment in this study (Khan et al., 2015). Moreover, on the baby care product segment in Sri Lankan context where parents' safety consciousness is augmented. It demonstrated positively significant linear relationship between BE and purchase intention (Senthilnathan and Tharmi, 2012). Studies in smart phone industry in developed country evidenced a strong positive correlation between BE with purchase intention. This can be explained that consumer has familiar with the product brand, and quality assurance, and social status (Huang et al., 2019). A research carried in Iran exhibit that BE not only has positive association with purchase intention, it has the globalization impact where brand which is highly rated in their country will received the same acceptance in other country (Moradi and Zarei, 2011). Further study on Samsung home appliance in Ishafan, Iran deduce that user experience has the greatest impact among all the effective dimension under BE which motivate CPI to home appliance. This past experience dimension is built over the time (Shafiee et al., 2019). Moreover, Vazifehdust et al. (2017) reported that there are significant relationships between BE and ultimate consumer buying intention on home appliance. Therefore, the current study would like to examine if the BE is pivotal factor influencing CPI towards green home appliance in Malaysia. specifically, we hypothesised that:

> H2: Brand equity positively affects the purchase intention of green home appliance brand.

The Influence of Environmental Awareness on Consumers' Purchase Intention

Environmental awareness is defined as environmental awareness refers to the concerns and comprehension of environmental problems (Chen et al., 2019). The attitude of consumer will be influenced positively by EA and significantly impact on the purchase intention on green product (Akroush et al., 2019). Consumer who has green consciousness and believe that their approach will help the environment benefit, will demonstrate a green product purchase intention. However, it they believe their approach cannot lead to a positive change or it is not worth the price, they will remain inactive (Maniatis, 2016). In additional, research exhibit that the energy concern will drive consumers' ethical commitments and further motivate them to green product (Ha and Janda, 2012).

According to Franzen and Meyer (2010), consumer who has high awareness of environmentally and energy concern, will be more alert on the natural resource's utilization on our planet. Green awareness influences human behaviour in several ways, which include reducing consumption, changing wasteful or harmful consumption patterns, and raising preference for environmentally friendly products (Suki, 2013). The social responsibility towards environment able to motivate the buying behaviour among consumers (Tan et al., 2019). Consumers who have EA means consumer embrace lifestyle and living activities which have a positive impact on environment or alternatively reduce negative impact on the environment (Wu and Chen, 2014). Research denotes that the green initiatives done by government has significant influence on household consumers in China, the campaigns has driven the green appliance sales for over the precedent year (Li et al., 2019). Nonetheless, the positive purchase attitude by Chinese consumers is believed to be stimulated by the high environment and energy conservation consciousness (Ha and Janda, 2012).

Furthermore, environmental concern and environmental knowledge have positive correlation on the willingness to purchase green products among young consumers when predicting the willingness of young consumers to purchase green products in developing countries (Yadav and Pathak, 2016). Nonetheless, the home appliance manufacturer cannot promote a green product by only focus on environmental benefits and not benefits of the consumers in term of functionality. Consumers who embrace environment friendly product do not differentiate between environmental and economic benefits. They see them as complimentary during the process of fulfil their personal needs as well as environment commitment (Maniatis, 2016).

In addition, the public also need to be assured that any conscious efforts made towards protecting the environment through energy conservation are going to make a difference strategically in the long term. Research show that environmental concern and environmental knowledge have significant association consumer attitude and impact on the purchase intention in TPB model (Li et al., 2019). By increasing the green home appliance penetration rate, it will have a positive correlation with the saving of electricity. Further study has

empirically verified the essence of knowledge on environment and impact to the surrounding in the purchase of energy-efficient home appliances (Waris and Hameed, 2020). Research in Qatar further support hypothesis which depicts that consumers have a positive inclination for the purchase of energy-efficient products if consumer is exposed to the information of environment and energy conservation *via* marketing materials (Al-Marri et al., 2018). Furthermore, Ko and Jin (2017) had empirically tested that environmental knowledge has positive correlation with the green apparel consumption. Both United States ad China sampling demonstrated the similar result of environment awareness association. To augmenting consumer awareness of residential energy consumption, United States government has launched the Energy Star Program in 1992. Even, awareness also does not directly translate into the purchase decision of energy saving home appliance, but implicitly assumes that the increased awareness will significantly impact on the consumer intention to shift from non-energy saving appliances to energy saving appliances (Murray and Mills, 2011).

In the context of Malaysia, study by Noor et al. (2012) showed that most of Malaysia acquired moderate environmental issue and knowledge. The study also reported that the environmental concern and attitudes positively contributed to green purchase intention. Teng et al. (2021) also reported that consumers who possessed high environmental concerns more likely to buy green products than consumers' who do not have concern on the environment. In addition, Ahmed et al. (2019) reported that environmental consciousness is directly influenced the consumer decision to re-purchase green home appliances. Hence, several studies have confirmed that a consumer who has concern for the environment will tend to have a stronger intention in purchasing a green product. In short, this research would like to examine if the awareness of environment and energy consciousness is substantial factor influencing CPI towards green home appliance in Malaysia. specifically, we hypothesised that:

> H3: Environmental awareness positively affects the purchase intention of green home appliance brand.

The Influence of Product Pricing on Consumers' Purchase Intention

Product pricing is one of the important factors in determining consumers' willingness to pay a premium green product home appliance. There is salient evidence that consumer intention to purchase can be significantly influenced by the presentation of a price (Weisstein et al., 2014). Although the perceived price is studied extensively in different industries, its influence has rarely been studied in the context of energy efficient home appliance industry (Akroush et al., 2019). If companies fail to distinguish themselves from product features, pricing strategies is the most effective way to gain the competitive advantage in the marketplace, and subsequently increasing the revenue (Ansar, 2013). Drozdenko et al. (2011)'s study shows that although that there is a positive relationship between prices and consumer buying behaviour, and consumer willing to pay more if the product perceived value is higher. Nonetheless,

several studies reveal that consumer will feel unfair if they could not perceive the difference or additional value in the product they purchased with higher price. Hence, it will lead to the spreading of negative information *via* word of mouth and have adverse effect on the seller (Victor et al., 2018). However, in the context of price fairness, consumer will have positive intention if the potential benefit of purchase green product able to overcome the price gap (Le and Liaw, 2017). Understanding how consumers make up their perceptions of prices is an important marketing strategy. However, there is research argued that most Malaysians perceived green products as highly priced goods, which is a resistance for them to purchase green home appliance (Sharaf et al., 2015). In the context of green home appliance, the purchasing and using energy-saving appliances are economical in the long run. The higher the perceived long-term cost reduction, the higher the perceived price value. The perception of consumer that the use of energy-saving appliances can save money when price value is high need to be incorporated in the marketing strategy (Zhang et al., 2020). The benefit to environment only be a secondary consideration of consumer in their purchase intention (Li et al., 2019).

However, low pricing policy in retail sector signalling positive impact on CPI. The low pricing strategy enable to marketer to build the belief and intention of the consumer on buying a product in discount period. In short, when price dispersion is high, consumers' purchase intentions are higher (Özer and Zheng, 2016). An appropriate pricing strategy is required during a new product launched, this applies to the green home appliance. Pricing strategy are major tools that company need to devise to persuade consumers to purchase the product in market (Lee, 2014). The pricing of green home appliance is relatively higher compare to traditional home appliance due to the additional attribute and benefits. Studies exhibit that consumer willing to pay extra cost compare to normal green product if there is a return of investment in utility rate (Drozdenko et al., 2011; Liargovas et al., 2017). However, if the level of green awareness is low among the consumers, their willingness to pay more for green products has declined even though they care about environmental issue (Ginsberg and Bloom, 2004; Chaimankong and Chaimankong, 2019).

Further study in hybrid car segment empirically show that the potential fuel saving will positively drive CPI even the pricing is relatively higher to normal vehicle (Chen et al., 2010). However, in electronic gadget sector for instance smart phone (Huang et al., 2019), price sensitivity is found to be one of the critical factors which positively influence CPI. A positive relationship exists between the price and green purchase intention that favours the notion that environmentally conscious individual might buy the environment friendly product even at a higher price (Drozdenko et al., 2011; Ansar, 2013). Moreover, Ko and Jin (2017) in their study which was conducted in both US during winter and China during summer using theory of TPB, summarised that feasible pricing strategy has positive association with green fashion product. Extended from previous studies, this research would like to further examine if pricing has significant influence

on CPI on green home appliance. Specifically, we hypothesised that:

> H4: Product pricing positively affects the purchase intention of green home appliance brand.

MATERIALS AND METHODS

Population

The population targeted in this study is the Malaysian population who are staying in Penang, Malaysia, age between 21 and 60 years old. They are chosen due to this population are the working adult who has the purchase power.

Sample

There is no rule of thumb that applies to all situations in fact as the sample size needed for a study depends on many factors including the size of the model, distribution of the variables, amount of missing data, reliability of the variables, and strength of the relationships among the variables (Muthén and Muthén, 2002). Nonetheless, there are few complex formulas to decide the sampling size, the general rule of thumb is no less than 50 participants (VanVoorhis and Morgan, 2007).

Sampling Design

We conducted an online survey was used to recruit participants using a convenience sampling method. In this research, convenience sampling was chosen due to the limitation of Movement Control Order 2.0 in Malaysia.

Data Collection Procedure

Data collection was held over a 2-week period in January 2021. It should be pointed out that a Movement Control Order (MCO) was being imposed in Malaysia at that time, from January 13, 2021 (Rodzi, 2021). The Malaysian government temporarily stopped or restricted many activities and businesses were closed. Specifically, the employer would have to also decide the total workforce present at the premises so that safe physical distancing can be maintained at the workplace. Due to this restriction, research activities were affected and numerous procedural adjustments had to be made (Weissman et al., 2020). Therefore, to ensure compliance with safety requirements, switching to online data collection was deemed necessary.

Using a convenience sampling technique, the participant fulfilling the inclusion criterion was selected to complete the self-report survey administered *via* the Internet, through Email and WhatsApp. A total of 150 responses were received from respondents, of which all responses were usable. The response rate for the study was 100%. A total of 150 responses were collected for this study. In addition, to determine the minimum required sample size in terms of statistical power, we utilised G*Power (Faul et al., 2009). The model of this study had four predictors. By using G*Power with an effect size of 0.15, alpha of 0.05, and a power of 0.95, the minimum sample size needed was only 129. Thus, we can safely say that our study with a sample size of 150 has a power of more than 0.95 and is large enough, and the findings can be used with confidence.

TABLE 1 | Demographic profile of respondents.

	Frequency	%
Gender		
Male	105	69.5
Female	46	30.5
Age		
18–25 years old	2	1.3
26–30 years old	42	27.8
31–40 years old	63	41.7
41–50 years old	29	19.2
51–60 years old	15	9.9
Ethnicity		
Malay	113	74.8
Chinese	21	13.9
Indian	17	11.3
Education level		
High school	20	13.2
Bachelor degree	119	78.8
Master's degree	4	2.6
Others	8	5.3
Marital status		
Single	58	38.4
Married	91	60.3
Divorced	1	0.7
Widowed	1	0.7

Table 1 demonstrated demographic of the respondents where 69.5% are male and 30.5% are female. Majority of the respondents are come from age group of 31–40 with 41.7%, followed by 26–30 with 27.8%; 41–50 with 19.2%; 51–60 with 9.9%; and 18–25 with 1.3%, for educational level, majority hold bachelor degree with 78.8%, followed by High School Level with 13.2%, others with 5.3%, and Master's with 2.6%, for marital status, most of the participants are married with 60.3%, followed by single with 38.4%, divorced and widowed are 0.7%, respectively.

MEASURES

Purchase Intention

This construct comprises 5 items which are adapted from Lee (2014) using the 5-Point Likert Scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The following items were used: "I am going to purchase green home appliance"; "I am planning to purchase green home appliance"; "I am likely to purchase green home appliance"; "I will purchase green home appliance in future"; and "I will purchase again green home appliance in future." The Cronbach's alpha (CA) coefficient was 0.91.

Environmental Awareness

This construct comprises 4 items adapted from Suki (2013) using the 5-Point Likert Scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The following items were used: "I agree that environmental issue is an emergency issue"; "I agree that environmental issues are consumers' responsibility"; "My daily activities affect the environment"; and "I agree that buying a green product, indirectly influence the environmental." The CA coefficient was 0.82.

After Sales Service

This construct comprises 5 items adapted from Muraly (2019) using the 5-Point Likert Scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The following items were used: "I expect the company ASS staff is dependable and consistent in solving customer complaints"; "I expect the company ASS staff is fast to respond"; "If any delay in repair service/replacement on my product purchased always update me within short period"; "I expect easy accessible towards the service centre"; and "I expect the company ASS staff is polite and knowledgeable." The CA coefficient was 0.93.

Brand Equity

This construct comprises 5 items adapted from Jalilvand et al. (2011) using the 5-Point Likert Scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The following items were used: "I can quickly recall the logo or symbol of a specify Home Appliance brand"; "Some characteristics of Home Appliance Brand X come to my mind quickly"; "I am aware of Brand X"; "I will not buy other brands, if X brand is available"; and "I always perceive Brand X must be of very good quality." The CA coefficient was 0.91.

Product Pricing

This construct comprises 5 items adapted from several sources using the 5-Point Likert Scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The following items were used: "I am willing to pay extra for recycle product," "I am willing to pay extra for energy saving product," and "I am willing to pay extra with if government tax benefit" were adapted from Drozdenko et al. (2011); whereas, "I would change life style if price of green products is less expensive"; and "I am willing to pay for green product if price are same" were adapted from Suki (2013). The CA coefficient was 0.80.

Data Analysis

We adopt partial least squares structural equation modeling (PLS-SEM) as the statistical method to assess the research model in this study, using SmartPLS 3.3.3. PLS-SEM is primarily used to develop theories in exploratory research. It does this by focusing on explaining the variance in the dependent variables when examining the model. We employed PLS-SEM due to the inherent suitability of this approach for exploratory studies, which is the purpose of the current study (Ali et al., 2018).

PLS-SEM includes the evaluation of measurement model and structural model (Anderson and Gerbing, 1988). This combination analysis will enable the measurement errors of the observed variables to be analysed as a component of the model, and will combine the analysis of the variables of each factor with hypothesis testing.

In order to established the measurement model, the relationship between latent variables and their measurement items or indicators will be evaluated (Ali et al., 2018). In addition, the goodness of the measures used in the study also will be evaluated through indicator reliability and discriminant validity. The method includes checking the reliability of individual

TABLE 2 | Results of measurement model assessment.

Latent variable	Items	Loading	AVE	CR	CA	Mean	SD
ASS	ASS1	0.907	0.788	0.949	0.934	4.37	0.70
	ASS2	0.931					
	ASS3	0.852					
	ASS4	0.835					
	ASS5	0.909					
BE	BE1	0.900	0.734	0.932	0.909	3.85	0.79
	BE2	0.915					
	BE3	0.879					
	BE4	0.739					
	BE5	0.837					
CPI	PI1	0.889	0.749	0.937	0.916	4.23	0.67
	PI2	0.861					
	PI3	0.789					
	PI4	0.886					
	PI5	0.897					
EA	EA1	0.796	0.657	0.885	0.830	4.35	0.68
	EA2	0.805					
	EA3	0.790					
	EA4	0.851					
PP	P1	0.697	0.555	0.861	0.799	4.25	0.59
	P2	0.801					
	P3	0.794					
	P4	0.794					
	P5	0.665					

ASS, after sales service; BE, brand equity; CPI, consumer purchase intention; EA, environmental awareness; PP, product pricing.

indicators, the internal consistency reliability of each construct, and the convergent and discriminant validity (Hair et al., 2017). For the next stage of the structural model, path coefficient analysis will be perform to explain the relationship between each latent variable. The model aims to test the predictive power of the research model (Peng and Lai, 2012). The model examines the endogenous variables (R^2), the estimation of the path coefficient and a confidence interval of 95% (CI 0.95), and the estimation of the effect size (f^2) (Hair et al., 2017).

RESULTS

Measurement Model Assessment

This section indicates the criteria necessary to confirm the convergent validity, discriminant validity, and construct reliability of the measurement model. This study comprised of five reflective constructs, namely, ASS, BE, CPI, EA, and PP. In order to assess construct reliability, the threshold value of composite reliability (CR) and CA should be higher than 0.70. In this study, the values ranged from 0.861 to 0.949, thus confirming the construct reliability. Next, to assess the convergent validity, the threshold value of average variance extracted (AVE) and outer loadings should be more than 0.5 (Ali et al., 2018). The results of the AVE in this study ranged between 0.555 and 0.788, thus met the required thresholds. Furthermore, the outer loadings values are ranged between 0.675 and 0.925, were considered acceptable as they were above 0.50. Thus, it can be concluded that all constructs indicated an acceptable degree of convergent validity. The complete results are indicated in **Table 2**.

TABLE 3 | Discriminant validity using heterotrait-monotrait (HTMT) ratio.

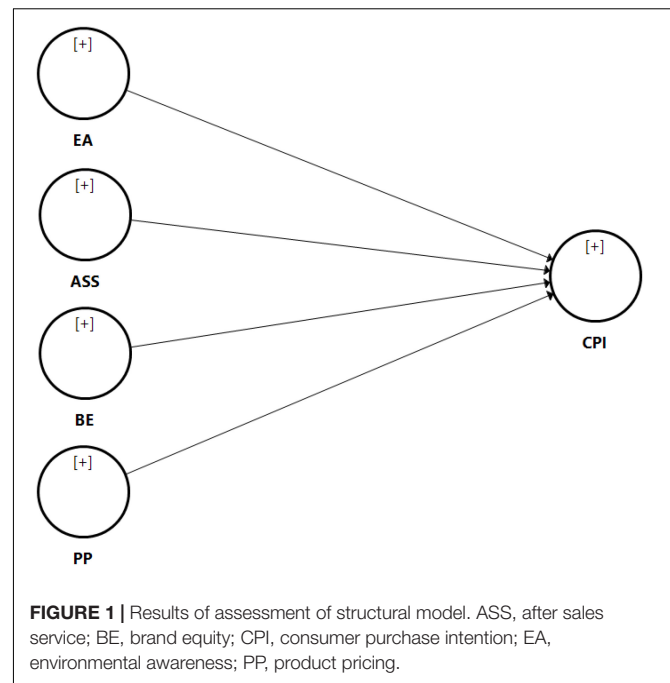|	ASS	BE	CPI	EA	PP
ASS					
BE	0.242				
CPI	0.298	0.490			
EA	0.255	0.104	0.374		
PP	0.343	0.423	0.734	0.448	

ASS, after sales service; BE, brand equity; CPI, consumer purchase intention; EA, environmental awareness; PP, product pricing.

We used the heterotrait-monotrait (HTMT) ratio to evaluate the discriminant validity of the research variables. For HTMT, discriminant validity is achieved when the correlation between each pair of the latent exogenous constructs is less than 0.85 (Henseler et al., 2015). **Table 3** shows the value of HTMT for all constructs is lower than 0.85, therefore confirming discriminant validity.

Structural Model Assessment

Based on **Table 2**, the mean scores and standard deviations (SD) for our study variables were 4.20 for CPI (SD = 0.67); 4.35 for EA (SD = 0.68); 4.37 for ASS (SD = 0.70); 3.85 for BE (SD = 0.79); and 4.25 for PP (SD = 0.59). The collinearity between research variables was examined to ensure that the structural model did not include any lateral collinearity issue (Hair et al., 2017). **Table 4** shows that all inner VIF values were below 5 (Hair et al., 2017), indicating that collinearity among the predictor constructs was not an issue in the structural model.

The results show a moderate, and substantial explanatory R^2 value of 0.485 for CPI, suggesting that 48.5% of the variance for CPI can be described by ASS, BE, EA, and PP. The next step in the assessment of the structural model involves the evaluation of the path coefficients in relation to the model's latent variables. **Table 4** and **Figure 1** indicate the results of the hypotheses testing, including the path coefficients and the effect size for each path. The results show that ASS (β = 0.051, t = 0.746, p > 0.05), BE (β = 0.256, t = 3.577, p < 0.05), EA (β = 0.132, t = 2.326, p < 0.05), and PP (β = 0.482, t = 7.278, p < 0.05) positively affects consumer purchasing intention, thus supporting hypotheses H2, H3, and H4. Meanwhile, ASS did not show a significant effect towards consumer purchasing intention, thus hypotheses H1 was rejected. PP has the strongest effect on CPI based on path coefficient and effect size, followed by BE and EA. Lastly, the results of cross validated redundancy indicate that the value of Q^2 is greater than zero for the endogenous variables, which is 0.343

FIGURE 1 | Results of assessment of structural model. ASS, after sales service; BE, brand equity; CPI, consumer purchase intention; EA, environmental awareness; PP, product pricing.

and acceptable (Ali et al., 2018). Therefore, the results allude to the predictive capability of the model based on the value of the endogenous constructs.

DISCUSSION

The main goal of this study is to determine whether ASS, BE, EA, and PP affected the consumer's purchase intention on green home appliance brand in Penang, Malaysia. one hypothesis is rejected, and three hypotheses are accepted. PP is the strongest indicator of CPI, followed by BE and EA. Nevertheless, ASS appear to be not a significant predictor of CPI on green home appliance.

The result of H1 of this study was not supported, where ASS does not have significant effect on CPI. The research data show inconsistency with the research by Domazet et al. (2018), Huang and Ge (2019), and Singhal et al. (2019). Their result denotes that the responsiveness of ASS is one of the essential dimensions to be considered during the selection of home appliance by consumer. Nevertheless, research in other industries revealed similar outcome to the current study where ASS is insignificant to association of CPI. For example, Kesumahati and Jurnali (2020)'s study on pharmaceutical retail purchase exhibit that ASS quality

TABLE 4 | Results of hypothesis testing.

Hypothesis	Relationship	Coefficient	t-value	95% CI	f^2	Supported	VIF
H1	ASS → CPI	0.051	0.746	[-0.086, 0.181]	0.004	No	1.149
H2	BE → CPI	0.256	3.577	[0.126, 0.406]	0.108	Yes	1.181
H3	EA → CPI	0.132	2.326	[0.023, 0.240]	0.028	Yes	1.200
H4	PP → CPI	0.482	7.278	[0.348, 0.605]	0.323	Yes	1.397

ASS, after sales service; BE, brand equity; CPI, consumer purchase intention; EA, environmental awareness; PP, product pricing.

does not has significant influence on the customer purchase intention. Similar finding is revealed by Akkucuk and Esmaeili (2016) in smartphone industry where BE and attributes are the primary consideration during purchase intention, and ASS is negligible. Both scenarios above can be explained by consumer is trusting on the branding of product or retail outlet. According to Aaker (1996), one of the dimensions in BE is consumer perceived quality. Perceived quality is not the actual quality of the product but the consumer's subjective evaluation of the product (Jalilvand et al., 2011). In other words, if consumer trust on the branding of product, they will perceive that the product has good quality and subsequently neglect the actual ASS criteria. For example, if consumer purchase Apple product, they always assume the product quality and less defect. Hence, ASS is not an important issue.

The H2 of this research was that BE is positively affects CPI on green home appliance. The finding was supported therefore, our finding is aligned with Khan et al. (2015), Akkucuk and Esmaeili (2016), Vazifehdust et al. (2017), and Shafiee et al. (2019). Underpinning by Aaker's (1996) Theory on BE, the researchers proved that strong brand awareness, brand association and perceived quality has strong impact on CPI. The positive impact of BE not only occur in green home appliance, but similar impact is also demonstrated across other industries like automobile, electronic gadget, fashion, food and beverage, etc. Hence, the manufactures of green home appliance shall focus on the marketing mix strategies to strengthen their BE. Studies evidenced that effective marketing mix strategies enable the company to develop a multi-dimensional consumer BE scale, especially in the area of brand awareness, perceived quality, and brand association (Valette-Florence et al., 2011; Soon-Ho and Lee, 2020).

The findings of this study also revealed the significant effect of EA on CPI on green home appliance in Penang, thus confirmed of those previous studies by Ahmed et al., 2019, Waris and Hameed (2020), and Teng et al. (2021). Where environmental consciousness has positively influence CPI on green product. Consumer who have higher environmental concern, usually will tend to purchase green product. Besides, the purchase intention of consumer will positively influence by green consciousness during their selection of product. The effort of cultivating the awareness and knowledge on environment need to be continued as there are proves showing ethical norms have a significant impact on the willingness to purchase of green appliance, however, this process consumes longer period and it need continuous effort, especially by government *via* education (Li et al., 2019).

Additionally, the findings confirmed the positive significant effect of PP on CPI on green home appliance in Penang, thus support the H4. Our findings corroborated previous studies by Akroush et al. (2019), Huang et al. (2019), and Li et al. (2019). The pricing factor can be positively influence the consumer intention or negatively impact on the consumer intention base on the price fairness concept (Haws and Bearden, 2006; Charuvatana, 2019). Consumers need to gain the benefits on additional price they spent on the green home appliance from various dimension. For example, buyer entitle for government

income tax rebate if buying green home appliance. Another example would be consumer gain monetary advantage in utility consumption after investing in green home appliance. Without mentioned benefits, consumer will not intention to purchase green home appliance which is relatively higher price. Besides, our findings indicated that tax incentives, utility advantages, price reduction will stimulate their intention to purchase green home appliance. Moreover, household appliances are relatively expensive commodities and entail short and long-term financial consequences due to household budgets (Murali et al., 2016). Hence, the manufactures of green home appliance need to further examine their product cost structure, to provide a more affordable price to the income group of M40 and B40 in Penang, Malaysia. According to Tan et al. (2019), price is considered as the key factor affecting the buying decision of green products for price-sensitive customers.

Consumer purchase intention is a psychological process that is important to businesses and marketing professionals. A deep understanding of consumer intention help marketer to position the products and services effectively. If a consumer has a positive feeling on a specific product, it creates the purchase intention (Langga et al., 2020). Indubitably, our findings revealed that EA, BE, and pricing are imperative. In electrical home appliance, pricing and BE are three of the major consideration in various studies across the countries, which include Drozdenko et al. (2015) in United States, Shafiee et al. (2019) in Europe, and Wickramasinghe and Mathusinghe (2016) in Sri Lanka. The willingness of consumer to pay more for green product has decline even the concern on environmental has increase. Obviously, the main impediment is the personnel financial restriction especially during economic downturn (Drozdenko et al., 2015). Many scholars believe that the driving force to influence CPI in green home appliance is the product branding. The brand name itself is more than the generic product features and quality (Shafiee et al., 2019).

CONCLUSION, PRACTICAL IMPLICATIONS, AND LIMITATIONS

There were limited studies related to the factors that influenced consumers' purchase intention on green home appliance in Malaysia (Ogiemwonyi et al., 2020; Harun et al., 2022), especially Penang. This study helps to examine the possible factors influence consumer intention of green home appliance brand in context of Penang consumer. The results will add value to the consumer purchasing behaviour and green marketing literature. Moreover, the findings of this research reveal that ASS have no significant influence on CPI on green home appliance brand. These findings have contradicted with some or previous research result in another region, and worthwhile to further investigate in Malaysia context.

Several practical implications also emerge. To attain the company business goal, the management need to understand the consumer intention, market trend, and demand for green home appliance. This has a robust relationship with the company marketing strategies which will influence consumers buying

intention. Ultimately enhance company revenue. This research would help to provide home appliance manufacturers some insight and enables the manufactures to tailor the home alliance product which able to stimulate the purchase intention of consumer. The result of this research indicated that pricing is the primary factor which significantly impact the consumer intention. Therefore, manufacturers shall focus on reducing the green home PP, or the additional attributes of the green appliance shall be able to compensate the additional price occurred. Besides, the green home PP shall be designed in a more affordable position to cater 80% of Penang population which are income M40 and B40. BE is found to be another factor that influence CPI; therefore, the industries would need to devise better marketing strategies in Malaysia to enhance their brand image, brand awareness, and brand loyalty. As a result, it increases the sales and profit for the companies. Additionally, fossil fuel is the main source of electricity generation in Peninsular Malaysia, and household appliance are the main contributor of electricity consumption. By understanding the factors influencing consumer intention on green home appliance, government or related ministry can devise comprehensive strategy and policy to encourage the citizens, especially Penang citizens purchase intention of green appliance. For example, the Sustainable Energy Development Authority (SEDA) Malaysia had come up with Sustainability Achieved *Via* Energy Efficiency (SAVE) 3.0 programme as an initiative to increase public awareness to encourage them to buy energy efficient appliances that will save consumer's electricity consumption, especially for domestic consumers. This programme is implemented from January 2022 to December 2022. The findings of this study can serve as insight for the next SAVE programme to encourage more households in Malaysia adopting green initiatives.

If pricing is the primary factor, government can provide convincing personal income tax rebate if the people purchase green home appliance. On the other hand, government can duplicate the green car policy in automobile industry where government waive the duties on green car.

There are several limitations that must be considered in this research. First, the research focuses only on four predictors which consist of EA, ASS, BE, and pricing on CPI. In fact, there should be more factors which influence CPI. Hence, future researchers can focus on other factors which are not mentioned in this study, for example, the demographic characteristics. Additionally, the concept of green home appliance in this study is macroscopic, but influencing factors may vary with the different types of product, for example, refrigerator, water heater, air conditioners, and other specific home appliance. Therefore, future research should focus on specific categories of energy-saving home appliance. Second, the data collection only can be done *via* online as Penang is under Movement Control Order 2.0 during the data collection. The time horizon for similar research can be perform base on longitudinal studies instead of cross-sectional. Hence, the causal and effect of target respondents can be observed, recorded, and analysed. For instance, collaboration with specified manufacturers to measure the impact of before and after price reduction on the sales volume of green home appliance. Finally, time constraint is another limitation. Hence, only 150 respondents able to be collected. If time permissible, higher amount of sample shall be collected to increase the accuracy and validity of the research result. Several other influencing factors could be investigated in future studies.

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 approval was not provided for this study on human participants because the study was conducted according to the guidelines of the Declaration of Helsinki and following academic ethics. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

CT and KK: conceptualization, validation, and visualization. CT and WW: methodology. WW: software and formal analysis. CT: investigation, data curation, and writing—original draft preparation. CT, KK, and WW: resources and writing—review and editing. KK: supervision. All authors have read and agreed to the published version of the manuscript.

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How different advertising appeals (green vs. non-green) impact consumers' willingness to pay a premium for green agricultural products

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Green food has exceptional impacts in addressing food safety and environmental challenges. However, consumers' perception of green food is not substantial, which results in a decline in consumption intention. Since advertising appeals can play a bridging role in resolving information asymmetry. This study is based on self-construal theory, chooses green agricultural products images and text as experimental stimuli, and analyzes the interaction and influence mechanism between advertising appeals and consumers' willingness to pay a premium for green agricultural products through three sets of experimental studies. The findings demonstrate that self-construal and green agricultural product advertising appeals interact to influence consumers' willingness to pay a premium for green agricultural products. Green perceived value is more strongly influenced by matching dependent self-construal and green advertising appeals than non-green advertising appeals. Green perceived value plays a full mediating role in this interactive effect. Green agricultural products companies should adopt different advertising strategies according to the various categories of consumers to enhance consumers' green perceived value and increase the willingness to pay a premium.

KEYWORDS

advertising appeals, green agricultural products, willingness to pay a premium, green perceived value, self-construal

1. Introduction

Environmental problems (such as global warming, water and soil pollution, energy shortages, etc.) and food safety concerns have become more prevalent. The probability of extreme heat events, such as the one in South Asia this year, was approximately once every 3,000 years before human-caused climate change began, according to research published on May 23 by Frederick Otto of the Grantham Research Institute for Climate Change and the Environment at Imperial College London, UK (HuanQiu, 2022). High temperatures have worsened air pollution, with "bad" air quality ratings on June 17 in

several French cities like Paris, Lille, and Marseille (NetEase, 2022). Green consumerism can aid in lowering carbon emissions, which are blamed for "excessive carbon emissions" that cause "global warming."

Green food is quite effective at lowering pollution levels. In China, in comparison to traditional agricultural production methods, the green food production model has reduced chemical nitrogen fertilizer application by 39%, reduced pesticide use intensity by 60%, and increased soil organic matter content by 17.6%, according to the report "Evaluation of Ecological and Environmental Effects, Economic Benefits, and Social Effects of Green Food." From 2009 to 2018, there was an overall decrease of 14.58 million tons in chemical nitrogen fertilizer input, 542,000 tons in pesticide input, and 55.58 million tons in carbon dioxide emissions. Then resulted in an overall value of 3.2 trillion yuan in ecosystem services (CGFDC, 2020).

Environmentally friendly products, such as those that are green and organic, are referred to as "green agricultural products" (Zhou et al., 2017). Green agricultural products are becoming more and more popular among customers as their income, environmental consciousness, and worry about food safety and environmental pollution incidents rise (Han et al., 2010; Wang and Wang, 2010; Chen et al., 2015). However, consumers' lack of knowledge of green agricultural products and mistrust of corporate advertising limits their desire to consume (Rana et al., 2017; Jiang et al., 2021). Companies are increasingly focused on how to enhance their reputation as environmentally friendly businesses in the eyes of consumers (Luo et al., 2020; Islam and Hussain, 2022). The key to solving these problems lies in how to increase consumers' attention to green agricultural products, enhancing consumers' willingness to pay green, and encouraging consumers to pay for premium green agricultural products.

There are three primary categories of the current study on willingness to pay a premium for green agricultural products: individual characteristics aspects (gender, education, income, age, marital status, etc.; Zhang and Wang, 2009; de Medeiros et al., 2016; Kucher et al., 2019; Yang et al., 2021), internal psychological factors (trust, cognition, perception, environmental beliefs, health awareness, signaling, peer effects, etc.; de Medeiros et al., 2016; Salazar and Oerlemans, 2016; Konuk, 2018; Zhang et al., 2018; Berger, 2019; Zhong and Chen, 2019; Xu and Lin, 2021), external contextual aspects (market environment, environmental and social attributes, policies, etc.; Min et al., 2017; Kucher et al., 2019; Shao and Unal, 2019) can affect the amount of premium paid by consumers.

The aforementioned studies could yet use some further development. Firstly, the introduction of advertising appeals can compensate for the existing studies on the information asymmetry in the market for produce, the lack of consumer knowledge and trust in green agricultural products, and the fact that current studies rarely use it as the research object. Second,

it's unclear if advertising appeals—green vs. non-green—can raise consumers' willingness to pay a premium. Third, more research on boundary circumstances is still required. Advertising appeals that are matched to customer attributes have been found to affect consumers' purchasing decisions and actions (Wang et al., 2021). Self-construal is regarded as being connected to a consumer's willingness to pay as one of the key consumer traits (Dogan and Ozmen, 2019). Through verbal or sensory cues, advertisements shape consumers' attitudes and actions toward certain products or services (Pileliene and Grigaliunaite, 2017). Advertising appeals are a significant external element influencing consumer behavior, according to Yang et al. (2015) and Sheng et al. (2019). Then, under what circumstances may advertising appeals maximize the impact of advertising and inspire customers to pay a premium?

Based on the analysis above, advertising appeals help to enhance consumers' attention to the quality of green agricultural products, reduce consumers' search costs and switching costs (Pozzi, 2012; Richards et al., 2017), enhance consumers' knowledge of the standards of green agricultural products production, processing, transportation, packaging, and the costs paid by companies, which in turn affects consumers' perceived green value and ultimately enhances consumers' willingness to pay a premium (Jiang et al., 2021). Therefore, the study uses green agricultural products as its research object and conducts three sets of experiments to examine the mechanisms influencing consumers' willingness to pay a premium for green agricultural products and the mediating role played by green perceived value, to provide ideas for governments and enterprizes to promote green consumption and alleviate environmental problems.

2. Literature review and hypotheses

2.1. Advertising appeal and willingness to pay a premium for green agricultural products

Advertising appeal is the process through which a business informs consumers about a good or service using advertising techniques to draw them in and encourage consumer spending (Akbari, 2015). The technique through which businesses encourage customers to make purchases by using advertising content that promotes green messages is known as "green advertising appeal" (Carlson et al., 1996). Based on the compilation of previous studies, green advertising appeals can be classified into the following four categories.

First, green advertising appeals can be divided into egoistic advertising appeal and altruistic advertising appeal based on the target audience of the advertisement (Song and Kim, 2019). A relevant study based on the construal level theory (CLT) showed that when promoting organic foods, matching illustrations

(with photos) with altruistic appeal would improve advertising effectiveness. When promoting conventional foods, matching photos (with illustrations) with altruistic appeal would improve advertising effectiveness (Septianto et al., 2019). Related research based on information processing fluency theory suggested that under egoistic advertising appeal, cool anthropomorphic images could lead to higher purchase intention for green products due to the mediating role of trust in brand competence. However, under altruistic advertising appeal, cute anthropomorphic images could enhance consumers' trust in brand goodwill and make them more willing to purchase green products (Lu et al., 2021).

Second, according to the level of detail of advertising content, green advertising appeals can be divided into concrete appeal and abstract appeal (Yang et al., 2015). According to CLT, when a green product was related to the interests of others, consumers would think that the product was psychologically distant from themselves, and consumers tended to think using abstraction, and the abstract appeal was more likely to generate green purchase intentions; while when a green product was related to the interests of the self, neither abstract appeal nor concrete appeal could have an impact on green purchase intentions. Among them, public self-awareness and identity salience moderated the effects of advertising appeals and interest associations on green purchase intention (Yang et al., 2015).

Third, based on consumer characteristics, green advertising appeals can be divided into emotional advertising appeal and rational advertising appeal (Matthes et al., 2014). Research on high school students who smoked showed that for emotional advertising appeal, narrative self-reference led to anti-smoking behavioral intentions more than analytical self-reference; for rational advertising appeal, analytical self-reference led to anti-smoking behavioral intentions more than narrative self-reference (Lee et al., 2020). A related study on smartphones showed that emotional advertising appeal had a positive effect on hedonism and rational advertising appeal had a positive effect on utilitarian values (Kim et al., 2020).

Fourth, according to the types of advertisements, green advertising appeals can be divided into green advertising appeal and non-green advertising appeal (Ku et al., 2012), with green advertising appeal emphasizing the attributes of products or services related to environmental friendliness and non-green advertising appeal emphasizing the attributes of products or services related to consumer benefits, including health and saving money (Iyer and Banerjee, 1993). Only a few pertinent research have been conducted on the fourth category, focusing mostly on how advertising appeals affect purchase intention, advertising attitude, product attitude, and persuasiveness (Schuhwerk and Lefkoff-Hagius, 1995; Ku et al., 2012; Kong and Zhang, 2014; Yang et al., 2017; Sun and Miao, 2018; Yuan et al., 2020). Research on how advertising appeals affect consumers' willingness to pay a premium for green agricultural products is lacking. Therefore, this study is based

on the signaling theory and aims to investigate the impact of advertising appeals on willingness to pay a premium for green agriculture products.

