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# Beyond "Go Green": Matching Message Framing to Consumers' eco Knowledge to Boost Advertising Effectiveness through Brand Authenticity

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**Abstract**

Marketers use gain- or loss-framed messages to promote sustainable products. However, the boundary conditions for their effectiveness remain underexplored. This study examines how distinct dimensions of environmental knowledge—subjective (confidence) and objective (competence)—interact with message framing to influence green advertising effectiveness. The findings reveal that subjective environmental knowledge (SEK) enhances advertising effectiveness in gain-framed messages but diminishes it in loss-framed contexts. Conversely, objective environmental knowledge (OEK) increases effectiveness in loss-framed messages but reduces it in gain-framed settings. Furthermore, perceived authenticity mediates these relationships, though the mechanism varies by context. While authenticity drives the effectiveness of gain-framed messages for both SEK and OEK, its mediating role in loss-framed messages is significant only for consumers with high OEK. These results have critical implications for segmentation and targeting. In crafting green advertising strategies, marketers should move beyond treating consumers as a singular monolith and, instead, tailor message frames to match the specific knowledge profile of their target audience to foster authentic brand relationships.

**Keywords:** Message framing; Environmental knowledge; Green advertising effectiveness; Authenticity; Mediating model

## 1. Introduction

Green advertising plays a crucial role in promoting consumer awareness of environmental issues and influences green purchasing behaviors (Chang et al., 2015; D'Souza & Taghian, 2005; Jiang et al., 2024). With the significant improvement in society's overall environmental awareness, the persuasive functions of green advertising have gained prominence (Kim et al., 2019), becoming an indispensable component in fostering a sustainable society. However, the effectiveness of green advertising is fundamentally contingent upon consumers' environmental knowledge, which serves as a critical mediating mechanism between advertising exposure and purchase intentions (Li, 2025). Concurrently, digital marketing

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advancements and personalized consumer needs have escalated the demand for customized green advertising (Olsen & Pracejus, 2020). Nevertheless, a significant knowledge gap persists wherein many consumers lack sufficient environmental literacy to effectively process green advertising claims (Li, 2025; Yang et al., 2024), resulting in advertisements that either overwhelm consumers with excessive information (Rodero, 2020; Rodero & Potter, 2021) or omit essential details (Agarwal & Kumar, 2021; Kumar et al., 2021), thereby negatively affecting consumer decision-making (Johar, 2016; Rodero, 2020).

Recent research emphasizes that inappropriate green marketing stimuli can backfire, thus triggering psychological resistance rather than fostering positive brand resonance (Guo et al., 2025). In the context of green advertising, this tension highlights a critical issue regarding how consumers process such information: while generic knowledge measures suggest that high knowledge leads to better decisions (Li, 2025; Schmuck et al., 2018; Taufique et al., 2016), advertisers often overlook the divergence between consumers' perceived confidence and actual competence. Without addressing this distinction, explaining why specific ad strategies succeed for some consumers but fail for others is especially difficult. Consequently, enhancing the effectiveness of green advertising within this complex, diverse landscape is recognized as a paramount concern for manufacturers, media practitioners, and academics (Chang et al., 2015; Kim et al., 2019; Segev et al., 2016), highlighting the critical need to align advertising strategies with different cognitive types of environmental knowledge.

The relevant literature distinguishes two dimensions of environmental knowledge—subjective and objective—which have different impacts on consumers' eco-friendly behaviors (Dursun et al., 2019; Ellen, 1994). *Subjective environmental knowledge* (SEK) reflects consumers' perceived confidence in their own understanding (Alba & Hutchinson, 2000), which is believed to amplify the subjective attribution of actions and is closely associated with personal experiences (Wong-Parodi & Berlin Rubin, 2022). In contrast, *objective environmental knowledge* (OEK) represents consumers' actual competence and accuracy regarding factual information (Carlson et al., 2009; Moorman et al., 2004), often serving as a driving factor for actual pro-environmental actions, though it lacks a significant relationship with ultimate behavior (Ellen, 1994). However, despite these clear theoretical distinctions, advertising researchers have often treated environmental knowledge as a unidimensional construct (Gao et al., 2022; Taufique et al., 2016), thereby leaving a gap in the literature regarding how confidence and competence distinctly shape information processing outcomes, which, in turn, obscures the boundary conditions of green advertising and make it difficult to predict when a campaign will succeed or fail.

In terms of advertising strategy, prior research on green advertising effectiveness has generally fallen into one of two categories: exploring (1) whether green appeals are perceptible via consumer judgment standards (Banerjee et al., 1995) or (2) whether the information structure—specifically ad appeal—aligns with basic content models (Iyer & Banerjee, 1993; Stafford et al., 1996). Substantial evidence demonstrates that message framing (gain vs. loss) significantly influences green advertising outcomes (Chang et al., 2015; Dong et al., 2025; Segev et al., 2015); however, the boundary conditions governing these effects remain underexplored. Concurrently, the relevant literature indicates that consumers' environmental knowledge plays a critical role in determining advertising effectiveness (Li, 2025; Schmuck et al., 2018; Zhang et al., 2024), but the interplay between message framing and environmental knowledge has not been sufficiently examined (Fu & Gao, 2023), particularly regarding how distinct types of environmental knowledge interact with different message frames to enhance advertising effectiveness. Addressing this issue requires investigating both the congruence between message frames and environmental knowledge types and their interactive impacts on both green purchase intentions and advertising/brand attitudes.

The underlying mechanism through which the match between message frames and environmental knowledge influences green advertising effectiveness also remains unclear. However, Shoenberger et al. (2020) showed that perceived authenticity significantly enhances advertising evaluations and consumer purchase intentions, and Yang et al. (2021) reported that different message frames elicit varying emotional and cognitive responses, which in turn shape individuals' authenticity evaluations. Moreover, distinct knowledge levels influence these cognitive reactions during the assessment of ad authenticity (Beverland & Farrelly, 2010; Moon et al., 2023). Consequently, we posited that perceived authenticity serves as a crucial mechanism linking the interaction of message framing and consumer knowledge to advertising effectiveness. However, empirical literature addressing this mediating effect remains limited.

The objectives of this study were twofold: (1) to investigate the interactive effect between advertising message frames (gain vs. loss) and distinct types of environmental knowledge (SEK vs. OEK) on the effectiveness of green advertising, and (2) to explore the mediating role of perceived authenticity within this interaction, if any. Drawing on prospect theory (Van 't Riet et al., 2016) and consumer knowledge theory (Llewellyn, 2021), we conducted two studies to test these relationships. The main findings suggest a distinct double dissociation: consumers' SEK enhances the effectiveness of gain-framed messages but diminishes it for loss-framed ones, whereas consumers' OEK amplifies the effectiveness of loss-framed messages but reduces it for gain-framed ones. Additionally, we examined the mediating role of authenticity in the relationship between environmental knowledge and green advertising effectiveness across different message frames.

To reveal insightful findings and demonstrate our contributions to the green marketing literature, we sought to go beyond reporting the empirical results of matching effects to illustrate the underlying story that unpacks the cognitive mechanisms of consumer decision-making (Wang, 2025). Based on the well-identified research gaps, the novelty of this study design lies in (1) deriving the matching between distinct environmental knowledge dimensions (SEK vs. OEK) and message frames through the theoretical lenses of confidence and competence, and (2) explicating the mechanism of perceived authenticity that drives the effectiveness of such congruence. Theoretically, this approach can delineate the distinct roles of consumers' perceived confidence (SEK) and actual competence (OEK) in processing framed messages, thereby enriching the understanding of how internal cognitive states interact with external persuasion cues. Managerially, our study offers a strategic framework for marketers, advertisers, and policymakers. By moving beyond treating consumers as a single entity and, instead, tailoring message frames to match the specific knowledge profiles of their target audience, practitioners can foster authentic brand relationships, reduce marketing costs, and improve the overall effectiveness of green advertising.

The remainder of this paper is organized as follows. Section 2 defines message framing and environmental knowledge, reviews significant findings, and introduces our conceptual model and hypotheses. Section 3 reports the empirical results regarding the impact of SEK and OEK on green advertising effectiveness across message frames. Section 4 further explores the mediating role of authenticity in these relationships. Finally, Section 5 summarizes the theoretical and managerial implications and suggests future research directions.

## 2. Theoretical Background and Research Hypotheses

### *2.1 Message Framing*

Message framing allows manufacturers to effectively achieve desirable advertising outcomes by conveying product information to consumers. Tversky and Kahneman (1981) classified advertising messages into gain-framing and loss-framing. Gain-framing emphasizes the positive consequences of

taking action, whereas loss-framing highlights the negative consequences of inaction (Levin et al., 1998). According to the prospect theory proposed by Tversky and Kahneman (1981), individuals exhibit varying responses to the same information. The presentation of information in different ways, emphasizing gains or losses, influences people's behavior and judgments (Maheswaran & Meyers-Levy, 1990). Moreover, individuals demonstrate diverse behavioral choices when confronted with different message frames, owing to variations in individual traits (Amatulli et al., 2019; Dai & Gong, 2024; Septianto et al., 2019). Gain framing is more effective than loss framing in generating short-term environmental benefits, while loss framing is more effective for promoting long-term environmental benefits. This is supported by research on green advertising by Schwarz (2012). Similar differences in response exist across domains ranging from green advertising to risk appetite (Detweiler et al., 1999; Van 't Riet et al., 2016), persuasiveness (Yan et al., 2010), health management (Gallagher & Updegraff, 2012; Spina et al., 2018), food waste (Khalil et al., 2021), and consumer behavior (Baxter & Gram-Hanssen, 2016). Therefore, when employing green advertising to promote eco-friendly consumer awareness and purchase behavior, manufacturers should select the appropriate message framing based on the characteristics of their target consumers, as it effectively influences behavioral decisions that align with manufacturers' expectations. By enabling customized green advertising that caters to individual differences, manufacturers can enhance the effectiveness of their advertising and, ultimately, foster greater success in promoting sustainable consumer behavior.

### *2.2 Environmental Knowledge*

Environmental knowledge, a crucial factor, allows consumers to express their unique characteristics alongside demographic variables (Frick et al., 2004). It encompasses individuals' environmental protection awareness, including the natural environment, environmental issues, and actions (Braun & Dierkes, 2019; Pratiwi et al., 2018; Rahman et al., 2019). Prior research has presented divergent perspectives on the role of environmental knowledge in influencing consumers' green consumption behavior. Some scholars argue that environmental knowledge positively impacts consumers' green consumption behavior (Liu et al., 2018; Sadiq et al., 2021), whereas others contend that it does not significantly influence green consumption behavior (Oskamp, 2000). We posit that the efficacy of environmental knowledge can be evaluated within the social context in which consumers operate. If individuals play a leading role in environmental protection efforts, environmental knowledge positively influences their eco-friendly behavior. Conversely, when government responsibility for environmental protection is emphasized, consumers may not exhibit positive environmental behavior and may even engage in behaviors detrimental to green consumption. This highlights the importance of environmental knowledge in terms of responsibility.

However, relying solely on this social context fails to comprehensively explain the mixed results and contradictions in existing research. This study suggests that understanding the nature of environmental knowledge itself is the key to resolving these conflicts. Consumers' cognitive processing of green marketing communications directly influences their green consumption practices.

In green consumption, consumers possess varying levels of OEK and SEK. Moorman et al. (2004) categorized the knowledge based on consumers' evaluation, distinguishing between the two types. *Objective knowledge* represents consumers' actual competence regarding accurate, fact-based information that relies on abilities and professional expertise (Carlson et al., 2009; Moorman et al., 2004). *Subjective knowledge* pertains to individuals' self-perceived understanding and confidence, stemming from professional knowledge, personal experiences, and situational factors (Alba & Hutchinson, 1987).