Green agricultural products have a good reputation, which can improve consumer experiences. However, consumers find it challenging to understand their quality and production processes, which causes them to question the quality of green agricultural products. As a result, there may be communication and transactional issues between businesses and consumers (Ki and Kim, 2022). "Trusted signals" (green or organic food certification) can lessen this information asymmetry because it is more expensive for certified products to violate the applicable standards and laws, forcing businesses to focus on product quality to survive in the market. This separation of high- and low-quality producers makes "trusted signals" more effective (Atkinson and Rosenthal, 2014). In an asymmetric information environment, customers eventually suffer the expense of obtaining the signal and pay a premium for green agricultural products. Consumers rely on signals to identify products to generate internal impressions of green agricultural products (Yang et al., 2021).

Due to their own potential desire to purchase, consumers may be willing to pay a premium for green agricultural products. This desire to purchase can be sparked by external environmental stimuli, while the company's advertising, the delivery of product information, the color of the product's packaging, and the transparency of the packaging can influence consumers' green consumption behavior, and these external stimuli are all relevant to advertising appeals (Owusu and Anifori, 2013; Septianto et al., 2019; Srivastava et al., 2019; Biondi and Camanzi, 2020). Willingness to pay a premium for green agricultural products due to green advertising appeals indicates their willingness to do so for reasons of environmental (social) interest considerations. Consumers' willingness to pay a premium for green agricultural products to meet their dietary demands are referred to as "willingness to pay a premium for green agricultural products due to non-green advertising appeal." Consequently, the following study hypotheses are put out.

H1. Advertising appeals significantly increase consumers' willingness to pay a premium more for green agricultural products. Green advertising appeal has a more considerable impact on consumers' willingness to pay a premium for green agricultural products than non-green advertising appeal.

H1a. Green advertising appeal significantly increase consumers' willingness to pay a premium for green agricultural products.

H1b. Non-green advertising appeal significantly increase consumers' willingness to pay a premium for green agricultural products.

2.2. Advertising appeal and green perceived value

Consumers' perceptions of green agricultural products are distinct and vary depending on the advertising appeals they are exposed to Xue et al. (2019). Scarcity advertising appeal (non-green) helped to enhance consumers' perceived value (Eisend, 2008). Emotional green appeal (the proud green appeal and the admiring green appeal) contributed to increasing consumers' perceived value (Wang et al., 2017). Specifically, positive green emotional appeal made consumers feel happy, helped increase consumer acceptance of the advertisement and brand (Fredrickson, 2001), and thus increased consumers' green perceived value (Wang et al., 2022). Consumers' green perceived value less strongly because non-green advertising appeal focuses more on characteristics connected to how green agricultural products perform (Kong and Zhang, 2014). Consumers can more clearly detect a higher level of green perceived value thanks to green advertising appeal, which communicates more characteristics related to the environmental friendliness of green agricultural products (Kong and Zhang, 2014). Companies help consumers gain a deeper understanding of the environmentally friendly attributes of products and their contribution to sustainable development by informing consumers about these topics through advertisements (Zhang et al., 2010; Sheng et al., 2021), making it much easier for consumers to understand the green perceived value of goods and services. Consequently, the following study hypothesis is put out.

H2. Advertising appeals significantly increase the green perceived value of green agricultural products. Green advertising appeal has a larger impact on the green perceived value of green agricultural products than non-green advertising appeal.

2.3. Green perceived value and willingness to pay a premium for green agricultural products

According to consumer value theory, customers should consider more than just the characteristics of the items themselves. They should also consider the value perceptions that the products give consumers (Hur et al., 2013). The part of the green perceived value of green agricultural products related to the environmentally friendly characteristics and attributes that are acknowledged by consumers and are the reason why consumers are willing to pay a premium for green agricultural products is referred to as the green perceived value of green agricultural products (Yang and Zhou, 2006). Customers' demands for quality of life are rising as their incomes rise, but green agricultural products are also safer and healthier for consumers than traditional produce. As a result, customers are willing to spend more for them. On the other

side, green agricultural products can reduce environmental pollution, conserve energy, and adhere to environmental protection policies. Because of these long-term advantages, willingness to pay a premium for the product to profit from them. Additionally, related studies (de Medeiros et al., 2016; Papista et al., 2018) demonstrate that consumers' perceptions of the value of green agricultural products influence their future purchases of green agricultural products as well as the maintenance of long-term consumer relationships (Zhuang et al., 2010; Ariffin et al., 2016). Consequently, the following study hypothesis is put out.

H3. Green perceived value has a significant positive effect on the willingness to pay a premium for green agricultural products.

2.4. Self-construal and advertising appeal have an interactional impact on the green perceived value

Self-construal, which can be further broken down into independent and interdependent self-construal, refers to the standards by which people interpret themselves, or how they perceive themselves about others when they perceive themselves (Markus and Kitayama, 1991). The self-construal theory was first applied to explain how people's values vary between cultures (Markus and Kitayama, 1991). It was then widely used to research the effectiveness of advertising and green consumer behavior. Independent self-constructed consumers, for example, are more effective when paired with individual advertising appeals, but interdependent self-constructed consumers are more effective when paired with collective advertising appeals (Chai et al., 2011). When consumers with high independent self-construals were paired with comparative advertising, advertising preferences for products with minimal cognitive engagement were more prominent (Zhang et al., 2011). Consumers with interdependent self-constructs are more inclined to put the needs of others and society above their personal needs when purchasing green products, and they are more likely to have higher purchase intentions for green agricultural products under the influence of group and societal norms (Chuang et al., 2016). Consequently, the following study hypotheses are put out.

H4. Advertising appeals and self-construal have an equalizing influence on the green perceived value of the environment.

H4a. Compared to non-green advertising appeal, there is a larger effect of matching green advertising appeal with interdependent self-construal on the green perceived value.

H4b. There is no appreciable difference between the effects of matching non-green advertising appeal with independent self-construal and those of green advertising appeal.

Combining the aforementioned analysis, the research framework is built as Figure 1.

FIGURE 1
Model of the effect of advertising appeals (green vs. non-green) on willingness to pay a premium.
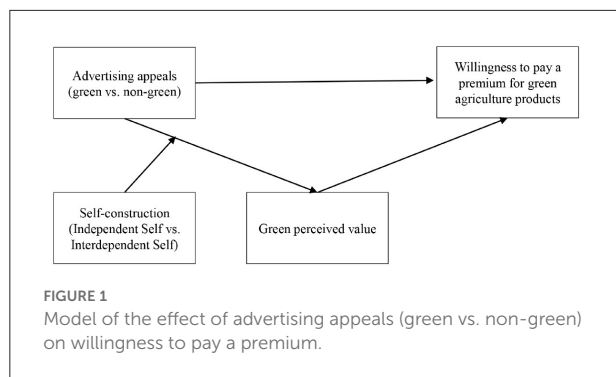
3. Methodology

3.1. Participants and procedure

Based on the calculation method of Cohen's study and other relevant studies (Cohen, 1988; Bastian et al., 2014; Leenaars et al., 2016; Islam and Hussain, 2022), Gpower software was used to calculate the sample size of experiment 1, experiment 2, and experiment 3. The experimental effect was tested with a sample size of 159 at a significance level of 0.05 and statistical test validity of 0.80 under a medium effect size (Effect size f = 0.25), so the sample size of the subsequent experimental subjects was set to be >159.

A total of 649 data points were collected for three experiments between April and June 2022 using a questionnaire method based on the Chinese Credamo (equivalent to MTurk) questionnaire collection platform, which was well-recognized by academics (Jin et al., 2020). Participants were randomly chosen from green agricultural products consumers across all Chinese provinces. Three different sorts of screening questions were included in the questionnaire's design. The first was, "Have you ever purchased organic or green food?" The second was, "Under normal circumstances, what color is mineral water?" The third screening question, which is repeated at the beginning and end of the questionnaire, is, "Which features of the product do you think the above commercial portrays more? (again repeating the prior answer)." This was done to verify the subjects' consumption of organic produce on the one hand and to verify the accuracy of the questionnaires the subjects had to fill out on the other.

Three experiments were used in the study to experimentally analyze the hypotheses. The study used the following design to increase the veracity and usability of the experimental materials. First, for the following two reasons, all three experiments were carried out using common products that are less expensive and more familiar to consumers. On the one hand, this was done to reduce the influence of product involvement on advertising effectiveness, which is caused by the fact that the more expensive a product is, the more involved consumers are with it. On

the other hand, it was done to ensure the authenticity of the experiments and the generalizability of the findings. Second, to prevent experimental bias caused by various photographs due to color and typeface, the same backdrop image was utilized for each group of studies (Wu et al., 2019). Third, the product descriptions and advertising slogans for each group of studies were taken from and modified from the offline and online advertising campaigns for the products, which were more like realistic print advertisements. Fourth, the study didn't show the product labels to customers to avoid whatever preexisting perceptions they may have had of the original produce brands (Yuan et al., 2020). Fifth, to increase the experiment's robustness and externality, different stimulus materials were employed for each of the three experiments. Sixth, the majority of the pre-experimental participants were master's and doctoral students to lessen the impact of demographic factors on the pre-experiments. Because similar group features might lessen the influence of random components (employment, wealth, education, etc.) on research findings, graduate students are frequently utilized as experimental subjects in studies relating to advertising and consumer behavior (Wang, 2014). In formal experiments, social samples are used to increase the generalizability of the research findings.

3.2. Measures

The questionnaire was divided into three main sections: a graphic introduction to green agricultural products; a scale for each variable; and a section with repeated screening questions and personal information about the subjects. The measurement scales for each variable were adapted from well-known research scales to accommodate the unique circumstances of the consumption of green agricultural products. Every measurement question used a Likert scale with a maximum of 7. To assure the robustness of the experimental results and multidimensional proof that the study is generalizable, different measuring scales for the same variable were used (Yuan et al., 2020).

3.2.1. Willingness to pay a premium

In experiments 1 and 3, a single-item questionnaire served as the dependent variable for willingness to pay a premium (Netemeyer et al., 2004). The willingness to pay a premium question in experiment 1 was "What is the highest I would be ready to pay per 500 g for the advertised eggs, assuming the typical price of eggs in the market is 5 yuan per 500 g." In experiment 3, the willingness to pay a premium question was "What is the highest I would be ready to pay per 500 g for the marketed apples? Assuming the typical price of apples in the market is 3 yuan per 500 g."

A four-item questionnaire from Chaudhuri and Ligas (2009) was used to measure the dependent variable of experiment 2's willingness to pay a premium. One of the questions was, "I am willing to pay a higher price for the advertising campaign products compared to other products," and the reliability of the willingness to pay a premium there was 0.708.

3.2.2. Green perceived value

A four-item questionnaire from Yang and Zhou (2006) was used to measure the mediating variable for both experiment 2 and experiment 3. The reliability of green perceived value in experiment 2 was 0.871, and in experiment 3, the reliability of green perceived value was 0.923, and one of the questions was "I think the product of this advertising campaign will reduce environmental pollution."

3.2.3. Self-constructal

In experiment 3, the moderating variable self-construal was based on the manipulated items from Trafimow et al. (1991) and Kühnen et al. (2001). In the independent self-construal group, the guideline was "Please think carefully and write down 3 expectations you have of yourself," while in the interdependent self-construal group, the guideline was "Please think carefully and write down 3 expectations that your family or friends have of you."

4. Experimental design

Green eggs were utilized as the research subject in experiment 1 to examine the primary impact of advertising appeals (green advertising appeal vs. non-green advertising appeal) on consumers' willingness to pay a premium for environmentally friendly produce. In experiment 2, green rice was used as the research subject, and the mediating function of green perceived value was once more examined based on the main result. In experiment 3, which used green apples as its study subject, the moderating impact of self-construal was examined once more in light of the primary effect and mediating effect.

4.1. Experiment 1

4.1.1. Pre-experiment
(1) Experimental procedure

In the simple factor design of the experiment, subjects were randomly assigned to one of two groups (advertising appeals: green vs. non-green), and images of eggs, advertising slogans, and text descriptions of the two groups of advertisements (green vs. non-green) were displayed, with consistent product images

and different advertising slogans and text descriptions. This was followed by the measurement of the question items related to the manipulation of advertising appeals. In the pre-experiment, 30 volunteers were randomly divided into two experimental groups, each with 15 participants, to minimize the impact of demographic factors.

(2) Manipulation test

"Which characteristics of the product do you think the above advertisement reflects more?" was created as a validation question to check the accuracy of the manipulation. According to the results of an independent—samples t-test on the advertising appeals, the advertising appeal M_{green} = 1.43, SD = 1.09; $M_{non-green}$ = 3.94, SD = 2.22; p = 0.000. The manipulation of the advertising appeals was so successful.

4.1.2. Formal experiment
(1) Experimental procedure

In the simple factor design of the experiment, subjects were randomly assigned to one of two groups (advertising appeals: green vs. non-green), and images of eggs, advertising slogans, and text descriptions of the two groups of advertisements (green vs. non-green) were displayed, with consistent product images and different advertising slogans and text descriptions. It was followed by measuring the question items related to the manipulation of advertising appeals, willingness to pay a premium for green products, and demographic variables. To exclude the influence of demographic factors, 200 participants in the formal experiment were divided into two groups of 100 participants each, and after completing the questionnaire, each participant was given 1 RMB.

(2) Experimental results

Independent—samples t-test: willingness to pay a premium M_{green} = 8.38, SD = 3.32; $M_{non-green}$ = 7.46, SD = 1.59; p = 0.013. Consumers' willingness to pay a premium as a result of a green advertising appeal is more significantly influenced than that of non-green advertising appeal.

Table 1 displays the findings of the descriptive statistical analysis. The sample's age distribution was 29 years on average. Females are overrepresented, most likely because they are the ones who purchase the majority of household necessities. The higher percentage of undergraduates in education, the higher education level matches with the screening question of whether they have purchased green agricultural products, probably because the education level makes this category of consumers have a higher awareness of green agricultural products. The higher percentage of income matches the likelihood that they have purchased green agricultural products.

TABLE 1 Descriptive statistical analysis of the sample in experiment 1 ($N = 200$).

Variables	Definition	Frequency	Percentage (%)
Gender	Female	131	65.50
	Male	69	34.50
Education	High school or below	10	5
	College	22	11
	Undergraduate	148	74
	Master or above	20	10
Monthly income	≤2,000	33	16.50
(RMB)	2,000–4,000	44	22
	4,000–6,000	41	20.50
	6,000–8,000	30	15
	≥8,000	52	26

4.1.3. Discussion

The primary impact of advertising appeals (green advertising appeal vs. non-green advertising appeal) on consumers' willingness to pay a premium for green agricultural products was confirmed by experiment 1. The findings demonstrated that advertising appeals could significantly increase consumers' willingness to pay a premium for green agricultural products, with green advertising appeal eliciting a higher level of premium willingness than non-green advertising appeal. H1, H1a, and H1b were examined.

4.2. Experiment 2

4.2.1. Pre-experiment

(1) Experimental procedure

In the simple factor design of the experiment, subjects were randomly assigned to one of two groups (advertising appeals: green vs. non-green), and images of rice, advertising slogans, and text descriptions of the two groups of advertisements (green vs. non-green) were displayed, with consistent product images and different advertising slogans and text descriptions. This was followed by the measurement of the question items related to the manipulation of advertising appeals. In the pre-experiment, 30 volunteers were randomly divided into two experimental groups, each with 15 participants, to minimize the impact of demographic factors.

(2) Manipulation test

"Which characteristics of the produce do you think the above advertisement reflects more?" was created as a validation question to check the accuracy of the manipulation. According to the results of an independent—samples t-test on the advertising appeals, the advertising appeal $M_{green} = 2.76$, SD

FIGURE 2
Analysis of mediating effect.
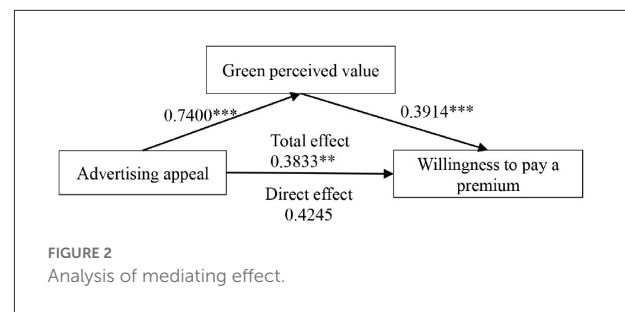
$= 1.92$; $M_{non-green} = 5.09$, SD $= 1.64$; $p = 0.003$. The manipulation of the advertising appeals was successful.

4.2.2. Formal experiment

(1) Experimental procedure

In the simple factor design of the experiment, subjects were randomly assigned to one of two groups (advertising appeals: green vs. non-green), and images of rice, advertising slogans, and text descriptions of the two groups of advertisements (green vs. non-green) were displayed, with consistent product images and different advertising slogans and text descriptions. This was followed by measurement of the question items related to the manipulation of advertising appeals, willingness to pay a premium for green agricultural products, green perceived value, and demographic variables. To exclude the influence of demographic factors, 200 participants in the formal experiment were divided into two groups of 100 participants each and were given 1 RMB after completing the questionnaire.

(2) Experimental results

Analysis of dependability shows that the questionnaire has strong reliability; the reliability of willingness to pay a premium for produce is 0.708, and the reliability of green perceived value is 0.871.

Independent—samples t-test: willingness to pay a premium $M_{green} = 5.65$, SD $= 0.761$; $M_{non-green} = 5.26$, SD $= 0.893$; $p = 0.001$. Consumers' willingness to pay a premium as a result of green advertising appeal is more significantly influenced than that of non-green advertising appeal. Green perceived value $M_{green} = 6.13$, SD $= 0.513$; $M_{non-green} = 5.39$, SD $= 1.10$; $p = 0.000$. Consumers' influence on the green perceived value as a result of green advertising appeal is more significantly influenced than that of non-green advertising appeal.

Figure 2 displays the findings of the mediating effect analysis. To examine the relationship between advertising appeals and consumers' willingness to pay a premium for green agricultural products, PROCESS model 4 was utilized. Results with a sample size of 5,000 and 95% confidence interval revealed that the indirect effect was significant ($\beta = 0.2896$, 95% CI $= [0.160, 0.419]$) and the direct effect was not significant($\beta =$

TABLE 2 Descriptive statistical analysis of the sample in experiment 2 ($N = 200$).

Variables	Definition	Frequency	Percentage (%)
Gender	Female	111	55.50
	Male	89	44.50
Education	High school or below	8	4
	College	16	8
	Undergraduate	153	76.50
	Master or above	23	11.50
Monthly income	≤2000	13	6.50
(RMB)	2,000–4,000	35	17.50
	4,000–6,000	30	15
	6,000–8,000	37	18.50
	≥8,000	85	42.5

0.2896, 95% CI = [0.160,0.419]). The total effect of advertising appeals on willingness to pay a premium for green agricultural products was significant ($\beta = 0.3833$, $p = 0.0013$, 95% CI = [0.1520,0.6147]). As a result, advertising appeals and willingness to pay a premium for organic produce are full mediated by green perceived value.

Table 2 displays the findings of the descriptive statistical analysis. The sample's age distribution was 30.5 years on average. Other sample characteristics matched those discovered for the samples from experiment 1.

4.2.3. Discussion

Experiment 2 confirmed the mediating effect of green perceived value. as well as the main influence of advertising appeals (green advertising appeal vs. non-green advertising appeal) on the willingness to pay a premium for green agricultural products. The findings demonstrate that advertising appeal can significantly increase consumers' willingness to pay more for green agricultural products than non-green advertising appeal, can significantly increase consumers' green perceived value relative to non-green advertising appeal, and can significantly increase consumers' willingness to pay a premium for green agricultural products. H2 and H3 were confirmed, while H1, H1a, and H1b were confirmed once more.

4.3. Experiment 3

4.3.1. Pre-experiment

(1) Experimental procedure

To once more confirm the main and mediating effects as well as the moderating influence of self-construal, materials were used to stimulate subjects' contextual self-construal at the start of the experiment. The study applied a 2 (green

advertising appeal vs. non-green advertising appeal) × 2 (self-construal: interdependent self vs. independent self) two-factor intergroup randomized experiment, in which participants were randomly assigned to four experimental groups. Self-construal and advertising appeals manipulation question items were measured *post hoc*, and the product visuals were the same for all four groups but with various advertising slogans and textual descriptions. The pre-60 experiment's participants were divided into four experimental groups, with 15 participants in each, to eliminate the influence of demographic factors.

(2) Manipulation test

The validity of the self-construal manipulation was tested by asking, "Did the thinking just now make me think of myself or my family and friends?" The independent sample t-test on the self-construal yielded the following results: $M_{independent} = 2.83$, SD = 2.12; $M_{interdependent} = 4.67$, SD = 2.19; $p = 0.002$. Consequently, the manipulation of the advertising appeal proved successful.

The validity of the advertising appeals manipulation was tested by asking, "Which attribute of the product do you think the above advertisement reflects more?" The findings of an independent sample *t*-test on the advertising appeals revealed that the advertising appeal $M_{green} = 2.57$, SD = 1.70; $M_{non-green} = 5.03$, SD = 1.97; $p = 0.000$. Consequently, the manipulation of advertising appeals proved successful.

4.3.2. Formal experiment

(1) Experimental process

The formal experiment will have 249 participants, with ∼62 in each group. After completing the questionnaire, each participant will receive a reward of 1RMB. The experimental procedure is the same as the pre-experiment.

(2) Experimental results Analysis of dependability:

The questionnaire had a strong level of reliability, as evidenced by the reliability of the green perceived value, which was 0.923. Independent samples *t*-test: Willingness to pay a premium $M_{green} = 5.35$, SD = 1.234; $M_{non-green} = 4.90$, SD = 0.968; $p = 0.001$. Consumers' willingness to pay a premium as a result of green advertising appeal is more significantly influenced than that of non-green advertising appeal. Green perceived value $M_{green} = 6, 02$, SD = 0, 734; $M_{non-green} = 4.65$, SD = 1.346; $p = 0.000$. Consumers' influence on the green perceived value as a result of green advertising appeal is more significantly influenced than that of non-green advertising appeal.

Mediating effect analysis: using the Jamovi program, an examination of the relationship between advertising appeals and willingness to pay a premium for green agricultural products was undertaken. The findings indicated that the indirect effect was significant ($\beta = 0.277$, $p = 0.038$, 95% CI = [0.0098,0.360]), the

TABLE 3 ANOVA results.

	SS	F	p
Model	124.55	35.65	<0.001
Advertising appeals	99.89	85.77	<0.001
Self-construal	1.55	1.33	0.25
Advertising appeals * Self-construal	6.73	5.78	0.017

FIGURE 3

The interaction effect of self-construal and advertising appeals on the green perceived value.
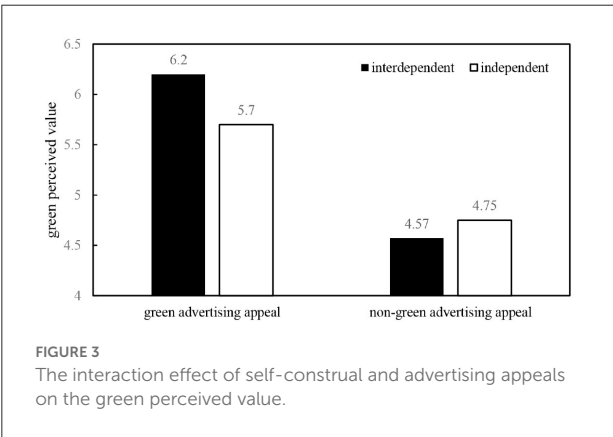
direct effect was not significant ($\beta = 0.1196$, $p = 0.100$, 95% CI = [−0.0515, 0.590]), and the overall effect of advertising appeals on willingness to pay a premium for green agricultural products was significant ($\beta = 0.2018$, $p = 0.001$, 95% CI = [0.1797, 0.728]). Then, advertising appeals and willingness to pay a premium for green agricultural products were full mediated by green perceived value. The same outcomes as in experiment 2.

Interactive effect analysis: To analyze the interactive effect of self-construal on the relationship between advertising appeals and green perceived value, Jamovi was utilized. Table 3 displays the ANOVA results and demonstrates how advertising appeals have a positive impact on green perceived value. The Interactive effect between advertising appeals and self-construal is also found to be significant, supporting H4 as well. Figure 3's simple effects analysis findings revealed that consumers in the green advertising appeal group had higher levels of green perceived value with interdependent self matching ($M_{interdependent} = 6.2$, $M_{independent} = 5.7$, $p = 0.000$, supporting H4a). The effect of matching non-green advertising appeal to self-construal on green perceived value did not differ significantly from that of non-green advertising appeal ($M_{interdependent} = 4.57$, $M_{independent} = 4.75$, $p = 0.464$, supporting H4b).

Table 4 displays the findings of the descriptive statistical analysis. The sample's age distribution was 29.9 years on average. Other sample characteristics matched those discovered for the samples from experiment 1.

TABLE 4 Descriptive statistical analysis of the sample in experiment 3 ($N = 249$).

Variables	Definition	Frequency	Percentage (%)
Gender	Female	160	64.30
	Male	89	35.70
Education	High school or below	11	4.40
	College	25	10
	Undergraduate	170	68.30
	Master or above	43	17.30
Monthly income	≤2000	36	14.50
(RMB)	2,000–4,000	43	17.30
	4,000–6,000	44	17.70
	6,000–8,000	50	20.10
	≥8,000	76	30.50

4.3.3. Discussion

The three effects of self-construal were once more confirmed in experiment 3, along with their mediating and moderating effects. The study's findings indicate that advertisements can significantly increase consumers' willingness to pay a premium for green agricultural products, with green advertising appeal having a higher likelihood of doing so than non-green advertising appeal. The connection between advertising appeals and willingness to pay a premium is moderated by green perceived value. Advertising appeals and green perceived value interacted with each other through self-construal, and consumers who were exposed to green advertising appeal had higher levels of green perceived value when their interdependent selves were matched. Comparing the impact of green advertising appeal to non-green advertising appeal on the green perceived value, there was no discernible difference. H4, H4a, and H4b were confirmed, and H1, H1a, H1b, H2, and H3 underwent new testing.

5. Conclusions and implications

5.1. Research findings and discussion

First, the willingness to pay a premium for green agricultural products was significantly influenced by advertising appeals. A substantial willingness to pay a premium was more likely to result in green advertising appeal than non-green advertising appeal. This finding differs from previous research on products with low environmental impact (cereals) in two ways (Kong and Zhang, 2014). One is that a previous study concluded that there was no difference in the impact of green advertising appeal and non-advertising green appeal on willingness to pay a premium, while this study concluded that green advertising appeal is more likely to make consumers more willing to pay a premium than non-green advertising appeal, which may have two reasons,

on the one hand, because the subjects of this study are eggs, rice, and apples, respectively, which are more concrete products than simple cereals, and previous studies showed that concrete information was more likely to make consumers more willing to buy than abstract information (Xue et al., 2019). On the other hand, it may be because cereals simply indicate their slogans (Jiang et al., 2021), while the products in this study, in addition to their slogans, have a green food mark that is recognized and licensed by specialized agencies, which is more recognized and trusted by consumers than other products, and consumers are willing to pay extra for this certification. The second is that most prior research has been done from the perspective of other types of advertising appeals on willingness to pay (Wang, 2017; Wang et al., 2017; Li and Sun, 2022). However, this study's willingness to pay a premium refers to consumers' willingness to pay for the same type of product when they are aware that A's price is higher than B's, but consumers are still willing to pay the extra price (Netemeyer et al., 2004). When compared to the willingness to pay, willingness to pay a premium is one of the best predictors of consumer loyalty (Aaker, 1996) and can more accurately depict consumers' actual behavior (Netemeyer et al., 2004). In comparison to earlier research, this one shows a stronger explanatory power in terms of variable selection.

Second, consumers' green perceived value is more strongly influenced by green advertising than by non-green advertising, with green advertising acting as a full mediator between advertising appeals and the willingness to pay a premium for green agricultural products. The following is where the results of this study diverge from those of earlier ones. The first distinction is that while fewer researchers have examined the full mediating role played by green perceived value, existing studies are more likely to analyze the partial mediating role played by the higher-order variable of perceived value (Wang, 2017; Wang et al., 2017; Li and Sun, 2022). This study aims to advance the research on perceived value and offer suggestions for future research on green perceived value. The second distinction is that most existing studies analyze purchase intention from the perspective of emotional appeal and altruistic advertising appeal (Jaeger and Weber, 2020), but less from the perspective of green and non-green advertising appeals. The findings suggest that the green perceived value of consumers' produce directly affects consumers' willingness to pay a premium and that the higher the green value of produce perceived by consumers from advertising appeals, the higher the consumer loyalty (Chen, 2013), which in turn encourages consumers to pay higher prices for both green and non-green advertising appeals.

Third, self-construal played an interactive role between advertising appeals and green perceived value. This finding differs from the existing studies in two ways. The first point is that existing studies more often analyze self-construal as a moderating role between advertising appeals and purchase intention (Kareklas et al., 2014; Yang et al., 2015; Hornik et al., 2017), while this study analyzed the effect of the

interaction between self-construal and advertising appeals on green perceived value, with different dependent variables, which helped broaden self-construal related research. The second point is that most of the existing studies on self-construal and advertising appeals classified advertising appeals as emotional appeal/rational appeal, personal nostalgia appeal/historical nostalgia appeal, and charity advertising (Hong and Chang, 2015; Chang and Feng, 2016; Xu, 2019; Lee et al., 2020), and this study analyzed from the green/non-green perspective, which helped to improve the theoretical model related to advertising appeals. The findings showed that consumers' value differences and self-construal affected the effectiveness of advertising appeals, and when consumers' interdependent self-construal was dominant, consumers paid more attention to the social and overall interests reflected in advertising appeals, and green advertising appeal was more consistent with interdependent self-construal, and advertising messages were more easily accepted by consumers (Mao et al., 2017). Green advertising appeal was more persuasive and had higher green perceived value.

5.2. Theoretical contributions

First, it made clear how advertising appeals affected consumers' willingness to pay a premium for green agricultural products. Although studies had shown that advertising appeals had a significant positive effect on the academic's less well-understood willingness to pay a premium for green agricultural products, the mechanism of this study. To start, advertising appeals were typically divided into emotional/rational appeals, egoistic/altruistic appeals, and concrete/abstract appeals (Kareklas et al., 2014; Yang et al., 2015; Hornik et al., 2017), and were less frequently analyzed from a green/non-green. Next, analyses focused more on click-through rate, word-of-mouth, customer response, and readiness to buy than on willingness to pay a premium (Green and Peloza, 2014; Kim et al., 2020; Lu et al., 2021). There were fewer assessments from the standpoint of green agricultural products, and the majority of earlier studies focused on batteries, paper towels, beverages, laundry detergents, and autos (Schuhwerk and Lefkoff-Hagius, 1995; Kong and Zhang, 2014; Yang et al., 2015; Lu et al., 2021). Since they had no purpose other than to indirectly harm customers' health, research on green agricultural products was required (Ottman, 2010).

Second, expand the study of green perceived value as a mediating factor. To begin with, fewer studies have been done from the standpoint of green perceived value, and more studies have focused on perceived value as a higher-order variable (Xue et al., 2019; Cao et al., 2021). Next, the existing articles that examine the impact of advertising appeals on perceived green value typically draw from appeals to self-interest, altruism, and advertising intrinsic goals vs. extrinsic goals (Li and Cui, 2021; Li and Sun, 2022). The previous research has more frequently

examined the impact of perceived value on the willingness to pay for green products and less frequently examined the impact of perceived value on the willingness to pay a premium for produce. Furthermore, less research has been done from the perspective of produce, with the influence of perceived value on green product purchase intention mostly examined for consumers of clothes, housing, tourism, and all e-commerce (Wang et al., 2017; Li and Sun, 2022). The study contributes to the body of knowledge about green perceived value as a mediating factor in the relationship between advertisement attractiveness and willingness to pay a premium.

5.3. Managerial implications

First, when engaging in green marketing, businesses can emphasize the distinctive qualities of green agricultural products, such as their safety and health, environmental friendliness, etc., to further differentiate them from conventional produce. They can also highlight the differentiated benefits of green agricultural products, encourage consumers to recognize the green attributes, cater to their needs, and ultimately persuade customers to purchase green agricultural products.

Second, to increase the effectiveness of advertising appeals, enterprizes should raise consumers' perceptions of the value of green products by providing them with advertising information while shopping. The green perceived value acts as a mediator between advertising appeals and willingness to pay a premium for green agricultural products. To increase customers' green perceived value and ultimately increase their willingness to pay premium, images, music, and films about the green value of green agricultural products can be played during the advertising and marketing process.

Third, the effectiveness of corporate advertising appeals might be impacted by the self-constructed attributes of consumers. Businesses can utilize digital tools to gather and evaluate consumer personality attributes before making targeted appeals to various consumer traits. Businesses can increase the potency of their advertising appeals by using the personal pronoun technique, task activation method, and story activation method in their campaigns to temporarily activate consumers' interdependent self-construal.

5.4. Inadequate investigation

First, the experimental materials consist of pictures, advertising slogans, and product introductions with no video display, which will somewhat affect the communication effect of advertising and is more appropriate for the promotion of green

agricultural products that are sold offline, though some produce are sold online with the use of video communication tools.

Second, the willingness to pay a premium is primarily assessed using a variety of scales. Consumer self-assessment may be biased, therefore the follow-up study will focus on actual observational data points such as click-through rate and purchase frequency.

Data availability statement

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

Author contributions

Conceptualization, validation, writing—original draft preparation, and visualization: MZ. Methodology, software, formal analysis, and writing—review and editing: DT. Investigation and data curation: JC. Supervision: AX and QZ. Funding acquisition: QZ. All authors have read and agreed to the published 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.

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News consumption and green habits on the use of circular packaging in online shopping in Taiwan: An extension of the theory of planned behavior

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The COVID-19 pandemic is far from over as outbreaks continue to spread around the world. The demand for packaging bags and cartons has also risen sharply in e-commerce shopping and takeaways because consumers have changed their shopping habits during the pandemic. The primary purpose of this study was to explore the factors prompting consumers to accept and use circular packaging when they shop online. From January to February 2022, a total of 373 online questionnaires were completed. The results showed that news consumption positively affected environmental attitudes, subjective norms, perceived behavioral control and circular packaging behavior intentions. Environmental attitudes, subjective norms, perceived behavioral control also affected the intention of circular packaging. Furthermore, news consumption influenced circular packaging behavioral intentions through environmental attitudes and green habits. Developing green habits in people's daily lives will be of great help in guiding consumers to engage in other sustainable behaviors that are beneficial to life.

KEYWORDS

news consumption, green habit, circular packaging, theory of planed behavior, COVID-19

Introduction

In addition to creating a massive crisis globally, the COVID-19 pandemic has also had a disastrous impact on efforts to achieve the Agenda 2030 for Sustainable Development. The Sustainable Development Goals Report 2021 pointed out that, despite the standstill of global human flows due to the pandemic, there are still climate and pollution crises. According to statistics, one million plastic beverage bottles are purchased every minute worldwide, and five trillion disposable plastic bags are discarded every year (United Nations Statistics Division, 2022). In addition, many problems with garbage have been caused by the pandemic, and the recycling business entirely stopped in some areas due to fear of spreading the virus (New Taipei City Government, 2021). With the worsening pandemic,

people have utilized plastic gloves, plastic masks, and protective glasses in addition to face masks for personal protection and to avoid exposure. Disposable masks contain a large amount of polypropylene, which takes a long time to decompose, produces numerous toxins, and poses a potential threat to humans and the environment. At the same time, the large number of discarded masks has also increased ocean pollution (Awakening News Networks, 2020; World Health Organization, 2022). The pandemic has led many restaurants to revert to single-use cutlery, and they refuse to accept the environmentally beneficial containers brought in by consumers, again citing avoidance of exposure to accelerate disease transmission (Greenpeace, 2021c). The quarantine policies in various countries and the measures prohibiting people from going out non-essentially when the pandemic is severe have prompted many consumers to reduce physical face-to-face consumption and turn to shopping online and ordering food for delivery. These changes have led to an increase in household waste, including cardboard boxes and plastic bags for packaging as well as plastic products for delivery meals (Greenpeace, 2021a). The pandemic has intensified the consumption of disposable plastics, and the behavior of reducing plastics is decreasing.

Plastic is an inexpensive, lightweight, strong, and durable material especially suitable for packaging food and beverages. Plastic has become an indispensable material in people's daily lives over the past decades. However, plastics persist for a long time after use and pose a significant threat to the environment and climate in the waste stage, such as contaminating soil and water sources (Gareiou et al., 2022). Half of the world's plastic products are currently made for single-use, of which only 14% of plastic pack-aging is collected for recycling (World Economic Forum, 2022). As for the conservation of forest resources and the sustainable development of forests, trees can absorb and store carbon due to photo-synthesis, and forests help reduce the greenhouse effect, slowing global warming (Business Today, 2020a). The circular economy is a process that includes reducing, repurposing, remanufacturing, and recycling. Thus, reducing paper waste in the production process is essential (de Klerk et al., 2022). Using the most suitable carton to increase the volume ratio and reduce the amount of packaging material, using recycled paper materials, and testing different product combinations (Environmental Protection Administration, 2020), are all environmentally beneficial behaviors to save, recycle, and reuse resources.

Although measures to close the city or restrict movement during the COVID-19 pandemic were not implemented in Taiwan, various local counties and cities have temporarily encouraged the use of disposable tableware due to the fear of exposure. Policies banning in-restaurant dining have led to changes to takeaway or food delivery, with a sharp increase in recycled paper containers and plastic products. Domestic waste has increased by more than 20% after the outbreak of the pandemic, as compared with the amount of waste before the outbreak (Chinese Television System, 2021; Greenpeace, 2021b). Since the end of the COVID-19 pandemic is unknown, the most

fundamental way to solve the plastic pollution crisis and reduce the impact of cutting down trees is to establish the environmental-protection habit of reuse (Greenpeace 2022d).