In essence, objective knowledge reflects what one knows, whereas subjective knowledge reflects what one thinks one knows (Alba & Hutchinson, 2000).

Prior research has discussed the similarities and dissimilarities between objective and subjective knowledge with respect to their relationship with consumer behavior. Both types of knowledge can impact consumers' psychological variables, such as behavioral motivation and norms (Raju et al., 1995). However, subjective knowledge positively influences certain behavioral variables like product or brand information acquisition, whereas objective knowledge often exhibits an inverted U-shaped relationship (Raju et al., 1995). To illustrate, when buying an energy-saving fridge, consumers with SEK tend to focus on specific details, such as energy savings and environmental benefits. In contrast, consumers with OEK may prioritize details, such as the use of new refrigerants.

Additionally, although one's objective knowledge often determines the extent of their subjective knowledge, consumers may subjectively believe they possess correct knowledge even when objectively incorrect because subjective knowledge is also influenced by factors (Carlson et al., 2009). For instance, some consumers consider the idea that frequently drinking boiled water harms health as subjectively correct, although it is objectively incorrect. Under the influence of subjective and objective knowledge, consumers' behavioral outcomes may be either consistent or different (Fatha & Ayoubi, 2023). Therefore, for this study, we categorized environmental knowledge into OEK—which represents factual and precise competence regarding environmental protection—and SEK, which reflects consumers' self-assessed confidence and understanding of environmental preservation.

### *2.3 Impact of the Interactive Effects of Message Framing and Environmental Knowledge on the Effectiveness of Green Advertising*

Consumers' perceptions of green advertising and their behavioral decision-making are both influenced by the message framing of green advertising and the consumers' environmental knowledge (Jin & Han, 2014). Previous research has predominantly examined the relationship between variables from a single perspective, focusing on either message framing or environmental knowledge. For example, Ekebas-Turedi et al. (2021) investigated the direct influence of message framing on consumers' responses to green advertising. However, the impact of message framing can vary across situations. For example, in text-based advertising, the loss frame tends to appeal more strongly to consumers (Gómez-Carmona et al., 2021). Moreover, loss-framed messages are more persuasive for less-involved consumers than gain-framed messages regarding green advertising effectiveness (Wu et al., 2021). Therefore, it is crucial to explore the matching effects of message framing and consumers' characteristics to understand the effectiveness of green advertising further (Fu & Gao, 2023).

As a personal characteristic, environmental knowledge plays a significant role in determining the effectiveness of green advertising, as it can improve consumers' purchase intentions for green products (Pratiwi et al., 2018; Rahman et al., 2019). For this study, we posited that explaining the effectiveness of consumers' responses to green advertising from the perspective of message framing and environmental knowledge is insufficient. The message-framing perspective overlooks consumers' characteristics and unique responses based on these characteristics (Fu & Gao, 2023), while the environmental knowledge perspective fails to recognize that external stimuli are the fundamental trigger for activating consumers' psychological processes (Fu & Gao, 2023). Hence, we combined message framing and environmental knowledge to comprehensively explore the impact of the interaction between the two on the effectiveness of green advertising.

Prior research examining the interaction between message framing and subjective knowledge has revealed that consumers with varying subjective knowledge respond differently to message framing and

exhibit significant variations in their purchase intentions (Jin & Han, 2014). For example, loss framing tends to elicit stronger reactions from consumers with lower subjective knowledge, particularly regarding food safety concerns (Jin & Han, 2014). Moreover, scholars suggest that advertisements that utilize loss-framing are more persuasive for consumers with higher levels of objective knowledge (Kim & Park, 2010). Ardoin et al. (2015) examined how message framing and environmental knowledge influence purchase intentions. They discovered that gain-framing worked better for consumers with high subjective knowledge, while loss-framing was well-suited for those with low subjective knowledge. Moreover, loss-framing was more effective for consumers with high objective knowledge, and gain-framing was better for those with low objective knowledge.

Regarding the impact of green advertising, the literature suggests that the interaction between SEK and message framing is driven by motivational mechanisms such as self-verification and defensive processing (Campbell & Kirmani, 2000; Li & Shi, 2026; Stuppy et al., 2020). An increase in SEK enhances consumers' confidence in their subjective understanding of eco-friendly related information (Alba & Hutchinson, 1987; Moorman et al., 2004). According to self-verification theory, consumers are motivated to confirm their positive self-views (Escalas & Bettman, 2003; Swann et al., 1992). Gain-framed messages, which emphasize positive outcomes, align congruently with these consumers' positive self-concepts, thereby serving as a form of confidence affirmation that facilitates persuasion (Escalas & Bettman, 2005; Kim & Chen, 2025; Lee & Aaker, 2004). However, in a loss-framing condition, the negative information may be perceived as a threat to their ego or competence (Shiv et al., 1997). When confidence conflicts with threatening information, individuals often engage in defensive processing or psychological reactance to protect their self-concept (Bhattacharjee et al., 2014; Darke & Ritchie, 2007; Riedel et al., 2024). Consequently, this defensive reaction undermines and negatively affects their evaluation of green advertising effectiveness. Conversely, in the gain-framing condition, this confidence affirmation helps high-SEK consumers reaffirm their existing behaviors (Farrell et al., 2001) and identify with green advertising, positively influencing its effectiveness.

In contrast, OEK is believed to operate through a cognitive mechanism based on diagnostic processing (Hong & Sternthal, 2010; Nam et al., 2012). An increase in OEK leads to a more rational evaluation of green advertisements. Information-processing studies suggest that consumers with high OEK possess the cognitive resources to process complex negative information without feeling overwhelmed (Elsharnouby et al., 2021; Ketelaar et al., 2015; Xia & Sudharshan, 2002). Loss-framing allows consumers to rationalize and assess the risks and consequences of not using green products for themselves and the environment. As negative information is often viewed as more diagnostic and informative than positive information (Brunk & de Boer, 2020; Floyd et al., 2014; Rozin & Royzman, 2001), high-OEK consumers utilize loss frames to activate their preference for risk prevention (Detweiler et al., 1999; Van 't Riet et al., 2016), positively influencing green advertising effectiveness.

Conversely, in a gain-framing condition, more rational consumers accurately evaluate the trade-off between the inherent costs and benefits associated with adopting green products (Fu & Gao, 2023). Gain frames often lack the urgency and the specific diagnostic cues that are present in loss frames (Chang, 2007; Lee & Aaker, 2004); hence, the likelihood of purchasing green products diminishes if they perceive that the benefits are insufficient and the costs outweigh them. Therefore, we proposed the following:

**H1a**: In loss framing, consumers' SEK has a negative effect on the effectiveness of green advertising.

**H1b**: In gain framing, consumers' SEK positively affects the effectiveness of green advertising.

**H2a:** In loss framing, consumers' OEK positively affects the effectiveness of green advertising.

**H2b:** In gain framing, consumers' OEK negatively affects the effectiveness of green advertising.

### *2.4 Mediation Effect of Authenticity*

Authenticity plays a crucial role in consumers' decision-making processes, as it is a subjective judgment based on the objective perception of a product's impression (Cinelli & LeBoeuf, 2020), and their perceptions of authenticity influence consumers' purchase decisions (Nunes et al., 2021). Authenticity encompasses six main characteristics: originality, quality commitment and credibility, heritage and style persistence, scarceness, sacredness, and purity (Liao & Ma, 2009). Given the rise of new media marketing, many manufacturers and advertisers emphasize the promotion of consumer perceptions of authenticity in their marketing activities (Kreling et al., 2022). Scholars have explored various domains such as live delivery, augmented reality marketing, and blog marketing, recognizing authenticity as a crucial variable for improving advertising evaluation and consumers' purchase intentions (Shoenberger et al., 2020; Sung, 2021; van Esch et al., 2018).

Consumers' desire for product authenticity revolves around reality, accuracy, and sincerity, reflecting their self-image and worldview (Kim & Huang, 2021). Researchers have identified factors, such as celebrity endorsement (Moulard et al., 2015), the perceived credibility of authenticity claims (Kim & Song, 2020), and social commitment and legitimacy (Fritz et al., 2017), that are influential in fostering consumers' perception of product authenticity. Therefore, manufacturers should provide trustworthy product information, including benefits and costs, in their advertisements to enhance consumers' perceptions of authenticity (Hajian et al., 2024; Pittman et al., 2022). However, an essential prerequisite for enhancing consumers' perception of authenticity is that consumers possess the necessary knowledge to assess the credibility of manufacturer information (Tillema, 2006).

Manufacturers and advertisers strive to capture consumer attention and generate interest in green products through green advertising while conveying relevant information (Agarwal & Kumar, 2021). Conveyance of information is crucial in capturing consumer attention (Agarwal & Kumar, 2021; Santa & Drews, 2023). The message framing employed in green advertising attracts consumer attention (Fu & Gao, 2023). However, the effectiveness of the same message frame varies among individuals because of the differences in their traits (Ropret Homar & Knežević Cvelbar, 2021).

Furthermore, consumers' engagement with their environmental knowledge during interaction is driven by curiosity about the unknown and agreement or disagreement based on existing knowledge (Wade & Kidd, 2019). Manufacturers ultimately desire consumers to perceive their products' promised benefits or avoided costs as authentic, as authenticity positively influences consumers' attitudes toward advertising and purchase intentions (Cornelis & Peter, 2017). Given these considerations, we posit that the interaction between the message frame of green advertising and consumers' environmental knowledge significantly affects consumers' perception of the authenticity of green advertising, impacting the effectiveness of green advertising. Thus, we proposed:

**H3:** Authenticity plays a mediating role in the interaction impact of the message frame and consumers' environmental knowledge on the effectiveness of green advertising.

Figure 1 presents the proposed research model and research hypotheses.

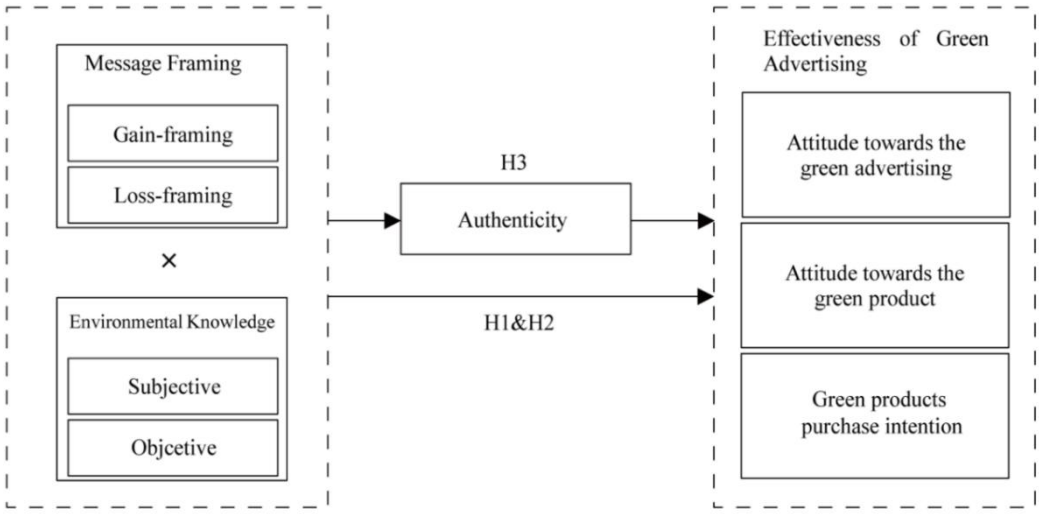


**Figure 1.** The Research Framework for Green Advertising

## 3. An Overview of the Studies

In this research, we examined the impact of message framing and environmental knowledge on green advertising effectiveness through two primary studies with two sub-studies each. Studies 1a and 1b explore the interactive effects of message framing (gain-framed vs. loss-framed) and environment knowledge (SEK vs. OEK) on green advertising's effectiveness. Studies 2a and 2b delve into the role of authenticity as a mediator in these effectiveness models.