Herein, the current research on consumers' green behaviors includes the theory of planned behavior to explore the factors affecting ecological behaviors (Wang and Wang, 2016; Hameed et al., 2019; Sharma and Foropon, 2019), the impact of green space on green behaviors (Kruize et al., 2019; Hamilton, 2020), and the impact of organizations on employees' green behaviors (Francoeur et al., 2019; Li et al., 2021; Unsworth et al., 2021). Environmentally beneficial behaviors are a global trend, whereas the pandemic is an uncertain factor affecting green behaviors. The pandemic is not over yet, and it may have a recurrent effect on human behavior (Common Health Magazine, 2021). To reduce the chance of interpersonal contact, the consumption of single-use packaging materials in online shopping has been greatly increased, which highlights the dilemma between environmental protection and practical needs, and also has potential impacts on environmental pollution and human health. Even after the epidemic, personal selling may resume the use of environmentally friendly packaging, but packaging waste in online shopping may continue. Although there have been some studies on consumer behavioral changes in the use of plastic packaging during the pandemic (Liu et al., 2021; Leal Filho et al., 2022), there is still a lack of similar research on consumers' willingness to accept circular packaging for online shopping. Therefore, the main purpose of this study was to explore which factors prompt consumers to accept and use circular packaging when they shopped online.

Therefore, the research questions are:

1. To explore the influence of people's attitude, subjective norm, perceived behavioral control on their behavioral intentions to use circular packaging in online shopping.
2. To explore the influence of news consumption on attitudes, subjective norms, and perceived behavioral control to use circular packaging in online shopping.
3. To explore the mediating effect of habit in an extension model of the theory of planned behavior.

Consumers have the right not to participate in environmental protection. For any environmental protection plan, the key to success or failure lies on public engagement. Environmental protection is not a rigid demand of consumers, so they can achieve environmental protection goals only by encouraging and guiding them to take action continuously (Business Today, 2020b). Therefore, the most important contribution of this study was to identify key factors that will help consumers to adopt circular packaging for online shopping. The results of this study are expected to support both business opportunities and a healthy environment under the rapid development of the e-commerce market.

This paper first introduced the motivation, then conducted literature reviews and hypotheses, collected data to verify hypotheses, and finally put forward discussion and suggestions.

Theoretical background and research hypotheses

Environmentally friendly packaging

Packaging is the consumers' subjective image of a commodity. Mueller Loose and Szolnoki (2012) pointed out that packaging design is critical to conveying the attributes of products to consumers (Mueller Loose and Szolnoki, 2012). There is currently no unified definition of circular packaging (Ketelsen et al., 2020), and different scholars have different definitions for circular packaging. Han et al. (2018) identified that sustainable or green packaging covers the three aspects of raw materials, production processes, and waste management (Han et al., 2018). The authors pro-posed using recycled materials and renewable energy as well as reducing the use of petroleum, which has an environmental impact. Environmentally friendly packaging should be produced in an energy-efficient manner, and the packaging should be as thin and light as possible. At the same time, at the end of the life cycle, the packaging should be biodegradable, reused, or recycled.

The Sustainable Packaging Coalition (SPC) under GreenBlue proposed five environmentally friendly product packaging methods, including taking a life cycle approach, considering the packaging and product relationship, choosing effective sustainability labeling and marketing, being creative, and talking with others. Packaging sustainability should be from the beginning of the design to the end of the life cycle and take into account such aspects as consumer usage and greenhouse gas emission factors. Packaging can prevent product damage and has communication benefits, so sustainable packaging for communicating with consumers is an important part of the development stage. Educating consumers regarding packaging issues will help manufacturers develop sustainable packaging materials. Furthermore, R&D personnel should strive to design more sustainable packaging materials and provide sustainable and practical dialogs in the product supply chain (GREENBIZ, 2013).

Presently, the common circular packaging materials are environmentally friendly cartons, packaging boxes, packaging bags, and packaging cases. Environmentally friendly cartons are made of recycled pulp and environmentally friendly water-based inks. Compared with plastic packaging, cartons decompose more easily and have a lower environmental burden. The environmentally friendly packing box is more environmentally friendly than plastic packaging and is usually used for food packaging and meal takeout or delivery. It avoids the risk of decomposition of plastic caused by hot food and thus prevents harm to the human body. Raw materials for circular packaging bags and environmental packaging boxes are diversified as renewable resources, bio-degradable materials, or paper bags are all material options for environmentally friendly packaging bags. Some environmentally friendly packaging bags have the functions of anti-fouling, impact resistance, waterproof, low carbon emissions, and can be reused to reduce environmental burden (PackAgeplus, 2021). In this study, circular packaging refers to packaging bags or boxes that consumers can reuse made from environmentally friendly packaging material.

Scholars have published related issues on reusable packaging and eco-packaging. Testa et al. (2020) pointed out the importance of seeking information in order to guide consumption choices that are more consistent with the circular economy. Geueke et al. (2018) focused on chemical safety aspects of recycled food packaging. Guillard et al. (2018) reviewed the major challenges that food packaging must tackle in the near future in order to enter the virtuous loop of circular bio-economy and they proposed some solutions. A study revealed that perceptions of eco-packaging directly influences consumer propensity to purchase and the positive relationship between perceptions of eco-packaging and purchases of eco-packaged goods is indirectly supported by an increase in an organization's perceived brand equity and enhanced customer loyalty toward the organization (Zeng et al., 2017). Foschi and Bonoli (2019) described how European Commission has worked to regulate production and consumption patterns on plastic carrier bags and packaging thus facilitating the achievement of specific targets provided by the recent Directive. Ertz et al. (2017) used the theory of planned behavior to identify the mechanism about the consumption of reusable containers and showed that the context strongly impacts perceived behavioral control and motivations as well as attitudes. Besides, Attitude is a significantly stronger predictor of intentions for Westerners than Asians. Meherishi et al. (2019) presented a systematic literature review of studies to generate a greater understanding of the work done in the field of sustainable packaging in supply chain management (SPSCM). The review identified three main supply chain structures studied in SPSCM literature of which there has been an increased focus on fragmented portions and dyads of the supply chain with respect to packaging.

News consumption and theory of planned behavior

Mass media is an important channel for the public to obtain information and knowledge of environmental issues. For environmental issues, according to the quantity of coverage theory, Mazur (2009) suggested that the quantity of media coverage on environmental issues, that is, the significance of their coverage, is even more important than the content, as most readers are more likely to be influenced by media messages than by the content (Mazur, 2009). If unpopular environmental issues can receive media attention, it will naturally affect the general public's concern for environmental issues and gain public attention to environmental issues (Yang, 2020). Cox (2013) suggested that the media influences what issues the public consider. Furthermore, how the news is packaged also affects the perceptual construct of readers or viewers and evokes certain perceptions and values (Cox, 2013). In addition, the agenda-setting theory explains the effect of news media on the generation of public opinion. This theory claims that the quantity of the media coverage of an issue

is proportional to the public's perception of the importance of the issue; that is, the more the mass media reports on an issue, the deeper the psychological impression of the audience, and the higher the perceived importance of the issue (Dzwo, 2008). If the green packaging issue can receive media attention and there is a large quantity of media coverage, people's consumption of the news on this issue will increase.

Media, social networks, or advertising can all affect personal attitudes. Online comments are a kind of information transmission, conveying the social impact of virtual communities. This kind of influence is similar to the impact of subjective norms on the individual in the theory of planned behavior. Jalilvand and Samiei (2012) pointed out that information communication can be a kind of transmission of information on other people's past behavioral habits (Jalilvand and Samiei, 2012). It reflects how other people's past experience of a certain behavior is the degree to which they perceive it to be easy or difficult to complete (Lee, 2021).

The theory of planned behavior suggests that behavioral intentions determine individual behaviors and that behavior intentions are determined by attitudes (whether I want it or not), subjective norms (other people's opinions), and perceived behavioral control (whether I can do it or not; Ye, 2012). In theory, the attitude toward behavior refers to a person's overall evaluation of a behavior, including behavioral beliefs and outcome evaluations. Meanwhile, behavior beliefs refer to the possible results of participating in a behavior, and outcome evaluation is the favored evaluation of the results of a behavior. Subjective norms include normative beliefs and motivation to comply. The former is the view of the important person of the individual regarding the individual's participating behaviors, and the latter refers to whether individuals obey the opinions of others on their behaviors. Perceived behavioral control means that individuals evaluate the resources they have to judge whether they have enough control over a subsequent behavior (Wang et al., 2020). Ajzen (2005) pointed out that the measurement results of behavioral intentions can replace the performance of actual behaviors (Ajzen, 2005; Liao, 2022). At present, research on sustainable issues using TPB theory has achieved good results, including topics such as solving household food waste (La Barbera et al., 2022), the intention of food waste composting (Rahman et al., 2022), e-waste recycling behavior (Mohamad et al., 2022), and waste disposal *via* garbage exchange supermarkets (Lu et al., 2022).

Therefore, this study suggested that when a large number of people are exposed to online shopping news using circular packaging, it will have an impact on consumers' behavioral attitudes, subjective norms, and perceived behavioral control. If an individual has a positive attitude toward a particular behavior, with the more subjective norms supporting the behavior and the stronger the perceived behavioral control, the higher the individual's intention will be to engage in the behavior (Ye, 2012; Wang et al., 2020). Based on the above, the following hypotheses were proposed:

H1: News consumption has a positive impact on the behavioral intention to use circular packaging through attitude.

H2: News consumption has a positive impact on the behavioral intention to use circular packaging through subjective norms.

H3: News consumption has a positive impact on the behavioral intention to use circular packaging through perceived behavioral control.

News consumption, attitude, habit, and behavioral intention

News consumption is information consumption, and information affects individuals' attitudes (Chen and Tao, 2018). The theory of planned behavior (TPB; Ajzen, 1985) indicates that the performance of attitude can predict one's likely behavior. When an individual's attitude toward a behavior is more positive, the behavioral intention will be higher; conversely, if the attitude is more negative, the behavioral intention will be lower accordingly. Habits can be thought of as frequently repeating past behaviors; habits are, to some extent, automatic or non-subjective (Saba and Natale, 2008). Attitudes and habit processes are two important factors for coping with social problems, such as obesity or climate change, or adjusting one's behavior in times of crisis during a pandemic. Attitude is a psychological tendency to evaluate the degree of liking or disliking a particular entity (Eagly and Chaiken, 1993). This study focused on attitude-to-behavior intentions, such as using recyclable bags or recyclable cartons to protect the environment. Therefore, here, attitudes can be understood as individuals' evaluations of behaviors and their outcomes. Habits are memory-based tendencies that automatically respond to cues that lead to past behavioral performance. These tendencies are derived from memory cue-response associations in the context of a stable environment obtained by repeatedly responding to cues (Verplanken, 2018). This response may be an overt behavior or habitual thinking (Verplanken et al., 2007). Habits are often seen as social ills that need to be addressed; perhaps a healthier, safer, or more sustainable society may be created through a change in attitude. More importantly, however, habits play a major role in regulating desirable daily behaviors or consolidating long-term behavioral changes. Attitudes can be the starting point for habit formation (Verplanken and Orbell, 2022). In their investigation of the impact of different oils on food choices, Saba and Natale (2008) pointed out that oil consumption habits influenced oil purchase intentions (Saba and Natale, 2008); this finding clearly showed the influence of habits on behavioral intentions.

When people try something new, and it works, or people like it, the behavior may be repeated and eventually become a habit (Verplanken and Orbell, 2022). While habit formation may

reinforce behavior changes, it also aligns behavioral change with the attitude that inspired it in the first place in a broader sense (Aarts and Dijksterhuis, 2000). If behaviors are something a person truly wishes to build, then a positive, strong, and stable attitude is a good place to start (Verplanken and Orbell, 2022). Furthermore, attitude is influenced by the amount of news information (Lee, 2021). Therefore, the following hypotheses were proposed by this study:

> *H4*: News consumption has an impact on the behavioral intention to use circular packaging through attitude and habit.

Data and methodology

Research design

From January to the end of February 2022, the survey was conducted using convenience sampling. Convenience sampling is a common form of sampling found in population research. Convenience sampling is popular because it is not costly and simplistic. When used to generate a potential hypothesis or study objective, convenience sampling is useful (Stratton, 2021). We solicited voluntary participants in the study after stating the research purpose. We used questionnaire items developed by other scholars and tested the appropriateness of the questionnaire through reliability and validity. Due to covid-19, the questionnaire of this study was distributed using online questionnaires. This study involved a sample of 373 adults (aged 18 years or over) living in Taiwan. Demographic variables such as gender, age, marriage, and education were also collected in this study.

Measures

The main variables in this study included news consumption, attitude, habits, subjective norms, perceived behavioral control and behavioral intention, which were measured in six main constructs, and a structured questionnaire was used as the measurement tool. The news consumption construct was mainly the circular packaging news consumption measure. The news consumption scale items were modified from those of Yoon et al. (2021) with a total of three items. The attitude construct mainly referred to an individual's evaluation on the use of circular goods for environmental protection. The items of the attitude scale were modified from those of Hong and Fu (2012), with a total of six items. Habit referred to an individual's behavior of environmental protection and product reuse in daily life. The items of the habit scale were modified from those of Untaru et al. (2020), and there were five items.

Subjective norms referred to individuals' positive support or negative opposition to key reference groups for their use of circular packaging when shopping online and their willingness to comply with these norms. The items of the subjective norms scale

were modified from those of Kamalanon et al. (2022), with a total of four items.

Perceived behavioral control referred to individuals' ability to control the difficulty of choosing to use a recycling bag when the option of using a recycling bag is presented. The items of the perceived behavioral control scale were modified from those of Hong and Fu (2012) and Kamalanon et al. (2022), with a total of four items.

Behavioral intention referred to an individual's willingness and the possibility to use circular packaging. The items of the behavioral intention scale were modified from those of Kamalanon et al. (2022), and there were four items in total. The 5-point Likert scale was adopted for measuring the scales, with five grades divided from strongly agree (5) to strongly disagree (1).

To test the reliability and validity of the questionnaire, this study first conducted an analysis using Cronbach's α. If it met 0.60, it showed good reliability (Kerlinger and Lee, 1999). Then, this study conducted a validity analysis using composite reliability (CR) and average variance extracted (AVE). For news consumption, Cronbach's alpha was 0.948, CR was 0.966, and AVE was 0.906. For attitude, Cronbach's alpha was 0.919, CR was 0.939, and AVE was 0.722. For habits, Cronbach's alpha was 0.853, CR was 0.897, and AVE was 0.637. For subjective norms, Cronbach's alpha was 0.873, CR was 0.913, and AVE was 0.723. For perceived behavioral control, Cronbach's alpha was 0.867, CR was 0.910, and AVE was 0.718. For behavioral intention, Cronbach's alpha was 0.873, CR was 0.929, and AVE was 0.766. This study achieved reliability coefficients for all constructs >0.7 and AVE > 0.5 (Hair et al., 2016). Generally speaking, in this study, the fitness of the measurement tool was positive (Table 1; Figure 1).

Data analysis

This study used the Statistical Package for Social Sciences (version 21.0 IBM SPSS Inc., Chicago, IL, USA) to perform statistical analyses. Average mean, standard deviation, and percentage were used in the descriptive statistics. The statistical methods included the correlation analysis and the regression analysis to test the contribution and significance of the variables. This study also measured the Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE) of each variable to understand the reliability and validity of the scale. PROCESS Macro for SPSS was then used to verify the mediation effects. During all the testing of the PROCESS Models, this study used 10,000 bootstrap samples with 95 percent confidence intervals for the boot-strap analyses.

Results

In the survey sample, the proportion of male and female respondents was nearly even (51.2 and 48.8%, respectively; Table 2). The age distribution was mostly 41–50 years old,

TABLE 1 The reliability, validity, and correlation of variables.

Variables	Cronbach's α	CR	AVE	1	2	3	4	5	6
1. News Consumption	0.948	0.966	0.906	1					
2. Attitude	0.919	0.939	0.722	0.147**	1				
3. subjective norms	0.873	0.913	0.723	0.204**	0.596**	1			
4. perceived behavioral control	0.867	0.910	0.718	0.231**	0.695**	0.647**	1		
5. Habit	0.853	0.897	0.637	0.220**	0.482**	0.488**	0.648**	1	
6. Behavioral Intent	0.873	0.929	0.766	0.176**	0.661**	0.585**	0.749**	0.604**	1

**$p < 0.01$.

H1: News Consumption- Attitudes- Behavioral Intention
H2: News Consumption- Subjective Norms- Behavioral Intention
H3: News Consumption- Perceived Behavioral Control- Behavioral Intention
H4: News Consumption- Attitudes- Habits- Behavioral Intention

FIGURE 1
Shows the research model for the six constructs and their theoretical relationships.
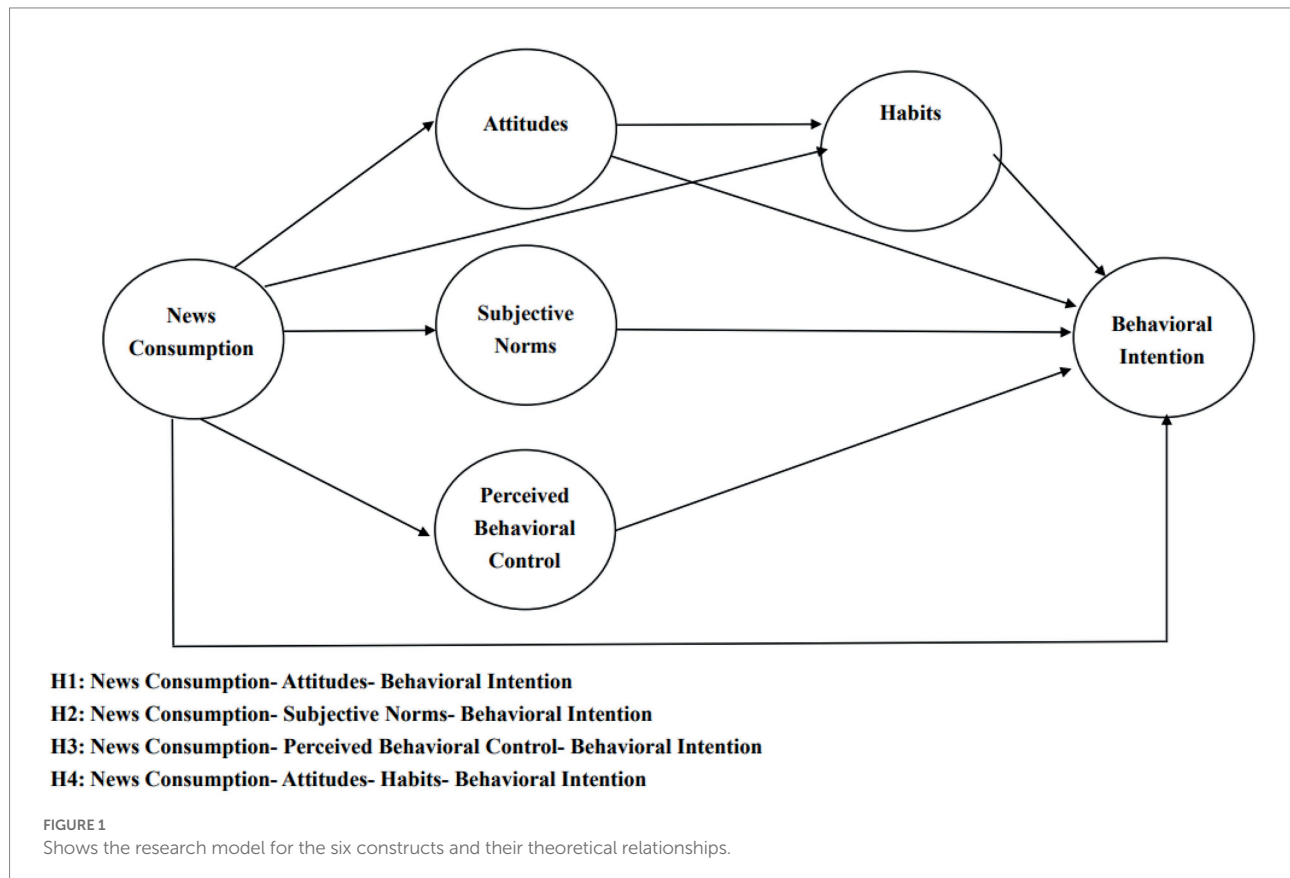
accounting for 36.9%, followed by 51–60 years old, accounting for 24.6%. In terms of educational level, those with college education accounted for the highest proportion (46.1%), followed by those with a master's degree or above (29.7%).

News consumption-attitudes-behavioral intention

To verify whether the amount of news consumption had a significant impact on environmental attitude, a regression analysis was conducted with news consumption as the independent variable and attitude as the dependent variable. The results showed that news consumption had a significant positive impact on environmental attitude (beta = 0.147, p = 0.004); that is, the more

consumers consumed circular packaging news, the more positive environmental attitude they would have. Secondly, the influence of news consumption on the use intention of circular packaging was tested. The results showed that news consumption had a significant positive impact on the use intention of circular packaging (beta = 0.176, p = 0.001); that is, the more consumers consumed circular packaging news, the higher their intention to use circular packaging. Furthermore, the effect of environmental attitude on the use intention of circular packaging was verified. The results showed that environmental attitude had a significant positive impact on the use intention of circular packaging (beta = 0.661, p < 0.001). In other words, when consumers had a positive environmental attitude, their intention to use circular packaging was higher. Finally, whether news consumption and environmental attitude had a significant impact on consumers'

TABLE 2 The sample description (total $n = 373$).

Variables		Numbers	Percentage
Gender	Male	191	51.2%
	Female	182	48.8%
Age	<20	6	1.9%
	20–30	21	5.6%
	31–40	67	17.9%
	41–50	138	36.9%
	51–60	92	24.6%
	>60	49	13.1%
Marriage	Married	282	75.6%
	Single	87	23.3%
	Others	4	1.1%
Education	High school or below	90	24.2%
	University	172	46.1%
	Graduate school	111	29.7%

TABLE 3 Analysis of news consumption and environmental attitudes toward the use of circular packaging.

Independent variable	Dependent variable	
	The intention to use circular packaging	
	Model I	Model II
News consumption	0.176**	0.081*
Environmental attitude		0.650***
F value	11.851***	147.588***
R^2	0.031	0.444

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

intention to use circular packaging was tested. The results showed that the original news consumption (independent variable) had a significant relationship with the use intention of circular packaging (dependent variable). However, after the mediating variable (environmental attitude) was added, the relationship between the original independent variable and dependent variable weakened (beta decreased from 0.176 to 0.081, $p = 0.040$), and the mediating variable was significant ($p < 0.001$). Therefore, the environmental attitude had a partial mediating effect between news consumption and the intention to use circular packaging (Table 3). The results of the bootstrapping analyses conducted by PROCESS also supported this hypothesis. This study demonstrated that the indirect effect of news consumption on the intention to use circular packaging *via* environmental attitude was 0.0430, with a 95% confidence interval that did not contain zero (CI = [0.0146, 0.0721]).

News consumption-subjective norms – behavioral intention

To verify whether the amount of news consumption had a significant impact on subjective norms, a regression analysis was conducted with news consumption as the independent variable and subjective norms as the dependent variable. The results showed that news consumption had a significant positive impact on subjective norms (beta = 0.204, $p < 0.001$); that is, the more consumers consumed circular packaging news, the more positive subjective norms they would have. Secondly, the influence of news consumption on the use intention of circular packaging was tested. The results showed that news consumption had a significant positive impact on the use intention of circular packaging (beta = 0.176, $p = 0.001$); that is, the more consumers consumed circular packaging news, the higher their intention to use circular packaging. Furthermore, the effect of subjective norms on the use intention of circular packaging was verified. The results showed

that subjective norms had a significant positive impact on the use intention of circular packaging (beta = 0.585, $p < 0.001$). In other words, when consumers had a positive subjective norm, their intention to use circular packaging was higher. Finally, whether news consumption and subjective norms had a significant impact on consumers' intention to use circular packaging was tested. The results showed that the original news consumption (independent variable) had a significant relationship with the use intention of circular packaging (dependent variable). However, after the mediating variable (subjective norm) was added, the relationship between the original independent variable and dependent variable weakened (beta decreased from 0.176 to 0.059, $p = 0.169$), and the mediating variable was significant ($p < 0.001$). Therefore, the subjective norm had a perfect mediating effect between news consumption and the intention to use circular packaging (Table 4). The results of the bootstrapping analyses conducted by PROCESS also supported this hypothesis. This study demonstrated that the indirect effect of news consumption on the intention to use circular packaging *via* the subjective norm was 0.1167, with a 95% confidence interval that did not contain zero (CI = [0.0571, 0.1752]).

News consumption-perceived behavioral control – behavioral intention

To verify whether the amount of news consumption had a significant impact on perceived behavioral control, a regression analysis was conducted with news consumption as the independent variable and perceived behavioral control as the dependent variable. The results showed that news consumption had a significant positive impact on perceived behavioral control (beta = 0.231, $p < 0.001$); that is, the more consumers consumed circular packaging news, the more positive perceived behavioral control they would have. Secondly, the influence of news consumption on the use intention of circular packaging was tested. The results showed that news consumption had a significant positive impact on the use intention of circular packaging (beta = 0.176, $p = 0.001$); that is, the more consumers consumed circular packaging news, the higher their intention to use circular packaging. Furthermore, the effect of perceived behavioral control on the use intention of circular packaging was verified. The results

TABLE 4 Analysis of news consumption and the subjective norm toward the use of circular packaging.

Independent variable	Dependent variable	
	The intention to use circular packaging	
	Model I	Model II
News consumption	0.176**	0.059
Subjective norm		0.573***
F value	11.851***	177.513***
R^2	0.031	0.345

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

TABLE 5 Analysis of news consumption and the perceived behavioral control toward the use of circular packaging.

Independent variable	Dependent variable	
	The intention to use circular packaging	
	Model I	Model II
News consumption	0.176**	0.003
Perceived behavioral control		0.748***
F value	11.851***	446.134***
R^2	0.031	0.561

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

showed that perceived behavioral control had a significant positive impact on the use intention of circular packaging (beta = 0.749, $p < 0.001$). In other words, when consumers had a positive perceived behavioral control, their intention to use circular packaging was higher. Finally, whether news consumption and perceived behavioral control had a significant impact on consumers' intention to use circular packaging was tested. The results showed that the original news consumption (independent variable) had a significant relationship with the use intention of circular packaging (dependent variable). However, after the mediating variable (perceived behavioral control) was added, the relationship between the original independent variable and dependent variable weakened (beta decreased from 0.176 to 0.003, $p = 0.922$), and the mediating variable was significant ($p < 0.001$). Therefore, the perceived behavioral control had a perfect mediating effect between news consumption and the intention to use circular packaging (Table 5). The results of the bootstrapping analyses conducted by PROCESS also supported this hypothesis. This study demonstrated that the indirect effect of news consumption on the intention to use circular packaging *via* the subjective norm was 0.1725, with a 95% confidence interval that did not contain zero (CI = [0.1018, 0.2440]).

The overall model of multiple regression analysis is as Figure 2.

News consumption-attitudes-habits-behavioral intention (serial multiple mediation model)

As can be seen in Figure 3, total effect (c = 0.1759, SE = 0.0230, $t = 3.4426$, $p = 0.0006$) of News consumption on behavioral intention was at a significant level. In addition, the direct effects of news consumption on attitudes (B = 0.0637, SE = 0.0223, $t = 2.8587$, $p = 0.0045$) and habits (B = 0.0729, SE = 0.0217, $t = 3.3680$, $p = 0.0008$) were at significant levels. The direct effect of attitudes as the first mediating variable on the second mediating variable of habits (B = 0.5062, SE = 0.0499, $t = 10.1448$, $p < 0.001$) is on significant level. A review of the direct effects of mediating variables on behavioral intention showed that the effects of attitudes (B = 0.4990, SE = 0.0417, $t = 11.9636$, $p < 0.001$) and habits (B = 0.3466, SE = 0.0384, $t = 9.0148$, $p < 0.001$) were at significant

levels. When news consumption and all other mediating variables were simultaneously entered into the equation, the relationship between news consumption and behavioral intention, in relation to direct effect, was not at a significant level (c' = 0.0245, SE = 0.0163, $t = 0.6792$, $p > 0.05$). Based on this result, the mediating variables were observed to mediate between news consumption and behavioral intention. In addition, the model overall was seen to be at a significant level ($F = 146.8257$, $p < 0.001$) and explained 54.42% of the total variance in behavioral intention.

The comparison of indirect effects and specific effects of news consumption on behavioral intention levels through attitudes and habits is included in Table 6. Statistical significance of the indirect effects within the tested model in the current research was examined over 10,000 bootstrap samples. Estimates were taken at a 95% confidence interval, and the results are presented in Table 6. The total indirect effect of news consumption through attitudes and habits on behavioral intention is statistically significant (estimate = 0.0682; 95% CI [0.0363, 0.1006]). Within the tested model, when considering the mediating variables separately and together in relation to the mediating indirect effects of news consumption on behavioral intention, single mediation of attitudes (estimate = 0.0318; 95% CI [0.0107, 0.0538]), serial-multiple mediation of attitudes and habits (estimate = 0.0112; 95% CI [0.0037, 0.0195]), and single mediation of habits (estimate = 0.0253; 95% CI [0.0108, 0.0419]) were found statistically significant. Contrasting findings presented in pairs were included in the current research in order to determine whether specific indirect effects of mediating variables were stronger than others. Only one statistically significant contrast not within the zero-point estimate based on the 95% confidence interval has been presented in Table 6. Based on the contrasting pair of specific indirect effects, the variable of attitudes was observed to have stronger mediation than the serial-multiple mediation of attitudes and habits.

Discussion and implications

Discussion

As the COVID-19 pandemic continues, the global home economy is developing rapidly, and e-commerce turnover
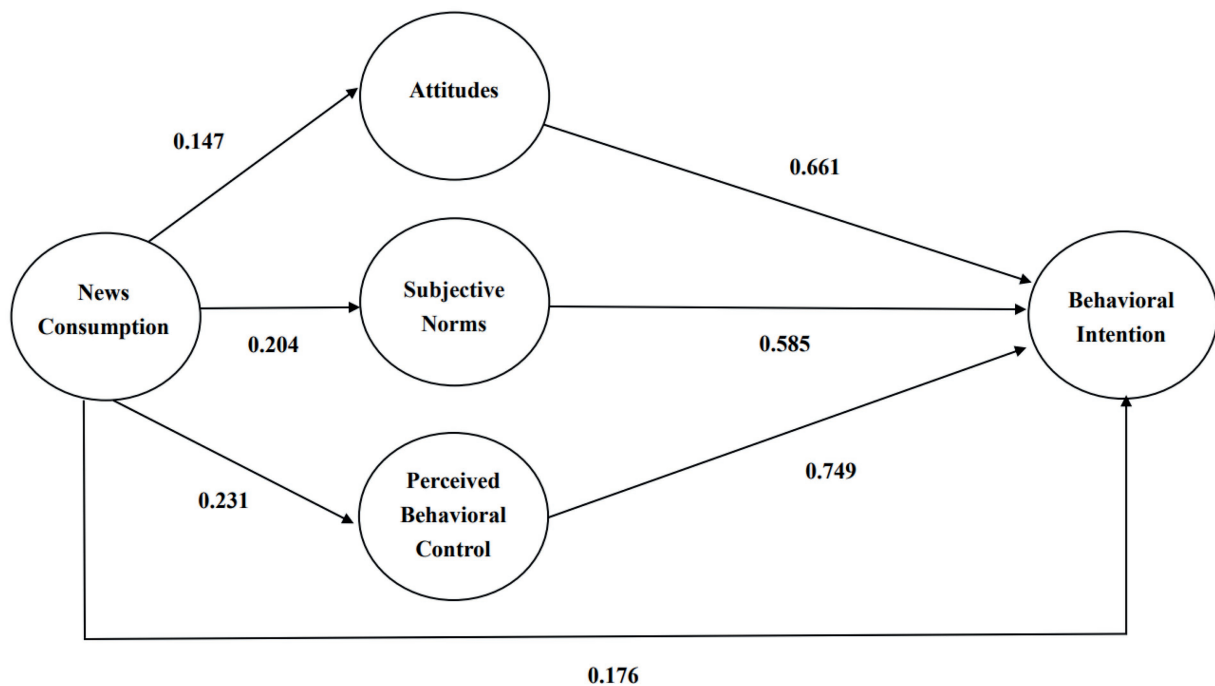
FIGURE 2
The overall model of multiple regression analysis.
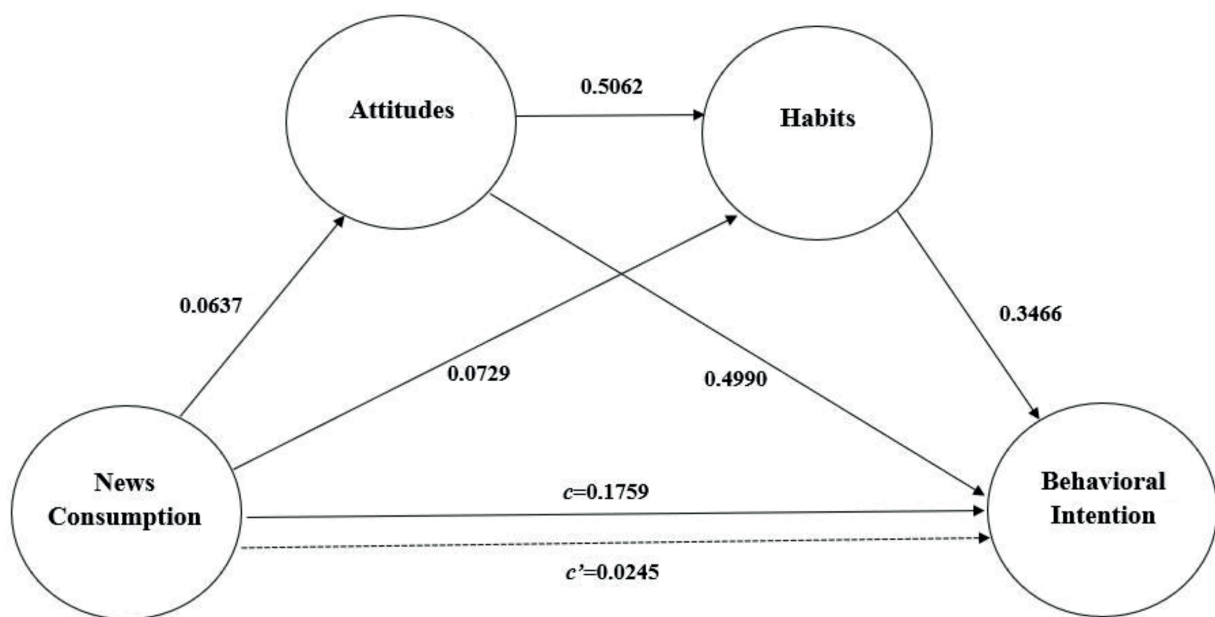
FIGURE 3
Path analysis of news consumption, attitudes, habits, and behavioral intention.

continues to rise (Lin, 2021). These events have resulted in the use of a large amount of packaging materials. The piles of cartons and bubble wrap materials indicate that consumption has caused an increased burden on garbage disposal and a crisis of environmental protection. With the large-scale consumption of online shopping

and takeaway food, it has become a priority to promote green pack-aging to make consumers identify with green packaging and to actively use it to reduce the garbage threatening the environment. The findings of this research identified that the reinforcement of media news could deepen people's environmental

TABLE 6 Comparison of the indirect effects of news consumption on behavioral intention through attitudes and habits and its specific indirect effects.

Effects	Coefficients		95% Confidence interval	
	Estimate	SE	Lower	Upper
Total Indirect Effects	0.0682	0.0164	0.0363	0.1006
News consumption->attitudes->behavioral intention (Model 1)	0.0318	0.0111	0.0107	0.0538
News consumption->habits->behavioral intention (Model 2)	0.0253	0.0079	0.0108	0.0419
News consumption->attitudes->habits->behavioral intention (Model 3)	0.0112	0.0040	0.0037	0.0195
Contrasts				
Model 1 versus Model 2	0.0065	0.0139	−0.0209	0.0333
Model 1 versus Model 3	0.0206	0.0083	0.0062	0.0382
Model 2 versus Model 3	0.0141	0.0085	−0.0018	0.0319

protection attitudes, subjective norms, perceived behavioral control and develop green habits in people's daily lives, and be of great help in guiding consumers to engage in other sustainable behaviors that are beneficial to life.

The theoretical contribution of this study is that the model, built solely on the basis of TPB, proved predictive of the intention to use circular packaging for online shopping; importantly, it also added two specific factors, news consumption and green habits, which have been shown to influence usage intention. This research has extended the application of TPB theory.

Theoretical implications

First, this study found that the consumption of circular packaging news positively impacted people's environmental protection attitude and the use of circular packaging, which agrees with previous research (Lee, 2021; Lee et al., 2021). At the same time, people's environmental attitudes played a mediating role. The large-scale involvement of green packaging media news could enhance consumers' attitudes toward environmental protection and further strengthen the public's willingness to use circular packaging. Therefore, to change the behavior of the public to use circular packaging, strengthening the media publicity of green packaging is the first and foremost task. Furthermore, although news related to recycling packaging could affect subjective norms and perceived behavioral control, the behavioral intention for consumers' use of recycling packaging was mainly affected by subjective norms and perceived behavioral control, which agreed with previous research (Rahman et al., 2022).

In addition, our study also found that news consumption was positively associated with people's environmental attitudes, then with their daily environmental habits, which in turn positively contributed to behavioral intention toward using circular packaging. The environmental attitude and habit played mediating roles. If the public was more exposed to recycling bag information, people had a more positive attitude toward environmental protection, as well as they would also engage in environmental protection habits in their daily life, and their intention to have new

environmentally friendly behaviors (the use of circular packaging) would also increase. This is similar to the findings of Untaru et al. (2020). Stern (2000) identified that different types of environmental protection behaviors are affected by attitude factors, personal abilities, environmental factors, habits, and practices, with different degrees of influence (Ketelsen et al., 2020; Mohamad et al., 2022). Thus, the development of public environmental protection attitudes and the establishment of environmental protection habits are important factors for promoting new environmental issues. When the public already has an attitude and habit of environmental protection, it means that they agree with the awareness of a healthy environment, and they are more willing to participate in related sustainable actions that are beneficial to environmental protection.