## 4. Study 1: Message Framing, Environmental Knowledge, and Ad Effectiveness

### *4.1 Study 1a*

#### *4.1.1 Study Design*

Study 1a utilized a 2 (gain framing vs. loss framing) × 1 (SEK) between-subjects design, using renewable paper towels as experimental materials for green products. To avoid the influence of participants' existing experiences, a virtual brand named Xinyu was created (Appendix A).

The independent variables in Study 1a were message framing and consumers' SEK, whereas the dependent variable was the effectiveness of green advertising. The experiment's message framing items were adapted from Septianto et al. (2019). The gain-framing and loss-framing items were similar, with the main difference being the focus on "benefits" for gain-framing and "costs" for loss-framing. The messages used in the experiments were sourced from the 2018 Annual Report of the World Wide Fund for Nature.

We measured SEK using six items (Cronbach's $\alpha$ = .904) adapted from Raju et al. (1995). The first three items assessed the participants' (1) ability to distinguish green products, (2) judgment of the quality of green products, and (3) judgment of the environmental benefits of green products. Participants rated these items on a five-point scale, ranging from 1 = very poor to 5 = very good. Items 4 and 5 examined participants' competence in properly recycling green products and were rated on a five-point scale from 1 = very unskilled to 5 = very skilled. Item 6 measured the participants' perceived ability to recommend the purchase of green products to others, and it was rated on a five-point scale from 1 = very poor ability to 5 = very strong ability.

The effectiveness of green advertising was assessed using three constructs: (1) attitude towards green advertising, (2) attitude towards green products, and (3) green product purchase intention. The measurement of attitude toward green advertising was adapted from MacKenzie and Lutz (1989) and comprised four items (Cronbach's $\alpha$ = .931). The measurement of attitudes towards green products was based on Lee and Ang (2003) and consisted of three items (Cronbach's $\alpha$ = .937). Green product purchase intention was measured following Ansu- Mensah (2021) and included three items (Cronbach's $\alpha$ = .954). All advertising effectiveness items were measured using a five-point Likert scale, with 1 = strongly disagree and 5 = strongly agree. Appendix B provides the detailed measurement items for Study 1a.

Fifty-eight participants (24 males, 41.4%, $M_{age}$ = 21.14, SD = 6.75) were recruited offline from the Consumer Behavior Laboratory (CBL) of a University in China and divided into gain-framing and loss-framing groups, completing a consumer behavior test without interaction. Initially, they viewed a renewable paper towel ad from a virtual brand. The gain-framing group saw materials highlighting "benefits," while the loss-framing group focused on "costs." They then evaluated their SEK and completed a questionnaire on advertising effectiveness, including attitudes towards the ad and product and purchase intentions. Participants also provided their demographic details. The study ended with a thank you to the participants along with a small gift worth $1.50.

*4.1.2 Results*

Independent sample t-tests were performed to check the validity of message-framing manipulation. The participants in the gain-framing condition scored higher on emphasizing gain than those in the loss-framing condition ($M_{gain}$ = 2.80, $M_{loss}$ = -3.00, $t$ = 43.50, $p$ < .001). The results suggest that the manipulation of message-framing was successful.

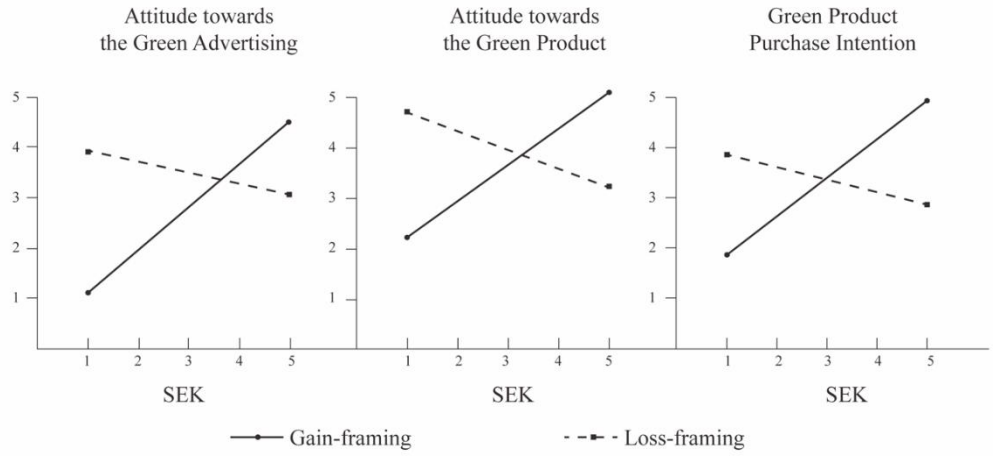


**Figure 2.** Simple Effects of SEK on Green Advertising Effectiveness

To test H1a and H1b, general linear models (GLMs) were utilized. The models' dependent variables were participants' attitudes toward the green ad and their product and purchase intentions. Independent variables included participants' average SEK, message framing (gain vs. loss), and their interaction, with age and sex as controls. The results showed a significantly negative interaction between message framing and SEK across all models. A simple effects analysis revealed that under gain framing, SEK exerted a positive influence on attitudes towards the green ad ($\beta$ = .856, $p$ < .01), attitudes towards the green product ($\beta$ = .715, $p$ < .01), and green product purchase intentions ($\beta$ = .750, $p$ < .01). Conversely, under loss framing, SEK harmed attitudes towards the green ad ($\beta$ = -.295, $p$ < .05), attitudes towards the green

product ($\beta$ = -.336, $p$ < .05), and green product purchase intentions ($\beta$ = -.209, $p$ < .10). Figure 2 illustrates the relationship between SEK and green advertising effectiveness.

A two-way analysis of variance (ANOVA) was conducted to strengthen the robustness of these findings. Following the recommendations of Fu and Gao (2023), participants with SEK values above the mean ($M_{SEK}$ = 3.28) were classified into the high subjective environmental knowledge (HSEK) group, while those with values below the mean were assigned to the low subjective environmental knowledge (LSEK) group. The analysis indicated a significant interactive effect of message framing and mean SEK on the effectiveness of green advertising across all three measures ($p$ < .01), suggesting that in gain framing, the effectiveness of green advertising for the HSEK group was greater than for the LSEK group. In contrast, the opposite pattern was observed for loss framing. Figure 3 presents the ANOVA results and the subsequent multiple comparison analysis. Hence, H1a and H1b were empirically supported.

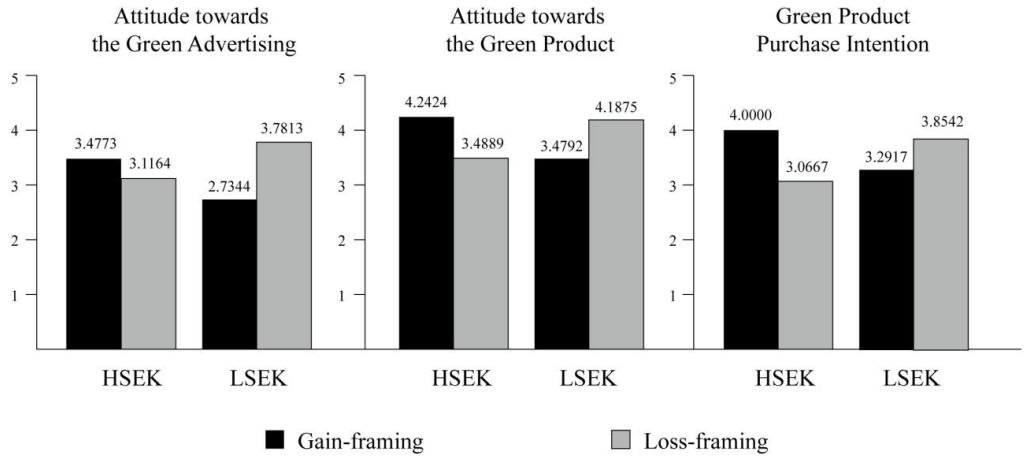


**Figure 3.** Mean of Green Advertising Effectiveness on SEK

*4.2 Study 1b*

*4.2.1 Study Design*

Study 1b explored the interactive effect of consumers' OEK and message framing on the effectiveness of green advertising, employing a 2 (gain-framing vs. loss-framing) × 1 (OEK) between-subjects design. The experimental materials for the green products remained consistent with the virtual brand of the renewable paper towels used in Study 1a.

Study 1b focused on the independent variables of message framing (gain framing and loss framing) and consumers' OEK, while the dependent variable was the effectiveness of green advertising.

The measurement of consumers' OEK was adapted from a study conducted by Wang et al. (2020). It utilized a set of eight true or false questions (please refer to the Appendix B). Participants were required to assess the accuracy of these eight questions, awarding one point for a correct judgment and zero points for an incorrect judgment. Participants' scores ranged from 0 to 8 on the OEK scale. All other measurements, including message framing and the effectiveness of green advertising, were defined as previously described. Cronbach's $\alpha$ values for attitude toward green advertising, green products, and green product purchase intention were .971, .977, and .987, respectively. As in Study 1a, 75 undergraduate students (21 males, 28%, $M_{age}$ = 19.04, SD = .97) from the CBL were recruited for Study 1b. These participants were randomly assigned to either the gain or loss-framing groups. They were

required to assess their OEK and complete a questionnaire to assess the effectiveness of green advertising. The investigation followed the same procedure as Study 1a.

*4.2.2 Results*

Study 1b utilized GLMs to examine H2a and H2b. In Study 1b, all independent variables related to SEK in Study 1a were replaced with OEK. The dependent and control variables were consistent with those previously defined. The analysis revealed a statistically significant interaction effect between message framing and aggregate OEK score on the effectiveness of green advertising ($p < .01$). Within the gain-framing condition, a higher OEK score was associated with negative impacts on attitudes toward green advertising ($\beta = -.407$, $p < .05$), green product attitudes ($\beta = -.494$, $p < .01$), and green product purchase intentions ($\beta = -.474$, $p < .01$). Conversely, in the loss-framing condition, OEK positively influenced attitudes towards green advertising ($\beta = .400$, $p < .05$), green product attitudes ($\beta = .359$, $p < .05$), and green product purchase intentions ($\beta = .307$, $p < .05$). Figure 4 presents the GLM results, supporting H2a and H2b. Additionally, the findings from the two-way ANOVA and multiple comparison tests further corroborated these results (Appendix C).

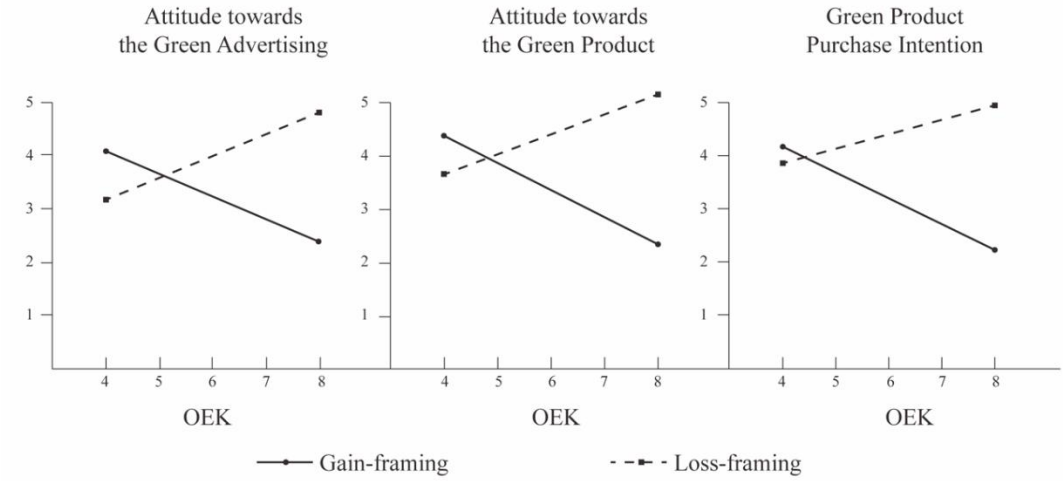


**Figure 4.** Simple Effects of OEK on Green Advertising Effectiveness

*4.3 Unified Analysis of Knowledge Type and Message Framing*

To further test the overarching theoretical framework and compare how the impact of knowledge levels on advertising effectiveness varies across different message frames and knowledge dimensions, we integrated the data from Studies 1a and 1b into a unified analytical model ($n = 133$). Given that SEK and OEK represent distinct psychological constructs measured using different scales, the continuous knowledge scores were standardized (i.e., Z-scores) within each sample prior to the analysis to ensure statistical comparability.

An analysis of covariance (ANCOVA) was conducted using a 2 (Message framing: gain vs. loss) × 2 (Knowledge dimension: SEK vs. OEK) × Standardized knowledge score design, controlling for participants' ages and gender. Consistent with our theoretical framework, the unified model yielded a highly significant three-way interaction effect across all three measures of green advertising effectiveness: attitudes toward green advertising ($F = 27.418$, $p < .001$), green product attitudes ($F = 27.341$, $p < .001$), and green product purchase intentions ($F = 17.192$, $p < .001$).

Importantly, this significant three-way interaction statistically confirms the proposed double dissociation. It demonstrates that the effect of knowledge levels on consumer responses under varying message frames differs fundamentally depending on whether the knowledge dimension is subjective or objective (see Figure 5). By integrating these variables into a single unified test, this analysis provides robust empirical evidence for the complex interplay among knowledge levels, knowledge dimensions, and message framing in shaping green advertising outcomes.

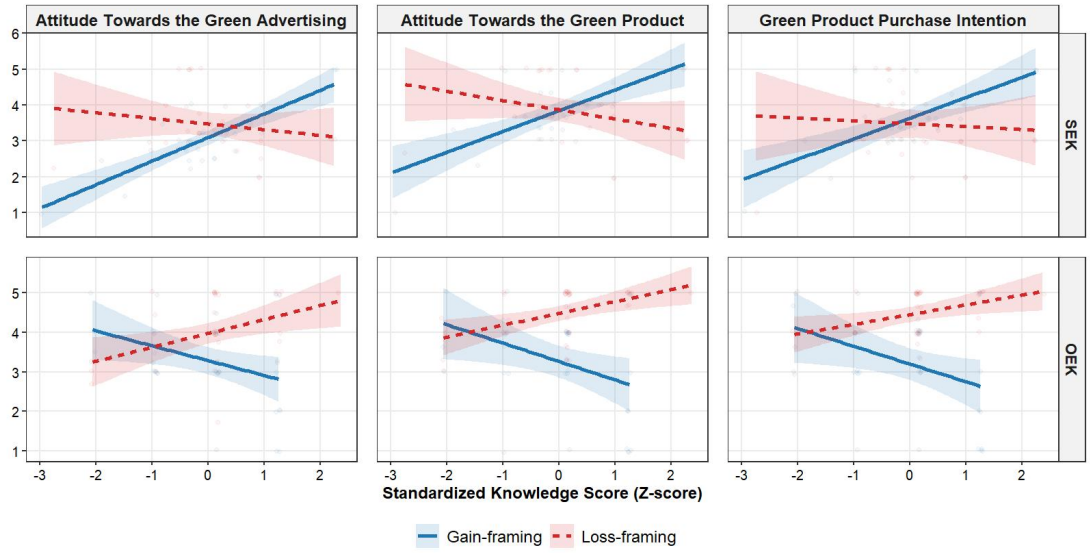


**Figure 5.** Interactive Effects of Message Framing and Knowledge on Green Advertising Effectiveness

*4.4 Summary*

Studies 1a and 1b show that message framing and environmental knowledge significantly affect green advertising's effectiveness. With gain-framed ads, individuals with high SEK had more positive attitudes toward the ads and products and a higher intent to purchase green products than those with low SEK. In contrast, those with high OEK displayed negative attitudes toward green advertising and products, as well as lower purchase intentions, suggesting high-OEK individuals are more analytical and less swayed by marketed green attributes, even with technological innovations.

For loss-framed messages, individuals with lower SEK responded more positively to green advertising than those with higher SEK, showing more favorable attitudes toward the ads and products and a higher purchase intention, which differs from that with OEK. This result indicates that people, irrespective of their green product knowledge, view losses as more significant than gains.

## 5. Study 2: Mediating Role of Authenticity

Study 1 investigated the impact of message framing and environmental knowledge on green advertising effectiveness through two sub-studies assessing various combinations. However, the mechanism underlying the framing-knowledge matching effect on green advertising effectiveness remains unclear. Thus, Study 2 examines the mediating role of authenticity in the interaction between message framing and consumer environmental knowledge on green advertising effectiveness (H3), comprising two sub-studies (Study 2a and Study 2b) and introducing authenticity as a mediator.

*5.1 Study 2a*

*5.1.1 Study Design*

Study 2a examined the mediating role of authenticity in the relationship between message framing, consumers' SEK, and the effectiveness of green advertising. A between-subjects experimental design was employed with a 2 (gain-framing vs. loss-framing) × 1 (SEK) configuration. Two hundred forty participants (106 males, 44.2%, $M_{age}$ = 27.10, SD = 6.76) from CBL in China were recruited and randomly assigned to the two framing groups. To avoid the influence of participants' prior brand experiences, a virtual brand of a water-saving faucet featuring a self-benefit appeal was created as the stimulus material (Appendix D). Participants were instructed to view a print advertisement for this virtual brand, which contained either gain-framed or loss-framed messages. Subsequently, they completed a questionnaire to assess their SEK and evaluate the effectiveness and perceived authenticity of the advertising. Finally, they were asked to provide demographic information.

Following Baek and Yoon (2017), the gain and loss framing were measured. The SEK consisted of five items adapted from Carmi et al. (2015) and Díaz-Siefer et al. (2015), all within the context of water conservation. Authenticity was measured using a scale developed by Napoli et al. (2014) and Morhart et al. (2015), comprising nine questions (Cronbach's $\alpha$ = .952). The effectiveness of green advertising was measured using the previous approach. Cronbach's $\alpha$ for attitude toward green advertising, attitude toward green products, and green product purchase intention were .962, .963, and .920, respectively. All items were rated on a five-point Likert scale, with 1 = strongly disagree and 5 = strongly agree (see Appendix E for details).

*5.1.2 Results*

The results of an independent samples t-test showed that participants in the gain-framing condition reported that the ad emphasized gain more than those in the loss-framing condition ($M_{gain}$ = 2.90, $M_{loss}$ = -2.85, $t$ = 41.01, $p$ < .001). Thus, the manipulation was successful.

In Study 2a, authenticity was a mediator of the framework established in Study 1a. For mediation effect analysis, we employed Process 3.5, as Hayes (2018) proposed. Given the nature of our variables (continuous variables included authenticity, SEK, green ad attitude, green product attitude, and green product purchase intentions; categorical variables included message framing), Model 8 was selected for our analysis, utilizing 5000 bootstrap samples and a 95% confidence interval. We investigated the effects of SEK on green advertising effectiveness and the mediation effect of authenticity on this relationship through a series of models, as summarized in Figure 6.

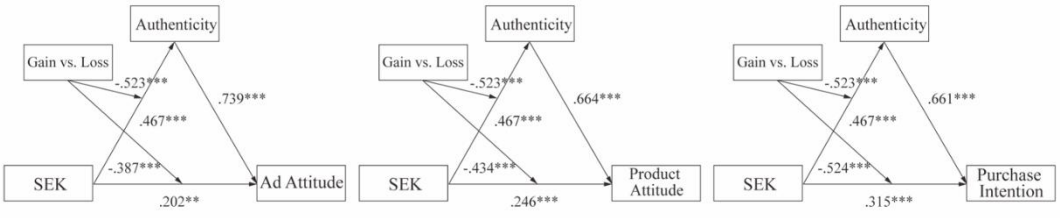


**Figure 6.** The Moderated Mediation Models on SEK, Authenticity, and Ad Effectiveness

Under the gain-framed condition, the total effect of SEK on attitudes toward green advertising ($\beta$ = .548), green product attitudes ($\beta$ = .556), and green product purchase intentions ($\beta$ = .624) was positive and statistically significant at $p$ < .01, which is consistent with the findings from Study 1a. Conversely,

under the loss-framed condition, the total effects of SEK on attitudes toward green advertising ($\beta$ = -.226), green product attitudes ($\beta$ = -.252), and green product purchase intentions ($\beta$ = -.245) were all significant at $p < .10$. The mediation analysis revealed that authenticity played a different role in the interaction between message framing and SEK on the effectiveness of green advertising.

In the context of gain framing, authenticity significantly mediated the relationship between SEK and green advertising effectiveness (mediation effect for ad attitude = .332, 95% CI = [.206, .459]; mediation effect for product attitude = .273, 95% CI = [.163, .382]; mediation effect for purchase intention = .245, 95% CI = [.134, .355]). However, in loss-framing, the mediation effect of authenticity on the relationship between SEK and green advertising effectiveness was not significant (mediation effect for ad attitude = -.042, 95% CI = [-.206, .122]; mediation effect for product attitude = -.039, 95% CI = [-.191, .113]; mediation effect for purchase intention = -.040, 95% CI = [-.196, .116]).

### *5.2 Study 2b*

Study 1b showed that consumers' OEK enhances green advertising effectiveness in loss-framed scenarios while it detracts from gain-framed scenarios. Study 2b investigates authenticity's mediation of the impact of message framing and OEK on green advertising effectiveness.

#### *5.2.1 Study Design*

Study 2b used a 2 (gain framing vs. loss framing) × 1 (OEK) between-subjects design with a virtual brand of water-saving faucet as the experimental product. One hundred sixty-eight participants (45 males, 26.8%, $M_{age}$ = 26.77, SD = 3.40) were recruited and randomly assigned to participate in the experiment in a specific framed group (gain-framing or loss-framing).

Participants were then asked to describe their attitudes toward green advertising (Cronbach's $\alpha$ = .952) and green products (Cronbach's $\alpha$ = .977), their purchase intention for the advertised product (Cronbach's $\alpha$ = .961), and the authenticity of the experimental materials (Cronbach's $\alpha$ = .951). Subsequently, we asked the participants about their levels of OEK. The OEK measurement consisted of eight items developed by Diaz-Siefer (2015). All OEK items pertained to water or energy conservation and were assessed using a triple-choice format. Participants scored 1 for correct answers and 0 for incorrect answers for each item. The total correct scores were summed to determine participants' OEK scores. As a manipulation check, participants rated the extent to which the message framing emphasized "loss" or "gain" based on the presented experimental materials. Finally, we collected the participants' demographic information.

#### *5.2.2 Results*

Study 2b investigated the effects of message framing (gain- and loss-framing) and OEK on attitudes towards green advertising and products and purchase intentions. Authenticity was examined as a mediating variable.