Managerial implications

This study proposed several management implications. First, it is important to utilize multiple media sources, including traditional electronic media (e.g., TV, newspapers, or periodicals) and online social media (e.g., FB, Instagram, TikTok, Podcast, YouTube, and other channels). Starting discussions with green packaging videos will link circular packaging, citizen awareness, a favorable environment, and other altruistic behaviors to deepen public environmental protection attitudes, thereby promoting the public's willingness to use circular packaging. Second, the influence of important reference groups is an important factor in changing consumers' willingness to use recycled packaging when shopping online. Therefore, educational institutions can promote the use of recycled packaging in online shopping on campus, provide small activities to increase participant motivation, or ally with eco-friendly YouTubers to make an impact on the public. Third, perceived behavioral control is also one of the driving forces that influences the use of circular packaging. It is recommended to strengthen the convenience of recycling packaging, such as reminding consumers to use recycled packaging bags at the last step of shopping or combining e-commerce goods distribution centers, schools, supermarkets,

public agencies, stores, and other places where the public often go, to strengthen recycling. The more convenient the process is provided by stores, the more willing consumers will be to join the use of recycled packaging. Finally, Circular packaging can be promoted among people with environmental attitudes and habits first. By starting with the consumption points that these groups are often exposed to, the concept of circular packaging will be gradually promoted in people's daily life. These consumption points include setting up a green e-commerce platform to guide consumers to use green packaging when purchasing or introducing incentives on the platform for consumers who use green packaging to accumulate feedback points or discounts.

Limitation and future research

Based on the suggestions of Ketelsen et al. (2020), this study explored consumers' responses to specific packaging (circular packaging for online shopping; rather than general eco-friendly packaging) in order to gain a deeper understanding of consumers' intention to accept specific eco-friendly solutions. This study only discussed external information, TPB and habits. Many factors affect consumers' choice of environmental protection behavior. It is suggested that subsequent research could divide consumers into groups according to their environmental protection habits for analysis and promote beneficial programs to consumers with different degrees of environmental protection use. In addition, different countries have different practices for developing green packaging for e-commerce, and the degree of popularization also varies. It is recommended that subsequent research includes a detailed analysis of the development policies of different countries to provide peer bench-marking. Third, most studies focus on demographic variables for comparison, with less exploration of the applicability of circular packaging for different cultures. It is suggested that follow-up researchers try to find solutions to the barriers to promoting green packaging from the cultural level.

Conclusion

The COVID-19 epidemic and the development of e-commerce have increased human reliance on single-use plastics, but we must continue to take sustainable actions. The findings indicated that the behavioral intention to use circular packaging in e-commerce shopping is affected by news consumption, attitudes, habits, subjective norms and perceived behavioral control, so starting from these factors to change people's behavior will greatly improve the reuse of environmentally friendly packaging.

Data availability statement

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

Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

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Conflict of interest

The author declares 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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Appendix

Variables	Items
News Consumption	I have read news or information about the circular packaging in online shopping on social media (e.g., Facebook, Twitter, Instagram)
	I have read news or information about the circular packaging in online shopping *via* instant messaging platform (e.g., text messages, Line)
	I have read news about the circular packaging in online shopping (e.g., newspaper articles, magazine, Google News)
Attitude	Using the circular packaging in online shopping can reduce negative environmental impacts
	Using the circular packaging in online shopping can reduce costs
	Using secondary sources can mitigate negative environmental impacts
	Let many people know and implement the circular packaging in online shopping
	Reducing the waste of resources can indirectly reduce the negative impact on the environment
	Using the circular packaging in online shopping can make our lives more livable
Subjective norms	Mass media in the publicity will cause me to use the recycling bag/box in online shopping
	The work environment will make me use recycle bags/boxes in online shopping
	My parents' request will let me use recycled bags/boxes in online shopping
	People around me influence my use of recycled bags/boxes in online shopping
Perceived behavioral control	In daily life, I will reuse resources
	I can protect the environment by using recycled bags/boxes in online shopping
	Every consumer can have a positive impact on society by purchasing products sold by socially responsible companies
	Everyone has an impact on pollution and natural resources, so what I do can make a difference
Habit	I replace plastic bags with reusable bags
	I bring my own food storage containers to store meat, fish, etc., and even cooked food
	I bring my own water bottle to reduce the need for bottled water
	I bring my own reusable food ware every day
	I use rags instead of disposable kitchen towels
Behavioral Intent	I am willing to use recycled bags/boxes in online shopping
	If the price is not different from other prices, I will use recycle bags/boxes while online shopping
	If the quality is no different from others, I will use recycled bags/boxes *while online shopping*
	I will consider switching to use other packaging products due to environmental factors.

Using strengths to attack weaknesses – The effect of comparative advertising on purchasing intention of green products

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Firms increasingly use comparative advertising in green marketing to convey information of green products to consumers, but there is still a lack of research on the effect and mechanism of comparative advertising in the green products field. Across four experimental studies, we show that comparative advertising facilitates consumers' purchase intention of green products (PIGP), because comparative advertising lead to higher perceived diagnosticity of Information. Yet, comparative advertising does not always bring high intention to buy green products. When using egoistic appeals, the perceived diagnosticity of information and purchase intention of green products were higher in comparative advertising than in non-comparative advertising. When utilizing altruistic appeals, there was no significant difference between the two kinds of advertising. In addition, individual differences of consumers also affect the effect of comparative advertising. The positive effect of comparative advertising on the purchase intention of green products is weakened for consumers with high green involvement. Our findings advance existing knowledge about the use of comparative advertising in green marketing and provide enlightening suggestions for how firms can promote consumers to buy green products.

KEYWORDS

green product, comparative advertising, advertising appeals, green involvement, perceived diagnosticity of information

Introduction

In recent years, the environmental pollution problems caused by human production and living activities are very prominent. It is necessary to better understand and identify the methods that affect human behavior to improve these problems (Schneider et al., 2001). One of the means is to encourage consumers to engage in green consumption and choose or buy green products instead of conventional products (White et al., 2019; Tezer and Bodur, 2020). How to take effective measures to promote consumers from traditional consumption behavior to green consumption behavior has become an important social

issue. More and more firms change their strategies, actively manufacture and promote green products that can meet the green needs of consumers and improve the ecological and environmental benefits (Leonidou et al., 2011).

Compared with ordinary products, green products not only have the functional attributes for normal use by consumers, but also have more prominent environmental attributes. The raw materials or production processes of green products bring less pollution to the society and ecological environment (Mazar and Zhong, 2010). In business practice, many advertisements of green products mention products of "other brand" or similar conventional products, comparing the functional attributes or environmental attributes of products to derogate the disadvantages of conventional products or highlight the advantages of green products. This is the application of comparative advertising in the context of green consumption. For example, Australia's Morning Fresh concentrated detergent compares itself with "other brands" in terms of ingredients, test standards, uses and environment-friendly attributes in its advertisements to highlight the advantages of its own products. In the advertisement, Ecover eco-friendly dishwashing liquid compares itself with conventional products, conveying the information about functional attribute and environmental attributes: "conventional detergent contains harmful petrochemical components and hurts hands, while Ecover dishwashing liquid is extracted from natural plants, safe and mild…the bottles of Ecover dishwashing liquid are made of 100% renewable materials, which reduce 70% carbon emissions compared with other conventional products using original plastic."

However, there is no definitive conclusion on the effect of comparative advertising, which needs to be analyzed according to the specific conditions, and there is a lack of discussion on comparative advertising in the field of green consumption. To address this situation, we focus on design dimension (i.e., advertising appeals), psychological processes, and consumer-specific condition of comparative advertising used for green products. We intend to answer the following questions important for the successful design and presentation of advertisements for green products: Can comparative advertising effectively attract consumers to buy green products? If so, what are the key dimensions in comparative advertising that encourage consumers to buy green products? What are the relevant underlying psychological processes and boundary conditions?

Based on Accessibility—Diagnosticity Theory (Feldman and Lynch, 1988; Lynch et al., 1988), we hypothesize that compared with non-comparative advertising, comparative advertising will facilitate consumers' purchase intention of green products (or PIGP). Further, we predict that such effect occurs through a process of consumers' perceived diagnosticity of advertising information. However, we do not expect these predictions to hold when altruistic appeals are used or green involvement of consumers is high. Four experiments across various product categories provide conclusive evidence for our theory.

Our research makes several contributions to the existing literature. First, we expand the research perspective of

comparative advertising and enriched the literature of comparative advertising. By reviewing and summarizing the literature on comparative advertising, we find that the existing research has not reached a consistent conclusion on how comparative advertising affects consumers, that is, the effect of comparative advertising is different in different conditions. More importantly, comparative advertising in the field of green consumption has not received enough attention from scholars. Our research discusses the positive effects of comparative advertising comparing green products with "other brands" or similar conventional products in the context of green product marketing. Besides, we also elaborate the psychological mechanism of comparative advertising to enhance consumers' intention to buy green products, and reveal the moderating role of advertising appeals and green involvement on the effect of comparative advertising.

Second, our findings advance earlier studies that provide limited insights into the appeals of green advertisements. According to the information of green products' functional and environment-friendly attributes conveyed in comparative advertisements, our research classifies the advertising appeals into egoism and altruism, and verifies that in the context of expressing egoistic appeals, the use of comparative advertisements has a more positive impact on consumers' PIGP than non-comparative advertisements; when expressing altruistic appeals, there is no significant difference between the effect of comparative advertising and non-comparative advertising on consumers' PIGP.

Third, by finding that comparative advertising based on "other brands" products or conventional products has a positive impact on the PIGP, our research provides a theoretical reference for firms to make effective green product advertising strategies. In particular, we also show that comparative advertising play a more positive role in low-green-involvement consumers who lack knowledge of green products. Therefore, in the marketing practice, according to the insight of the target consumers and product attributes, firms can use comparative advertising to better convey the green product information by comparing with the conventional products familiar to consumers or products of "other brands."

Finally, our research provides firms with valuable insight on how to successfully design and present comparative advertisements of green products. We test the interaction between advertising types and advertising appeals, and reveal that when egoistic appeals are adopted, comparative advertising leads to more positive PIGP than non-comparative advertising; and the adoption of altruistic appeal cannot produce this difference. Therefore, even though comparative advertising can facilitate consumers' purchase intention, it is not enough for firms to rely on altruistic information such as environmental protection, recycling and low carbon in advertising design to attract consumers. Instead, they should highlight the functional attributes of green products different from other products, so as to truly benefit from the use of comparative advertising strategies.

Theoretical background and hypothesis development

Green products and green consumption

Green products refer to products that have little or no negative impact on the environment at various stages such as R&D, production processes, use and post-use disposal (Organisation for Economic Co-operation and Development (OECD), 2002). There are differences between green products and conventional products in terms of functional and environment-friendly attributes. On the one hand, the raw materials, production processes and product functions of green products are high innovative (Lao, 2014). On the other hand, green products have stronger environment-friendly attributes, effectively reducing pollution and damage to the ecological environment (Gershoff and Frels, 2015).

In daily life, purchasing clean products without harmful petrochemical components, healthy organic food, energy-saving household appliances and electric vehicles are all green product purchases. Previous studies show that intention can predict behavior in various situations (Mullet and Karson, 1985). In the field of green consumption, PIGP can well predict the actual green purchase behavior of consumers (Ajzen, 1991). Consumers who show positive PIGP are more likely to take green product purchase behavior. Our research considers that PIGP is the psychological tendency of consumers to choose and buy green products actively, and is the conscious guidance of the actual purchasing behavior of green products. We use PIGP as the predictor of the purchasing behavior of green products.

Comparative advertising

Comparative advertising is the advertisements in which advertisers compare their own brands and products with those of other competitors in an explicit or implicit way to highlight their own advantages and thus influence consumers' purchase decisions and other consumption behaviors (Romano, 2004). "Competitor" (with whom to compare), "competitive product or service" (what to compare) and "comparison" (how to compare) are the three key elements of comparative advertising.

According to whether contain specific competitive brand or product information, comparative advertising can be classified into direct comparative advertising and indirect comparative advertising (Miniard et al., 2006; Bambauer-Sachse and Heinzle, 2018). As the name implies, the direct comparative advertising refers to the advertisement in which a brand or product compares with the named competitors (Pechmann and Ratneshwar, 1991). Indirect comparative advertising refers to the comparison with the anonymous competitors, such as products of "other brands" or "other similar products" (Miniard et al., 2006). It is worth noting that although comparative advertising has been used widely, direct comparative advertising is controversial and prohibited in some countries because it is easy to infringe the interests of the

compared object (Manzur et al., 2012). On the contrary, indirect comparative advertising helps firms avoid possible legal risks and is more common in marketing practice. Therefore, our research focuses on indirect comparative advertising of green products.

Previous studies have shown that comparative advertising is better than non-comparative advertising in improving consumers' attention, interest, information recall and brand attitude (Beard, 2016; del Barrio-García et al., 2020). One of the important driving factors may be activation (Bambauer-Sachse and Heinzle, 2018). Activation represents the level of internal energy mobilization and excitation caused by environmental stimuli such as advertisements (Yan et al., 2016). The information provided by comparative advertising is often considered unique, valuable and personal, leading to a high level of activation. A high degree of activation leads to more attention, enhances information processing (Storbeck and Clore, 2008), and affects emotion and cognition (Gorn et al., 2001). On the other hand, comparative advertising may trigger negative reactions (Beard, 2016; Bambauer-Sachse and Heinzle, 2018; del Barrio-García et al., 2020). Consumers often believe that comparative advertising is more aggressive, less credible (Barone et al., 2004) and more manipulative (Chang, 2007) than non-comparative advertising. Comparative advertising can also cause refutation and derogation (Pant et al., 2014). In summary, there is no consistent conclusion on the impact of comparative advertising on consumers. In different conditions, comparative advertising may produce different effects. More importantly, researchers still lack attention to comparative advertising in the context of green consumption. We propose that comparative advertising can promote consumers' PIGP.

The effect of comparative advertising on PIGP

Comparative advertising provides specific attribute information of products (such as feature, quality and advantages) so that consumers can make inferences based on similarities or differences (Dröge and Darmon, 1987; Pechmann and Ratneshwar, 1991). The comparative advertisement of green products does not make a comparison directly between a green product and another specific brand or product, but indirectly compares with a product of "other brands" or similar conventional products to publicize the comparative advantages of green products to win market share. Indirect comparison is considered to be more objective than the direct comparison.

The relationship between green products and traditional products is one of substitution and competition, which has relevance and comparability and conforms to the elements of comparative advertising. Moreover, green products show obvious advantages over conventional products: on the one hand, green products have certain innovation in raw materials, manufacturing processes, efficacy and performance (Lao, 2014), which means that the functional attributes of green products may be better than those of conventional products; on the other hand, the production

process of green products has little or no negative impact on the environment (Gershoff and Frels, 2015), so it has more environment-friendly attributes than conventional products. Because the advantages of green products are obvious and widely recognized, the use of comparative advertising for green products is not easy to bring undesirable outcomes such as consumers' refutation and resistance. Therefore, it seems appropriate and beneficial to use comparative advertising for green products.

We believe that green products can get more attention by using comparative advertising. First, more than one product is mentioned in the advertisements, which increases the personal relevance to more consumers (Wilkie and Farris, 1975) and attracts more consumers' attention (Grewal et al., 1997). Second, comparative advertising provides more information (Muehling et al., 1990). Comparative advertising displays both the positive information of green products and the negative information of conventional products at the same time, which leads to higher stimulation (Pechmann and Stewart, 1990) and more information processing (Muehling et al., 1990). Compared with green products, consumers are generally more familiar with conventional products and have more use experience. Comparative advertising may activate the pre-existing knowledge structure of consumers and enhance the availability of advertising information, which is conducive to consumers' positive brand attitude and high willingness to use products (del Barrio-García et al., 2020). We hypothesize:

> H1: Comparative advertising leads to higher PIGP than non-comparative advertising.

Accessibility-diagnosticity theory and perceived diagnosticity of information

Accessibility-diagnosticity theory (Feldman and Lynch, 1988; Lynch et al., 1988) proposes that whether information can be used by consumers for cognitive evaluation and decision depends on the accessibility and diagnosticity of information. Accessibility refers to how easy it is for consumers to recall and extract relevant information in their own memory, or how easy it is for certain information to be extracted and used relative to other information (Anderson, 1983). Diagnosticity refers to the usefulness of information in the cognitive and decision evaluation. The stronger the correlation between the information and the evaluated object, the more useful the information is for cognitive evaluation, that is, the higher the diagnosticity (Skowronski and Carlston, 1987; Dick et al., 1990).

The usefulness of information depends on the subjective perception of consumers. If consumers think that the information is helpful for them to know more about the product and make purchase decisions, they will use it to evaluate the product, so the consumers perceive the information as highly diagnosable. In particular, when little information is provided or the consumers have little relevant knowledge, the perceived diagnosticity of the

existing information will be high (Feldman and Lynch, 1988; Lynch et al., 1988). Filieri's research (Filieri, 2015) shows that improving consumers' perceived diagnosticity of certain information can promote them to make positive purchase decisions, because higher perceived diagnosticity of information can make consumers feel that they have a high understanding of the product and have greater confidence in their purchase decisions.

For an advertisement of a green product, the consumers' perceived diagnosticity of information refers to the extent to which consumers think that the advertising information is helpful to evaluate the green product and make decisions. First, compared with non-comparative advertising that only provide green product information, the introduction of conventional products information that consumers are relatively familiar with in comparative advertising can activate the pre-existing knowledge structure of consumers and help them extract relevant information from situations or memories, that is, the accessibility of comparative advertising information is higher. Secondly, comparative advertising compares the advantages and disadvantages of green product with conventional products or "other brand" products in terms of functional attributes or environmental attributes, providing consumers with detailed available information to make consumption decisions. Moreover, comparative advertising also provides reference points in the process of information coding (Lien, 2001), which can enhance consumers' ability to process and understand information (Moorman, 1990), and reduce consumers' doubts through more rational thinking. Thus, consumers lacking knowledge of green products can benefit from the benchmark provided by reference information (Lien, 2001).

Therefore, the information provided by comparative advertising is more relevant to decision-making than non-comparative advertising, which can better help consumers understand and evaluate products. That is, the consumers' perceived diagnosticity of comparative advertising information is high. And high perceived diagnosticity can promote consumers' positive evaluation of product information and improve consumers' intention to buy green products. More formally:

> H2: The influence of comparative advertising (vs. non-comparative advertising) on consumers' PIGP is mediated by perceived diagnosticity.

Egoistic and altruistic appeals in green advertisement

For the advertisement of green products, egoistic appeals emphasize the benefits that green products can bring to consumers, and explain the products functional features to let consumers know the health benefits and economic benefits that they can obtain (Green and Peloza, 2014; Kareklas et al., 2014). On the contrary, altruistic appeals emphasize the benefits that green

products can bring to the environment. By describing the environmental attributes of green products, altruistic appeals enable consumers to know the benefits that choosing green products can be generated for the society and the natural environment (Kareklas et al., 2014). The comparative advertising of green products usually points out the disadvantages of conventional products in terms of efficacy and performance to publicize the benefits brought by green products to consumers, which expresses egoistic appeals; or it claims the degree of damage caused by conventional products to the environment and emphasizes the effect of green products on environmental protection (Mazar and Zhong, 2010), which expresses altruistic appeals.

The influence of egoistic and altruistic appeals on consumers' purchase intention can be explained by Elaboration Likelihood Model (Petty and Cacioppo, 1986). According to the Elaboration Likelihood Model, there are two different paths for people to process the received information – the central route and the peripheral route. Under the central route, people think about the information comprehensively and fully, actively match their existing knowledge and experience with the received advertising information, and then make reasoning and judgment. If the product information in the advertisement is consistent with one's own product knowledge and past experience, he/she is likely to have a positive attitude towards the advertised product. Under the peripheral route, people do not think deeply and rationally about the information in the advertisement, but pay more attention to peripheral cues in the advertisement and make decisions according to their emotional reactions. Whether to choose the central route or the peripheral route mainly depends on the motivation and ability of individuals to think about the information. When individual has strong motivation and enough analytical ability, he/she will process information and make decisions *via* the central route; otherwise, one will process information and make decisions *via* peripheral route (Allison et al., 2017).

In green advertising, egoistic appeals are generally based on the functions of green products, highlighting the benefits of using green products on consumers' personal health, use experience, efficiency improvement, etc. These appeal points are more relevant to individuals and the accessibility of information is higher. Thus, before purchase decision-making, consumers are more inclined to carefully consider and logically judge advertising information *via* the central route (Lee et al., 2017). Under these conditions, compared with non-comparative advertising, comparative advertising provides detailed information of green product and conventional product at the same time, making consumers realize that the advertising information conforms to their own interests and helps them make purchase decisions. Therefore, we predict that for egoistic appeals, comparative advertising increases consumers' perceived diagnosticity of information, which leads to positive PIGP.

And altruistic appeals are based on the environmental attribute of green products, describing the impact of green products on the ecological environment and other people's

interests. These appeal points are less relevant to individuals, and the accessibility of information is low. Consumers are more inclined to deal with the product information in advertisements *via* the peripheral route. In this case, consumers pay less attention to the altruistic information in the advertisement, and the diagnosticity of the advertisement information is low (Xie et al., 2015). Therefore, for altruistic appeals, consumers are unlikely to carefully analyze the information describing the environmental attributes of products in advertisements, leading to no significant difference in their perceived diagnosticity of advertising information and PIGP between comparative advertising and non-comparative advertising. We propose:

> *H3a:* When using egoistic appeals, comparative advertising leads to higher perceived diagnosticity and PIGP than non-comparative advertising.

> *H3b:* When using altruistic appeals, there is no significant difference between the influence of comparative advertising and non-comparative advertising on consumers' perceived diagnosticity and PIGP.

Moderating role of green involvement

Green involvement is an individual's own interest and engagement in green brands, green products and related green information. Individuals with higher interests in green products are more willing to read green product advertisements and reports on natural environment issues. They have a better understanding of green product knowledge and the importance of environmental protection, who are called "high-green-involvement consumers," and conversely, "low–green-involvement consumers." Grimmer and Bingham (2013) found that consumers with high green involvement have more positive attitudes towards green products and related information, while the attitudes of consumers with low green involvement are negative or indifferent. However, De Vlieger et al. (2012) proposed that there is a negative correlation between consumers' green involvement and green product trust. The lower the green involvement, the more likely consumers are to show a higher degree of trust in green product information. Although scholars do not reach a consensus on the pattern of green involvement influencing consumers, green involvement is an important factor affecting consumers' evaluation of green products.

Consumers high in green involvement are interested in green products and relevant environmental protection information, have rich green product experience and knowledge, and are more likely to be convinced by green advertising information (Haytko and Matulich, 2008). Therefore, no matter whether comparative advertising or non-comparative advertising is used for green products, consumers with high green involvement will rationally call their own knowledge structure, actively process the advertising information of green products *via* the central route (Xu et al.,

2015). And they compare and evaluate green products and conventional products from the perspective of functions and value to help them make purchase decisions.

For consumers low in green involvement, on the one hand, their interest and understanding of green products information are relatively low, and they seldom actively and extensively collect information related to green products (Haytko and Matulich, 2008). They lack experience of using green products, so they are more vulnerable to external cues (such as advertising information) when making consumption decisions. Compared with non-comparative advertising, comparative advertising containing conventional products familiar to consumers can attract consumers' attention and guide them to process more advertising information. Moreover, directly presenting the comparative information between green products and conventional products in advertisements reduces the extra information search efforts of consumers, which is more helpful for consumers with low green involvement to make consumption decisions. On the other hand, consumers with low green involvement usually use the peripheral route to process green information without strict logical reasoning and information comparison. They are easy to make more emotional responses according to advertisements and pay more attention to the resonance effect between product information and their own emotions, resulting in their positive purchase intention for green products.

> *H4*a: When consumers' green involvement is high, there is no significant difference in the effect of comparative advertising and non-comparative advertising on consumers' PIGP.
>
> *H4*b: When consumers' green involvement is low, comparative advertising leads to more positive PIGP than non-comparative advertising.

In the following, we test our hypotheses through four studies. Study 1 preliminarily examines the main effect of comparative advertising (*H1*) based on the comparison with products of "other brands." Using a new category of green products, Study 2 tests the main effect of comparative advertising (*H1*) and the mediating role of perceived diagnosticity (*H2*) in the context of comparison with conventional products. Study 3 examines the moderating effect of advertising appeals by manipulating the egoistic and altruistic appeals expressed in advertisements. Study 4 tests the moderating effect of green involvement on the positive impact of comparative advertising by measuring consumers' green involvement (Figure 1).

Study 1: The effect of comparative advertising on PIGP

The purpose of Study 1 is to test the effect of comparative advertising on consumers' PIGP in the context of comparing green products with products of "other brands."

Design and participants

Study 1 utilized a two-level (advertising types: comparative advertising vs. non-comparative advertising), one-way between-subjects experimental design. Sixty-four participants were recruited from Credamo[1] in exchange for monetary compensation
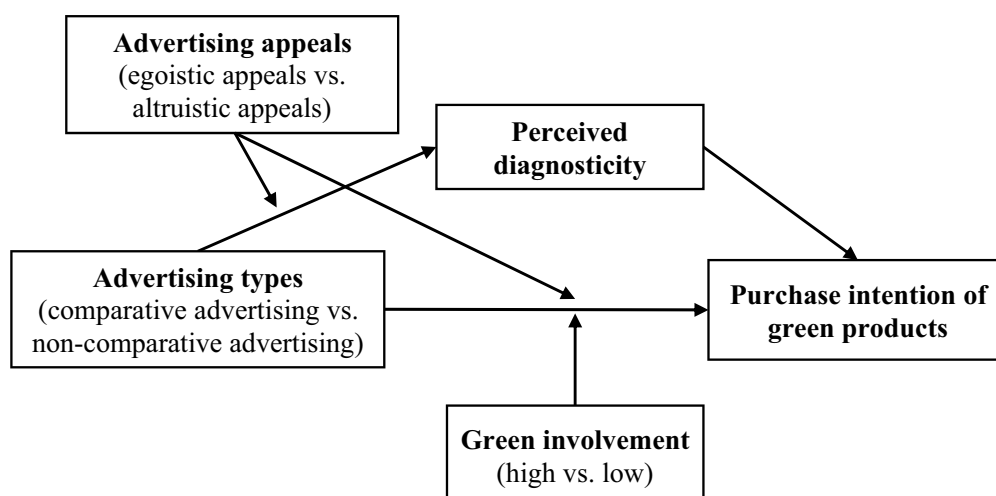

FIGURE 1
Conceptual model.

and randomly assigned to one of two conditions. Of these participants, 4 were removed from final analyses because they failed to complete the study in its entirety. Thus, the final sample consisted of 60 participants (M_{Age} = 25.78, SD_{Age} = 4.62; 58.33% female).

Procedure and stimuli

The choice of experimental stimuli and the manipulation of comparative advertising refer to previous research on green products and comparative advertising (Choi and Miracle, 2004; Miniard et al., 2006; Chang et al., 2015). In Study 1, the green product, environment-friendly dishwashing liquid, was used as the experimental stimulus, and the real brand Morning Fresh was selected to manipulate the advertising types in the form of pictures. First, the participants were asked to imagine that they needed to buy detergent in the near future, and then read the advertisement of Morning Fresh environment-friendly dishwashing liquid carefully.

In the comparison advertising condition, the participants read "Brand Comparison – You are right to choose Morning Fresh!" and comparative information of the products of Morning Fresh and "other brands" in the picture, including the use, composition, environmental attributes and so on. In the non-comparison advertising condition, the participants read "Brand Introduction – You are right to choose morning fresh!" and information about Morning Fresh such as the use, composition, environmental attributes. In addition to product information, there is no difference in other features of pictures in both conditions.[2]

After reading the advertisement, the participants answered the attention check: "What product(s) is (are) mentioned in the advertising content you just read? 1 = Morning Fresh dishwashing liquid, 2 = Morning Fresh dishwashing liquid and dishwashing liquids of other brands." They also reported their purchase intention of green products (Lee et al., 2008) with three items: "I want to buy the product," "it is a wise choice to buy the product in the advertisement," "the green advertisement prompts me to buy the product" (1 = strongly disagree, 7 = strongly agree; α = 0.82). Considering the possible impact of the real brand, we assessed participants' brand familiarity (α = 0.91) and brand evaluation (α = 0.75). Brand familiarity was assessed with four items (Campbell and Keller, 2003): "I often see advertisements about this brand," "I often see the display or sale of this brand's products," "I often hear others talk about or recommend this

brand," "I often buy or use this brand's products" (1 = strongly disagree, 7 = strongly agree). The brand evaluation scale (Thompson and Malaviya, 2013) has three items: "your overall impression of the brand is: (1 = "very bad / very low quality / quite dislike ", 7 = "very good/very high quality/quite like"). Finally, participants answered demographic variables such as gender and age.

Results

PIGP

Comparative advertising condition was coded as 1, and non-comparative advertising condition was coded as 2. A t-test showed that participants in comparative advertising condition reported higher PIGP (M = 5.72, SD = 0.70) than in non-comparative advertising condition (M = 5.10, SD = 0.94; t (58) = 2.89, $p < 0.01$, Cohen's d = 0.93; Figure 2).

In addition, gender had a significant main effect on PIGP (F (1, 58) = 4.52, $p < 0.05$). An ANOVA with gender as the covariant revealed that, the effect of comparative advertising on PIGP was still significant (F (1, 57) = 8.34, $p < 0.01$, partial η^2 = 0.13). Apart from the reported results, no other significant main effects were found.

Discussion

Study 1 preliminarily supports hypothesis 1, that is, comparative advertising can lead to higher intention to buy green products than non-comparative advertising. However, Study 1 still has shortcomings. For example, brand familiarity of consumers may confound our results because of the real brand used in the experiment. To this end, we designed Study 2, which uses energy-saving air conditioner as a new stimulus, and create a fictional brand to avoid unnecessary interference. In the context of comparing with conventional products, we examine the impact of

FIGURE 2
PIGP for comparative advertising and non-comparative advertising.

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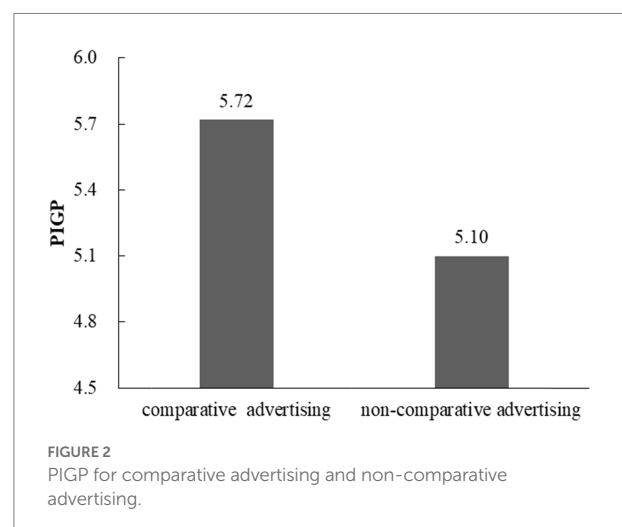
with other platforms, Credamo provides multiple screening functions for the recruitment of participants in the experiment, such as refusing participants with low personal credit scores, prohibiting the same IP address from filling in questionnaires repeatedly, intelligent human-computer verification, etc., which helps to reduce invalid experimental data and improve the preciseness of the research.

2   https://www.zhizhizhi.com/n/4xahb

comparative advertising on consumers' purchase intention of green products again, and explore the mediating role of perceived diagnosticity.

Study 2: The mediating role of perceived diagnosticity

Using fictional brand and new green products as stimuli, Study 2 tests the impact of comparative advertising again in the context of comparison with conventional products, and explores the mediating role of perceived diagnosticity.

Design and participants

Study 2 employed a two-level (advertising types: comparative advertising vs. non-comparative advertising), one-way between-subjects experimental design. Sixty-six participants were recruited from Credamo in exchange for monetary compensation and randomly assigned to one of two conditions. Of these participants, 6 were removed from final analyses because they failed the attention checks. Thus, the final sample consisted of 60 participants ($M_{Age} = 28.92$, $SD_{Age} = 5.43$; 61.67% female). After analyzing green advertising in various media channels, we found that green advertising practices about household appliances and automobiles are rich. Therefore, Study 2 used energy-saving air conditioner as experimental stimulus, and created a fictional brand Nonkle to prevent the existing brand cognition of participants from interfering with the experimental results.

Procedure and stimuli

First, participants imagined that they need to buy an air conditioner in the near future, and then carefully read the advertisement of an energy-saving air conditioner named Nonkle. The manipulation of advertising types was mainly in the form of text description. All participants read the following information: "Nonkle energy-saving air conditioner meets level-1 energy efficiency, consumes less than 1 kW•h of electricity per hour, and reduces carbon emissions," "Nonkle energy-saving air conditioner uses high-temperature sterilization…bringing you a comfortable experience," "Nonkle energy-saving air conditioner uses fluorine-free refrigerant to reduce the damage to the atmosphere and become the environmental protection guardian of the earth." In the comparative advertising condition, the participants read: "Nonkle is more energy-saving than conventional air conditioners," "Nonkle is cleaner than conventional air conditioners," "The Freon emission of conventional air conditioners exceeds the standard and destroys the ozone layer" (Table 1). The comparative and non-comparative versions were similar except for the manipulated text information.

After reading the advertisement, the participants answered attention check, dependent and mediating variables. The measure of PIGP used four items on a 7-point scale (Lao, 2014): "I am willing to learn more about this green product," "I am willing to recommend my relatives and friends to buy this green product," "I am willing to introduce and recommend this green product to my family," "if I need to buy it, I will buy this green product" ($\alpha = 0.74$). In addition, perceived diagnosticity was measured with three 7-point scale items ($\alpha = 0.88$) form Jiang and Benbasat (2007), which were adapted to fit the experiment context ("the information provided in the advertisement is very helpful for me to evaluate the product," "the information provided in the advertisement helps me to understand the performance of the product," "the information provided in the advertisement helps me to familiarize myself with the product"; 1 = strongly disagree, 7 = strongly agree). Finally, they reported their demographic information.

Results

PIGP

Comparative advertising was coded as 1, and non-comparative advertising was coded as 2. A t-test showed that participants reported higher PIGP in comparative advertising condition ($M = 5.88$, $SD = 0.76$) than in non-comparative advertising condition ($M = 5.33$, $SD = 0.54$; t (58) = 3.24, $p < 0.01$, Cohen's $d = 0.85$; Figure 3). Apart from the reported results, no other significant main effects were found. Therefore, H1 is still valid for green product advertisements that are compared with conventional products, that is, comparative advertising is effective to improve consumers' willingness to buy green products.

TABLE 1 The advertisements in different conditions.

Comparative advertising	Non-comparative advertising
Nonkle energy-saving air conditioner meets level-1 energy efficiency, which is more energy-saving than conventional air conditioners. It consumes less than 1 kW•h of electricity per hour, reduces carbon emissions, and saves money after long-term use. Nonkle energy-saving air conditioner uses high-temperature sterilization, which is cleaner than conventional air conditioners, bringing you a comfortable experience. The Freon emission of conventional air conditioners exceeds the standard and destroys the ozone layer. Nonkle energy-saving air conditioner uses fluorine-free refrigerants to reduce the damage to the atmosphere and become the environmental protective guardian of the earth.	Nonkle energy-saving air conditioner meets level-1 energy efficiency, consumes less than 1 kW•h of electricity per hour, and reduces carbon emissions, and saves money after long-term use. Nonkle energy-saving air conditioner uses high-temperature sterilization, bringing you a comfortable experience. Nonkle energy-saving air conditioner uses fluorine-free refrigerant to reduce the damage to the atmosphere and become the environmental protective guardian of the earth.

FIGURE 3
PIGP for comparative advertising and non-comparative advertising.
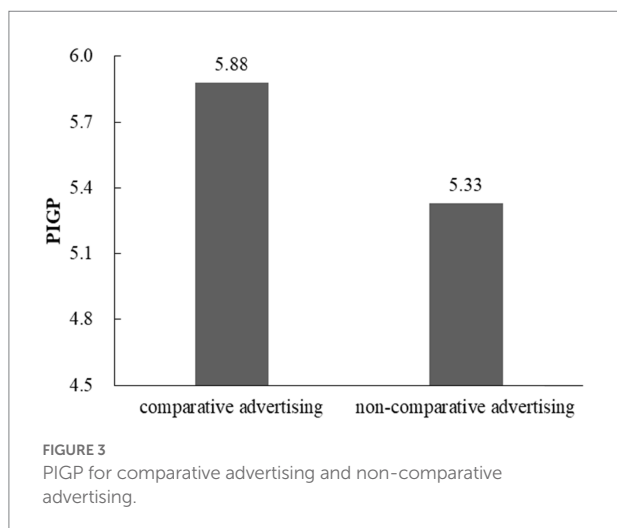
Perceived diagnosticity

An ANOVA with perceived diagnosticity as the dependent variable revealed a significant main effect of advertising types (F (1, 58) = 9.25, $p < 0.01$, $\eta^2 = 0.14$), Participants in comparative advertising condition report higher perceived diagnosticity ($M = 5.69$, $SD = 1.04$) than those in non-comparative advertising condition ($M = 5.00$, $SD = 0.68$).

Mediation analysis

We estimated a mediation model (SPSS Macro PROCESS, Model 4; bootstrap samples = 5,000) (Hayes, 2018) to examine whether perceived diagnosticity mediated the effect of comparative advertising on PIGP. As expected, the indirect effect was significant ($b = -0.31$, $SE = 0.12$; $95\%CI = [-0.6180, -0.1163]$), indicating that perceived diagnosticity mediated the effect of comparative advertising on PIGP, supporting *H2*.

Discussion

With different stimuli and manipulation, Study 2 proves hypothesis 1 again in the context of comparison with conventional products. At the same time, we also verify the mediating role of perceived diagnosticity (*H2*). So far, Study 1 and 2 finds that whether green products are compared with "other brands" or similar conventional products, comparative advertising is preferable to non-comparative advertising. However, for different advertising appeals, the impact of comparative advertising on green product purchase intention will be different. In this regard, Study 3 explores the interaction between advertising appeals and advertising types.

Study 3: The moderating role of advertising appeals

The purpose of Study 3 is to test whether egoistic and altruistic appeals can moderate the effect of comparative advertising on consumers' purchase intention of green products.

Design and participants

Study 3 employed a 2 (advertising types: comparative advertising vs. non-comparative advertising) × 2 (advertising appeals: egoistic appeal vs. altruistic appeal) between-subjects experimental design. We recruited 138 participants from Credamo and randomly assigned them to one of four conditions. Of these participants, 18 were removed from final analyses. Thus, analyses were run on 120 participants ($M_{Age} = 26.93$, $SD_{Age} = 5.46$; 47.50% female).