We found that, under gain-framing conditions, OEK negatively influenced attitudes towards green advertising ($\beta$ = -.168), green products ($\beta$ = -.158), and green product purchase intentions ($\beta$ = -.180), with statistical significance at $p < .05$. In loss-framing scenarios, OEK was positively associated with attitudes towards green advertising ($\beta$ = .186, $p < .05$), green products ($\beta$ = .240, $p < .01$), and green product purchase intentions ($\beta$ = .240, $p < .01$). These results not only corroborated the findings of Study 1b but also enhanced the credibility of the hypotheses tested for H2a and H2b. As in Study 2a, the mediation effects were analyzed using Model 8 of Process 3.5, with 5000 bootstrap samples and a 95% confidence interval, as proposed by Hayes (2018). The analysis revealed that in the context of gain

framing, authenticity significantly mediated the relationship between OEK and green advertising effectiveness (mediation effect for ad attitude = -.186, 95% CI = [-.312, -.060]; product attitude = -.185, 95% CI = [-.312, -.058]; and purchase intention = -.186, 95% CI = [-.314, -.058]). Conversely, in a loss-framed scenario, authenticity served as a mediator between OEK and the effectiveness of green advertising, albeit with a different directional impact (mediation effect for advertisement attitude = .135, 95% CI = [.002, .269]; product attitude = .117, 95% CI = [.001, .234]; and purchase intention = .104, 95% CI = [.000, .207]). Figure 7 shows the path coefficients.

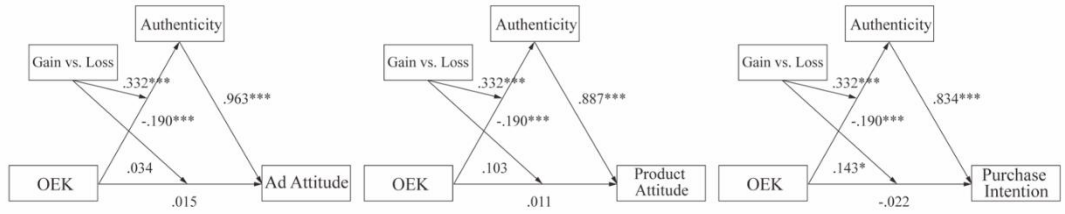


**Figure 7.** The Moderated Mediation Models on OEK, Authenticity, and Ad Effectiveness

*5.3 Summary*

Study 2 corroborates the findings of Study 1, affirming the significant interactive effects of message framing (gain versus loss framing) and environmental knowledge (SEK and OEK) on the effectiveness of green advertising and indicating that the role of authenticity in the relationship between message framing and SEK on green advertising effectiveness varied with the type of framing. The mediating effect of authenticity was significant for gain-framed messages but not for loss-framed messages. This finding is attributed to the reliance of consumers' SEK on personal confidence. In a gain-framed context, the stronger the consumers' SEK, the more capable they are of emotionally resonating with the authenticity of the green advertising's promises, enhancing advertising effectiveness. Conversely, in a loss-framed context, the stronger consumers' SEK, the more likely they were to overlook the authenticity of green advertising and directly assess its impact.

Unlike SEK, authenticity appears to play a crucial mediating role in OEK and green advertising effectiveness for both gain- and loss-framed messages. This finding indicates that, regardless of the framing, consumers with OEK can critically evaluate the realism of benefits or costs that are showcased in green advertising; such evaluation affects their subsequent evaluations and judgments.

## 6. General Discussion

*6.1 Conclusion*

Most prior studies have primarily focused on the isolated effects of message framing (Chang et al., 2015; Septianto et al., 2019) or consumer psychological states (Fu & Gao, 2023). While literature on advertising and marketing has suggested that the effectiveness of green advertising is influenced by the interaction of external factors, such as advertising elements, and internal factors, such as consumer characteristics (Fu & Gao, 2023), substantial empirical research on the matching effects of message framing and consumer characteristics on green advertising effectiveness is scarce. Furthermore, the mechanism underlying the impact of message framing and consumer characteristics on advertising effectiveness remains unclear.

This research addressed this gap by integrating message framing (gain vs. loss) and environmental knowledge (SEK vs. OEK) into a unified framework. Our findings revealed a distinct double dissociation demonstrating that the impact of both subjective and objective environmental knowledge on consumers' attitudes toward green advertising and products, as well as their purchase intentions, diverges significantly depending on the message framing employed.

Specifically, Study 1 revealed that consumers' SEK had a negative effect on the effectiveness of green advertising in loss-framed messages and a positive effect in gain-framed messages. Theoretically, this divergence aligns with motivational mechanisms, suggesting that high-SEK consumers seek confidence affirmation from gain frames but engage in defensive processing against the ego threat of loss frames. Conversely, consumers' OEK had a positive impact on the effectiveness of green advertising in loss-framed messages but exerted a negative effect in gain-framed messages. These results are consistent with a cognitive mechanism, indicating that high-OEK consumers are better equipped to process the diagnostic value of loss frames. These findings demonstrate a matching effect, highlighting the importance and necessity of aligning message framing with consumers' environmental knowledge to improve the effectiveness of green advertising.

Building on these theoretical foundations, Study 2 empirically uncovered the underlying mechanism by investigating how perceived authenticity mediates the impact of environmental knowledge on green advertising effectiveness across different message frames. These results revealed that perceived authenticity mediates this relationship in gain-framed messages. However, in loss-framed messages, authenticity's impact varies by environmental knowledge type: authenticity significantly mediates the effect for consumers with high OEK, but not for those with high SEK. These findings further underscore that tailoring message frames is critical for successfully cultivating perceived authenticity, which ultimately dictates the effectiveness of green advertising among different consumer segments.

### *6.2 Theoretical Contribution*

Our study offers three key contributions to the literature. First, we resolved the contradictory findings in prior research regarding the influence of environmental knowledge on green consumption (Liu et al., 2018; Rahman et al., 2019) by distinguishing between subjective and objective dimensions. By strictly separating SEK (confidence) from OEK (competence), we provided empirical evidence that clarifies why "knowledgeable" consumers may react differently to the same ad, effectively reconciling past discrepancies.

Second, we extended the message framing literature by establishing boundary conditions based on knowledge-frame congruence. Previous studies have predominantly focused on either message framing (Chang et al., 2015; Ekebas-Turedi et al., 2021; Wu et al., 2021) or environmental knowledge (Kim & Park, 2010; Pratiwi et al., 2018) in isolation. In contrast, we integrated these perspectives to reveal a matching effect whereby consumers' responses to green advertising are jointly determined by the interplay of message framing (gain vs. loss) and environmental knowledge (SEK vs. OEK). This finding highlights that distinct combinations of message frames and knowledge types drive divergent advertising outcomes, effectively shifting the theoretical focus from determining "which frame is superior" to understanding "for whom a specific frame is effective." By grounding this frame-knowledge congruence in motivational and cognitive theories, we provided a robust theoretical foundation for understanding advertising effectiveness and consumer responses.

Third, we empirically answer why these matching effects occur by uncovering the psychological mechanism of perceived authenticity. While authenticity is known to influence purchase intentions, its

role as a conditional mediator in green advertising has been underexplored. We show that for high-OEK consumers, loss frames (which often contain factual warnings) generate higher perceived authenticity, whereas for high-SEK consumers, such frames may backfire. This enriches the understanding of how consumers process green claims and validates authenticity as a crucial link between frame-knowledge congruence and advertising outcomes.

### *6.3 Management Implications*

This study provides valuable insights for not only marketing academics but also marketers, advertisers, and policymakers aiming to optimize green communication strategies. First, our findings offer critical guidance for precision segmentation and targeting. Marketers should move beyond treating green consumers as a monolith and instead adopt a tiered segmentation strategy based on knowledge types. Manufacturers and platforms can leverage behavioral data, such as browsing history of technical reports versus lifestyle blogs, or simple interactive quizzes to classify consumers into segments with high objective knowledge or high subjective knowledge. This allows for more precise targeting than traditional demographic segmentation, ensuring that the right audience receives the message frame that aligns with their cognitive profile.

Second, in the era of computational advertising, our results can be applied to inform better algorithm-driven content customization. Current recommendation systems primarily focus on product relevance, but we suggest integrating psychological profiling into the ad delivery logic. For consumers identified as having high subjective knowledge, such as those who express strong eco-identity but lack technical depth, algorithms should prioritize gain-framed content that emphasizes benefits and achievements to provide confidence affirmation and avoid defensive processing. Conversely, for consumers with high objective knowledge who engage with technical specifications, algorithms should deliver loss-framed content that highlights risks and factual consequences, as these consumers are equipped to process the greater diagnostic value to maximize engagement.

Third, prioritizing brand authenticity through tailored content strategies is essential. Since perceived authenticity is a key driver of effectiveness, the content strategy must align with the target audience's cognitive style. For audiences with high objective knowledge, marketers should use data-heavy, loss-framed narratives that leverage their cognitive resources to establish credibility. In contrast, for audiences with high subjective knowledge, brands should focus on empowering, gain-framed narratives to validate their confidence. Misalignment, such as lecturing a confident user with negative facts, risks damaging perceived authenticity by triggering defensive processing, thereby reducing purchase intentions.

Finally, manufacturers should balance the persuasive and motivational functions of their campaigns. If a product requires technical understanding, initial campaigns should focus on persuasion to build objective knowledge, making subsequent loss-framed ads more effective. If the goal is broad market appeal, boosting consumers' subjective confidence through positive reinforcement and gain-framed storytelling will yield better immediate results. By strictly distinguishing between confidence and competence, marketers can design more cost-effective campaigns that resonate on a deeper psychological level.

### *6.4 Limitations and Future Directions*

This study has limitations that present opportunities for future research. First, due to experimental constraints, we measured SEK and OEK in controlled settings. In reality, these two knowledge types often coexist and interact dynamically. While our multiple experiments ensured high internal validity, future research could employ field experiments or analyze secondary data (e.g., real-time click-stream

data) to validate these findings in complex, real-world environments. Second, we focused on authenticity as the primary mediator. Further research is needed to investigate additional underlying mechanisms, such as skepticism or processing fluency, thereby further enriching the theoretical framework. In particular, examining mechanisms such as psychological reactance or defensive processing could clarify why high-SEK consumers react negatively to loss frames when their self-confidence is threatened.

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## Data Availability Statement

Data will be made available on request.

## Ethics Statement

This study was approved by the Research Ethics Committee in Zhejiang University of Finance and Economics (approval no. ZUF-EA-21-SM04) on Jan 12, 2021.

## Conflicts of Interest

The authors declare no conflicts of interest.

## Disclaimer of Artificial Intelligence (AI) Usage in Manuscript Preparation

AI-assisted tools were used solely for language editing and proofreading. No AI-generated content, data analysis, or conceptual contributions were involved. The authors take full responsibility for the content, including its accuracy and originality.

## Appendix

*Appendix A: Stimulus of green advertising in Study 1.*


**Figure A1.** Ad with Gain Framing


**Figure A2.** Ad with Loss Framing

*Appendix B: Constructs and detailed items of Study 1.*

Manipulation check: Please read the material to determine the tendency of the content:

*The content of this advertisement emphasizes more on:*

*Emphasizing loss -3 -2 -1 0 1 2 3 Emphasizing gain*

Subjective environmental knowledge (SEK; 6 items; Raju & Mangold, 1995)

1. I have the capability to differentiate between renewable products and ordinary products.
2. I have the ability to discern the quality of renewable products.
3. I am highly cognizant of the environmental advantages associated with using renewable paper towels.
4. I have the proficiency to appropriately dispose of renewable paper towels.
5. I have the competence to correctly utilize renewable paper towels.
6. I have the expertise to make renewable paper towel purchase recommendations to others.

Objective environmental knowledge (OEK; 8 items; Wang et al., 2020)

1. Renewable paper towels are recyclable waste.
2. Agricultural film and plastic packaging are considered to be white pollutants.
3. Excessive CO2 emission are the primary cause of acid rain.
4. Waste batteries can pose harm to both the environment and human health.
5. Green foods are characterized by their safety, nutritional value, high quality, and the absence of pollution.
6. Burning crop residues does not result in environmental pollution.
7. Excessive pesticide usage does not have a detrimental impact on the environment.
8. Used bamboo chopsticks cannot be recycled.

Attitude toward green advertising (4 items; MacKenzie & Lutz, 1989)

1. The green advertising is good.
2. The green advertising is pleasant.
3. The advertising is favorable.
4. The advertising is believable.

Attitude toward the green product (3 items; Lee & Ang, 2003)

1. I think XINYU renewable paper towels are a very good product.
2. I like XINYU renewable paper towels.
3. I am very satisfied with XINYU renewable paper towels.

Purchase intention (3 items; Ansu- Mensah, 2021)

1. I intend to switch to the green variety of a product.
2. I am willing to purchase green products for personal use.
3. I plan to purchase green products because they do not pollute the environment.

Demographic

1. Gender
2. Age

*Appendix C: ANOVA of Study 1b.*

**Table C1.** ANOVA Results of Study 1b

| | Sum of Squares | df | Mean Square | *F* | *p* |
|---|---|---|---|---|---|
| ***Ad attitude model*** | | | | | |
| Framing | 3.14 | 1 | 3.14 | 3.46 | .067 |
| OEK | 0.00 | 1 | 0.00 | 0.00 | .989 |
| **Framing × OEK** | **3.71** | **1** | **3.71** | **4.09** | **.047** |
| Residuals | 64.40 | 71 | 0.91 | | |
| ***Product attitude model*** | | | | | |
| | **Sum of Squares** | **df** | **Mean Square** | ***F*** | ***p*** |
| Framing | 14.03 | 1 | 14.03 | 14.67 | < .001 |
| OEK | 0.04 | 1 | 0.04 | 0.04 | .843 |
| **Framing × OEK** | **4.02** | **1** | **4.02** | **4.21** | **.044** |
| Residuals | 67.91 | 71 | 0.96 | | |
| ***Purchase intention model*** | | | | | |
| | **Sum of Squares** | **df** | **Mean Square** | ***F*** | ***p*** |
| Framing | 15.40 | 1 | 15.40 | 16.16 | < .001 |
| OEK | 0.01 | 1 | 0.01 | 0.01 | .929 |
| **Framing × OEK** | **3.09** | **1** | **3.09** | **3.25** | **.076** |
| Residuals | 67.67 | 71 | 0.95 | | |

Note: Participants were divided into a high OEK group (n = 53) and a low OEK group (n = 22) based on the mean (5.88) and the median (6.00) of their OEK scores.

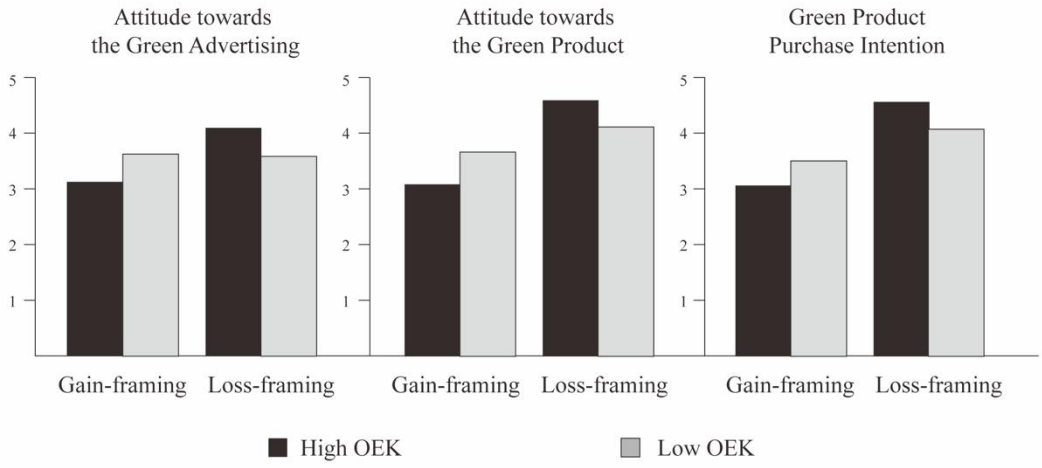


**Figure C1.** Mean of Green Advertising Effectiveness on OEK

*Appendix D: Stimulus of green advertising in Study 2.*


**Figure D1.** Ad with Gain Framing


**Figure D2.** Ad with Loss Framing

*Appendix E: Constructs and detailed items of Study 2*

(Only show the measures that differ from Study 1)

Subject environmental knowledge (SEK; 5 items; Carmi et al., 2015; Díaz-Siefer et al., 2015)

1. I think I understand the causes of water waste.
2. I think I know the solution to water waste.
3. I know all about water waste.
4. I know more about saving energy than most people.
5. I believe I know how to reduce energy consumption.

Object environmental knowledge (OEK; 8 items; Díaz-Siefer et al., 2015)

1. Which of the following actions results in water wastage?
2. Which of the following is not classified as a renewable energy source?
3. What is the approximate amount of water consumed during a 5-minute shower?
4. How much water does an average individual in China use on a daily basis?
5. How much water is required to fill a bathtub during showering activities?
6. What is the carbon footprint associated with a product?
7. What are the primary factors influencing the greenhouse effect?
8. Which of the following actions can effectively reduce greenhouse gas emissions?

Authenticity (9 items; Napoli et al., 2014; Morhart et al., 2015)

1. Quality is at the heart of the brand.
2. The brand is manufactured to the strictest standards, and everything the company does is to improve water-saving quality.
3. The brand is manufactured to the strictest quality standards.
4. The brand remains true to its lofty values.
5. The brand sticks to its principles.
6. The brand lived up to its promise.
7. The brand's product advertising is credible.
8. The brand name is trustworthy.
9. The brand doesn't make up any attributes it doesn't have.

## References

Agarwal, N. D., & Kumar, V. V. R. (2021). Three decades of green advertising – a review of literature and bibliometric analysis. *Benchmarking: An International Journal, 28(6),* 1934–1958. https://doi.org/10.1108/BIJ-07-2020-0380.

Alba, J. W., & Hutchinson, J. W. (1987). Dimensions of consumer expertise. *Journal of Consumer Research, 13(4)*, 411. https://doi.org/10.1086/209080.

Alba, J. W., & Hutchinson, J. W. (2000). Knowledge calibration: What consumers know and what they think they know. *Journal of Consumer Research*, *27(2)*, 123–156. https://doi.org/10.1086/314317.

Amatulli, C., De Angelis, M., Peluso, A. M., Soscia, I., & Guido, G. (2019). The effect of negative message framing on green consumption: An investigation of the role of shame. *Journal of Business Ethics*, *157(4)*, 1111–1132. https://doi.org/10.1007/s10551-017-3644-x.

Ansu-Mensah, P. (2021). Green product awareness effect on green purchase intentions of university students': An emerging market's perspective. *Future Business Journal, 7(1)*, 48. https://doi.org/10.1186/s43093-021-00094-5.

Ardoin, N. M., Wheaton, M., Bowers, A. W., Hunt, C. A., & Durham, W. H. (2015). Nature-based tourism's impact on environmental knowledge, attitudes, and behavior: A review and analysis of the literature and potential future research. *Journal of Sustainable Tourism, 23(6)*, 838–858. https://doi.org/10.1080/09669582.2015.1024258.

Baek, T. H., & Yoon, S. (2017). Guilt and shame: Environmental message framing effects. *Journal of Advertising, 46(3)*, 440–453. https://doi.org/10.1080/00913367.2017.1321069.

Banerjee, S., Gulas, C. S., & Iyer, E. (1995). Shades of green: A multidimensional analysis of environmental advertising. *Journal of Advertising, 24(2)*, 21–31. https://doi.org/10.1080/00913367.1995.10673473.

Baxter, J., & Gram-Hanssen, I. (2016). Environmental message framing: Enhancing consumer recycling of mobile phones. *Resources, Conservation and Recycling*, *109*, 96–101. https://doi.org/10.1016/j.resconrec.2016.02.012.

Beverland, M. B., & Farrelly, F. J. (2010). The quest for authenticity in consumption: Consumers' purposive choice of authentic cues to shape experienced outcomes. *Journal of Consumer Research*, *36(5)*, 838–856. https://doi.org/10.1086/615047.

Bhattacharjee, A., Berger, J., & Menon, G. (2014). When identity marketing backfires: Consumer agency in identity expression. *Journal of Consumer Research*, *41(2)*, 294–309. https://doi.org/10.1086/676125.

Braun, T., & Dierkes, P. (2019). Evaluating three dimensions of environmental knowledge and their impact on behaviour. *Research in Science Education, 49(5)*, 1347–1365. https://doi.org/10.1007/s11165-017-9658-7.

Brunk, K. H., & de Boer, C. (2020). How do consumers reconcile positive and negative CSR-related information to form an ethical brand perception? A mixed method inquiry. *Journal of Business Ethics, 161(2)*, 443–458. https://doi.org/10.1007/s10551-018-3973-4.

Campbell, M. C., & Kirmani, A. (2000). Consumers' use of persuasion knowledge: The effects of accessibility and cognitive capacity on perceptions of an influence agent. *Journal of Consumer Research, 27(1)*, 69–83. https://doi.org/10.1086/314309.

Carlson, J. P., Vincent, L. H., Hardesty, D. M., & Bearden, W. O. (2009). Objective and subjective knowledge relationships: A quantitative analysis of consumer research findings. *Journal of Consumer Research*, *35(5)*, 864–876. https://doi.org/10.1086/593688.

Carmi, N., Arnon, S., & Orion, N. (2015). Transforming environmental knowledge into behavior: The mediating role of environmental emotions. *The Journal of Environmental Education*, *46(3)*, 183–201. https://doi.org/10.1080/00958964.2015.1028517.

Chang, C. (2007). Diagnostic advertising content and individual differences: Testing a resource-matching perspective with a Taiwanese sample. *Journal of Advertising, 36(3)*, 75–84. https://doi.org/10.2753/JOA0091-3367360305.

Chang, H., Zhang, L., & Xie, G.-X. (2015). Message framing in green advertising: The effect of construal level and consumer environmental concern. *International Journal of Advertising, 34(1)*, 158–176. https://doi.org/10.1080/02650487.2014.994731.

Cinelli, M. D., & LeBoeuf, R. A. (2020). Keeping it real: How perceived brand authenticity affects product perceptions. *Journal of Consumer Psychology, 30(1)*, 40–59. https://doi.org/10.1002/jcpy.1123.

Cornelis, E., & Peter, P. C. (2017). The real campaign: The role of authenticity in the effectiveness of advertising disclaimers in digitally enhanced images. *Journal of Business Research, 77*, 102–112. https://doi.org/10.1016/j.jbusres.2017.03.018.

Dai, J., & Gong, S. (2024). Sustainable messaging strategies and consumer food waste: The congruence effect between message framing and state anxiety. *Journal of Retailing and Consumer Services, 79*, 103817. https://doi.org/10.1016/j.jretconser.2024.103817.

Darke, P. R., & Ritchie, R. J. B. (2007). The defensive consumer: Advertising deception, defensive processing, and distrust. *Journal of Marketing Research*, *44(1)*, 114–127. https://doi.org/10.1509/jmkr.44.1.114.

Detweiler, J. B., Bedell, B. T., Salovey, P., Pronin, E., & Rothman, A. J. (1999). Message framing and sunscreen use: Gain-framed messages motivate beach-goers. *Health Psychology*, *18(2)*, 189–196. https://doi.org/10.1037/0278-6133.18.2.189.

Díaz-Siefer, P., Neaman, A., Salgado, E., Celis-Diez, J., & Otto, S. (2015). Human-environment system knowledge: A correlate of pro-environmental behavior. *Sustainability, 7(11)*, 15510–15526. https://doi.org/10.3390/su71115510.