Procedure and stimuli

Study 3 used eco-friendly detergent with a fictional brand EGW as the experimental stimulus. The non-comparative advertising condition did not mention the information of conventional detergent products. Referring to previous studies (Yang et al., 2015) on the manipulation of egoism and altruism, the comparative advertising of egoistic appeal highlighted the functional benefits of EGW detergent for consumers, involving the safety and efficiency of detergent. And the altruistic appeal of comparative advertising highlighted the environmental benefits of EGW detergent, involving the impact of detergent ingredients, packaging materials and the like on the environment. There is no obvious difference in other features between advertisements (Table 2).

The participants were asked to imagine that they needed to buy detergent in the near future. After reading an advertisement for EGW eco-friendly detergent, they completed the manipulation check and attention check. We used the scale from Kareklas et al. (2014) to test if the manipulation of advertising appeals was successful. Items of altruistic appeal mainly include "the advertising content is based on environmental protection considerations/ resource conservation considerations/overall social interests considerations" (1 = strongly disagree, 7 = strongly agree; $\alpha = 0.95$). The egoistic appeal items mainly include "the advertising content is based on personal health considerations/personal use considerations/personal interests" (1 = strongly disagree, 7 = strongly agree; $\alpha = 0.93$). Then, participants answered questions about perceived diagnosticity ($\alpha = 0.89$; Jiang and Benbasat, 2007) and purchase intention of green products ($\alpha = 0.88$; Lee et al., 2008). Finally, demographic information was collected.

Results

Manipulation check

An ANOVA for the manipulation check of advertising appeals showed that the egoism score of egoistic appeal condition ($M = 5.29$, $SD = 0.86$) was significantly higher than that of altruistic appeal condition ($M = 2.74$, $SD = 0.63$; F (1, 116) = 344.63, $p < 0.001$). As for the score of altruism, the altruistic appeal condition (M = 5.44, SD = 0.59) was significantly higher than the egoistic appeal condition ($M = 2.82$, $SD = 0.71$; F (1, 116) = 490.76, $p < 0.001$).

TABLE 2 The advertisements in different conditions.

	Comparative advertising	Non-comparative advertising
Egoistic appeal	Chemical residues of traditional detergents are harmful to health. EGW eco-friendly detergents use natural plant ingredients, which will not irritate and hurt hands. They are little foam and easy to rinse, so as to better care for your health and that of your family. EGW eco-friendly detergent has high performance and only needs one-fifth of the amount of traditional detergent under the same effect. With various functions, EGW can save money for you for a long time.	EGW eco-friendly detergents use natural plant ingredients, which will not irritate and hurt hands. They are little foam and easy to rinse, so as to better care for your health and that of your family. EGW eco-friendly detergent has high performance and various functions, which can save money for you for a long time.
Altruistic appeal	Traditional detergents pollute the environment with a variety of chemical components. EGW eco-friendly detergents use natural plant components. The waste water after washing with EGW can be used to irrigate flowers and plants directly, which does not harm aquatic animals and plants, and can better maintain environmental safety. The bottle of EGW eco-friendly detergent is made of 100% recycled plastic, which reduces carbon emissions by 70% compared with other traditional detergents using original plastic bottles. In the long run, it can protect the ecological environment and promote sustainable development.	EGW eco-friendly detergents use natural plant components. The waste water after washing with EGW can be used to irrigate flowers and plants directly, which does not harm aquatic animals and plants, and can better maintain environmental safety. The bottle of EGW eco-friendly detergent is made of 100% recycled plastic, which reduces carbon emissions. In the long run, it can protect the ecological environment and promote sustainable development.

FIGURE 4
The interaction effect between advertising types and advertising appeals on PIGP.

FIGURE 5
The interaction effect between advertising types and advertising appeals on perceived diagnosticity.
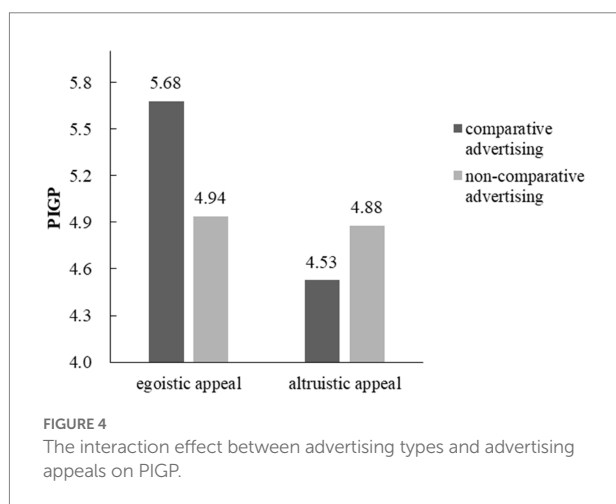
PIGP

A 2×2 ANOVA revealed no main effect of advertising types (coded as 1 for comparative advertising, and 2 for non-comparative advertising; $F_{(1, 116)} = 2.36$, $p = 0.13$), significant main effect of advertising appeals ($F_{(1, 116)} = 23.15$, $p < 0.001$, partial $\eta^2 = 0.17$), and significant interaction between advertising types and advertising appeals ($F_{(1,116)} = 18.32$, $p < 0.001$, partial $\eta^2 = 0.14$). In the egoistic appeal condition, participants read comparative advertisement had higher PIGP ($M = 5.68$, $SD = 0.64$) than those read non-comparative advertisement ($M = 4.94$, $SD = 0.52$; $F_{(1, 116)} = 16.92$, $p < 0.001$, partial $\eta^2 = 0.13$). In the altruistic appeal condition, no difference in PIGP as a function of advertising types ($M_{\text{comparative advertising}} = 4.53$, SD = 0.86, $M_{\text{non-comparative advertising}} = 4.88$, SD = 0.69; $F_{(1, 116)} = 3.76$, $p = 0.055$, Figure 4).

Perceived diagnosticity

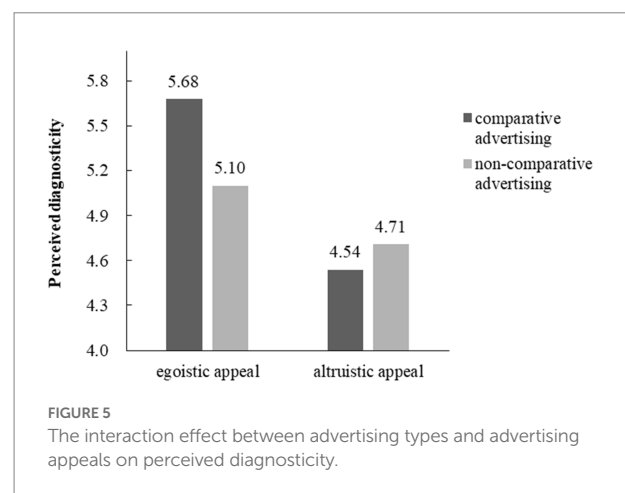A 2×2 ANOVA revealed no main effect of advertising types (coded as above; $F_{(1, 116)} = 2.88$, $p = 0.09$), significant main effect of advertising appeals ($F_{(1, 116)} = 41.13$, $p < 0.001$, partial $\eta^2 = 0.26$). More importantly, the interaction between advertising types and advertising appeals was significant ($F_{(1, 116)} = 9.69$, $p < 0.01$, partial $\eta^2 = 0.08$). For egoistic appeal, compared with non-comparative advertising ($M = 5.10$, $SD = 0.53$), people in comparative advertising condition ($M = 5.67$, $SD = 0.63$) reported higher perceived diagnosticity ($F_{(1, 116)} = 11.57$, $p < 0.01$, partial $\eta^2 = 0.09$). For altruistic appeal, there was no significant difference between the comparative advertising condition ($M = 4.54$, $SD = 0.80$) and non-comparative advertising condition ($M = 4.71$, $SD = 0.59$) in the perceived diagnosticity ($F_{(1, 116)} = 1.00$, $p = 0.32$), as shown in Figure 5.

Moderated mediation analysis

To examine whether advertising appeals moderates the underlying process *via* perceived diagnosticity, we estimated a moderated mediation model (SPSS Macro PROCESS, Model 8; bootstrap samples = 5,000; Hayes, 2018) using advertising types (coded as above) as the independent variable, perceived diagnosticity as mediator, advertising appeals as the moderator, and PIGP as the dependent variable. The interaction between advertising types and advertising appeals was significant ($b = 0.73$, $t\,(116) = 3.11$, $p < 0.01$). Perceived diagnosticity, in turn, facilitated PIGP ($b = 0.28$, $t\,(116) = 2.90$, $p < 0.01$). Advertising appeals moderated the indirect effect of advertising types on PIGP *via* perceived diagnosticity (index = 0.20, 95%$CI = [0.03, 0.47]$). The indirect effect of advertising types on PIGP *via* perceived diagnosticity was only significant for egoistic appeal ($b = -0.16$, 95%$CI = [-0.35, -0.03]$) but not for altruistic appeal condition ($b = 0.05$, 95%$CI = [-0.05, 0.19]$), confirming *H3*a and *H3*b.

Discussion

Study 3 reveals the interaction between advertising appeals and comparative advertising using new green products. Specifically, for egoistic appeal, comparative advertising makes consumers feel more diagnosticity of advertising information and generate more positive willingness to buy green products than non-comparative advertising. For altruistic appeal, there is no significant difference in the impact of comparative advertising and non-comparative advertising on consumers' perceived diagnosticity and purchase intention. So far, we have explored the impact of relevant factors in advertising on consumers' purchase intention, but the individual differences of consumers are also of great significance. Study 4 verifies how individual differences affect the effect of green product comparative advertising.

Study 4: The moderating role of green involvement

Study 4 tests the moderating effect of consumers' green involvement on the effect of comparative advertising (*H4*). We used environmentally friendly tissue as an experimental stimulus and created a fictitious brand BAMBO.

Design and participants

Study 4 was a mixed-factorial design that included advertising types (comparative advertising vs. non-comparative advertising) as a between-participants factor and green involvement as the measured variable. One hundred and forty-five participants were recruited and randomly assigned to one of two conditions. The

TABLE 3 The advertisements in different conditions.

Comparative advertising	Non-comparative advertising
BAMBO bamboo pulp tissue is made of original bamboo pulp. Compared with traditional wood pulp paper with harmful chemical ingredients, it is natural and environment-friendly, mild and no skin irritation, so that you and your family can use it safely and healthily. Traditional wood pulp tissue fells trees as raw materials. BAMBO bamboo pulp tissue uses bamboos with a short growth cycle (3–5 years) as raw materials, which is conducive to protecting forest resources, maintaining ecological environment and achieving sustainable development.	BAMBO bamboo pulp tissue is made of original bamboo pulp. It is natural and environment-friendly, mild and no skin irritation, so that you and your family can use it safely and healthily. BAMBO bamboo pulp tissue uses bamboos with a short growth cycle (3–5 years) as raw materials, which is conducive to protecting forest resources, maintaining ecological environment and achieving sustainable development.

final analyses consisted 123 participants ($M_{Age} = 27.94$, $SD_{Age} = 4.61$; 55.28% female) after 22 were removed.

Procedure and stimuli

First, we measured the green involvement ($\alpha = 0.93$) of the participants with the scale from Wang et al. (2017) and adapted it to fix our experiment. A total of five items are included: "I am interested in reading about environmental information and descriptions of green products," "I am willing to read consumer reports and articles about green products," "I often pay attention to environmental information and reports or advertisements related to green products," "I often compare the features of different green products and their impact on the environment," "I often talk about environmental issues or green products with others" (1 = strongly disagree, 7 = strongly agree).

After answering the above questions, participants were asked to imagine that they needed to buy some tissues in the near future, and then read the advertisement (see Table 3) of bamboo pulp tissue named BAMBO (a fictional brand). In addition to product information, there is no obvious difference in other features of advertisements in different conditions. After reading the advertisement, participants filled out questions assessing purchase intention ($\alpha = 0.92$) and demographic variables.

Results

PIGP

To test hypothesis 4, we estimated a simple moderation model (SPSS Macro PROCESS, Model 1; bootstrap samples = 5,000) (Hayes, 2018), in which the PIGP was expressed as a function of advertising types (coded as 1 for comparative, and 2 for non-comparative), green involvement (as a continuous variable),

FIGURE 6
PIGP as a function of advertising types and green involvement.
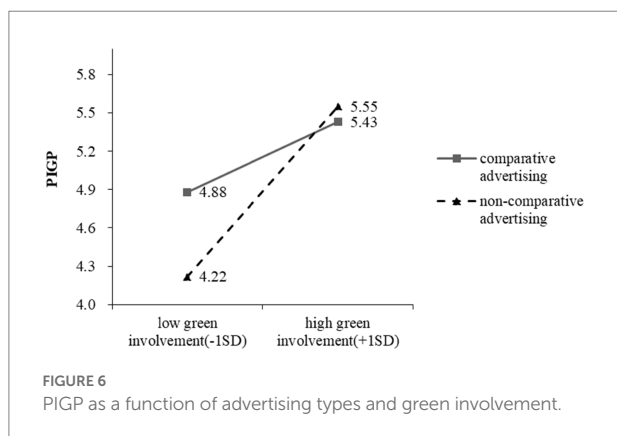
and their interaction. The analysis revealed a main effect of advertising types on the PIGP that was negative and significant ($b = -2.22$, t (119) $= -3.33$, $p < 0.01$), which indicates that comparative advertising can promote PIGP. The main effect of green involvement on PIGP was not significant ($b = -0.13$, t (119) $= -0.59$, $p = 0.56$). The interaction between advertising types and green involvement was significant ($b = 0.42$, t (119) $= 2.99$, $p < 0.01$). We further probed this interaction by estimating the conditional effects of advertising types on the PIGP at one standard deviation below and above the mean of green involvement. As we expected, participants with lower green involvement ($M - 1$ SD) reported a higher PIGP when the advertisement was comparative advertising (4.88) than non-comparative advertisement (4.22), $b = -0.66$, t (119) $= -3.57$, $p < 0.001$. Those with higher green involvement ($M + 1$ SD) reported PIGP that did not significantly vary as a function of whether the advertisement was comparative advertising (5.43) or non-comparative advertising (5.55), $b = 0.12$, t (119) $= 0.66$, $p = 0.51$ (Figure 6).

Discussion

Study 4 uses different experimental materials to reveal the moderating effect of green involvement on the comparative advertising effect. Specifically, for consumers with low green involvement, comparative advertising can trigger more positive PIGP than non-comparative advertising. However, for consumers with high green involvement, there is no significant difference in PIGP caused by comparative advertising and non-comparative advertising. From this point of view, comparative advertising plays a more positive role in low-green-involvement consumer groups that lack an understanding of green products and are not familiar with the attributes of green products.

General discussion

Results of four studies show that comparative advertising affects consumers' purchase intention of green products by

improving their perceived diagnosticity of information. We also identify conditions under which the positive impact of comparative advertising on purchase intention is weakened, namely when the advertising adopts altruistic appeals or the green involvement of the advertising audience is high.

Specifically, the results of Study 1 and 2 indicate that comparative advertising leads to more positive purchase intention of green products than non-comparative advertising, providing evidence for the effectiveness of comparative advertising in the field of green consumption. In Study 2, the mediating role of perceived diagnosticity is also tested. Compared with non-comparative advertising, comparative advertising can effectively enhance consumers' perceived diagnosticity of information, and thus improve the purchase intention. Study 3 finds that advertising appeals had a moderating effect on the purchase intention of consumers for green products. When advertising expresses egoistic appeal rather than altruistic appeal, using comparative advertising can produce higher perceived diagnosticity and purchase intention than non-comparative advertising. In Study 4, the moderating role of consumers' green involvement is revealed, and comparative advertising has a more positive effect on those consumers who have low green involvement.

Theoretical implications

First, our research extends earlier work of comparative advertising. Through reviewing the literature on comparative advertising, we find that the comparative advertising of green products in the current marketing practice has not received enough attention from scholars. Our research introduces comparative advertising into the field of green marketing, and discusses the effectiveness of comparative advertising in the context of green consumption. In addition, based on the Accessibility-diagnosticity theory, we elaborate on the psychological mechanism of comparative advertising to improve consumers' purchase intention of green products by improving the perceived diagnosticity of information, and explore the boundary conditions of the effect of comparative advertising from the perspective of advertising design dimension (i.e., advertising appeals) and consumer cognition (i.e., green involvement), Our findings further enriched the research on green consumption and comparative advertising.

Second, our research advances earlier studies that provide limited insights into advertising appeals for green products. Regarding the advertising appeals of green products, previous researches have mainly discussed the impact of rational appeal and emotional appeal (Petty et al., 1981; Leonidou et al., 2011), concrete appeal and abstract appeal (Ford et al., 1990; Yang et al., 2015) on consumers' willingness to buy green products. However, according to the differences between green products and ordinary products, we believe that dividing the advertising appeals of green products into egoistic and altruistic appeal is more helpful to

analyze consumers' psychological cognition and purchase intention of green products. Our research demonstrates that comparative advertising has a more positive effect on consumers' willingness to buy green products when expressing egoistic appeal but not altruistic appeal.

Third, our findings have implications for research examining the effects of green involvement. Green involvement is a concept extended with the development of green marketing. In recent years, some scholars have discussed the role of consumers' green involvement in green consumption in different research scenarios (Matthes et al., 2014; Wang et al., 2017). This article discusses the impact of advertising types (comparative vs. non-comparative) on consumers' purchase intention of green products under different levels of green involvement, and finds that the positive influence of comparative advertising is more obvious among consumers with low green involvement, because they lack experience of green products and are more susceptible to external cues (such as advertising information) when making consumption decisions. On the contrary, consumers with high green involvement have deep processing of green advertisement, and have rich knowledge of green products. Whether it is comparative or non-comparative advertising, they can still rely on their own knowledge and experience to judge green product information.

Managerial implications

Our findings provide a theoretical reference for the advertising strategy of green product firms. We show that comparative advertising has a positive impact on the willingness to buy green products. Therefore, firms can consider using advertising of indirect comparison according to the attributes of green products, and make comparison with the conventional products familiar to consumers, so as to better convey the information of green products and enhance consumers' intention to buy. In particular, some newly developed green products may be able to quickly improve product popularity through comparative advertising.

In addition, our findings highlight the key dimension – advertising appeals – when designing comparative advertising for green products. When egoistic appeal is used, comparative advertising leads to significantly higher willingness to buy green products than non-comparative advertising. Therefore, it is not enough for firms to compare altruistic attributes information such as "carbon-emissions-reducing, degradable and environment-friendly" when designing comparative advertising content. In order to give full play to the positive effect of comparative advertising, it is still necessary to highlight the egoistic functional attributes of green products that are different from conventional products, so that consumers can feel the benefits brought by using green products, and firms can really benefit from comparative advertising strategies.

Third, firms should also realize that when consumers have a high degree of green involvement, even well-designed comparative advertising may not be able to effectively improve consumers' purchase intention of green products. This article shows that consumers' green involvement influences the effect of comparative advertising, that is, comparative advertising has a stronger effect on those consumers who lack knowledge of green products. Therefore, firms should have clear insight into their target consumers and understand the green involvement of them. For example, firms should actively conduct social listening through social media and other channels to observe consumers' concerns and comments on public events related to the environment, corporate social responsibility activities and green product advertising. On the other hand, with the popularity of online shopping and the application of big data technology, firms can understand customers' green involvement by analyzing consumers' behavior in the stage of collecting green product information, such as the pre-sales dialogue between consumers and online customer service officer.

Limitations and future research

Based on a variety of brands (real and fictional), manipulation methods and across different product categories, our research provides conclusive evidence for our research hypothesis. However, this article also has some limitations.

First, this research provides consistent evidence to support our hypothesis using different green products as experimental materials (detergent, air conditioner and tissue), which are all utilitarian products. In the future, we can further test whether our findings are still valid for hedonic green products. Researchers can also explore the impact of comparative advertising for different types of green products on consumers based on other classification standards, such as durables and consumables.

Second, we only discuss a limited number of mediators. In addition to perceived diagnosticity, there may be other theories or variables that can explain the effect of comparative advertising on purchase intention of green products. For example, comparative advertising highlights the differences between green products and other products through comparison, which may increase consumers' willingness to buy by satisfying the need for differentiation or uniqueness.

Finally, our research takes purchase intention as a predictor of green product purchase behavior, and do not directly test the purchase behavior. However, many researchers point out that there is an obvious consumer attitude-behavior gap in green consumption, and consumers generally hold a positive attitude towards green products but seldom take practical actions (White et al., 2019). Further research can investigate and compare how advertising affects different stages of the purchase funnel, especially the actual green consumption behavior of consumers.

Data availability statement

Ethics statement

Author contributions

KN and YLin contributed equally to this work. The tasks they are responsible for consisted of data aggregation, data analysis and interpretation, literature research and writing the initial draft of the manuscript. SY conceived and designed experiments. YLiu and ZL helped in the development of the manuscript in the submitted form and language polishing of the manuscript. All authors contributed to the article and approved the submitted version.

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Exploring consumer perceived risk and purchase intention of water-saving appliances: A moderated dual-mediation model

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With the blooming of the socio-economy in China, urban water consumption continues rising, and the promotion of water-saving appliances has become one of the priorities of water saving efforts. Based on the perceived risk theory, this research constructs a moderated mediation model to explore the mechanisms that explain and affect consumers' willingness to purchase water-saving appliances. The study finds that consumers' perceived risk of buying water-saving appliances is mainly functional, economic, and psychological risks. Perceived risk will reduce consumers' quality trust and green trust in water-saving appliances, and indirectly influences consumers' willingness to buy through quality and green trust. In addition, we find that consumer knowledge of water-saving appliances can weaken the negative impact of perceived risk on quality trust and green trust and the indirect inhibitory effect on purchase intentions. In final, we provide policy recommendations to guide consumers to purchase water-saving appliances and promote the popularization of water-saving appliances.

KEYWORDS

water-saving appliance, perceived risk, consumer trust, consumer knowledge, purchase intention

Introduction

In 2020, China's national domestic water consumption was 86.31 billion m^3, accounting for 14.9% of the total water consumption in that year (Ministry of Water Resources, 2021). With the rapid social and economic development in recent years, the water shortage has become increasingly prominent among water resource issues. In total freshwater consumption, household water consumption has become critical as the water demands from urban and rural residents rise continuously. Specifically, in 2020, Beijing's household water consumption is 956 million m^3, reaching 37.5% of the total production and domestic water consumption (Beijing Water Authority, 2021). Considering the increasing amount of household water consumption, the popularization of water-saving appliances has become

important for improving water usage efficiency and establishing a water-saving society. In the *National Water-conservation Action Plan* jointly issued by the National Development and Reform Commission and the Ministry of Water Resources, the promotion of water-saving appliances has been clearly listed as one of the primary directions of water-conservation efforts in China. However, currently, the popularization of water-saving appliances in the consumer market in China is quite limited. For instance, the popularization rate of household water-saving appliances in 2019 is only 30% (Gou, 2019). Therefore, increasing consumers' purchase intention of water-saving appliances has been challenging for promoting water conservation.

As Batchelor et al. (2014) stated, the promotion of water-saving appliances has been extensively identified as the best way to save water unconsciously. In extant wisdom, the purchase intention of water-saving appliances is considered a function of individual differences and product characteristics. For example, based on the Spanish consumers' sample, Martínez-Espiñeira and García-Valiñas (2013) found that education and income levels positively impact the purchase intention of water-saving appliances, while age had a negative impact. Hustvedt et al. (2013) investigated the purchase intention of American consumers for water-saving washing machines and found that the energy-saving and water-saving performance, cost, and publicity channels of washing machines are the main factors affecting consumers' purchase intention. Tapsuwan et al. (2018) found in the purchase intention of water-saving sinks for Sydney households that consumers' purchase intention is affected by product function, use environment, and consumers' personality characteristics. Mu et al. (2014) found that water-saving knowledge, the degree of new and old houses, family size, and actual water prices will affect consumers' purchase of water-saving appliances. Fan et al. (2019) found that consumers' education level, income level and water-saving knowledge, as well as the water-saving and energy-saving performance of washing machines, will significantly affect the purchase intention of water-saving washing machines.

Although these studies offer insightful ideas about the factors that influence consumers' purchase intention of water-saving appliances, recent work has been limited in two important ways. Initially, those studies primarily focus on positive factors such as income level and water-saving knowledge, while mostly neglecting the negative impacts of consumers' perceived risk on water-saving appliances. Water-saving appliances belong to technologically innovative products in terms of water efficiency, and consumers usually perceive various potential risks when purchasing innovative products (Yin et al., 2019). In product transactions, perceived risk reduces consumers' expectations of the reliability of the seller or product (Hong and Cho, 2011). Regarding water-saving appliances, will perceived risks weaken consumers' trust in water-saving appliances and the corresponding purchase intentions? Next, these studies assume that all consumers who perceived risk would act the same way in purchasing water-saving appliances and ignored variations among the difference in consumers. From the perspective of

information asymmetry theory, mastering product knowledge can help consumers find internal information clues (Lee et al., 2015), which helps resist external uncertainties' interference. Therefore, another question is how consumers' knowledge about water-saving appliances shapes the impact of perceived risk on consumers' trust and purchase intention.

To address the issues above, we draw on the theory of perceived risk and examine how and when consumers' perceived risk influences their purchase intention of water-saving appliances. We explore the mediation mechanism of consumer trust, and the contingent conditional effect of consumers' product knowledge of water-saving appliances. Perceived risk theory argues that consumers prefer to minimize their perceived risk (Mitchell, 1999; Chen and Chang, 2012). However, the information asymmetry makes consumers hard to identify actual product value before purchase (Park et al., 2016), which raises their risk perceptions and negative consumption emotions about purchasing the products. In this condition, risk-related emotions such as anxiety or worry would negatively affect trust (Eid, 2011), and eventually purchase intention (Chang and Chen, 2008). Besides, information processing differs between customers with high and low levels of product knowledge (Selnes and Howell, 1999). Consumers with a high level of product knowledge could search for intrinsic information cues and process information less based on emotional factors (Lee et al., 2015). Thus, when consumers occupy a high level of product knowledge, their trust and purchase intention are less susceptible to perceived risk.

Our research makes several contributions to the current literature. First, unlike previous studies that primarily focus on consumer demographic and product characteristics, we explored consumers' perceived risk influencing the purchase intention of water-saving appliances. The research findings extend the psychological foundation of promoting consumer purchase intention on water-saving appliances. Then, regarding how perceived risk influences the purchase intention of green products, previous literature mainly focused on the mediation effect of green trust (Chen and Chang, 2012; Juliana et al., 2020), whereas it neglected the dual mediation effect of green trust and quality trust. By examining the dual mediation effect of quality trust and green trust, our study provides a more comprehensive understanding of the mechanism that transmits perceived risk into purchase intention. Lastly, we examine how consumer knowledge moderates the influence of perceived risk on consumer trust and, subsequently, purchase intention. Our findings revealed a nuanced process of how perceived risk interacts with consumer knowledge to shape consumers' trust and purchase intention of green products such as water-saving appliances.

The remainder of this paper is organized as follows. Following the Introduction, "Theory and hypotheses" briefly reviews the related literature and develops the research hypotheses. The research model is presented in "Materials and methods," and "Hypotheses testing" analyzes the data and tests hypotheses. "Discussion and implications" discusses the research results and provides theoretical and policy implications. In the final Section, we highlight the limitations and future research directions.

Theory and hypotheses

Consumers' perceived risks of purchasing water-saving appliances

The concept of perceived risk was originally proposed by Bauer (1967), who defined perceived risk as "the combination of uncertainty and severity of the outcome involved." Because this concept is highly context-dependent, it is usually defined based on the research setting in the following literature. For instance, in consumers' selection of online payment tools, perceived risk is defined as "the potential loss in pursuit of the expected outcome of using electronic services" (Yang et al., 2015). In public acceptance of nuclear energy technology, Wang et al. (2019) define perceived risk as "the degree to which individuals perceive themselves to be at risk (such as nuclear leakage and radiation) when developing and utilizing nuclear energy." Hwang and Choe (2020) defined perceived risk as "the subjective expectation of loss from visiting edible insect restaurants" in consumption intentions of edible insect restaurants.

In urban domestic water consumption, water-saving appliances refer to "devices or appliances that incorporate water-saving technology, can reduce water flow, water consumption, and improve water efficiency" (Ministry of Housing and Urban-Rural Development, 2014). Specifically, water-saving appliances usually include faucets, showers, toilets, washing machines, dishwashers, etc. In China, the popularization of water-saving appliances is still in the start-up stage, and the technology research and development and market promotion are immature. Consumers could face various uncertainties and perceive risks when purchasing water-saving appliances (Huang, 2017). Combined with the previous wisdom and the situation water-saving appliance market in China, we define the perceived risk of water-saving appliance purchases as "consumers' subjective expectations of potential losses in purchasing water-saving appliances."

The types of perceived risk can be traced back to the classic six-category framework proposed by Cunningham, including performance/function risk, financial/economic risk, opportunity/time risk, safety/physical risk, social risk, and psychological risk (Cunningham, 1967). Follow-up research divides consumers' perceived risk types according to the research background and settings. In a study of online payment tool choice, Yang et al. (2015) argue that consumers' perceived risks include economic, functional, security, time, privacy, service, and psychological risks. In the research on consume intention of edible insect restaurants, Hwang and Choe (2020) divided perceived risk into seven types: quality, psychology, health, finance, environment, time, and society. In the research on online travel booking, Park et al. (2016) divided perceived risks into eight types: time, economy, function, privacy, security, psychological, physical, and equipment. Chen et al. (2019) divided consumers' perceived risks into four types: financial, physical, time, and function in studying the purchase intention of new energy vehicles.

Based on the relevant literature and water-saving appliances' product characteristics, we argue that consumers could perceive four types of risk when purchasing water-saving appliances: function, economy, psychology, and time. Functional risk refers to consumers' perception of uncertainty in product performance, especially the possible defects of water-saving appliances in terms of performance, design, and compatibility compared to traditional water-saving appliances. Economic risk refers to the economic loss caused by purchasing, repairing, and maintaining water-saving appliances. Psychological risk refers to the potential pessimistic impact on consumers' inner state or self-perception when purchasing water-saving appliances. Time risk refers to the risk that water-saving appliances will cause consumers to spend extra time on learning, installing, and daily usage.

Theoretically, the overall perceived risk is indicated by the second-order factor consisting of multiple risk facets, such as function, economic, psychological risk, etc. (Park et al., 2016). Previous studies have found that the second-order model of perceived risk is more efficacious in comparison with the first-order model (Park et al., 2016; Marriott and Williams, 2018). The overall risk could well reflect the influence of each perceived risk facet; hence it is unnecessary to add each risk facet to the list for predicting the influence of overall perceived risk (Martins et al., 2014). As such, in the context of water-saving appliances, we follow the previous wisdom and model perceived risk as a second-order composite variable.

The impact of perceived risk on purchase intention

As a subjective perception of the negative consequences and uncertainties of post-consumption, consumers' assessment of perceived risk affects their purchasing decisions. According to the theory of perceived risk, consumers have the tendency to minimize risk (Mitchell, 1999), so an increase in perceived risk will decrease consumers' willingness to buy. Extant literature has confirmed the negative impact of consumers' perceived risk on purchase intention, such as purchasing new-energy vehicles and the food delivery based on mobile terminals (Liu and Zhao, 2021). Due to the inherent information asymmetry in the transaction, it is difficult for consumers to judge the actual value of a product when purchasing (Mishra et al., 1998), thus inhibiting consumers' willingness to purchase. Specifically, when consumers perceive purchasing a product as unacceptably risky, they are generally less likely to purchase it.

In China, water-saving appliances are immature in the consumer market, and most consumers cannot fully understand the actual value of water-saving appliances. Due to the imperfection of national standards, industry standards, and market permit institutions, water-saving appliances' quality varies considerably (Huang, 2017). In addition, water-saving appliances are more expensive than regular water appliances in purchasing and maintaining. In terms of time cost, consumers need to spend extra time learning and installing water-saving appliances. Finally, water-saving appliances may also negatively influence consumers' psychological states. The problems in product quality, price, and

time costs may individually or jointly cause consumers anxiety when purchasing and using water-saving appliances.

In sum, the uncertainties mentioned above could increase consumers' perceived risk of purchasing water-saving appliances. Under the influence of consumers' general risk aversion characteristics, consumers' willingness to purchase water-saving appliances is ultimately inhibited. Based on the above, the following assumptions are put forward:

> *H1*: Consumers' perceived risk negatively impacts their purchase intention of water-saving appliances.

The mediating role of consumer trust

Mayer et al. (1995) believe that "trust is the expectation of a party to perform its specific obligations and the willingness to accept possible damages in a transaction, regardless of its ability to control the other party." In the research on the purchase intention of organic cotton, consumer trust refers to "a sense of security that consumers believe that the purchased product can meet their consumption expectations" (Tong and Su, 2018). Referring to the above literature, we define consumer trust in purchasing water-saving appliances as "the psychological state of consumers who believe that water-saving appliances can meet their consumption expectations."

In the context of water-saving appliances, consumers' trust in water-saving appliances includes two facets: quality trust and green trust, and their consumption expectations are twofold, the cleaning function and the water efficiency, respectively. We define *quality trust* as "consumers' trust in the cleaning functions of water-saving appliances, "such as the shower experience and the clean effect of washing machines and dishwashers. Besides, consumers have consumption expectations for environmental performance when purchasing green products (Chen and Chang, 2012), unlike the trust in the quality of generic products or services such as online payment (Yang et al., 2015) or organic products (Tong and Su, 2018). Following Chen's (2010) definition of the general green trust as "a willingness to depend on one object based on the belief or expectation resulting from its credibility, benevolence, and ability about environmental performance," we define consumers' *green trust* in water-saving appliances as "consumers' expectations for water-saving performance," such as water efficiency and water-saving performance.

In purchase decision-making, the formation of a trusting belief could be based on the level of perceived risk (Yang et al., 2015). When facing an unfamiliar product, information asymmetry makes consumers hard to identify the actual product value before purchase (Park et al., 2016), which raises their risk perception and correlated negative emotions. Under such circumstances, risk-related emotions such as anxiety or worry would negatively affect trust (Eid, 2011). As a result, consumers who perceive risks tend to show a low trust level. For instance,

Zhang et al. (2019) found that perceived risk can significantly reduce consumers' trust in autonomous vehicles. Similarly, consumers would perceive various risks in terms of function, economy, psychology, and time when purchasing water-saving appliances. Therefore, they have doubts and worries about the cleaning functions and water-saving capabilities of the appliances, which ultimately reduces consumers' quality trust and green trust. Based on the above, the following hypotheses are put forward:

> *H2a*: Consumers' perceived risk negatively affects quality trust in water-saving appliances.

> *H2b*: Consumers' perceived risk negatively affects green trust in water-saving appliances.

Consumer trust is essential for companies to obtain consumers' purchasing intentions. Studies such as online shopping (Zhang et al., 2021), and organic food purchases (Yu et al., 2021) have verified the positive impact of consumer trust on purchase intention. As consumers trust increases, anxiety and uncertainty are reduced, and the integrity of the brand or company is strengthened (Chen et al., 2015). Regarding purchasing water-saving appliances, consumer trust is the psychological state of thinking that water-saving appliances can meet consumer expectations regarding cleaning ability and water-saving efficiency. Consumers believe that water-saving appliances can meet the expectation of product quality, user experience, and water-saving effects, thereby generating purchase intention. Therefore, the following assumptions are put forward:

> *H3a*: Consumers' quality trust positively affects purchase intention of water-saving appliances.

> *H3b*: Consumers' green trust positively affects purchase intention of water-saving appliances.

Combining the above arguments, the mediation effect is likely to hold true. In the context of water-saving appliances, the relationship between perceived risk and purchase intention is likely indirect and mediated by consumer's quality trust and green trust in water-saving appliances. The perceived risk will influence quality trust and green trust, and subsequently, purchase intention.

In terms of consumers' trust in functional performance, a strong perception of product risk will result in a low level of quality trust in water-saving appliances. Perceived risk in a product purchase refers to the uncertainty regarding the outcome and the associated expectation of losses. It could inhibit consumer trust and purchase behavior (Hong and Cho, 2011). If a product purchase is considered risky, the customer will show more negative emotions regarding this purchase (Wang and Hazen, 2016). Those negative emotions will compromise consumers' trust in the functional performance of water-saving appliances,

especially when they doubt that water efficiency may have a trade-off with cleaning power. In this circumstance, a consumer would be cautious about the usage quality when considering purchasing water-saving appliances. Could low-flow toilets flush waste as well as their standard counterparts? Is the water-efficiency washing machine reliable and durable? Will the showerhead save water by sacrificing the expected shower experience? If the consumer doubts functional performance and durability, he or she will put little quality trust in the merchant, thereby leading to a low purchase intention.

Besides, a consumer could have doubts about the environmental performance of the water-saving appliances, which potentially impairs their green trust in the products. Since consumer purchase intentions are positively affected by consumer trust (Harris and Goode, 2010), the decreased green trust will lower the purchase intention. For example, consumers considering the purchase of water-saving products would be most likely serious about water efficiency, whereas this sort of environmental performance is usually difficult to perceive before purchasing (Chen and Chang, 2012). In a recent survey on the adoption of water-efficient washing machines in China, water efficiency has been identified as one of the main factors contributing to purchase intention (Fan et al., 2019). In this condition, a consumer considering the purchase of a water-saving washing machine would usually be concerned if the water efficiency is worth the price. If customers doubt that the water efficiency cannot meet their expectations, they will begin to distrust the water-saving appliances, and then probably avoid purchasing.

The above arguments have indicated the mediating role of consumers' quality trust and green trust in the relationship between perceived risk and purchase intention. Perceived risk in water-saving appliances will reduce consumers' green and quality trust, ultimately weakening their willingness to purchase. Hence, the following hypotheses are put forward:

H4a: Quality trust mediates the relationship between consumers' perceived risk and purchase intention of water-saving appliances.

H4b: Green trust mediates the relationship between consumers' perceived risk and purchase intention of water-saving appliances.

The moderating role of consumer knowledge of water-saving appliances

Product knowledge refers to "a consumer's awareness of specific information concerning a given product" (Wang and Hazen, 2016). In the purchase decision-making of products or technologies, consumer product-related knowledge plays an important role. Consumers often use their product-related knowledge to evaluate products and tend to purchase based on their knowledge relevant to the products. What a consumer knows about a product is crucial in the case of

information-intensive products (Vigar-Ellis et al., 2015). Water-saving products are such information-intensive products that are often conveyed in a highly specialist format, requiring consumers' environmental knowledge to enable information processing. As suggested by Thøgersen et al. (2012), consumers' reactions of environmental products may vary across different consumer knowledge levels. Thus, in this current study, we anticipated that consumers' green trust and quality trust toward water-saving appliances with perceived risk would differ based on their level of knowledge. More specifically, perceived risk has a stronger effect on trust among low-knowledge consumers than their high-knowledge counterparts.

In the relevant literature, consumer knowledge has long been examined as one of the boundary conditions that can change outcomes. High-knowledge consumers can better search for more information and develop a more comprehensive understanding of decision-making (Kumar et al., 2021). They, therefore, rely more on cognitive judgments rather than on other cues (King and Balasubramanian, 1994). When evaluating water-saving products, consumers with high knowledge will rely on existing knowledge and cognitive evaluation and will be less likely to be influenced by perceived risk. Thus, compared with low-knowledge consumers, their trust in water-saving appliances is more likely to hold when they perceive risks. In contrast, consumers with low knowledge need more background knowledge to process product information. Hence their trust in water-saving appliances could be more compromised by cues that imply risk associated with the products.

Furthermore, in the context of product purchasing, perceived risk is composed of the individual's subjective feelings of certainty that the outcome will be unpleasant (Lee, 2009). The risk-related unpleasant emotions are crucial factors that can reduce consumer trust in purchasing products (Chen and Chang, 2012). Under this circumstance, consumers with high knowledge are more confident and less confused (Mazursky and Vinitzky, 2005). They are less likely to be influenced by emotional states when determining their final attitudes toward products (Lee, 2016), because their decisions are based more on their product-related knowledge (Devlin, 2011). In the context of water-saving appliances, consumers with higher knowledge could be less vulnerable to risk-related emotions, and their trust would be less susceptible to perceived risks. In other words, for consumers with a relatively high product knowledge, their trust in water-saving appliances is less negatively affected by perceived risk. Based on the above, the following hypotheses are put forward:

H5a: The relationship between perceived risk and quality trust is moderated by consumer knowledge, such that the relationship is weaker for consumers with a higher knowledge of water-saving appliances.

H5b: The relationship between perceived risk and green trust is moderated by consumer knowledge, such that the relationship is weaker for consumers with a higher knowledge of water-saving appliances.

As our arguments above stated, consumer knowledge moderates the relation between perceived risk and consumer trust, and consumer trust is positively associated with purchase intention. We further propose that consumer knowledge moderates the mediating effects of consumer quality trust and green trust in the relation between perceived risk and purchase intention—a moderated dual-mediation model (Figure 1).

Consumers' product knowledge is consistently considered as one of the moderators of the relationship between consumers' perception and purchase intention (Fu and Elliott, 2013). In the context of water-saving appliances, when consumers have a lower level of product knowledge, the negative influence of perceived risk would be strengthened, thereby reducing consumer trust and, subsequently, purchase intention. In contrast, when consumers have a higher level of product knowledge, the negative influence of perceived risk on trust would be weakened, thereby the negative impact of risk on purchase intention *via* trust would be mitigated. Alternatively, compared with a lower level of product knowledge, a higher level of product knowledge would weaken the indirect effect of consumer quality trust and green trust in the relation between perceived risk and purchase intention. Based on the above, the following assumptions are put forward:

> *H6a*: The indirect influence of perceived risk on purchase intention via quality trust will be weaker for consumers with a high level of knowledge.

> *H6b*: The indirect influence of perceived risk on purchase intention via green trust will be weaker for consumers with a high level of knowledge.

Materials and methods

Sample and procedures

Our questionnaire consists of five parts. To begin, we introduce the definition and scope of water-saving appliances and ask respondents to answer whether they have experience purchasing water-saving appliances, the channels for learning

FIGURE 1
Theoretical model.

about water-saving appliances, and their knowledge of water-saving appliances. Next, we ask respondents to answer questions about perceived risk when purchasing water-saving appliances, including functional risk, economic risk, psychological risk, and time risk (Oliver, 1997; Park et al., 2016). Then, the third part measures consumers' quality and green trust in water-saving appliances. The following fourth part measures consumers' willingness to purchase water-saving appliances. Finally, we collect demographic information on gender, age, education level, job position, income level, and regions. Based on the pre-test of 137 valid questionnaires, the final questionnaire includes 21 core items and 6 demographic items. To control the common method bias caused by the self-assessment questionnaire, we follow Newton et al. (2015) and arrange the measurement items of the independent and dependent variables appeared in a non-sequential manner.

In the data collection, we conducted an online survey and recruited participants using WeChat, a multipurpose mobile application for messaging, social media, and mobile payments (Westjohn et al., 2022). The snowball sampling method was employed (Yu et al., 2020). We first invited participants from different provincial administrative regions to answer the questionnaire. Meanwhile, they were asked to spread the survey to their family, friends, or colleagues. Finally, 448 questionnaires were returned. Following the questionnaire review procedure employed in the previous literature (Wang et al., 2019), we discarded the samples with missing values and screened participants based on a long string greater 6 (DeSimone et al., 2015). In addition, we also threw out samples based on a response time of less than 3 min. Finally, we obtained 337 valid questionnaires, and the effective response rate was 75.22%. Among the 337 valid questionnaires, 231 were female (68.55%), and 106 were male (31.45%); In terms of age, 272 were under 30 years old (81.90%), 45 were 31–45 years old (13.35%), and over 46 years old 16 people (4.75%). For the education level, 117 respondents with graduate degrees and above (34.72%), 213 respondents with bachelor's degree (63.20%), and 7 respondents with high school and technical secondary school or below (2.08%).

For the profession, there are 187 students (55.49%), 109 enterprises and government employees (32.34%), and 41 others (12.17%). In terms of monthly income, 214 people were below 5,000 Chinese yuan (63.50%), 71 people were 5,000–10,000 yuan (21.07%), 34 people were 10,000–15,000 yuan (10.09%), and 18 people were more than 15,000 yuan (5.34%). Regarding regions, 163 people come from water-deficient areas (48.37%), and 174 people from non-water-deficient areas (51.63%).

Measure

In our study, all the scales were developed based on previous research. Following the translation and back-translation procedure (Brislin, 1970), the items were obtained from the
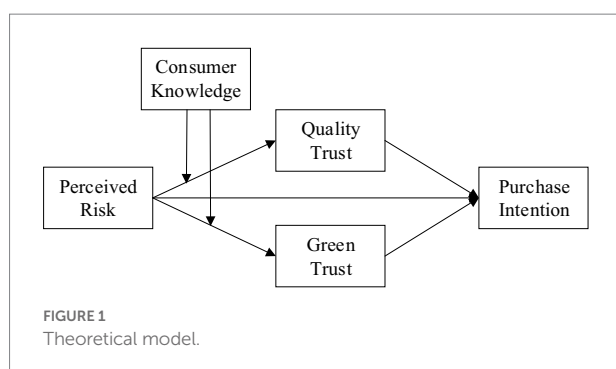
TABLE 1 Reliability and validity test results.

Main construct and items	Loadings	CR	Cronbach's α	AVE
Function Risk, FR		0.856	0.854	0.664
Compared with traditional water appliances, the function and quality of water-saving appliances are still not ideal	0.791			
Water-saving appliances have limited functionality and will be difficult to meet my needs	0.809			
Water-saving appliances have poor user experience due to design or performance issues	0.844			
Economic Risk, ER		0.844	0.837	0.644
Compared with traditional water appliances, the maintenance cost of water-saving appliances is higher	0.789			
Maintenance and other costs make the total cost of water-saving appliances higher than I expected	0.885			
The water bills saved by the water-saving appliances hardly make up for the extra costs they incur	0.726			
Psychological Risk, PR		0.920	0.917	0.794
Buying water-saving appliances creates additional worries for me compared to traditional water appliances	0.809			
Compared to traditional water appliances, buying water-saving appliances will make me feel less psychologically relaxed	0.948			
Buying water-saving appliances creates unwanted anxiety in me compared to traditional water appliances	0.910			
Consumer Knowledge, CK		0.900	0.898	0.751
I am very knowledgeable about water saving appliances	0.900			
I am familiar with some common water saving appliances	0.842			
I have received a lot of information about water saving appliances	0.856			
Quality Trust, QT		0.861	0.860	0.673
I'm willing to buy water saving appliances despite the possible risks	0.825			
I think water saving appliances are reliable and trustworthy	0.829			
I believe water saving appliances can meet my usage needs	0.807			
Green Trust, GT		0.877	0.876	0.704
I believe in the water saving performance of water saving appliances	0.826			
I believe that water saving appliances can effectively save water resources	0.868			
I believe water economizers are beneficial for improving water efficiency	0.823			
Purchase Intention, PI		0.858	0.857	0.669
Generally speaking, I am willing to buy water saving appliances	0.878			
I choose to buy water saving appliances if possible	0.815			
I want to buy despite the uncertainty of the water saver	0.756			

previous literature, then translated (English to Chinese) and back-translated (Chinese to English) by two bilingual scholars to ensure the validity of the translation in a cross-cultural setting. One scholar is a marketing professor in the United States, and the other scholar is a management professor at a university in China. All measures were rated using the Likert 7-point scale, ranging from strongly disagree (1) to strongly agree (7). Table 1 reports the detailed content of items.

Perceived risk was measured using the scale from Yang et al. (2015) and Park et al. (2016). Perceived risk is a second-order factor that consists of functional risk, economic risk, and psychological risk. The scale of consumer knowledge was developed by Wang et al. (2019), and we employed it to measure consumers' understanding of water-saving appliances. We measure quality trust by the scale developed by Oliveira et al.

(2017), which mainly measures consumers' trust in the quality of water-saving appliances. Meanwhile, we measure green trust by the scale developed by Chen and Chang (2012), which measures consumers' belief in the water-efficiency capability of water-saving appliances. We assessed purchase intention using the scale developed by Yang et al. (2015). The control variables were selected based on previous consumer purchase intention literature (Tong and Su, 2018), including gender, age, education, occupation, income, and region.

Model test

The second-order factor setting of the perceived risk construct was tested using STATA 17.0. In the exploratory factor analysis,

the eigenvalue of the time risk was less than 1, and all the fit indicators dropped after including time risk in CFA. Therefore, consumer perceived risk is a second-order construct composed of three first-order factors: functional risk, economic risk, and psychological risk.

We use confirmatory factor analysis (CFA) to assess the rationality of the model set. We examine the discriminant validity and convergent validity by indicators such as Cronbach's alpha, average variance extraction (AVE), and construct reliability (CR). In Table 2, CFA results suggest that the model included all the constructs fit the best ($\chi^2/df = 2.331$, CFI = 0.946, TLI = 0.935, SRMR = 0.060, RMSEA = 0.063). Table 1 reports the reliability and validity of each construct. All the items significantly loaded on the corresponding construct; factor loadings range from 0.756 to 0.948. The Cronbach's α and combined reliability (CR) of each construct are greater than 0.8, and the average extraction variance (AVE) is all greater than 0.6, significantly better than the acceptable critical value (Hair et al., 1998). In Table 3, AVE's square root is larger than the correlation coefficient between constructs (Fornell and Larcker, 1981), indicating good discriminant validity for the constructs.

We test the model of "risk perception - > quality/green trust - > purchase intention" to examine the influence path. The results show that the SEM model fits well ($\chi^2/df = 1.73$, CFI = 0.959, TLI = 0.952, SRMR = 0.067, RMSEA = 0.046; see Table 2). We employed Harman's single factor test for the common variance bias; the percentage of explained variance for the first common factor was 29.37% and far less than the 50% critical value (Liu and

hao, 2021). Therefore, there is no obvious common method bias issue that could seriously impact the analysis results.

Hypotheses testing

Regression analysis

To test the hypotheses above, we conducted hierarchical multiple regression analysis by entering control variables, independent variable (perceived risk), and mediator variables (green trust and quality trust) in separate steps. In line with previous studies on the purchase intention of green products, we controlled for social-demographic factors such as gender, education, age, occupation, and income of respondents. Besides, considering that water scarcity could influence an individual's concern about water-saving (Mahafza et al., 2017), we also control whether the respondent is located in water-shortage provinces.

Table 4 reports the regression analysis results. The results show that (1) perceived risk is negatively related to quality trust in water-saving appliances ($\beta = -0.197$, $p < 0.01$, Model 1); (2) The interaction between perceived risk and consumer knowledge is positively related to quality trust ($\beta = 0.094$, $p < 0.01$, Model 2); (3) perceived risk is negatively related to green trust on water-saving appliances ($\beta = -0.150$, $p < 0.01$, Model 3); (4) The interaction between perceived risk and consumer knowledge is positively related to green trust ($\beta = 0.065$, $p < 0.05$, Model 4); (5) Perceived

TABLE 2 Model fit and indicators.

Model fit indicators	χ^2/df	CFI	TLI	SRMR	RMSEA
Criterion	< 3	> 0.9	> 0.9	< 0.08	< 0.1
CFA model (2nd order without time risk)	2.331	0.946	0.935	0.060	0.063
CFA model (2nd order with time risk)	2.432	0.931	0.923	0.071	0.070
CFA model (1st order)	2.931	0.927	0.913	0.092	0.076
SEM model	1.725	0.959	0.952	0.067	0.046

TABLE 3 Descriptive statistics, correlation and average extraction variance (AVE).

	1	2	3	4	5	6	7	8
Perceived risk	*0.837*							
Function risk	0.800***	*0.815*						
Economic risk	0.755***	0.464***	*0.802*					
Psychologic risk	0.807***	0.435***	0.400***	*0.891*				
knowledge	0.216***	0.085	0.109**	0.295***	*0.867*			
Quality trust	−0.151***	−0.142***	−0.062	−0.144***	0.272***	*0.820*		
Green trust	−0.128**	−0.132**	0.002	−0.153***	0.224***	0.681***	*0.839*	
Purchase intention	−0.157***	−0.108**	−0.022	−0.217***	0.249***	0.716***	0.650***	*0.818*
Messan	4.250	4.163	4.865	3.722	3.852	5.318	5.556	5.533
S.D.	1.086	1.376	1.201	1.551	1.527	0.978	0.983	0.994

$N = 337$, *$p < 0.1$, **$p < 0.05$; ***$p < 0.01$; the bold diagonal text is the square root of AVE.

TABLE 4 Results of hierarchical regression analysis.

	Quality trust		Green trust		Purchase intention	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Perceived risk	−0.197***	−0.221***	−0.150***	−0.166***	−0.184***	−0.039
	(−4.546)	(−4.955)	(−3.366)	(−3.581)	(−4.032)	(−1.083)
Perceived risk × knowledge		0.094***		0.065**		
		(3.442)		(2.359)		
Quality trust						0.515***
						(8.717)
Green trust						0.285***
						(5.267)
Gender	0.101	0.092	−0.218*	−0.224*	−0.137	−0.127
	−0.800	−0.735	(−1.756)	(−1.800)	(−1.070)	(−1.338)
Education	−0.086	−0.080	−0.058	−0.054	0.010	0.070
	(−0.843)	(−0.786)	(−0.580)	(−0.538)	(0.090)	(0.989)
Age	0.229**	0.215**	0.147	0.137	0.103	−0.056
	(2.440)	(2.349)	(1.501)	(1.438)	(1.023)	(−0.742)
Occupation	0.008	0.013	0.063	0.066	0.025	0.003
	(0.145)	(0.235)	(1.077)	(1.125)	(0.393)	(0.071)
Income	−0.007	−0.030	0.107*	0.091	0.058	0.031
	(−0.103)	(−0.481)	(1.708)	(1.434)	(1.058)	(0.847)
Region	0.062	0.039	0.068	0.052	−0.097	−0.148**
	(0.598)	(0.380)	(0.634)	(0.489)	(−0.921)	(−2.031)
Knowledge	0.188***	0.189***	0.173***	0.174***	0.204***	0.058*
	(4.856)	(4.939)	(4.838)	(4.807)	(5.096)	(1.869)
_cons	4.799***	4.948***	5.069***	5.171***	5.425***	1.509***
	(9.665)	(10.340)	(10.577)	(10.916)	(11.177)	(3.988)
N	337	337	337	337	337	337
Adjusted R^2	0.123	0.148	0.086	0.096	0.101	0.564
F	8.382	7.930	6.047	5.201	5.845	46.054

$N = 337$, $*p < 0.1$, $**p < 0.05$; $***p < 0.01$.

risk is negatively related to purchase intention on water-saving appliances ($\beta = −0.184$, $p < 0.01$, Model 5); (6) The effect of perceived risk on purchase intention is not significant ($\beta = −0.039$, $n.s$, Model 6) when quality trust ($\beta = 0.515$, $p < 0.01$, Model 6) and green trust ($\beta = 0.285$, $p < 0.01$, Model 6) both present. In addition, the adjusted R-squared varies from 0.123 in model 1–0.564 in model 6, indicating that the explanatory power of the dual mediation model is the most robust.

The results support the hypotheses about the effect of perceived risk on purchase intention, and moderation of consumer knowledge on the relationship between perceived risk and consumer trust. To further test the mediation effect of consumer trust and moderated path analysis (Edwards and Lambert, 2007), we utilize the SEM model to verify the influence path. Next, we examined the moderation effect of consumer knowledge on the mediation path.

Analysis of mediation effect

To further test the mediation effect and moderation effect, we utilized the Structural equation modeling (SEM) method to test the influence path between consumers' perceived risk, quality trust, green trust, and purchase intention. Structural equation modeling is a helpful tool and method for exploring the associations between latent variables, which is in line with the theory about the interrelationships among the variables (Chin, 1998). Structural equation modeling consists of the measurement model and the structural model (Anderson and Gerbing, 1988). The measurement model explores the associations between measurement items and latent variables. The structural model mainly focuses on exploring the latent variables' associations. Next, we further test the mediating effect of quality trust and green trust, and the moderating effect of consumer knowledge.

We included all the control variables in the following analyses on the mediation effect and moderation effect.

The structural equation path coefficients are shown in Table 5. Consumer perceived risk negatively affects quality trust ($\beta = -0.192$, $p < 0.01$) and green trust ($\beta = -0.151$, $p < 0.05$), which supports H2a and H2b. Meanwhile, both quality trust ($\beta = 0.699$, $p < 0.01$) and green trust ($\beta = 0.183$, $p < 0.05$) positively influence purchase intention, which confirms H3a and H3b.

We employed SPSS PROCESS macro of Hayes (2017) to further examine the mediating effect of quality trust and green trust in the influence of perceived risk on purchase intention. The results in Table 6 showed that the overall effect of perceived risk on purchase intention was significant ($\beta = -0.120$, 95% CI [-0.191, -0.050]), which supports H1. The mediating effect of quality trust ($\beta = -0.086$, 95% CI [-0.142, -0.036]) and green trust ($\beta = -0.035$, 95% CI [-0.067, -0.007]) were both significant, which support hypotheses H4a and H4b. In addition, the direct effect of perceived risk on purchase intention is not significant when both quality trust and green trust are present ($\beta = 0.004$, 95% CI [-0.093, 0.101]). Thus, the two types of consumer trust fully mediate the effect of perceived risk on purchase intention.

Analysis of moderating effect

Next, we analyzed the difference in perceived risk's influence on quality trust under different levels of consumer knowledge (Table 7).

The results show that when consumer knowledge was at a lower level (-1 SD), perceived risk had a stronger negative impact on quality trust ($\beta = -0.365$, 95% CI [-0.502, -0.228]). When consumer knowledge is average, the negative impact of perceived risk on quality trust is weak ($\beta = -0.221$, 95% CI [-0.316,

-0.126]). When consumer knowledge is at a higher level ($+1$ SD), perceived risk's influence on quality trust was not significant ($\beta = -0.077$, 95% CI [-0.195, 0.041]). The results supported H5a, that is, the conditional effect of perceived risk on quality trust are significantly stronger for consumer knowledge at low levels. High consumer knowledge suppresses the negative correlation between perceived risk and trust, making that relationship non-significant. In addition, the moderating effect of consumer knowledge on the mediating effect of quality trust was also confirmed ($\beta = 0.066$, 95% CI [0.028, 0.107]); hence hypothesis H6a was supported.

We also analyzed the difference in perceived risk's influence on green trust under different levels of consumer knowledge. Table 7 shows that when consumer knowledge was at a lower level (-1 SD), perceived risk had a stronger negative impact on green trust ($\beta = -0.192$, 95% CI [-0.307, -0.076]). When consumer knowledge is average, the negative impact of perceived risk on quality trust is weak ($\beta = -0.108$, 95% CI [-0.187, -0.028]). When consumer knowledge is at a higher level ($+1$ SD), perceived risk's influence on quality trust was not significant ($\beta = -0.023$, 95% CI [-0.121, 0.074]). The results supported H5b, that is, consumer knowledge of water-saving appliances can alleviate the negative impact of perceived risk on green trust, and high levels of consumer knowledge can make the negative effect of perceived risk on trust non-significant. In addition, the moderating effect of consumer knowledge on the mediating effect of green trust was also confirmed ($\beta = 0.039$, 95% CI [0.006, 0.074]); hence hypothesis H6b was supported.

We further plotted the marginal effect of perceived risk affecting quality trust and green trust under the moderation of consumer knowledge. As shown in Figures 2, 3, the solid red line represents the influence coefficient of perceived risk on quality trust and green trust, and the blue dotted line represents the 95% confidence interval. For consumers with higher levels of product knowledge, their perceived risk showed a weaker negative influence on quality trust and green trust. Specifically, when the

TABLE 5 Structural equation path coefficients.

Hypothetical path	Standardized coefficient	Std. Err.	$p > \lvert z \rvert$	95% C.I.		Conclusion
				Lower	Upper	
H2a Perceived Risk - > quality trust	-0.192	0.069	0.005	-0.328	-0.057	Support
H2b Perceived Risk - > green trust	-0.151	0.069	0.029	-0.287	-0.016	Support
H3a Quality Trust - > purchase intention	0.699	0.076	0.000	0.550	0.848	Support
H3b Green Trust - > purchase intention	0.183	0.080	0.023	0.026	0.341	Support

TABLE 6 Mediating effect analysis of quality trust and green trust.

Hypothetical path	Total Effect	Direct Effect	Indirect Effect	95% C.I.		Conclusion
				Lower	Upper	
H1 Perceived risk— > purchase intention	-0.120			-0.191	-0.050	Support
		0.004		-0.093	0.101	
H4a Perceived risk— > quality trust > purchase intention			-0.086	-0.142	-0.036	Support
H4b Perceived risk— > green trust > purchase intention			-0.035	-0.067	-0.007	Support

TABLE 7 Analysis of the moderating effect of consumer knowledge.

Moderating effect model	Standardized coefficient	Std. Err.	95% C.I.		Conclusion
			Lower	Upper	
H5a Perceived risk—>quality trust	−0.121	0.036	−0.191	−0.050	Support
−1 SD (consumer knowledge)	−0.365	0.070	−0.502	−0.228	
Mean (consumer knowledge)	−0.221	0.048	−0.316	−0.126	
+1 SD (consumer knowledge)	−0.077	0.060	−0.195	0.041	
H6a The moderated mediating effect of quality trust	0.066	0.020	0.028	0.107	Support
H5b Perceived Risk—>green trust					Support
−1 SD (consumer knowledge)	−0.192	0.059	−0.307	−0.076	
Mean (consumer knowledge)	−0.108	0.040	−0.187	−0.028	
+1 SD (consumer knowledge)	−0.023	0.049	−0.121	0.074	
H6b The moderated mediating effect of green trust	0.039	0.017	0.006	0.074	Support
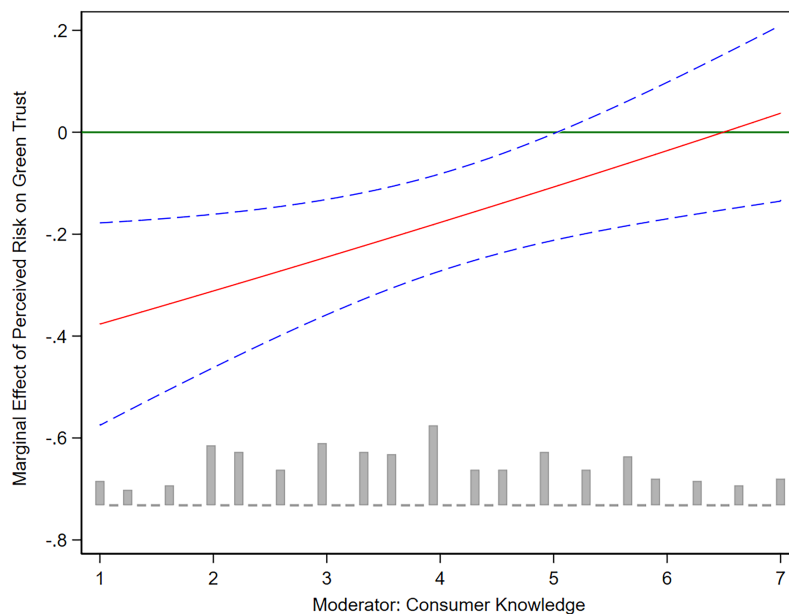
FIGURE 2
The marginal effect of perceived risk on quality trust.

consumer knowledge enters the high level (CK≥5), the negative impacts of perceived risk on quality trust and green trust turn to not significant. Therefore, for consumers with sufficient product knowledge about water-saving appliances, their trust level in water-saving appliances would be less sensitive to perceived risk.

Discussion and implications

Discussion

The popularization of water-use appliances is the main force that raises the water demand (Wang et al., 2014; Vieira

et al., 2017). Encouraging residents to adopt water-saving appliances has been considered a critical way to conserve water resources. In promoting consumer purchase intention on water-saving appliances, conventional wisdom mainly focuses on external factors, such as demographic characteristics and product characteristics (Mu et al., 2014; Tapsuwan et al., 2018; Fan et al., 2019). In contrast to the previous literature, we draw on the risk perception perspective and examine the psychological mechanisms that influence purchase intention. By constructing a moderated dual-mediation model, we revealed the influence of consumers' perceived risk on purchase intention of water-saving appliances and the mediating effect of consumer trust (*quality trust* and *green*
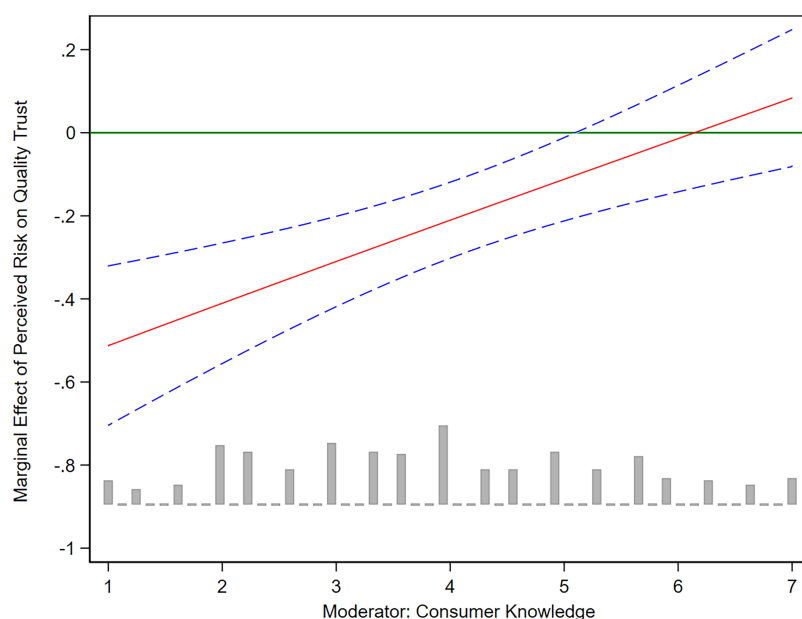
FIGURE 3
The marginal effect of perceived risk on green trust.

trust), and the moderating effect of consumer knowledge. The main conclusions are as follows.

In purchasing water-saving appliances, consumers' perceived risk consists of functional risk, economic risk, and psychological risk, which negatively impact consumers' purchase intention of water-saving appliances. We found that perceived risk about water-saving appliances' functional quality, user experience, maintenance costs, and psychological anxiety are major factors that inhibit consumers' willingness to purchase.

Consumers' quality trust and green trust in water-saving appliances play negative mediating roles between perceived risk and purchase intention. The mediating effect of quality trust is stronger than that of green trust. As analysis results present, consumers who perceive risks show lower quality and green trust in water-saving appliances, indirectly affecting their willingness to buy them. Meanwhile, compared with green trust, consumers' perceived risk has a stronger negative impact on quality trust, and quality trust has a stronger positive effect on purchase intention.

Consumer knowledge can mitigate the negative impact of perceived risk on consumer trust and the indirect effect of consumer trust on purchase intention. We found that for consumers with more affluent knowledge of water-saving appliances, their perceived risk had a lower level of negative impact on quality trust and green trust. For this segment of consumers, the indirect effect of perceived risk on purchase intention is weaker.

Theoretical implication

In the field of green products, water-saving appliances are essential in conserving our limited water resources, especially in those water-scarcity areas. To further the research on consumer purchase intention of water-saving appliances, we draw on perceived risk theory and examine the influence mechanism of perceived risk on purchase intention. We constructed a moderated dual-mediation model by introducing quality and green trust as the mediators, and consumer knowledge as the moderator, thereby revealing how and when perceived risk shapes purchase intention. Based on the above findings, our contribution is threefold.

Compared with previous studies focusing on the impact of education, and income, we revealed the psychological factors influencing purchase intention on water-saving appliances. Conventional wisdom primarily focuses on consumer demographic such as education and income (Martínez-Espiñeira and García-Valiñas, 2013; Tapsuwan et al., 2018), and product characteristics such as water-saving performance (Hustvedt et al., 2013; Fan et al., 2019), leaving the psychological factors and mechanisms unresolved. Drawing on perceived risk theory, we explored the multiple psychological risks that influence purchase intention, including function risk, economic risk, and psychological risk, thereby extending the micro-foundation of how to promote consumer purchase intention on water-saving appliances.

Perceived risk has long been identified as harming green purchase intention (Zhuang et al., 2021). In terms of how perceived risk inhibits the purchase intention of green products, previous wisdom mainly sheds light on the mediation effect of green trust (Chen and Chang, 2012; Juliana et al., 2020). Meanwhile, the dual mediation effect of green trust and quality trust has yet to receive attention. By integrating quality trust and green trust into the same model, our study is one of the first to

examine the dual mediation effect of quality trust and green trust, which advanced in theorizing the trust mechanism between perceived risk and purchase intention of green products.

Lastly, our study is one of the first to examine the interaction of perceived risk and consumer knowledge on consumer trust and purchaser intention of green products such as water-saving appliances. A recent meta-analysis research has suggested that perceived risk negatively influences the purchase intention of green products (Zhuang et al., 2021). However, little research has explored consumer knowledge as the moderator of the effects of perceived risk (Juliana et al., 2020). This shortcoming is vital because consumer knowledge largely determines the degree to which perception factors shape trust and purchase intention (Lee et al., 2015). We theorized and empirically tested consumer knowledge as the moderator and examined the contingent influence of perceived risk on the purchase intention of water-saving appliances, and the dual mediating effect of green trust and quality trust. In doing so, we enrich the perceived risk literature by framing consumer knowledge as a contextual contingency factor for the influence of perceived risks on green purchase intention.

Managerial implication

With the climbing tensions in water supply worldwide, water-saving appliances have been considered vital for water conservation (Fan et al., 2019). In practical terms, enterprises must minimize consumers' perceived risk regarding green product purchases (Zhuang et al., 2021). Therefore, our research on how and when perceived risk negatively influences purchase intention could offer several practical implications.

First, our findings indicate that the purchase intention of water-saving appliances is negatively associated with perceived risks, including function risk, economic risk, and psychological risk. Therefore, the government and enterprises should take action to minimize those perceived risks regarding water-saving appliances. The government should strengthen the support and supervision for after-sales services of water-saving appliances. Consumers' perceived risk mainly comes from uncertainty about the post-purchase experience (Marriott and Williams, 2018). In this regard, government departments like quality supervision, industry and commerce, and water affairs can supervise merchants to improve after-sales services. For instance, merchants could extend the period of unconditional return, provide free on-site maintenance, timely online answering, etc. The government could issue certificates to merchants with excellent after-sales service and publicize their excellent practices, by doing this to guide the continuous standardization and improvement of after-sales service in the water-saving appliance market, eliminating consumers' anxieties about purchasing water-saving appliances as much as possible.

Moreover, our findings suggest that consumers' perceived risk could negatively influence quality and green trust, thus depressing their purchase intention. To block the negative influence of perceived risk on purchase intention, the government and firms

should enhance consumers' trust in water-saving appliances. When consumers buy water-saving appliances, besides their expectations for elementary product quality, they also have specific requirements for water-saving performance (Fan et al., 2019). Therefore, in the design and production of water-saving appliances, the product's functional quality and water-saving performance should be considered. Governments and firms should improve national and industry standards for water-saving appliances, requiring water appliances with higher cleaning performance and water efficiency. On this basis, governments should enact policies and regulations and operate joint enforcement, ensuring that only qualified water-saving appliances can enter the sales market, and retire unqualified products as soon as possible.

Finally, we also found that after perceived risks, consumers with higher levels of knowledge are less likely to reduce their trust, and in turn purchase intention of water-saving appliances. What a consumer knows about a product or service is crucial to how it is marketed, and this is particularly true in the case of information-intensive products (Vigar-Ellis et al., 2015). Considering this, the government and merchants could collaborate to strengthen public advertising, thus popularizing the knowledge about water-saving appliances. Besides, the government could promote water-saving appliances *via* public procurement, especially in those public places, thus helping more residents learn and understand water-saving appliances.

Limitations and future research

As with all studies, though the present manuscript has some interesting findings and implications, it is not without some inherent limitations. First, this study relies on cross-sectional data and self-reported data. Thus, we cannot flatly claim the causality demonstrated in our model since we did not employ a rigorous longitudinal design. Future research can adopt longitudinal, experimental, or qualitative designs to replicate and extend our study's findings.

Second, the sample of this research is relatively small and needs to be fully representative of the Chinese population. For instance, our sample is unbalanced, with more females participating. Future research may replicate our study with equal female and male participants. Besides, while the residents' water conservation awareness varies across regions, 61.42% of our respondents come from Beijing, Guangdong, and Jiangsu, the developed regions in China. Although we controlled the gender, education, age, occupation, location, and income in regression analyses, caution still needs to be taken when generalizing the research findings. Future studies can further validate our findings based on more extensive and diverse population strata samples.

Third, like prior literature on consumer perceived risk (Park et al., 2016; Marriott and Williams, 2018), we evaluated the perceived risk of purchasing water-saving appliances at a specific time point. Since perceived risk's facets and influence might vary for different product categories and decision-making phases, this

shortcoming could be vital in marketing water-saving appliances. To accurately capture the change of perceived risk as well as the level of perceived risk, an experience sampling methodology may be adopted to assess the trajectories of perceived risk and then examine its facets and influences 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

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Author contributions

WT and TM: conceptualization. WT: methodology, software, formal analysis, data curation, writing—original draft preparation,

and funding acquisition. TM: validation, writing—review and editing. All authors contributed to the article and approved the submitted version.

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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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Mollifying green skepticism: Effective strategies for inspiring green participation in the hospitality industry

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Environmental awareness is a growing concern for consumers, and effective green messaging strategies are crucial for businesses. This 2 × 2 between-subject experiment investigates the influence of message style and sidedness on consumer participation in green practices and explores the role of message usefulness and skepticism. Our results show that a narrative message style and a two-sided message increase perceived usefulness, reduce skepticism, and lead to greater behavioral intent. Further, the study supports the moderated serial mediation role of message usefulness and skepticism. These findings offer significant implications for businesses seeking to promote sustainable practices and engage consumers in green initiatives.

KEYWORDS

narrative message, two-sided message, message usefulness, skepticism, green participation

Introduction

Environmental awareness has become a major concern for many consumers, and there is a growing preference for eco-friendly products and companies (Atkinson and Rosenthal, 2014; Kim et al., 2020; Zhuang et al., 2021). This is particularly relevant to the hospitality industry, as businesses like hotels consume large amounts of resources such as water and energy that negatively impact the environment (Jones et al., 2014). In response to consumer demand for sustainability, many hospitality businesses have adopted eco-friendly practices (Hsieh, 2012; Myung et al., 2012). For example, the hotel industry has embraced environmental sustainability to attract travelers who are seeking "green" brands (Lee, 2017). With 66% of millennials indicating that sustainability is an important factor in their hotel booking decisions (Trivago, 2019), the industry must adopt eco-friendly practices to stay competitive.

However, when the hospitality industry develops and communicates green initiatives, it often encounters consumer skepticism (Polonsky and Rosenberger, 2001; Matthes and Wonneberger, 2014), a response that aligns with predictions from attribution theory. Attribution theory, a psychological framework that examines how individuals interpret and ascribe causes to events or behaviors, can be employed to comprehend consumer skepticism toward the hospitality industry's green initiatives (Kelley, 1973; Kelley and Michela, 1980).

This skepticism is fueled primarily by the perception that green initiatives, such as request to reuse towels, are motivated by cost savings (Goh and Balaji, 2016). Further,

consumers may doubt the actual environmental impact of these initiatives, suspecting they merely serve as greenwashing tactics to attract environmentally conscious consumers without effecting real change (Szabo and Webster, 2021). Moreover, consumers may be skeptical about the motives of the hospitality industry as a whole, wondering if businesses are truly committed to sustainability or if they are simply paying lip service to the idea to appeal to the target market (Lee and Johnson, 2022; Hernandez et al., 2023).

To address these concerns and capitalize on consumer interest in eco-friendliness, hospitality companies must create effective green messaging strategies that not only promote their environmental practices but also appear authentic to the consumer. The primary purpose of this research is to propose and test two such message variables: message style (narrative vs. non-narrative) and message sidedness (two-sided vs. one-sided). These variables can lead to greater persuasiveness of green messages such as higher intent to participate in a green practice, by enhancing message usefulness and reducing skepticism.

Drawing on narrative persuasion theory, which posits that narrative messages featuring relatable characters and concrete details can lead to increased persuasion and reduced skepticism (Van Laer et al., 2014; Kim et al., 2021), we anticipate that a narrative message style will result in higher participation intent in a hotel's green practices compared to a non-narrative style. Moreover, rather than relying exclusively on one-sided messages emphasizing only positive information, it is crucial to utilize two-sided messages that also disclose negative information. Such messages have been shown to be more effective in increasing persuasiveness, because they are perceived as more honest and resonate with consumers (Pechmann, 1992). This approach is particularly important in the hospitality industry, where consumer skepticism is already heightened, and therefore, balanced communication strategies are essential for fostering trust and promoting sustainable practices.