Dong, M., Cao, D., & Liu, T. (2025). The influence of message framing and time metaphors in green advertising on consumer effects: An examination based on the mediating role of approach-avoidance motivation. *Frontiers in Psychology, 16*, 1552963. https://doi.org/10.3389/fpsyg.2025.1552963.

D'Souza, C., & Taghian, M. (2005). Green advertising effects on attitude and choice of advertising themes. *Asia Pacific Journal of Marketing and Logistics, 17(3)*, 51–66. https://doi.org/10.1108/13555850510672386.

Dursun, İ., Tümer Kabadayı, E., & Tuğer, A. T. (2019). Overcoming the psychological barriers to energy conservation behaviour: The influence of objective and subjective environmental knowledge. *International Journal of Consumer Studies, 43(4)*, 402–416. https://doi.org/10.1111/ijcs.12519.

Ekebas-Turedi, C., Kordrostami, E., & Benoit, I. D. (2021). The impact of message framing and perceived consumer effectiveness on green ads. *Journal of Consumer Marketing, 38(4)*, 386–396. https://doi.org/10.1108/JCM-12-2019-3557.

Ellen, P. S. (1994). Do we know what we need to know? Objective and subjective knowledge effects on pro-ecological behaviors. *Journal of Business Research, 30(1)*, 43–52. https://doi.org/10.1016/0148-2963(94)90067-1.

Elsharnouby, M. H., Mohsen, J., Saeed, O. T., & Mahrous, A. A. (2021). Enhancing resilience to negative information in consumer-brand interaction: The mediating role of brand knowledge and involvement. *Journal of Research in Interactive Marketing, 15(4)*, 571–591. https://doi.org/10.1108/JRIM-05-2020-0107.

Escalas, J. E., & Bettman, J. R. (2003). You are what they eat: The influence of reference groups on consumers' connections to brands. *Journal of Consumer Psychology, 13(3)*, 339–348. https://doi.org/10.1207/S15327663JCP1303_14.

Escalas, J. E., & Bettman, J. R. (2005). Self-construal, reference groups, and brand meaning. *Journal of Consumer Research, 32(3)*, 378–389. https://doi.org/10.1086/497549.

Farrell, K., Ferguson, E., James, V., & Lowe, K. C. (2001). Confidence in the safety of blood for transfusion: The effect of message framing. *Transfusion, 41(11)*, 1335–1340. https://doi.org/10.1046/j.1537-2995.2001.41111335.x.

Fatha, L., & Ayoubi, R. (2023). A revisit to the role of gender, age, subjective and objective knowledge in consumers' attitudes towards organic food. *Journal of Strategic Marketing, 31(3)*, 499–515. https://doi.org/10.1080/0965254X.2021.1939405.

Floyd, K., Freling, R., Alhoqail, S., Cho, H. Y., & Freling, T. (2014). How online product reviews affect retail sales: A meta-analysis. *Journal of Retailing, 90(2)*, 217–232. https://doi.org/10.1016/j.jretai.2014.04.004.

Frick, J., Kaiser, F. G., & Wilson, M. (2004). Environmental knowledge and conservation behavior: Exploring prevalence and structure in a representative sample. *Personality and Individual Differences, 37(8)*, 1597–1613. https://doi.org/10.1016/j.paid.2004.02.015.

Fritz, K., Schoenmueller, V., & Bruhn, M. (2017). Authenticity in branding – exploring antecedents and consequences of brand authenticity. *European Journal of Marketing, 51(2)*, 324–348. https://doi.org/10.1108/EJM-10-2014-0633.

Fu, L., & Gao, J. (2023). Bitter or sweet? The interactive impact of message framing and environmental attitude on the effectiveness of green advertising. *Asian Journal of Communication, 33(3)*, 246–267. https://doi.org/10.1080/01292986.2023.2179088.

Gao, B., Li, Z., & Yan, J. (2022). The influence of social commerce on eco‐friendly consumer behavior: Technological and social roles. *Journal of Consumer Behaviour, 21(4)*, 653–672. https://doi.org/10.1002/cb.2022.

Gallagher, K. M., & Updegraff, J. A. (2012). Health message framing effects on attitudes, intentions, and behavior: A meta-analytic review. *Annals of Behavioral Medicine, 43(1)*, 101–116. https://doi.org/10.1007/s12160-011-9308-7.

Gómez-Carmona, D., Muñoz-Leiva, F., Liébana-Cabanillas, F., Nieto-Ruiz, A., Martínez-Fiestas, M., & Campoy, C. (2021). The effect of consumer concern for the environment, self-regulatory focus and message framing on green advertising effectiveness: An eye tracking study. *Environmental Communication, 15(6)*, 813–841. https://doi.org/10.1080/17524032.2021.1914701.

Guo, R., Wang, J., Zhou, M., Cao, Z., Tao, L., Luo, Y., Zhang, W., & Chen, J. (2025). Resonance or resistance? The dual impact of green brand ritual on customer engagement behavior. *Journal of Research in Interactive Marketing, 19(1)*, 76–97. https://doi.org/10.1108/JRIM-12-2023-0444.

Hajian, A., Sadeghi, R., Prybutok, V. R., & Koh, C. E. (2024). Increasing trust and value of mobile advertising in retailing: A survey design, machine learning approach, and blockchain in the trust path. *Journal of Retailing and Consumer Services, 79*, 103794. https://doi.org/10.1016/j.jretconser.2024.103794.

Hong, J., & Sternthal, B. (2010). The effects of consumer prior knowledge and processing strategies on judgments. *Journal of Marketing Research, 47(2)*, 301–311. https://doi.org/10.1509/jmkr.47.2.301.

Iyer, E. & B. Banerjee. (1993). Anatomy of green advertising. *Advances in Consumer Research, 20(1)*, 494–501.

Jiang, K., Mo, S., & Qin, M. (2024). Descriptive or injunctive? The effect of sustainable normative appeals and advertising orientations on environmentally responsible consumption behavior in a collective action perspective. *Journal of Retailing and Consumer Services, 79*, 103894. https://doi.org/10.1016/j.jretconser.2024.103894.

Jin, H. J., & Han, D. H. (2014). Interaction between message framing and consumers' prior subjective knowledge regarding food safety issues. *Food Policy, 44*, 95–102. https://doi.org/10.1016/j.foodpol.2013.10.007.

Johar, G. V. (2016). Mistaken inferences from advertising conversations: A modest research agenda. *Journal of Advertising, 45(3)*, 318–325. https://doi.org/10.1080/00913367.2016.1217810.

Ketelaar, P. E., Willemsen, L. M., Sleven, L., & Kerkhof, P. (2015). The good, the bad, and the expert: How consumer expertise affects review valence effects on purchase intentions in online product reviews. *Journal of Computer-Mediated Communication, 20(6)*, 649–666. https://doi.org/10.1111/jcc4.12139.

Khalil, M., Septianto, F., Lang, B., & Northey, G. (2021). The interactive effect of numerical precision and message framing in increasing consumer awareness of food waste issues. *Journal of Retailing and Consumer Services*, *60*, 102470. https://doi.org/10.1016/j.jretconser.2021.102470.

Kim, H. K., & Chen, M. (2025). A meta-analysis of gain–loss framing effects in narrative persuasion. *Journal of Communication, 75(3)*, 220–230. https://doi.org/10.1093/joc/jqaf002.

Kim, J.-H., & Song, H. (2020). The influence of perceived credibility on purchase intention via competence and authenticity. *International Journal of Hospitality Management, 90*, 102617. https://doi.org/10.1016/j.ijhm.2020.102617.

Kim, K., & Park, J. S. (2010). Message framing and the effectiveness of DTC advertising: The moderating role of subjective product knowledge. *Journal of Medical Marketing, 10(2)*, 165–176. https://doi.org/10.1057/jmm.2010.4.

Kim, S.-H., & Huang, R. (2021). Understanding local food consumption from an ideological perspective: Locavorism, authenticity, pride, and willingness to visit. *Journal of Retailing and Consumer Services*, *58*, 102330. https://doi.org/10.1016/j.jretconser.2020.102330.

Kim, W.-H., Malek, K., & Roberts, K. R. (2019). The effectiveness of green advertising in the convention industry: An application of a dual coding approach and the norm activation model. *Journal of Hospitality and Tourism Management, 39*, 185–192. https://doi.org/10.1016/j.jhtm.2019.04.007.

Kreling, R., Meier, A., & Reinecke, L. (2022). Feeling authentic on social media: Subjective authenticity across Instagram stories and posts. *Social Media + Society, 8(1)*, 205630512210862. https://doi.org/10.1177/20563051221086235.

Kumar, P., Polonsky, M., Dwivedi, Y. K., & Kar, A. (2021). Green information quality and green brand evaluation: The moderating effects of eco-label credibility and consumer knowledge. *European Journal of Marketing, 55(7)*, 2037–2071. https://doi.org/10.1108/EJM-10-2019-0808.

Lee, A. Y., & Aaker, J. L. (2004). Bringing the frame into focus: The influence of regulatory fit on processing fluency and persuasion. *Journal of Personality and Social Psychology, 86(2)*, 205–218. https://doi.org/10.1037/0022-3514.86.2.205.

Lee, Y. H., & Ang, K. S. (2003). Brand name suggestiveness: A Chinese language perspective. *International Journal of Research in Marketing, 20(4)*, 323–335. https://doi.org/10.1016/j.ijresmar.2003.03.002.

Levin, I. P., Schneider, S. L., & Gaeth, G. J. (1998). All frames are not created equal: A typology and critical analysis of framing effects. *Organizational Behavior and Human Decision Processes, 76(2)*, 149–188. https://doi.org/10.1006/obhd.1998.2804.

Li, D. (2025). Impact of green advertisement and environmental knowledge on intention of consumers to buy green products. *BMC Psychology, 13(1)*, 220. https://doi.org/10.1186/s40359-025-02538-x.

Li, Z., & Shi, J. (2026). Message effects on psychological reactance: Meta-analyses. *Human Communication Research, 52(1)*, 38–52. https://doi.org/10.1093/hcr/hqaf016.

Liao, S., & Ma, Y. (2009). Conceptualizing consumer need for product authenticity. *International Journal of Business and Information, 4(1)*, 89–114. https://doi.org/10.6702/ijbi.2009.4.1.5.

Liu, Y., Hong, Z., Zhu, J., Yan, J., Qi, J., & Liu, P. (2018). Promoting green residential buildings: Residents' environmental attitude, subjective knowledge, and social trust matter. *Energy Policy, 112*, 152–161. https://doi.org/10.1016/j.enpol.2017.10.020.

Llewellyn, N. (2021). The embodiment of consumer knowledge. *Journal of Consumer Research, 48(2)*, 212–234. https://doi.org/10.1093/jcr/ucab003.

MacKenzie, S. B., & Lutz, R. J. (1989). An empirical examination of the structural antecedents of attitude toward the ad in an advertising pretesting context. *Journal of Marketing, 53(2)*, 48–65. https://doi.org/10.1177/002224298905300204.

Maheswaran, D., & Meyers-Levy, J. (1990). The influence of message framing and issue involvement. *Journal of Marketing Research, 27(3)*, 361–367. https://doi.org/10.1177/002224379002700310.

Moon, H., Yu, J., Chua, B.-L., & Han, H. (2023). Impact of green brand authenticity on warm glow, green satisfaction, and willingness to pay more. *Journal of Travel & Tourism Marketing, 40(4)*, 326–344. https://doi.org/10.1080/10548408.2023.2245446.

Moorman, C., Diehl, K., Brinberg, D., & Kidwell, B. (2004). Subjective knowledge, search locations, and consumer choice. *Journal of Consumer Research, 31(3)*, 673–680. https://doi.org/10.1086/425102.