Overall, this research sheds light on the factors that increase the persuasiveness of green messages, offering valuable guidance for companies across various industries. By examining these factors, businesses not only in the hospitality sector but also in other sectors can benefit from this knowledge, allowing them to craft effective green messages that resonate with their target audiences and promote sustainable practices more successfully. Further, by addressing consumer skepticism and communicating eco-friendly initiatives in a way that is both useful and meaningful to consumers, companies can effectively connect and engage with their target audience, ultimately driving demand for their eco-friendly offerings. Given the growing trend of increasing consumer demand for sustainability and skepticism, the insights provided by this research are more valuable than ever.

Literature review and hypotheses

The effect of narrative (vs. non-narrative) message style on message effectiveness

Two common message styles are narrative and non-narrative messages. Narrative messages are presented in a story-like format,

often featuring a testimonial, anecdote, or episodic memory (Escalas, 1998; Hinyard and Kreuter, 2007; Shen et al., 2015). Social media provides a unique space where narratives can take different forms, including blog updates, pictures, and Twitter feeds that provide a glimpse into the author's ongoing personal narrative in life (Linde, 2015). Conversely, non-narrative messages may contain many forms, and are often presented as factual explanations or arguments, but they exclude the use of narratives (Padgett and Allen, 1997; Escalas, 2004).

Previous research suggests narratives are more effective than non-narratives by capturing attention, eliciting emotional responses, and connecting with the audience on a personal level (Chang, 2009; Escalas, 2012; Kim et al., 2017). Relatable characters and vivid details in narratives make the message more concrete, leading to increased message persuasion and reduced levels of skepticism (Escalas, 2004; Chang, 2009; Van Laer et al., 2014), particularly when testimonials or anecdotes based on real-life experiences are used (Dal Cin et al., 2004).

Moreover, narratives have the unique ability to transform abstract ideas into tangible, relatable concepts by incorporating temporal, physical, and social elements (Padgett and Allen, 1997; Green, 2006). The temporal structure imparts a sense of progression, illustrating how the abstract idea unfolds over time. Physical elements, such as setting and characters, situate the abstract idea within a specific place and time, making it more accessible and relatable. Social elements, including relationships and interactions between characters, demonstrate the impact of the abstract idea on people and their relationships, providing a context for its real-world implications.

Narratives effectively convey key concepts by grounding them in specific examples or experiences, rendering them more concrete and easier to comprehend (Escalas, 2004). By fostering a more comprehensive understanding of the underlying ideas, narratives facilitate consumer identification with the message, resulting in increased persuasion and engagement. Thus, narratives serve as a powerful tool for making abstract ideas tangible, relatable, and ultimately, more understandable.

Narrative messaging has the potential to overcome consumer skepticism about green marketing initiatives by providing useful information with vividness and details, while reducing potential skepticism. For example, a hotel may communicate its green initiatives in advertising and marketing venues through a short narrative that showcases the efforts of a couple who recently stayed at the hotel. The narrative could highlight how this couple contributed to the hotel's green efforts, rather than simply presenting a list of facts. By displaying the couple along with their story, viewers can engage with the green messages and ultimately become less skeptical about the hotel's green efforts by learning how the couple's specific actions benefit the environment. Additionally, narrative green messaging has the potential to enhance consumers' intention to participate in the hotel's green efforts by making the message more relatable (Dessart and Pitardi, 2019). Therefore, by adopting a narrative approach, green marketing messages can effectively overcome consumer skepticism and promote consumer participation.

H1: Narrative (vs. non-narrative) style messages will result in greater perception of message usefulness (*H1*a), reduced

skepticism (*H1*b), and higher intent to participate in the hotel's green practice (*H1*c).

The effect of one-sided (vs. two-sided) messages on message effectiveness

Consumers may exhibit skepticism toward advertisements that heavily emphasize environmental initiatives, as they may perceive these initiatives as opportunistic and driven by cost-saving concerns (Goh and Balaji, 2016). Attribution theory suggests that consumers may make extrinsic attributions about such initiatives, assuming that the hotel's messaging is motivated by self-interest rather than genuine environmental concern (Ellen et al., 2000; Parguel et al., 2011). To overcome this skepticism, advertisers must devise strategies that present their environmental sustainability efforts in a more authentic and credible manner.

One approach to foster credibility is to incorporate a specific shortcoming or limitation, which can convey to the audience that the advertiser or brand is honest and trustworthy (Pechmann, 1992). Instead of solely emphasizing the positive aspects of a brand, research shows that a more effective approach is to present negative information alongside positive information, in what is referred to as a "two-sided message" (Rucker et al., 2008). This approach can encourage consumers to make an intrinsic attribution about a hotel's messaging, leading to enhanced evaluations due to the perceived sincerity of the hotel's motivations (Parguel et al., 2011).

Companies can enhance their credibility with skeptical consumers by acknowledging their product's limitations or shortcomings, demonstrating transparency and honesty (Crowley and Hoyer, 1994; Winter and Krämer, 2012). A meta-analysis by O'Keefe (1999) supports the idea that two-sided messages are more effective than one-sided messages in changing attitudes and beliefs, particularly when the audience is aware of the opposing arguments, as explained by the reactance-based approach (Brehm and Brehm, 1981) and the counterargument availability-approach (Hovland et al., 1949). For instance, a hotel might promote its commitment to green practices (a positive attribute) while also acknowledging that it will financially benefit from those practices (a negative attribute).

Providing a more comprehensive and balanced view of the initiatives through two-sided messages can lead to increased trust and engagement from consumers, who appreciate transparency and honesty. Additionally, by offering a more complete picture of the green initiatives, including any potential self-serving attributes or limitations, consumers can make more informed decisions about whether or not to participate. Ultimately, incorporating a two-sided message strategy can help hotel brands better communicate the benefits and limitations of their green initiatives while building credibility and trust with consumers, leading to higher levels of participation in their green practices (Arbouw et al., 2019).

H2: Two-sided (vs. one-sided) messages will result in greater perception of message usefulness (*H2*a), less skepticism (*H2*b), and higher intent to participate in the hotel's green practice (*H2*c) as compared to one-sided messages.

The moderating effect of message sidedness

We posit the effectiveness of a narrative (vs. non-narrative) message style in encouraging consumers' intent to participate in green practices can be further bolstered by using two-sided messages. This is because many consumers are skeptical of green claims and often distrust communication from companies (Calfee and Ringold, 1994; Obermiller and Spangenberg, 1998; Rahman et al., 2015). Two-sided messages have the potential to alleviate this skepticism by acknowledging unfavorable information about the brand itself, such as admitting financial gains from green practices. This approach can enhance the perceived utility, novelty, and honesty of the message (Kamins and Assael, 1987; Pechmann, 1992), and further enhance the already positive effect of a narrative message by equipping consumers with a more comprehensive understanding of the firm's green initiatives. Further, voluntarily disclosing self-serving information is uncommon, and such disclosures are more likely to be seen as honest rather than opportunistic (Ellen et al., 2000; Parguel et al., 2011). Additionally, Forehand and Grier (2003) contend that public acknowledgement of the benefits that accrue to the company itself can inhibit the development of skepticism and negative reactions.

H3: Two-sided (vs. one-sided) green messages will enhance the effect of narrative (vs. non-narrative) style messages on perceived message usefulness (*H3*a) and skepticism (*H3*b).

Downstream effect: serial mediator role of message usefulness and skepticism

As previously discussed, due to the prevalence of greenwashing in the advertising industry and the complexity and ambiguity of environmental issues (Lyon and Montgomery, 2013), the combination of narrative and two-sided messages can enhance the perceived usefulness of green messages by presenting more comprehensive and detailed information. We further anticipate that this heightened perceived usefulness will have a positive effect on consumers' skepticism, ultimately leading to an increased intention to participate in green initiatives. When consumers perceive a message as useful and informative, they are more likely to consider it credible and trustworthy, which in turn mitigates their skepticism (Cheung et al., 2008). This argument is supported by a wealth of empirical evidence from the literature. For instance, prior research has demonstrated that the perceived usefulness of a message is positively associated with its perceived credibility (Kamins and Assael, 1987; DeLorme et al., 2009). Other studies have indicated that message usefulness can positively influence attitude and behavior change (Petty and Cacioppo, 1984; Alwitt and Prabhaker, 1994).

Skepticism has been identified as a crucial factor in determining the effectiveness of green advertising, as consumers tend to react negatively when they doubt the veracity of claims made (Obermiller et al., 2005; Yoo and MacInnis, 2005; Matthes and Wonneberger, 2014). This skepticism not only engenders adverse attitudes toward the message but also diminishes consumers' willingness to engage in environmentally friendly behaviors, such as green purchases and participation in green programs (Forehand and Grier, 2003; Du et al.,

2010; Yu et al., 2022). By positing a serial mediation effect involving message usefulness and skepticism, this research aspires to provide a more nuanced understanding of the combined influence of narrative message style and two-sided messaging on consumers' involvement in green practices within the hospitality sector.

Top of Form

> *H4*: The joint effects of message style and message sidedness on and participation intent in the hotel's green practice will be serially mediated by message usefulness and skepticism.

Method

Hypotheses were tested through a between-subjects experiment with a 2×2 design, varying message style (narrative vs. non-narrative) and message sidedness (two-sided vs. one-sided). A total of 260 participants were recruited from MTurk and compensated for their participation; all were at least 18 years old, US residents, and active on social media. Participants were diverse in age ($M = 35.68$, range 20–59), with 53% female, 72% white, and 53.5% college educated. On average, participants had three social media accounts, such as Facebook, Instagram, and Twitter.

Stimuli. The Facebook post stimuli were created with four different versions of the same message; the only differences were the manipulations used to achieve the desired effects (see Appendix A for complete details). The narrative version depicted a fictional couple who participated in the hotel's green initiatives, while the non-narrative version simply stated that many guests of the hotel participated in the bed linens and towels reuse program. The two-sided message contained an acknowledgement of the hotel's self-serving motive (i.e., money saving) for the green initiative. Facebook was chosen as the platform given its popularity among travel advertisers, with 79% of them using it for marketing purposes, and having the highest number of users compared to other social media platforms (Manoukian, 2019; Emarketer, 2022).

Procedure. Participants were informed of a United States based hotel chain's upcoming social media campaigns on its new green initiatives and were asked for feedback. Only participants active on social media were included, and eligible participants were randomly assigned to one of four study conditions. They were instructed to view the stimuli in full-screen mode, and to respond to various dependent measures including measures of green participation intent, perceived message skepticism, message usefulness, environmental concern, manipulation checks for message style, and message sidedness, and demographic information. To reduce the likelihood of halo effects, a measure of green participation intent was collected prior to other variables. Additionally, the study included a distraction question asking participants to indicate how often they engaged in various leisure activities and a suspicion probe question asking participants to guess the objective and hypotheses of the study. Results indicate none of the participants guessed the hypotheses. To ensure participants were paying attention to the survey, we also included an attention check question asking how often they pay attention to TV commercials. We instructed participants to select "very frequently 7" as their response, regardless of their actual answer, to confirm that they were reading and following the instructions carefully. After

eliminating 17 participants who failed the attention check, provided insincere responses, or were not native English speakers, a final dataset of 243 participants was obtained.

Measures. All of the variables were assessed on a seven-point Likert scale, ranging from "disagree" to "agree." Green participation intent ($\alpha = 0.97$, $M = 4.93$, $SD = 1.42$) was measured with two items taken from Rahman et al. (2015): "I have an intention to participate in the hotel's green practice" and "I will participate in the hotel's green practice." Perceived green message skepticism ($\alpha = 0.97$, $M = 4.73$, $SD = 1.60$) was measured with three items adopted from Mohr et al. (1998): "The green claims in the post I just saw are intended to mislead," "I do not believe the hotel truly cares about the environment as it claims," and "The green claims in the post are exaggerated." Message usefulness ($\alpha = 0.97$, $M = 5.15$, $SD = 1.43$) was measured with three items modified from Matthes and Wonneberger (2014): "I find information in the post useful," "The information in the post is useful for my buying decisions," and "The post delivers the information that I need for my buying decisions." Environmental concern ($\alpha = 0.94$, $M = 4.90$, $SD = 1.71$) was measured with three items taken from Schuhwerk and Lefkoff-Hagius (1995): "I am willing to make sacrifices to protect the environment," "I am concerned about the environment," and "The condition of the environment affects the quality of my life." Message style manipulation was checked with three items ($\alpha = 0.95$, $M = 4.24$, $SD = 1.53$) from Kim et al. (2017): "This message reads like a story," "This message shows characters engaged in specific actions to achieve goals," and "This message mentions when, where, and how things happened." Finally, message sidedness manipulation was checked with two items ($r = 0.70$, $M = 4.17$, $SD = 1.47$), "This message has both positive facts that help the hotel and negative facts that hurt the hotel" and "This message presents balanced information." Descriptive statistics are shown in Table 1.

Results

Randomization checks. The four experiment conditions did not differ significantly in terms of participants' gender (χ^2 (3) = 0.48, $p > 0.90$), age ($F(3,239) = 1.11$, $p = 0.35$), education ($F(3,239) = 1.44$, $p = 0.24$), income ($F(3,239) = 0.46$, $p = 0.70$), or environmental concern ($F(3,239) = 1.45$, $p = 0.23$).

Manipulation checks. The manipulation check for message style was subjected to a 2 (message style: narrative vs. non-narrative) × 2 (message sidedness: two-sided vs. one-sided) ANOVA. First, the results confirmed a significant main effect of message style, ($F(1,239) = 213.45$, $p < 0.001$, $\eta_p^2 = 0.47$), indicating that participants perceived the narrative ($M = 5.17$, $SD = 0.10$) message as more story-like, action-oriented, and detailed compared to the non-narrative

TABLE 1 Descriptive statistics.

Variable	M	SD	Min	Max
1. Message style	4.24	1.53	1	7
2. Message Sidedness	4.17	1.47	1	7
3. Message Usefulness	5.05	1.43	1	7
4. Skepticism	4.73	1.60	1	7
5. Green participation intent	4.93	1.42	1	7

TABLE 2 Conditional indirect effects on green participation intent.

Indirect Path	Condition	B	Boot SE	Boot 95% CI
MS - skepticism - green participation intent	One-sided	0.20	0.09	0.04–0.41
	Two-sided	0.05	0.06	0.06–0.17
MS - MU - green participation intent	One-sided	0.51	0.20	0.56–1.34
	Two-sided	0.27	0.10	0.09–0.47
MS - MU- skepticism - green participation intent	One-sided	0.21	0.09	0.06–0.41
	Two-sided	0.06	0.03	0.01–0.14
Index of moderated serial mediation		−0.15	0.07	−0.32 to −0.04

MS, message style; MU, message usefulness.

message ($M = 3.06$, $SD = 0.10$). The message sidedness manipulation also had a significant main effect ($F(1,239) = 75.89$, $p < 0.001$, $\eta_p^2 = 0.24$). Participants who viewed the two-sided message reported that the message contained more balanced information with both positive and negative aspects ($M = 4.87$, $SD = 0.12$) compared to the one-sided message ($M = 3.43$, $SD = 0.12$).

No significant two-way interactions were found for both cases. Therefore, manipulations were successful.

Hypothesis tests. H1 through H3 were examined with a series of 2 (message style: narrative vs. non-narrative) × 2 (message sidedness: two-sided vs. one-sided) ANOVAs. First, in support of H1a through H1c, the results confirmed a significant main effect of message style on message usefulness ($F(1,239) = 74.41$, $p < 0.001$, $\eta_p^2 = 0.24$), skepticism ($F(1,239) = 79.52$, $p < 0.001$, $\eta_p^2 = 0.17$), and green participation intent ($F(1,239) = 55.80$, $p < 0.001$, $\eta_p^2 = 0.19$). Specifically, the narrative messages resulted in higher message usefulness (H1a: $M_{narrative} = 5.77$ vs. $M_{non-narrative} = 4.51$), lower levels of skepticism (H1b: $M_{narrative} = 2.97$ vs. $M_{non-narrative} = 4.10$), and greater intent to participate in the hotel's green practice (H1c: $M_{narrative} = 5.45$ vs. $M_{non-narrative} = 4.28$). Thus, H1a through H1c were supported.

For H2, the results verified a significant main effect of message style. As expected, the two-sided messages produced higher message usefulness (H2a: $F(1,239) = 42.83$, $p < 0.001$, $\eta_p^2 = 0.15$, $M_{two-sided} = 5.62$ vs. $M_{one-sided} = 4.67$), less skepticism (H2b: $F(1,239) = 46.39$, $p < 0.001$, $\eta_p^2 = 0.16$, $M_{two-sided} = 3.0$ vs. $M_{one-sided} = 4.10$), and greater intent to participate in the hotel's green practice (H2c: $F(1,239) = 34.80$, $p < 0.001$, $\eta_p^2 = 0.13$, $M_{two-sided} = 5.32$ vs. $M_{one-sided} = 4.04$). Thus, H2a through H2c were supported.

For H3, we found a significant interaction between message style and message sidedness on message usefulness ($F(1,293) = 10.30$, $p < 0.05$, $\eta_p^2 = 0.04$) and skepticism ($F(1,293) = 18.05$, $p < 0.001$, $\eta_p^2 = 0.007$). Follow-up analyses were conducted within each level of message sidedness. Surprisingly, the difference between narrative and non-narrative messages was greater when the messages were one-sided ($M_{narrative} = 3.16$ vs. $M_{non-narrative} = 3.81$) rather than two-sided ($M_{narrative} = 2.76$ vs. $M_{non-narrative} = 3.22$). For skepticism, we found a similar pattern of results. The effect of narrative (vs. non-narrative) messages on skepticism was greater when the messages were one-sided ($M_{narrative} = 3.18$ vs. $M_{non-narrative} = 5.02$) rather than two-sided ($M_{narrative} = 2.76$ vs. $M_{non-narrative} = 3.22$). Thus, H3a and H3b were not supported.

H4 was tested via a moderated serial mediator model using the bootstrapping procedure (10,000 samples) of the PROCESS" macro (model 84, Hayes, 2013) with message usefulness and skepticism as serial mediators. All variables that define indirect effects were

mean-centered to minimize multicollinearity. As shown in Table 2 (refer to the last row), the index of moderated mediation result confirmed the joint effect of message style and message sidedness on intent to participate in the hotel's green practice was serially mediated by message usefulness and skepticism ($B = -0.15$, 95% bias-corrected CI $= -0.32$ to -0.04). Interestingly, the results of the conditional indirect effect were consistent with H3 findings, with the serial mediation effect found to be greater when the narrative messages were one-sided ($B = 0.21$, 95% bias-corrected CI $= 0.06–0.41$) compared to two-sided messages ($B = 0.06$, 95% bias-corrected CI $= 0.01–0.14$). As shown in Figure 1, the direct effect of message style was not significant in this model, indicating full mediation. Detailed path coefficients are shown Figure 1. Thus, H4 was supported.

General discussion

While businesses are increasingly adopting environmentally-friendly practices to improve their public image, consumer skepticism toward green initiatives persists due to the perception that such efforts are mainly driven by self-interest (Matthes and Wonneberger, 2014). In this context, the findings of the present study have several important implications for both theory and practice.

First, this study highlights the importance of employing a narrative style as a method to augment the efficacy of green messages, offering novel insights into the manner in which message style influences consumer attitudes and behaviors. While extant literature has substantiated the persuasive power of narrative-based appeals across various contexts (Padgett and Allen, 1997; Escalas, 2004; Van Laer et al., 2014; Kim et al., 2017), the application of such approaches to message usefulness and green messaging has remained relatively unexplored. The current research advances the narrative persuasion literature by establishing a connection between the favorable impact of narratives and green communication, illustrating that the utilization of a narrative message style can enhance the perceived utility of messages while facilitating message processing.

The positive effect of the narrative message style can be attributed to its capacity to emotionally engage consumers, enhance message retention, facilitate comprehension, increase relatability, and mitigate skepticism (Escalas, 2004; Green, 2006; Chang, 2009). These factors collectively contribute to the persuasive power of narrative messages, rendering them particularly effective in addressing consumer skepticism toward green initiatives and promoting consumer participation (Van Laer et al., 2014; Kim et al., 2022). This finding implies that the adoption of narrative appeals can serve as an

FIGURE 1
The moderated serial multiple mediation on green participation intent. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.
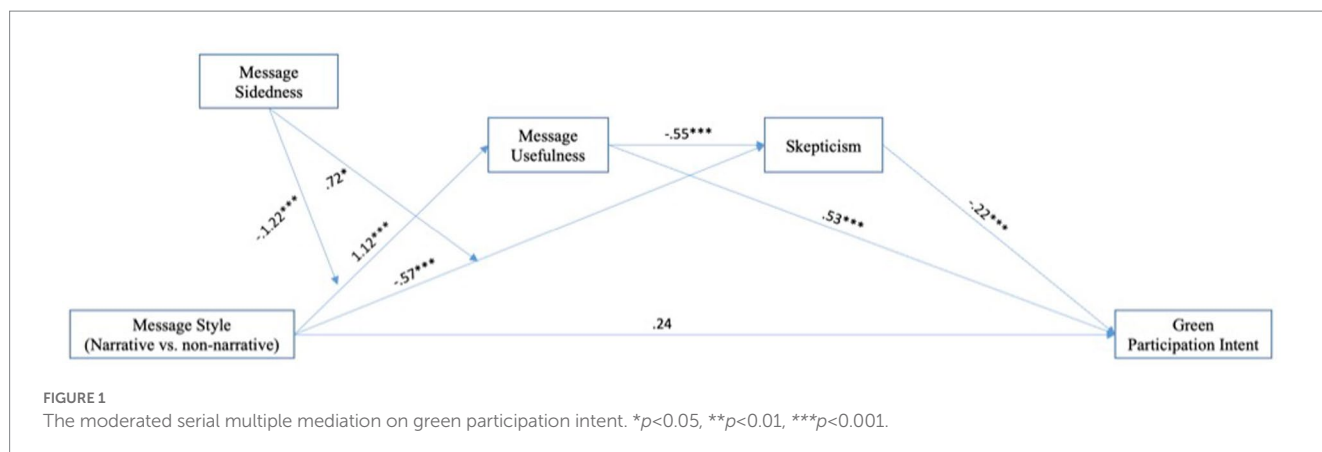
efficacious strategy in addressing consumer skepticism toward green initiatives, which is often engendered by concerns about a company's self-interest (Matthes and Wonneberger, 2014).

Second, this study contributes to the extant literature by providing empirical evidence that two-sided green messages yield a significant positive effect on consumer responses. Attribution theory posits that consumers' evaluations of green messaging are contingent upon their perceptions of the rationale behind the message's creation (Kelley and Michela, 1980). Given the rising consumer skepticism that the hotel industry's green initiatives already face, a hotel's green messages may be perceived as opportunistic or manipulative (Forehand and Grier, 2003; Parguel et al., 2011). The inclusion of a self-serving motive in two-sided messaging can be construed as a comprehensive, candid, and transparent account of the hotel's commitment to green initiatives. The positive impact of two-sided messages can be attributed to several factors, such as enhanced credibility (Pechmann, 1992; Crowley and Hoyer, 1994), increased message usefulness (DeLorme et al., 2009), reduced counterarguments (O'Keefe, 1999), and heightened message processing (Rucker et al., 2008). These factors contribute to a greater persuasive impact, beneficial not only in green marketing but also in other domains where trust and credibility are essential. By acknowledging potential profit motives, hotels can demonstrate their cognizance of consumer skepticism and their dedication to maintaining transparency and honesty in their communication. This approach, in turn, fosters trust and credibility with consumers, leading to higher levels of engagement and participation in the hotel's green practices.

Third, regarding the moderating role of message sidedness, our initial hypothesis posited that two-sided messages would amplify the positive effect of narrative messages on message usefulness and attenuate skepticism. Contrary to our expectations, the findings revealed two-sided messages bolstered the impact of non-narrative messages more than narrative messages. A plausible explanation for this observation could be that non-narrative messages inherently possess weaker message usefulness and elicit heightened skepticism, rendering them more vulnerable to the influence of message sidedness. In contrast, narrative messages are already perceived as highly useful and evoke minimal skepticism, leaving scant scope for enhancement through the incorporation of message sidedness. Consequently, the enhanced effect of two-sided messages becomes more pronounced in the context of non-narrative messages. Further, our study makes a noteworthy contribution to scholarly discourse by proposing and

empirically validating the serial mediation roles of message usefulness and skepticism in the combined effect of message style and message sidedness on intention to participate in green practices.

Regarding practical implications, our findings offer guidelines for companies seeking promote sustainable practices. First, results suggest adding a short narrative to the green message can significantly reduce consumer skepticism toward hotel's sustainability efforts. This helps convey the hotel's commitment and alleviate consumer doubts. However, authentic and ethical messaging is crucial to prevent unintended skepticism. Hotels' sustainable practices. This is crucial because consumers are interested in sustainable hotels but skeptical of their motives. Incorporating a narrative can convey the authenticity of the hotel's commitment and alleviate consumer skepticism. Second, this study highlights the importance of hotels being transparent about the self-serving benefits of their commitment to environmental causes. Openly acknowledging the financial gains of these initiatives can increase consumer trust and willingness to participate. Overall, our study suggests advertising focused on promoting green initiatives should consider using narrative and two-sided appeals, providing more information about specific actions and benefits of green practices. This can encourage consumer motivation to participate in sustainable practices.

Limitations and future research

This study focused on social media as a message platform and did not explore the potential influence of others on the impact of green advertising. Future research could explore the impact of reference groups and social influence on consumers' acceptance of green advertising and eco-tourism, in general. Such research could shed light on the role of social norms in shaping consumers' attitudes and behaviors toward sustainability. Second, this study was conducted in the context of the hotel industry, and the findings may not be generalizable to other industries. Our interactions had small effect sizes and should be interpreted with caution, practically. Replication with larger samples may be useful. Future research could extend these findings to other industries such as fashion and consumer products, which are increasingly incorporating sustainability initiatives into their branding strategies. Nevertheless, this research provides important insight and implications for hotels seeking to utilize green message strategies.

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 USC Institutional Review Board. The patients/participants provided their written informed consent to participate in this study.

Author contributions

EKi: study conception and design, data collection and analysis, manuscript writing, project administration, and funding acquisition. EKw: manuscript writing. SH: manuscript writing and funding acquisition. HS: data anlaysis, study design, and manuscript writing. MS: manuscript writing and editing. All authors contributed to the article and approved the submitted version.

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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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1176863/full#supplementary-material

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Impacts of residential environment on residents' place attachment, satisfaction, WOM, and pro-environmental behavior: evidence from the Korean housing industry

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This study considers seven residential environment elements and examines their effect on residents' place attachment (place dependence and place identity), satisfaction, word-of-mouth behavior, and pro-environmental behavior. The study also examines whether gender moderates the proposed relationships. The data were collected from 603 respondents who owned a condominium in Seoul, South Korea. We analyzed the data using structural equation modeling with SmartPLS 4. The finding shows that all seven elements of the residential environment have a significant impact on either dimension of place attachment, except for the insignificant effect of social environment on place dependence. Both dimensions of place attachment have a significant effect on satisfaction, WOM, and pro-environmental behavior except for the insignificant effect of place dependence on pro-environmental behavior. The interaction effect test of gender shows that males consider eco-friendly materials and green/recreational areas more than females. On the other hand, females are found to weigh and social environments more heavily than males. The finding shows that pro-environmental behavior is influenced by place identity (not by place dependence) and satisfaction, indicating a key role of affective response.

KEYWORDS

residential environment, place attachment, satisfaction, word-of-mouth, pro-environmental behavior

Introduction

Because half of the population in Korea lives in condominiums (called "apartments" in Korea; KOSIS, 2021), the gray forest of high-rise buildings comes into mind as a first image of South Korea. The concept of residential place, in Korea, has changed from a simple space to a complex space, reflecting the characteristics of sophisticated consumers who are highly involved in the purchase process and who base their evaluation on different elements of residential environment that influence residents' overall evaluation of the place. Residents conduct extensive

information search and evaluate alternatives to find the best choice that suits their need. To attract these consumers, some residential developers in Korea have embraced environmentally friendly building material and technology to enhance their brand image and set themselves apart from the competitors by being certified as eco-friendly housing (Choi et al., 2017).

Many studies have been conducted to identify various elements (e.g., operation management, maintenance, location condition, safety management, and construction) related to residential environment (Roh and Yoon, 2022). However, very little is known about how residential environment influences residents' satisfaction and subsequent behaviors. While some studies (Lee and Jeong, 2021) examined the effect of residential environment on place attachment, they did not use a dimensional approach for place attachment, failing to understand the mechanism, through which residential environment influences overall satisfaction and behaviors. In order to address the gap in the literature, our study proposes a framework based on the well-established hierarchy of effects model (Mehrabian and Russell, 1974; de Matos and Krielow, 2018; Lee et al., 2021). This study, based on the model, views that residents' cognitive evaluation of the residential environment will influence affective responses (two dimensions of place attachment and satisfaction), which in turn, influence behavior. In an effort to understand the effect of residential environment on residents' behavior, our study examines two types of consequential behaviors: their positive word-of-mouth intention (WOM) about the residential complex to other consumers and their pro-environmental behavior (PEB) which can help in the conservation of resources. In establishing the relationship, our study borrows concepts from social exchange theory (Emerson, 1976; Nunkoo and Ramkissoon, 2011) and conservation of resources theory (Hobfoll et al., 1990; Gosling and Williams, 2010). However, research on whether gender-specific differences in how However, research on whether gender-specific differences in how beliefs about the residential environment psychologically benefit person-place bonds remains unclear. The residential environment psychologically benefit person-place bonds remains unclear. Prior studies (Hwang and Ziebarth, 2006; Richardson and Mitchell, 2010; Mridha, 2020) suggest that males and females weigh residential environmental beliefs, place attachment, overall satisfaction, and consequential behavior differently. We believe that the empirical evidence will yield significant strategic implications for city developers and urban housing marketers. Furthermore, the findings of the study will have implications for policy makers and local governments seeking to incentivize developers and attract potential residents to the city area.

Literature review

Residential environment

Residential environment refers to factors that evaluate residential quality, which is a determinant of residential satisfaction. The residential environment is evaluated through various residential environment evaluation indicators and is used to analyze the cognitive-emotional-behavioral processes of residents (Amérigo and Aragones, 1997). For example, Craik and Zube (1976) applied the concept of Perceived Environmental Quality Index (PEQI) to evaluate the residential quality. Adriaanse (2007) measured residential

satisfaction using a residential environmental satisfaction scale (RESS). Hwang (2013) suggest different elements of residential environment including housing features, security, natural environment, social network, architectural quality, pollution, transportation, commercial services, green areas, and adequate educational services, and amenities. Residential environment studies report that the quality of residential environment is strongly related to residential place attachment and satisfaction (Chen et al., 2019; Junot, 2022). Chen et al. (2019) found residents' positive evaluation of the residential environment was a predictor of place attachment. Although residential quality itself is likely to be a major determinant of residential satisfaction, negative evaluation of the surrounding environment such as high crime rate (Mullins et al., 2001) and lack of community amenities (Fried, 1982) can cause dissatisfaction. Studies suggest that residents may use a distinct set of consideration based on the type of housing and location. For example, Mohit et al. (2010) report a positive relationship between residential environment comprising of dwelling unit features, residential unit support service, public facilities, social environment, and neighborhood facilities and residents' satisfaction in the public housing sector in Malaysia. It is possible that residents of private housing consider a separate set of elements from those of public housing. Lee and Yeom (2011) found a positive relationship between residential environment and residents' satisfaction using the Korea Green Building Certification Criteria (KGBCC) index. Their study that included ecological environment indicates that residents in the private housing sector may consider conservation of the environment important in their purchase decision. Lee and Choi (2013) suggest the six elements of eco-friendly housing (location condition, indoor function, brand, investment value, green space, and saving facilities) positively affect residents' loyalty. Our study with focus on eco-friendly housing considers a comprehensive set of residential environment elements based on prior research: eco-friendly building material, management office service, dwelling unit features, public facilities, social environment, economic value, and green/recreation area. We apply the hierarchy of effects model which is widely used to explain people's behavior in connection with cognitive and affective responses (Mehrabian and Russell, 1974; de Matos and Krielow, 2018; Lee et al., 2021).

Place attachment

Place attachment refers to a resident's emotional bond to a place and is comprised of two dimensions: place identity and place dependence (Kim et al., 2017; Lee et al., 2019). It facilitates to understand the integration of place beliefs, feelings, and behaviors (Canter, 1992; Jorgensen and Stedman, 2006). Place identity is a symbolic or emotional attachment of the resident to the place (Kim et al., 2017), as the resident assigns a meaning to the place, and the place becomes a part of the resident's self-identity (Su et al., 2018) due to a sense of belongingness and the place forms a part of their self-concept (individual self-identity and social self-identity; Scannell and Gifford, 2010). According to the theory of place identity, the determination of a place identity is not solely reliant on the physical components, but also on the meaning and association established between individuals and the place (Bott et al., 2003; Lewicka, 2008). On the other hand, place dependence is an attachment formed based on function of the place that provides resources and facilities, which

help residents achieve goals (Vaske et al., 2017; Lee et al., 2019). Based on Bendapudi and Berry (1997)'s (1982) study, place dependence refers to the continuation of a relationship because of limitations imposed by a specific location, wherein one party feels compelled to maintain a place-related connection due to economic, social, or psychological factors (Johnson, 1982). The degree of constraint is determined by the party's perceived reliance on their relationship partner. Therefore, in a relationship between A and B, A's inclination to retain the relationship based on constraints is influenced by A's dependence on B (Dwyer et al., 1987).

Theoretical framework

Based on the above literature review, the study proposes a framework for testing the relationship between residential environment – place attachment – satisfaction – WOM intention and PEB. Building on the hierarchy of effects model (Smith et al., 2008; Hsiao, 2020), it considers residential environment as a cognitive attitudes or evaluation of resident. And it considers place attachment and satisfaction as an affective attitude. Finally, it considers WOM intention and PEB as a conative attitude. Building on place attachment theory (Kim et al., 2017; Lee et al., 2019), it considers why the perception of residential environment influence place identity and dependence. The framework focuses on resident's WOM intention and PEB from and use conservation of resources theory (COR; Hobfoll et al., 1990; Gosling and Williams, 2010), which emphasizes the importance of interaction between resident and resident environment. Therefore, Figure 1 illustrates the general theoretical framework using the hierarchy of effects model. The model specifies that three components of attitude (i.e., cognitive, affective, and conative) are hierarchical (Smith et al., 2008; Hsiao, 2020). This model can be applied to understand residents' place attachment and satisfaction. Attitude change may occur when the cognitive component is addressed first, which leads to the subsequent changes in the order of affective and behavioral components. Some critics (Barry and Howard, 1990) of the model argue that the order may change in some cases, in which the behavioral component is addressed first, followed by cognitive and affective components. For instance, a person joins his friend to run (i.e., behavioral) to realize health benefits (i.e., cognitive) and develops a positive attitude toward running (i.e., affective). Based on the hierarchy of effects model (Smith et al., 2008; Hsiao, 2020), we view that residents' cognitive evaluation of the residential environment will influence affective responses such as a sense of attachment to the place and overall satisfaction. These affective responses are expected to influence behaviors such as WOM and PEB. Our hypotheses are discussed below.

Development of hypotheses

Residential environment and place attachment

We anticipate that residential environment will have a significant impact on both dimensions of place attachment (place dependence and place identity). Our rationale is as follows. If residential environment delivers expected functions or benefits to the residents, residents are likely to evaluate the environment positively and become dependent on the place. For example, a resident who enjoys the club house (one of the functions/benefits of the residential environment) to socialize with other residents may develop a sense of attachment to the place because of the function provided. We also anticipate a positive effect of residential environment on place identity. We view that residents will develop a sense of belongingness to the place when they have a positive evaluation of the residential environment (Khosravi et al., 2020).

First, whether eco-friendly materials, not endocrine disruptors, or carcinogens, are used in the residential space is a crucial factor in determining the quality of housing and has a significant impact on consumers' housing choice and housing behavior (Lee and Choi, 2013). Therefore, whether or not eco-friendly materials are used in a product is an important factor influencing attachment (Chen et al., 2017). Since apartments are formed on a large scale, the management office service for managing apartments as multi-unit dwellings is a crucial factor constituting the quality of the living environment. Just as the services of employees affect customer attachment (Ulrich et al., 1991), the management office service in an apartment building affects residential attachment as a service to support residents (Yun and Park, 2017).

Dwelling unit features such as corridor, staircase, cleanliness of drains, street lighting, garbage collection is an important variable that constitutes the quality of the living environment of an eco-friendly apartment (Chun et al., 2008; Mohit et al., 2010; Lee and Choi, 2013; Adewale et al., 2020). Public facilities refer to the well-equipped OS/play area, parking, perimeter roads, and pedestrian walkways necessary for using the apartment complex (Mohit et al., 2010). However, in Korea, when constructing an apartment, it is mandatory to have a hall for the elderly, infant/children's facilities, and convenience facilities for disabled people. Therefore, in Korea, the

FIGURE 1
Theoretical framework.
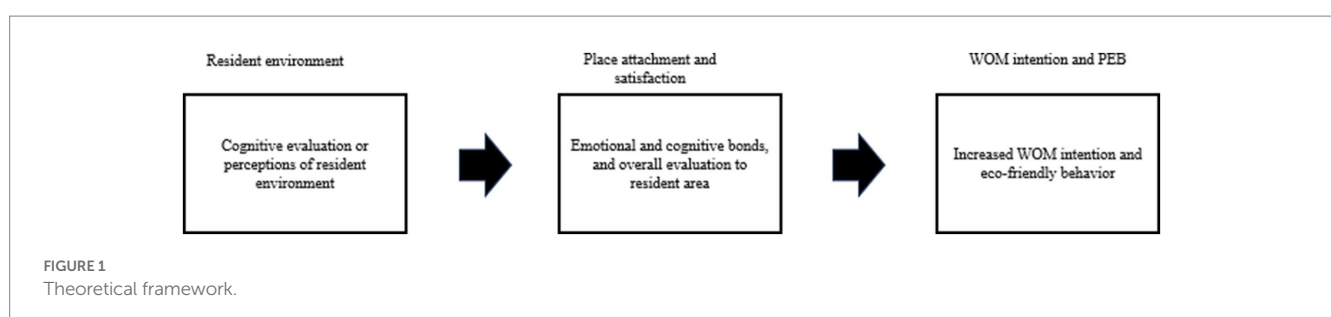
range of public facilities has been expanded, becoming an important variable that determines the residential quality of residents.