Morhart, F., Malär, L., Guèvremont, A., Girardin, F., & Grohmann, B. (2015). Brand authenticity: An integrative framework and measurement scale. *Journal of Consumer Psychology, 25(2)*, 200–218. https://doi.org/10.1016/j.jcps.2014.11.006.

Moulard, J. G., Garrity, C. P., & Rice, D. H. (2015). What makes a human brand authentic? Identifying the antecedents of celebrity authenticity. *Psychology & Marketing*, *32(2)*, 173–186. https://doi.org/10.1002/mar.20771.

Nam, M., Wang, J., & Lee, A. Y. (2012). The difference between differences: How expertise affects diagnosticity of attribute alignability. *Journal of Consumer Research, 39(4)*, 736–750. https://doi.org/10.1086/664987.

Napoli, J., Dickinson, S. J., Beverland, M. B., & Farrelly, F. (2014). Measuring consumer-based brand authenticity. *Journal of Business Research, 67(6)*, 1090–1098. https://doi.org/10.1016/j.jbusres.2013.06.001.

Nunes, J. C., Ordanini, A., & Giambastiani, G. (2021). The concept of authenticity: What it means to consumers. *Journal of Marketing, 85(4)*, 1–20. https://doi.org/10.1177/0022242921997081.

Olsen, G. D., & Pracejus, J. W. (2020). Customized advertising: Allowing consumers to directly tailor messages leads to better outcomes for the brand. *Journal of Business Research, 116*, 245–257. https://doi.org/10.1016/j.jbusres.2020.04.054.

Oskamp, S. (2000). Psychology of promoting environmentalism: Psychological contributions to achieving an ecologically sustainable future for humanity. *Journal of Social Issues, 56(3)*, 373–390. https://doi.org/10.1111/0022-4537.00173.

Pittman, M., Oeldorf-Hirsch, A., & Brannan, A. (2022). Green advertising on social media: Brand authenticity mediates the effect of different appeals on purchase intent and digital engagement. *Journal*

*of Current Issues & Research in Advertising, 43(1)*, 106–121. https://doi.org/10.1080/10641734.2021.1964655.

Pratiwi, N. P. D. K., Sulhaini, & Rinuastuti, B. H. (2018). The effect of environmental knowledge, green advertising and environmental attitude toward green purchase intention. *Russian Journal of Agricultural and Socio-Economic Sciences*, *78(6)*, 95–105. https://doi.org/10.18551/rjoas.2018-06.10

Rahman, Md. S., Hossain, Md. I., & Hossain, G. Md. S. (2019). Factors affecting environmental knowledge and green purchase behavior of energy saving light users in Bangladesh: An empirical study. *International Journal of Academic Research in Economics and Management Sciences, 8(3)*, 364–384. https://doi.org/10.6007/IJAREMS/v8-i3/6625.

Raju, P. S., Lonial, S. C., & Glynn Mangold, W. (1995). Differential effects of subjective knowledge, objective knowledge, and usage experience on decision making: An exploratory investigation. *Journal of Consumer Psychology, 4(2)*, 153–180. https://doi.org/10.1207/s15327663jcp0402_04.

Riedel, A. S., Weeks, C. S., & Beatson, A. T. (2024). Dealing with intrusive ads: A study of which functionalities help consumers feel agency. *International Journal of Advertising, 43(2)*, 361–387. https://doi.org/10.1080/02650487.2023.2197778.

Rodero, E. (2020). Do your ads talk too fast to your audio audience? How speech rates of audio commercials influence cognitive and physiological outcomes. *Journal of Advertising Research, 60(3)*, 337–349. https://doi.org/10.2501/JAR-2019-038.

Rodero, E., & Potter, R. F. (2021). Do not sound like an announcer. The emphasis strategy in commercials. *Psychology & Marketing, 38(9)*, 1417–1425. https://doi.org/10.1002/mar.21525.

Ropret Homar, A., & Knežević Cvelbar, L. (2021). The effects of framing on environmental decisions: A systematic literature review. *Ecological Economics*, *183*, 106950. https://doi.org/10.1016/j.ecolecon.2021.106950.

Rozin, P., & Royzman, E. B. (2001). Negativity bias, negativity dominance, and contagion. *Personality and Social Psychology Review, 5(4)*, 296–320. https://doi.org/10.1207/S15327957PSPR0504_2.

Sadiq, M., Bharti, K., Adil, M., & Singh, R. (2021). Why do consumers buy green apparel? The role of dispositional traits, environmental orientation, environmental knowledge, and monetary incentive. *Journal of Retailing and Consumer Services*, *62*, 102643. https://doi.org/10.1016/j.jretconser.2021.102643.

Santa, J. C., & Drews, S. (2023). Heuristic processing of green advertising: Review and policy implications. *Ecological Economics, 206*, 107760. https://doi.org/10.1016/j.ecolecon.2023.107760.

Schmuck, D., Matthes, J., & Naderer, B. (2018). Misleading consumers with green advertising? An affect–reason–involvement account of greenwashing effects in environmental advertising. *Journal of Advertising, 47(2)*, 127–145. https://doi.org/10.1080/00913367.2018.1452652.

Schwarz, N. (2012). Feelings-as-information theory. In *Handbook of Theories of Social Psychology: Volume 1* (Vol. 1, pp. 289–308). SAGE Publications Ltd.

Segev, S., Fernandes, J., & Hong, C. (2016). Is your product really green? A content analysis to reassess green advertising. *Journal of Advertising, 45(1)*, 85–93. https://doi.org/10.1080/00913367.2015.1083918.

Segev, S., Fernandes, J., & Wang, W. (2015). The effects of gain versus loss message framing and point of reference on consumer responses to green advertising. *Journal of Current Issues & Research in Advertising, 36(1)*, 35–51. https://doi.org/10.1080/10641734.2014.912600.

Septianto, F., Northey, G., & Dolan, R. (2019). The effects of political ideology and message framing on counterfeiting: The mediating role of emotions. *Journal of Business Research, 99*, 206–214. https://doi.org/10.1016/j.jbusres.2019.02.059.

Shiv, B., Edell, J. A., & Payne, J. W. (1997). Factors affecting the impact of negatively and positively framed ad messages. *Journal of Consumer Research, 24(3)*, 285–294. https://doi.org/10.1086/209510.

Shoenberger, H., Kim, E. A., & Johnson, E. K. (2020). #BeingReal about Instagram ad models: The effects of perceived authenticity: How image modification of female body size alters advertising attitude and buying intention. *Journal of Advertising Research, 60(2)*, 197–207. https://doi.org/10.2501/JAR-2019-035.

Spina, M., Arndt, J., Landau, M. J., & Cameron, L. D. (2018). Enhancing health message framing with metaphor and cultural values: Impact on Latinas' cervical cancer screening. *Annals of Behavioral Medicine, 52(2)*, 106–115. https://doi.org/10.1093/abm/kax009.

Stafford, M. R., Stafford, T. F., & Chowdhury, J. (1996). Predispositions toward green issues: The potential efficacy of advertising appeals. *Journal of Current Issues & Research in Advertising, 18(1)*, 67–79. https://doi.org/10.1080/10641734.1996.10505041.

Stuppy, A., Mead, N. L., & Van Osselaer, S. M. J. (2020). I am, therefore I buy: Low self-esteem and the pursuit of self-verifying consumption. *Journal of Consumer Research, 46(5)*, 956–973. https://doi.org/10.1093/jcr/ucz029.

Sung, E.C. (2021). The effects of augmented reality mobile app advertising: Viral marketing via shared social experience. *Journal of Business Research*, *122*, 75–87. https://doi.org/10.1016/j.jbusres.2020.08.034.

Swann, W. B., Stein-Seroussi, A., & Giesler, R. B. (1992). Why people self-verify. *Journal of Personality and Social Psychology, 62(3)*, 392–401. https://doi.org/10.1037/0022-3514.62.3.392.

Taufique, K. M. R., Siwar, C., Chamhuri, N., & Sarah, F. H. (2016). Integrating general environmental knowledge and eco-label knowledge in understanding ecologically conscious consumer behavior. *Procedia Economics and Finance, 37*, 39–45. https://doi.org/10.1016/S2212-5671(16)30090-9.

Tillema, H. H. (2006). Authenticity in knowledge-productive learning: What drives knowledge construction in collaborative inquiry? *Human Resource Development International, 9(2)*, 173–190. https://doi.org/10.1080/13678860500523122.

Tversky, A., & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science, 211(4481)*, 453–458. https://doi.org/10.1126/science.7455683.

van Esch, P., Arli, D., Castner, J., Talukdar, N., & Northey, G. (2018). Consumer attitudes towards bloggers and paid blog advertisements: What's new? *Marketing Intelligence & Planning, 36(7)*, 778–793. https://doi.org/10.1108/MIP-01-2018-0027.

Van 't Riet, J., Cox, A. D., Cox, D., Zimet, G. D., De Bruijn, G.-J., Van Den Putte, B., De Vries, H., Werrij, M. Q., & Ruiter, R. A. C. (2016). Does perceived risk influence the effects of message framing? Revisiting the link between prospect theory and message framing. *Health Psychology Review, 10(4)*, 447–459. https://doi.org/10.1080/17437199.2016.1176865.

Wade, S., & Kidd, C. (2019). The role of prior knowledge and curiosity in learning. *Psychonomic Bulletin & Review*, *26(4)*, 1377–1387. https://doi.org/10.3758/s13423-019-01598-6.

Wang, C. L. (2025). Editorial: Demonstrating contributions through storytelling. *Journal of Research in Interactive Marketing*, *19(1)*, 1–4. https://doi.org/10.1108/JRIM-01-2025-455.

Wang, J., Wang, J., & Gao, J. (2020). Effect of green consumption value on consumption intention in a pro-environmental setting: The mediating role of approach and avoidance motivation. *Sage Open*, *10(1)*, 215824402090207. https://doi.org/10.1177/2158244020902074.

Wong-Parodi, G., & Berlin Rubin, N. (2022). Exploring how climate change subjective attribution, personal experience with extremes, concern, and subjective knowledge relate to pro-environmental attitudes and behavioral intentions in the United States. *Journal of Environmental Psychology*, *79*, 101728. https://doi.org/10.1016/j.jenvp.2021.101728.

Wu, Z., Guo, T., & Li, B. (2021). Message framing's role in encouraging idle item recycling. *Asia Pacific Journal of Marketing and Logistics*, *33(8)*, 1758–1775. https://doi.org/10.1108/APJML-03-2020-0135.

Xia, L., & Sudharshan, D. (2002). Effects of interruptions on consumer online decision processes. *Journal of Consumer Psychology*, *12(3)*, 265–280. https://doi.org/10.1207/S15327663JCP1203_08.

Yan, C., Dillard, J. P., & Shen, F. (2010). The effects of mood, message framing, and behavioral advocacy on persuasion. *Journal of Communication*, *60(2)*, 344–363. https://doi.org/10.1111/j.1460-2466.2010.01485.x.

Yang, Y., Xue, F., & Qiao, G. (2024). The impact of information acquisition ability on consumers' trust in eco-labels in China: Insight of food sustainability. *Frontiers in Sustainable Food Systems*, *8*, 1449848. https://doi.org/10.3389/fsufs.2024.1449848.

Yang, Y., Zhu, S., Gan, Y., & Dang, J. (2021). To be authentic, to be eco: Exploring the link between authenticity and pro-environmental behavior. *Frontiers in Psychology, 12,* 755860. https://doi.org/10.3389/fpsyg.2021.755860.

Zhang, G., Wang, L., & Meng, H. (2024). Environmental knowledge level and consumer behavior regarding green fashion: A moderated mediation model. *Asia Pacific Journal of Marketing and Logistics, 36(4)*, 977–992. https://doi.org/10.1108/APJML-07-2023-0637.

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