The social environment is a vital component of residential quality, such as the level of noise around or inside an apartment complex, installation and control of facilities and safety devices for accident prevention, and community relations with residents (Hidalgo and Hernandez, 2001; Mohit et al., 2010). The social environment is an open space for socializing and interacting (Binyi and Mwanza, 2014), which constitutes part of place quality and influences place identity (attachment; Isa et al., 2022). Economic value refers to the economic benefit that a resident derives from residence. Therefore, when purchasing a house, residents consider the price and ease of sale (jeonse or monthly rent) of the house (Lee and Choi, 2013). The economic value of a house is affected by the construction company and the size of the complex (Chun et al., 2008). Lastly, green/recreational area is a space that allows residents to find psychological stability against changes in the living environment, such as air pollution and temperature rise in the living space due to climate change. Therefore, residents judge the quality of housing based on whether the community they live in has enough attractive leisure spaces and green spaces, and form attachment to places (Arnberger and Eder, 2012; Li et al., 2022). Therefore, we propose that all seven elements of residential environment will influence the two dimensions of place attachment.

> *H1*: Positive evaluation of the residential environment (*H1*a: eco-friendly material, *H1*b: management office service, *H1*c: dwelling unit features, *H1*d: public facilities, *H1*e: social environment, *H1*f: economic value, *H1*g: green/recreational area) influence the residents' place dependence.

> *H2*: Residential environment (*H2*a: eco-friendly material, *H2*b: management office service, *H2*c: dwelling unit features, *H2*d: public facilities, *H2*e: social environment, *H2*f: economic value, *H2*g: green/recreational area) will influence the residents' place identity.

Place attachment, satisfaction, WOM, and pro-environmental behavior

Place attachment is a bond to the place. Studies suggest that emotional response is an important variable that affects satisfaction, WOM, and eco-friendly behavior (Lee et al., 2019). Place attachment has a positive impact on the residents' overall satisfaction (Fornara et al., 2019). Satisfaction is defined as a pleasurable feeling that results from the cognitive process of comparing performance against expectations (Bonaiuto and Fornara, 2004). This definition means that residents are likely to be satisfied when the performance of the residential environment exceeds their expectations. Some studies (Smith and Bolton, 2002) examine the role of emotion in satisfaction judgments and find that emotional response contribute to explaining customer satisfaction judgments, even when considering the cognitive factors that lead to satisfaction. This may be because information processing including encoding and retrieval of information is influenced by

the individual's emotional state such that individuals who are in a positive emotional state tend to rely on heuristics, mental shortcuts that allow them to make a quick decision based on the limited information (Smith and Bolton, 2002). Based on prior research on the role of emotion, we propose that place attachment (emotional bond) will have a direct influence on residents' satisfaction judgment.

Our study anticipates that place attachment will have a significant impact on behavioral intentions (word-of-mouth and pro-environmental behavior) in addition to its impact on satisfaction judgment. Studies across disciplines support that emotion plays a key role in shaping and influencing behaviors (Kusi et al., 2021). Studies (Zhang et al., 2014) in advertising show that emotional appeals that evoke emotion are more effective at driving actions than rational appeals that require cognitive evaluations. We borrow the concepts of reciprocity, from social exchange theory (Emerson, 1976; Nunkoo and Ramkissoon, 2011) to explain our proposition that place attachment influences residents' WOM behavior. Reciprocity is the practice of performing mutual or corresponding actions based on the other party's actions and refers to a social norm that guides the maintenance of social relations. According to this theory, residents are likely to engage in behaviors that are beneficial to the company (e.g., WOM), when they feel positive and attached to the company (Lee et al., 2012; Chen et al., 2018). Thus, we propose that place attachment will have a positive impact on the residents' WOM behavior.

We also anticipate place attachment to have an influence on the residents' pro-environmental behavior (PEB) and use conservation of resources theory (COR) to explain our proposition. PEB is defined in this study as an action of residents that involves reduction of the harmful impact on the environment and contribution to the environmental conservation (Steg and Vlek, 2009; Lee et al., 2013, 2014a; Ertz et al., 2016). PEB, as described by Stern (2000), encompasses any behavior that modifies the availability of matter or energy within the environment or influences the structure and functioning of an ecosystem or biosphere in a manner that benefits rather than hampers the environment. Based on COR theory (Hobfoll et al., 1990; Gosling and Williams, 2010), resources are objects (e.g., oil), personal characteristics (e.g., leadership), and energies (e.g., time), and they are limited and scarce people try to sustain the resources that are important to them (Junot, 2022). The theory explains that if people have a close attachment to a significant other, they regard it as a value to form a social identity and are willing to preserve, maintain, love, and care for it. On the contrary, these theories explain that when the valued states are damaged, people are under stressed and act like social support so that it is not threatened. We view that residents who are attached to the place will engage in pro-environmental behavior to preserve the limited resources. There are some studies that show the positive effect of place attachment on pro-environmental behavior in the areas of festival and trading (Lee and Lee, 2020; Lee et al., 2021). For example, Lee et al. (2021) reveal that place attachment promotes visitors' pro-environmental behavior and support for the festival. Similarly, Lee and Lee (2020) who examine the effect of place attachment in the trading area, show that place attachment (i.e., trading area attachment) has a positive influence on satisfaction, loyalty, and pro-environmental behavior.

> *H3*: Place dependence influence the residents' satisfaction (*H3*a), WOM (*H3*b), and PEB (*H3*c).

H4: Place identity influence the residents' satisfaction (*H4*a), WOM (*H4*b), and PEB (*H4*c).

H5: Satisfaction influence the residents' WOM (*H5*a) and PEB (*H5*b).

The moderating role of gender in the relationship between residential environment and place attachment

Gender has been used as an important segmentation variable because males and females show different values, opinions, behaviors, and tendencies. For example, Hwang and Ziebarth (2006) show that residents' evaluation of the residential environment differs based on gender. Some studies (e.g., Cohen et al., 2007; Richardson and Mitchell, 2010) find that men value green space more than women, while women consider neighborhood environment more important than males. Male and female residents' satisfaction level is also found to be different. Mridha (2020) reveals that females' housing satisfaction is higher than males. Males and females are also known to have different perceptions about the living space (Saegert and Winkel, 1980). While males view the living space as a place for work, females perceive it as a place for interaction. These previous studies suggest that males and females consider a distinct set of residential environment elements in determining place attachment. Thus, we propose that gender will play a moderating role in the relationship between residential environment and place attachment.

H6: The relationship between residential environment and place attachment may differ based on gender.

Based on the hypotheses, the proposed model is shown in Figure 2.

Methodology

Sampling and data collection

Even though we utilized items from previous studies, they underwent modifications during a pre-test phase. We conducted a pre-test involving 10 condominium owners in order to identify any potential biases or ambiguities. The feedback obtained from the pre-test was used to modify the questionnaire accordingly. Subsequently, three experts and two academics reviewed the items to ensure their measurement appropriateness, readability, and clarity. According to their comments, some wording and sentences have been corrected.

Data were collected from condominium owners who resided in Seoul, S. Korea. We used a research company to collect data. The research company had an extensive consumer panel comprised of approximately 400,000 panel members in South Korea. The purpose of the study was explained to the participants, and they were given reassurance about the confidentiality of their information. To

encourage a higher response rate, incentives were provided to participants upon successfully completing the questionnaire using an online survey company. The online survey company explained in the survey guide that the survey was conducted for academic research, that the survey results would be used only for statistical analysis, and that the panelists were to answer anonymously. The research company used simple random sampling method and reached out to 3,457 panel members, and 618 respondents completed the questionnaire. Responses with omission of essential information were excluded, leaving 603 responses qualified for final data analysis. The final sample size was 618, which exceeds the minimum requirement of 385 for a 95% confidence level and 5% sampling error.

Measures

We used multiple items to measure all constructs. The measures were anchored by 1 ("strongly disagree" or "not at all satisfied") and 7 ("strongly agree" or "very satisfied"). We used seven elements to measure residential environment. We borrowed the items from Mohit et al. (2010) to measure eco-friendly material (6 items), management office services (6 items), dwelling unit features (5 items), public facilities (7 items), and social environment (5 items). We adapted four items from the studies of Lundgren (2013) and Siahaan et al. (2019) to measure economic value. Green/recreational area was measured with six items (Arnberger and Eder, 2012). We borrowed items from the studies of Ramkissoon et al. (2013) and Halpenny (2006) to measure place dependence (six items) and place identity (5 items). Using the items of Lee et al. (2000), we measured satisfaction with three items. WOM intention was measured with two items based the study of Lee et al. (2014b). Finally, we used six items to measure PEB, and they were borrowed from the studies of Lee et al. (2019) and Ramkissoon et al. (2013).

Data analysis

Demographic profile of the respondents

Table 1 shows the demographic profile of the respondents. The sample included a little bit more males (51.7%) than females (48.3%). About half of the respondents were in the age groups of 40s (27%), and 50s and older (26.5%). The most common occupation was professional (18.1%), followed by service industry worker (14.3%) and manufacturing employee (11.9%). About 59% of the respondents were married. Most of the respondents had a household size of 3 (35.8%) or 4 (41.8%) and obtained a college degree (73.3%). In terms of income, about 76% of the respondents earned a minimum of 5,000,000 won (approximately $3,700) a month. Most of the respondents (74%) had owned the place for less than 5 years.

Measurement model

We performed reliability and validity tests using measurement model with SmartPLS 4.0 program (Han et al., 2022). As shown in Table 2, Cronbach's α and composite reliability values exceeded the standard threshold of 0.7. This suggests internal consistency of the measurement model, securing morphological identity. The factor loadings and AVE values were higher than the cut-off point of 0.5,

FIGURE 2
Proposed model.
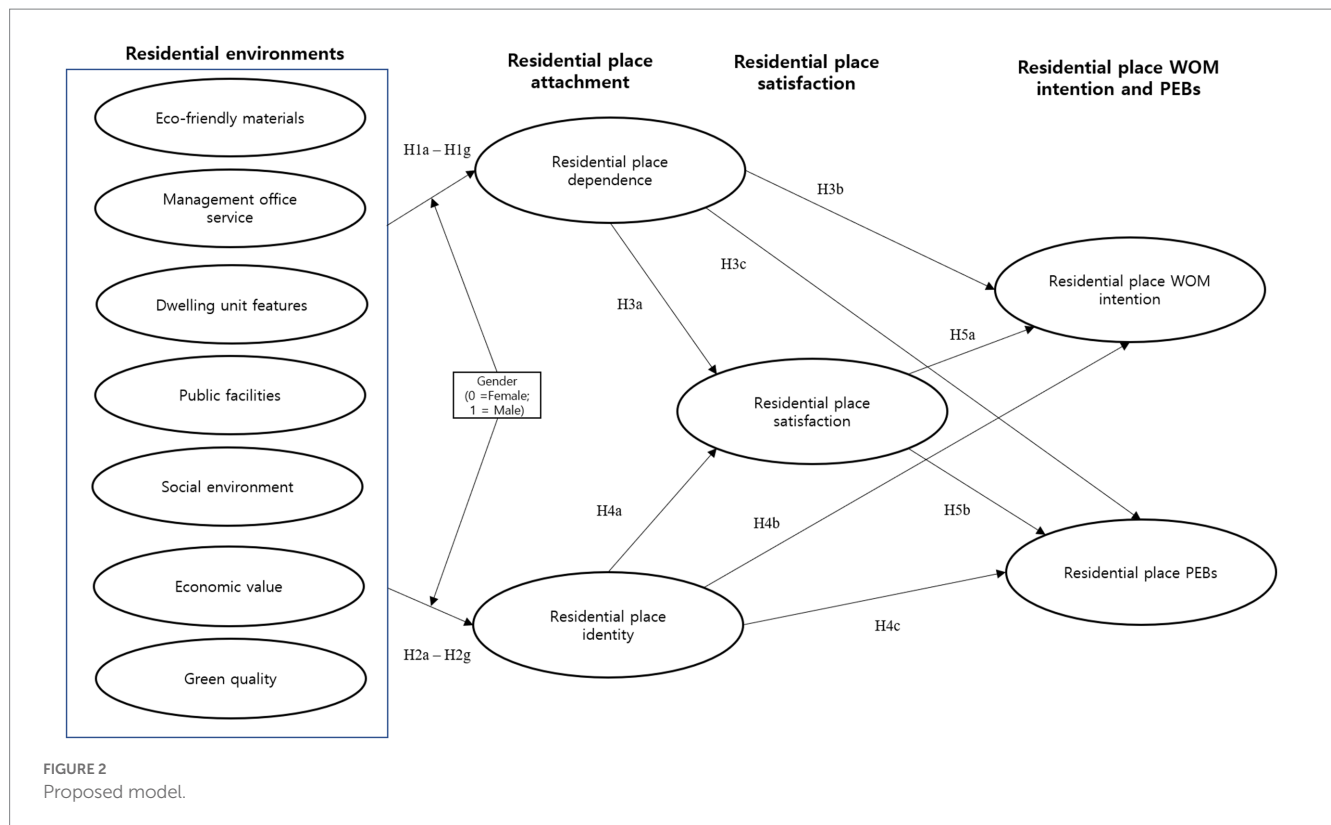
confirming convergent validity (Fornell and Larcker, 1981). As shown in Table 3, the correlation coefficients were smaller than the square root values of average variance extracted (AVE), suggesting evidence of discriminant validity. In addition, the heterotrait-monotrait (HTMT) values indicating the heterogeneity and homogeneity ratio of the correlation coefficient were lower than 0.9 (see Table 4), confirming discriminant validity. Normality was also established because the values of kurtosis (-0.477 to 0.789) and skewness (-0.750 to -0.248) were less than the absolute values of 9.0 and 2.0, respectively (Schmider et al., 2010).

Common method bias assessment

Following Kang et al. (2021)'s method, we used procedural and statistical approaches to check for common method bias. We used three procedural methods (Podsakoff et al., 2003, 2012). The first one was involved with using a pre-test, based on which we modified words, phrases, and sentences to reduce ambiguity and enhance clarity. The second approach was to inform respondents of the study purpose. The third approach was to change the order of the independent variables, mediators, and dependent variables so that the respondents could not guess the relationship among the variables. As for the statistical approach, we checked the variance inflation factor (VIF) values against the 3.3 threshold (Kock, 2015; Wang et al., 2022). Because the VIF values (1.825–2.997) were below 3.3, common method bias was not a threat to our study.

Structural model assessment

We evaluated the fit of the model using SmartPLS 4.0 program (Hair et al., 2019; Hur and Lee, 2021; see Table 5). The finding that all VIF values were lower than 3.3 indicates no problem of multicollinearity between the constructs. The predictive fit of the

model was considered appropriate because the values associated with the Stone-Geisser's test (Q^2) were higher than 0. In addition, the R^2 values were greater than 0.10 (Falk and Miller, 1992), confirming the explanatory power of the model. Finally, the standardized root mean squared residual values were less than 0.1, indicating an appropriate model fit (Hu and Bentler, 1998).

Hypotheses testing

Main effect test

Hypothesis 1 states that seven elements of the residential environment will have a positive impact on place dependance. As shown in Table 5 (see Model 1), eco-friendly material ($\beta = 0.246$, $p < 0.001$), dwelling unit features ($\beta = 0.114$, $p < 0.05$), economic value ($\beta = 0.192$, $p < 0.001$), and green/recreational area ($\beta = 0.229$, $p < 0.001$) have a has a significant impact on place dependence. Therefore, $H1$a, $H1$c, $H1$f, and $H1$g are supported. Meanwhile, management office service ($\beta = 0.084$, n.s.), public facilities ($\beta = 0.048$, n.s.), social environment ($\beta = 0.061$, n.s.) did not have a significant impact on place dependence. Hence, $H1$b, $H1$d, and $H1$e are not supported.

Hypothesis 2 addresses that seven elements of residential environment will have a positive impact on place identity. Eco-friendly material ($\beta = 0.155$, $p < 0.01$), management office service ($\beta = 0.170$, $p < 0.001$), economic value ($\beta = 0.133$, $p < 0.01$), and green/recreational area ($\beta = 0.390$, $p < 0.001$) have a has a significant impact on place identity. Therefore, $H2$a, $H2$b, $H2$f, and $H2$g are supported. However, dwelling unit features ($\beta = 0.073$, n.s.), public facilities ($\beta = -0.055$, n.s.), and social environment ($\beta = 0.067$, n.s.) did not have a significant impact on place dependence. Hence, $H2$c, $H2$d, and $H1$e are not supported.

TABLE 1 Demographic profile of the respondents (*n* = 603).

Category		Frequency	Percentage
Gender	Male	312	51.7
	Female	291	48.3
Age	20s	130	21.5
	30s	150	24.9
	40s	163	27
	Over 50s	160	26.5
Job	Student	47	7.8
	Manufacturing	72	11.9
	Construction	30	5
	Wholesale and retail	42	7
	Transport business	3	0.5
	Finance / Real Estate / Telecommunications	53	8.8
	Service industry	86	14.3
	Tourism (accommodation, food, and beverage)	6	1
	Professional	109	18.1
	Public official	29	4.8
	Housewife	72	11.9
	Others	54	9
Marital status	Not married	244	40.5
	Married	355	58.9
	Others	4	0.7
Number of family	1	32	5.3
	2	73	12.1
	3	216	35.8
	4	252	41.8
	5	29	4.8
	6 or more	1	0.2
Education	High school	48	8
	Two-year college	42	7
	Four-year college	442	73.3
	Graduate school	71	11.8
Monthly average income (Unit: 10 thousand won) (1 dollar ≒ 1,350 won)	less than 100	11	1.8
	100–199	13	2.2
	200–299	45	7.5
	300–499	73	12.1
	500–599	91	15.1

(Continued)

TABLE 1 (Continued)

Category		Frequency	Percentage
	600–699	158	26.2
	700–799	102	16.9
	Over 800	110	18.2
Period of residence (years)	<3	52	8.5
	3 – <5	35	65.8
	5 – <7	45	7.5
	7 – <10	56	9.3
	10 – <15	81	13.4
	15 – <20	78	12.9
	≥30	101	16.7

Hypotheses 3 posits that place dependence will influence residents' satisfaction, WOM intention, and PEB. Place dependence has a significant impact on satisfaction ($\beta = 0.407$, $p < 0.001$), WOM intention ($\beta = 0.180$, $p < 0.01$). However, place dependence did not have a significant impact on PEB ($\beta = 0.078$, n.s.). Therefore, *H3*a and *H3*b are supported, but not supporting *H3*-3.

Hypotheses 4 presents that place identity will influence residents' satisfaction, WOM intention, and PEB. Place identity has a significant impact on residents' satisfaction ($\beta = 0.451$, $p < 0.001$), WOM intention ($\beta = 0.278$, $p < 0.001$), and PEB ($\beta = 0.282$, $p < 0.001$). Therefore, *H4*a, *H4*b, and *H4*c are supported. Lastly, Hypothesis 5 proposes that residents' satisfaction will influence WOM intention and PEB. The study finds that satisfaction has a positive impact on WOM intention ($\beta = 0.412$, $p < 0.001$) and PEB ($\beta = 0.261$, $p < 0.001$). Hence, *H5*a and *H5*b were supported.

Interaction effect analysis of gender for RQ

The study, using the SmartPLS 4.0 program, examined the interaction effect of gender to identify the moderating role of gender in the structural relationship between residential environment and place attachment. As shown in Table 5 (see Model 2), the study finds that the effect of public facilities ($\beta = 0.336$, $p < 0.001$) on place dependence, and eco-friendly material ($\beta = 0.209$, $p < 0.05$) on place identity were stronger for males than females. Meanwhile, the effect of green/recreational area on place dependence ($p < 0.05$) and place identity ($p < 0.01$) is also found to be greater for females than males. Therefore, *H6* was partially supported.

Discussion

This study using a comprehensive set of residential environment elements, finds that each element of the residential environment influences the two dimensions of place attachment differently for males and female residents. Social environment is found to have no impact on place dependence and identity for residents. The study finds that eco-friendly material, dwelling unit features, economic value, and green/recreational area are the drivers of place dependence. In other words, residents as a whole value these four elements more than other elements in shaping their dependence on the place.

TABLE 2 Measurement model.

Constructs and items	Factor loadings	Cronbach's alpha	CR	AVE
Residential place satisfaction		0.910	0.944	0.848
I am satisfied with my decision to live in this area.	0.918			
Living in this area my feelings are particularly good	0.919			
I am happy to live in this area	0.925			
Economic value		0.854	0.895	0.630
Construction company	0.756			
Complex size	0.765			
Apartment (house) sale (jeonse or monthly rent) price	0.827			
Ease of sale (jeonse or monthly rent)	0.817			
Overall, economic value	0.803			
Public facilities		0.906	0.926	0.641
OS/play area	0.847			
Parking	0.720			
Hall for the elderly (new added item)	0.798			
Infant/children facilities (new added item)	0.840			
Facilities for the Disabled (new added item)	0.802			
Perimeter roads	0.753			
Pedestrian walkways	0.836			
Management office service		0.941	0.953	0.773
Management office staff's knowledge of apartment management	0.870			
Kindness of the management office staff	0.896			
Courtesy of management office staff	0.887			
The management office staff respond quickly to the needs of residents	0.889			
The degree to which the management office staff is willing to help the needs of residents	0.894			
Enough staffs to serve residents	0.837			
Green/recreational area		0.916	0.934	0.704
The community has enough attractive recreation areas.	0.859			
My favorite recreation areas are part of the community.	0.848			
I am a regular user of the recreation areas of the community.	0.835			
The community has enough green spaces.	0.802			
I know most of the recreation areas of the community.	0.840			
I feel very safe in the recreation areas of the community.	0.849			
Social environment		0.877	0.911	0.672
Noise	0.735			
Accident	0.837			
Security	0.834			
Control	0.873			
Community relations	0.812			
Eco-friendly material		0.951	0.961	0.802
The material was made of materials that protect the environment.	0.894			
Materials will reduce the consumption of natural resources.	0.888			
The material can be recycled.	0.855			
The material is an environment-certified material.	0.910			

(Continued)

TABLE 2 (Continued)

Constructs and items	Factor loadings	Cronbach's alpha	CR	AVE
The material is a material that has passed an environmental audit.	0.907			
The material was made of materials for reducing (lowering) CO2 emission.	0.920			
Residential place dependence		0.901	0.926	0.716
I cannot think of anything better than the facilities and environment this area has to offer.	0.825			
Here you can enjoy the best environment and facilities.	0.866			
I like to live in this area more than any other area	0.852			
More than any other area, this one satisfies me more.	0.874			
This is a place where I can be comfortable.	0.811			
Residential place identity		0.916	0.941	0.799
This area makes me feel a strong sense of unity with me.	0.884			
This area is almost like a part of me.	0.914			
Living in this area tells me who I am. #				
I am very attached to this place.	0.898			
This place means a lot to me.	0.879			
Dwelling unit features		0.908	0.935	0.783
Living area#				
Dinning space	0.854			
Bedroom space	0.873			
Toilet	0.912			
Bathroom	0.900			
Residential place WOM intention		0.837	0.925	0.860
I will tell the people around me about the good things about this area.	0.914			
If someone asks about choosing a residential area, they will recommend living in this area.	0.913			
Residential place PEB (Pro-environmental behavior)		0.881	0.913	0.677
If necessary, I will reduce my visits to my favorite places here to avoid environmental damage.	0.800			
I'm going to tell my friends not to feed the animals recklessly here.#				
I am signing a signature campaign to support the protection of community recreational spaces and the natural environment.	0.803			
I will try my best to know a lot about the leisure space and natural environment of the local community.	0.847			
I am willing to pay if the cost of using the leisure space and natural environment of the community is introduced.	0.814			
I will reduce my visits to my favorite places if necessary to restore the recreational spaces and natural environment of the community.	0.850			

CR, composite reliability; AVE, average variance extracted.

Meanwhile, eco-friendly material, management office service, and economic value are the drivers of place identity. The findings indicate that residents as a whole value these three elements more than other elements in shaping their identity on the place.

Our study shows that males and females show a difference in assessing a couple of residential environment elements. While males consider public facilities concerned with parking, children-related facility, road, and sidewalk important in shaping their dependence on the place, females do not. Females consider green/recreational area important in affecting their dependence on the place, while males do not. It is possible that females utilize the recreational space more often than males, and, thus, place more weights on green/recreational area.

The study finds that green/recreational area and eco-friendly material are the driving forces behind residents' place identity for females. This means that female residents view these elements in forming their self-identity as these elements have a special meaning to

TABLE 3 Fornell-Larcker criterion.

Constructs	1	2	3	4	5	6	7	8	9	10	11	12
1. Eco-friendly material	**0.896**											
2. Management office service	0.498	**0.879**										
3. Dwelling unit features	0.501	0.585	**0.885**									
4. Public facilities	0.627	0.563	0.632	**0.801**								
5. Social environment	0.479	0.577	0.668	0.611	**0.819**							
6. Economic value	0.568	0.539	0.630	0.662	0.599	**0.794**						
7. Green/recreational area	0.495	0.550	0.653	0.619	0.652	0.626	**0.839**					
8. RPD	0.627	0.565	0.628	0.627	0.597	0.661	0.661	**0.846**				
9. RPI	0.542	0.583	0.598	0.553	0.588	0.606	0.700	0.765	**0.894**			
10. RPWOM	0.449	0.582	0.659	0.558	0.641	0.651	0.725	0.752	0.763	**0.921**		
11. RPPEB	0.453	0.561	0.609	0.544	0.630	0.594	0.736	0.702	0.730	0.759	**0.927**	
12. RPSAT	0.466	0.556	0.498	0.514	0.497	0.492	0.554	0.490	0.541	0.534	0.513	**0.823**
Mean	4.18	4.66	4.95	4.69	4.61	4.79	4.93	4.43	4.68	4.94	4.86	4.78
SD	1.34	1.21	1.14	1.25	1.20	1.21	1.19	1.21	1.25	1.22	1.22	1.07

Bold: The square root of the variance shared between the constructs and their measures (AVE). All correlations coefficients are significant at the level of $p = 0.001$. RPD, residential place dependence; RPI, residential place identity; RPSAT, residential place satisfaction; RPWOM, residential place WOM; RPPEB, residential place pro environmental behavior.

TABLE 4 Heterotrait-monotrait ratio (HTMT).

Constructs	1	2	3	4	5	6	7	8	9	10	11	12
1. Eco-friendly material												
2. Management office service	0.525											
3. Dwelling unit features	0.539	0.632										
4. Public facilities	0.676	0.607	0.695									
5. Social environment	0.520	0.626	0.744	0.673								
6. Economic value	0.625	0.595	0.711	0.745	0.681							
7. Green/recreational area	0.530	0.591	0.715	0.672	0.723	0.701						
8. RPD	0.681	0.612	0.693	0.690	0.663	0.746	0.724					
9. RPI	0.580	0.627	0.655	0.600	0.650	0.675	0.761	0.840				
10. RPSAT	0.482	0.628	0.724	0.606	0.713	0.729	0.791	0.827	0.835			
11. RPWOM	0.508	0.632	0.698	0.618	0.730	0.698	0.837	0.807	0.833	0.869		
12. RPPEB	0.508	0.609	0.556	0.571	0.560	0.564	0.615	0.551	0.600	0.594	0.596	

RPD, residential place dependence; RPI, residential place identity; RPSAT, residential place satisfaction; RPWOM, residential place WOM; RPPEB, residential place pro environmental behavior.

them. Green/recreational area is shown to have a greater impact on females than males in forming place identity. This result is consistent with the impact of green/recreational area on place dependence. Males consider eco-friendly material more in forming place identity than females.

This study finds that place dependence and identity have differently influence satisfaction and WOM intention. This means that different dimensions of place attachment may drive resident's overall feelings and WOM behavior. Our interpretation is that those residents value functions and symbolic meanings of the place in evaluating places and in determining WOM behavior. The study finds that the effect of place identity on pro-environmental behavior is significant. While the effect of place dependence on pro-environmental behavior is not significant, the effect of place identity on pro-environmental behavior is not significant is significant. Place identity is an important predictor of pro-environmental behavior.

Implications

Theoretical implications

This research makes some theoretical contributions to the literature by drawing from concepts from environmental psychology and marketing (Mehrabian and Russell, 1974; de Matos and Krielow, 2018; Lee et al., 2021), included elements related to environmentalism (i.e., green/recreational area and eco-friendly material), house features, social aspect, public facilities around the place, value, and

TABLE 5 Structural estimates (PLS).

	Paths	Model 1 Estimate	t	p		Model 2 Estimate	t	p	
H1-1	Eco-friendly material → RPD	0.246	5.811	0.000	*p* < 0.001	0.225	3.829	0.000	*p* < 0.001
H1-2	Management office service → RPD	0.084	1.853	0.064	n.s	0.122	1.840	0.066	n.s
H1-3	Dwelling unit features → RPD	0.114	2.325	0.020	*p* < 0.05	0.109	1.636	0.102	n.s
H1-4	Public facilities → RPD	0.048	0.859	0.390	n.s	−0.095	1.201	0.230	n.s
H1-5	Social environment → RPD	0.061	1.361	0.173	n.s	0.091	1.395	0.163	n.s
H1-6	Economic value → RPD	0.192	4.085	0.000	*p* < 0.001	0.206	3.038	0.002	*p* < 0.01
H1-7	Green/recreational area → RPD	0.229	4.043	0.000	*p* < 0.001	0.324	4.723	0.000	*p* < 0.001
H2-1	Eco-friendly material → RPI	0.155	3.445	0.001	*p* < 0.01	0.077	1.340	0.180	n.s
H2-2	Management office service → RPI	0.170	3.802	0.000	*p* < 0.001	0.141	2.372	0.018	*p* < 0.05
H2-3	Dwelling unit features → RPI	0.073	1.478	0.139	n.s	0.073	1.069	0.285	n.s
H2-4	Public facilities → RPI	−0.055	0.997	0.319	n.s	−0.122	1.895	0.058	n.s
H2-5	Social environment → RPI	0.067	1.449	0.147	n.s	0.123	2.035	0.042	*p* < 0.05
H2-6	Economic value → RPI	0.133	2.692	0.007	*p* < 0.01	0.106	1.596	0.110	n.s
H2-7	Green/recreational area → RPI	0.390	6.692	0.000	*p* < 0.001	0.543	8.483	0.000	*p* < 0.001
		0.407	8.608	0.000	*p* < 0.001	0.407	8.605	0.000	*p* < 0.001
H3-1	RPD → RPSAT	0.180	3.453	0.001	*p* < 0.01	0.180	3.453	0.001	*p* < 0.01
H3-2	RPD → RPWOM	0.078	1.171	0.241	n.s	0.078	1.172	0.241	
H3-3	RPD → RPPEB	0.451	9.337	0.000	*p* < 0.001	0.451	9.337	0.000	*p* < 0.001
H4-1	RPI → RPSAT	0.278	4.078	0.000	*p* < 0.001	0.278	4.078	0.000	*p* < 0.001
H4-2	RPI → RPWOM	0.282	3.672	0.000	*p* < 0.001	0.282	3.672	0.000	*p* < 0.001
H4-3	RPI → RPPEB	0.412	6.950	0.000	*p* < 0.001	0.412	6.950	0.000	*p* < 0.001
H5-1	RPSAT → RPWOM	0.261	3.365	0.001	*p* < 0.01	0.261	3.365	0.001	*p* < 0.01
H5-2	RPSAT → RPPEB	0.246	5.811	0.000	*p* < 0.001	0.029	0.543	0.587	n.s
						−0.052	0.948	0.343	n.s
	Gender * Eco-friendly material → RPD					0.336	3.260	0.001	*p* < 0.01
	Gender * Eco-friendly material → RPI					0.177	1.727	0.084	n.s
	Gender * Management office service → RPD					−0.022	0.237	0.813	n.s
	Gender * Management office service → RPI					0.060	0.628	0.530	n.s
	Gender * Dwelling unit features → RPD					0.001	0.008	0.994	n.s
	Gender * Dwelling unit features → RPI					0.051	0.549	0.583	n.s
	Gender * Public facilities → RPD					−0.088	1.013	0.311	n.s
	Gender * Public facilities → RPI					−0.164	1.835	0.067	n.s
	Gender * Social environment → RPD					−0.248	2.530	0.011	*p* < 0.05
	Gender * Social environment → RPI					−0.417	4.064	0.000	*p* < 0.001

(Continued)

TABLE 5 (Continued)

Paths	Model 1				Model 2			
	Estimate	t	p		Estimate	t	p	
Gender * Economic value → RPD					−0.067	0.786	0.432	n.s
Gender * Economic value → RPI					0.072	0.877	0.380	n.s
Gender * Green/recreational area → RPD					0.066	0.756	0.450	n.s
Gender * Green/recreational area → RPI					0.209	2.223	0.026	$p < 0.05$
Gender → RPB					0.225	3.829	0.000	$p < 0.001$
Gender → RPI					0.122	1.840	0.066	n.s
	R^2	Q^2			R^2	Q^2		
RPD	0.618	0.600			0.638	0.531		
RPI	0.589	0.570			0.622	0.481		
RPSAT	0.650	0.572			0.650	0.595		
RPWOM	0.642	0.546			0.642	0.557		
RPPEB	0.330	0.366			0.330	0.372		

***$p < 0.001$, **$p < 0.01$, *$p < 0.05$; n.s., not significant; RPD, residential place dependence; RPI, residential place identity; RPSAT, residential place satisfaction; RPWOM, residential place WOM; RPPEB, residential place pro environmental behavior; Gender (0 = Female, 1 = Male).

service. By embracing various elements, the study reveals relative impacts of the residential environment elements on place attachment. The residential environmental elements that are most important in influencing two dimensions of place attachment are eco-friendly material and green/recreational area. Green/recreational area is considered more important to females than males in determining place attachment. On the other hand, eco-friendly material is more important to males than females in influencing place identity. Another crucial element is economic value which is based on residents' cognitive evaluation of the offerings, and is found to be a crucial element that influences place dependence, not place identity.

Another contribution of the study is related to the integration of cognitive, affective, and conative components of attitude. This study, based on the model of hierarchy of effects (Smith et al., 2008; Hsiao, 2020), identified how cognitive evaluation of the residential environment elements influences affective responses (place attachment and satisfaction), which in turn, influence behavior (WOM intention and PEBs). Thus, the findings support the model of hierarchical effects and suggest that future studies may want to consider cognitive and affective responses in studying residents' behaviors. Using the reciprocity principle of the social exchange theory (Emerson, 1976; Nunkoo and Ramkissoon, 2011), this study examined the role of affective responses in influencing WOM behavior. The significant result suggests that the reciprocity principle is applicable to the residential studies. Based on place attachment theory (Kim et al., 2017; Lee et al., 2019). And conservation of resources theory (Hobfoll et al., 1990; Gosling and Williams, 2010), our study anticipated that residents who are affectively attached to the place will be involved in pro-environmental behavior. The significant finding suggests that conservation of resources theory is helpful for explaining residents' pro-environmental behavior. The finding that place identity (not place dependence) and satisfaction are important predictors of

pro-environmental behavior suggests that positive affective responses are a determinant of pro-environmental behavior.

Finally, this study makes a theoretical contribution by showing differences between males and females in their assessment of the residential environment elements and place attachment. The differences are found in their assessment of public facilities, eco-friendly material, and green/recreational area. The gender-based differences suggest that males and females have a different attitude toward eco-friendly housing and consider different elements in evaluating the place. Future research may be needed to understand the underlying causes of the differences.

Practical implications

This study offers several practical implications. First, the study finding related to the importance of eco-friendly material and green/recreational area, suggests that developers should use appropriate material and design to label the housing as eco-friendly. In creating a marketing communication material, developers may want to emphasize the fact they address environmentalism by using eco-friendly material and offering green/recreational spaces. Residents are also found to consider economic value a crucial factor. Developers may want to emphasize many different economic benefits associated with eco-friendly housing in their promotional material.

The differences between males and females have some practical implications. The finding shows that males value eco-friendly material and public facilities more than females. On the other hand, females consider green/recreational area environment more than males. The finding suggests that developers and marketers focus on green/recreational area in their communication to females as it impacts their place dependence and identity and thereafter their WOM intention. For example, a message to female buyers may want to emphasize safety

and security of the community and quiet environment. If the main decision-maker is a male, the message may be modified to focus on building material (e.g., eco-friendly material) and public facilities (e.g., abundant and convenient parking spaces). The study finding suggests that developers and marketers tailor their offerings and communication based on gender and consider the diverse needs of males and females in designing and building residential complexes.

One of the interesting findings is related to the effect of gender on pro-environmental behavior. While pro-environmental behavior is driven by overall satisfaction and place identity. Place dependence is found to have no impact on pro-environmental behavior. As discussed before, place dependence is related to function of the place. Satisfaction and place identity are concerned with pleasurable feelings and emotional attachment. Emotional response is critical in transforming residents' behavior. This finding suggests that developers should make efforts to establish an emotional tie with the residents. Residents' pro-environmental behavior and WOM are especially important to local governments in rural areas who are faced with declining population and rising debts. Our study finding suggests that pro-environmental behavior can be shaped, and affective responses are critical for influencing the behavior. Given that eco-friendly material and green/recreational area are two strong predictors of place attachment, developers and local governments alike should take into consideration environmental issues from designing and building to marketing. For example, local governments may want to use incentives to encourage developers to create green spaces within the community.

Limitations and future research

The study limitations and directions for future research are discussed as follows. First, this study examined a comprehensive set of residential environment elements and its effect on place attachment. Future studies may want to study some psychological variables such as attitude toward eco-friendly housing and personal values. Although our study revealed some differences between males and females, the study could not pinpoint the underlying causes. Future studies may want to investigate what causes males and females to respond differently toward eco-friendly housing. For example, what makes males more interested in public facilities and eco-friendly material than females? Second, the R^2 value (0.330) for pro-environmental behavior was relatively lower than other R^2 values (0.589–0.650). Future studies may want to consider some other variables (e.g., place environmental concern, Lee et al., 2014a house types, Azimi and Esmaeilzadeh, 2017; comparison of general purchase households and resettled cooperative households, Oh

and Lee, 2003) that may account for pro-environmental behavior. This will be a critical issue from the government who wants to promote citizens' involvement in pro-environmental behavior. Lastly, this study was conducted in Seoul, S. Korea. Seoul is a city full of condominiums with little green space. The importance rating of residential environment elements may be different for other areas (e.g., suburban area, rural area). Future studies may want to collect data from different residential areas to compare the results.

Data availability statement

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

Author contributions

JS, J-JY, and Y-KL designed the study, collected the data, and contributed to manuscript writing, and data analysis. SC contributed to the literature review, manuscript writing, and data analysis. All authors contributed to the article and approved the submitted version.

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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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