Dynamic or Static? The Effect of Ingredient Image Presentation on Perceived Product Efficacy

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Abstract

Product packaging elements are important factors influencing product efficacy. Previous research has focused on examining how characteristics such as the number and size of packaging elements affect perceived product efficacy, yet lacks in-depth investigation into how different presentation modes (dynamic vs. static) of ingredient imagery influence perceived product efficacy. In view of this, this paper focuses on ingredient imagery on packaging and, against the backdrop of technology-enabled dynamic design, investigates the impact of presentation mode (dynamic vs. static) of ingredient imagery on packaging on perceived product efficacy. Through three scenario experiments and one laboratory experiment, we find that: the presentation mode of ingredient imagery significantly influences perceived product efficacy, mental imagery plays a significant mediating role in the aforementioned process, and perceived performance risk serves as a boundary condition for the establishment of the aforementioned mediating effect. This study not only expands the connotation and application domains of mental imagery and perceived performance risk, but also provides marketing practice implications for how enterprises can utilize packaging design to enhance perceived product efficacy.

Full Text

Dynamic or Static? The Influence of Ingredient Image Presentation on Perceived Product Efficacy

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Abstract

Packaging elements are critical factors influencing perceived product efficacy. Previous research has primarily examined how quantitative features such as the number and size of packaging elements affect perceived product efficacy, yet lacks in-depth investigation into how different presentation modes of ingredient images (dynamic vs. static) influence this perception. Addressing this gap, this paper focuses on ingredient images on packaging and explores how their presentation mode (dynamic vs. static) affects perceived product efficacy against the backdrop of technology-enabled dynamic design. Through three scenario experiments and one laboratory experiment, we find that ingredient image presentation significantly influences perceived product efficacy, with mental imagery playing a substantial mediating role in this process, while perceived performance risk serves as a boundary condition for this mediating effect. This research not only expands the theoretical connotations and application domains of mental imagery and perceived performance risk but also provides practical marketing insights for how companies can leverage packaging design to enhance perceived product efficacy.

Keywords: ingredient images, dynamic/static presentation, perceived product efficacy, mental imagery, perceived performance risk

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Introduction

During product purchase, packaging elements shape consumers' first impressions of products. The well-known DuPont Law states that 63% of consumers choose products based on packaging. Packaging elements can convey product information and attract consumer attention (Orth & Malkewitz, 2008). For instance, companies often display ingredient images on packaging to communicate information related to product quality (Thomas & Capelli, 2018). Furthermore, subtle differences in design elements such as ingredient images significantly influence consumer decision-making. Therefore, investigating how packaging element characteristics affect consumer product evaluation and decision-making behaviors holds significant theoretical and practical importance. Previous studies have shown that packaging elements influence perceived product efficacy, including packaging color (Roullet & Droulers, 2005), number of elements (Ilyuk & Block, 2016), and simple versus complex design (Chen et al., 2023). With technological advancement, dynamic ingredient images have emerged as a novel packaging element increasingly applied in product packaging design. For example, scanning Schwarzkopf hair oil packaging reveals a dynamic visualization of oil molecules flowing smoothly. This raises the question: Do dynamic versus static presentation modes of ingredient images influence consumers' inferences about product efficacy?

Existing literature on how ingredient images affect product efficacy has primarily focused on quantitative features such as number and size (Capelli & Thomas,

2021; Thomas & Capelli, 2018), with scarce attention paid to different presentation modes (dynamic vs. static). Although some studies suggest that dynamic images attract consumers more than static images (Cian et al., 2014), others find static presentations superior. For example, companies with stable characteristics using static (vs. dynamic) brand logos can enhance consumers' positive attitudes (Brasel & Hagtvedt, 2016). Synthesizing these findings, whether dynamic or static ingredient image presentation better enhances perceived product efficacy remains an unresolved question. Grounded in associative learning theory, this paper delves into how different presentation modes of ingredient images influence perceived product efficacy by triggering distinct psychological responses. Dynamic (vs. static) presentation of ingredient images more readily stimulates consumers to imagine product usage scenarios, thereby generating mental imagery that influences product evaluation. Therefore, this paper introduces mental imagery to reveal the psychological mechanism through which ingredient image presentation affects perceived product efficacy. Additionally, research indicates that certain contextual factors influence individuals' information processing styles, altering consumers' sensitivity to image information and affecting mental imagery generation. Similarly, under different levels of perceived performance risk, consumers exhibit varying sensitivity to image information, which may influence how they process ingredient image presentation modes. Accordingly, we hypothesize that perceived performance risk may serve as a boundary condition for the mediating effect of mental imagery in the relationship between ingredient image presentation and perceived product efficacy.

1.1 The Effect of Ingredient Image Presentation on Perceived Product Efficacy

Previous research identifies visual and verbal elements as two important categories of packaging elements (Rettie & Brewer, 2000), which influence product evaluation by changing consumers' emotions or cognitions (Silayoi & Speece, 2004). At the cognitive level, perceived product efficacy is defined as consumers' inferences or expectations about product performance (Kramer et al., 2012) and represents one of the important cognitive beliefs influencing purchase decisions (Woodroof et al., 2020). Existing studies demonstrate that perceived product efficacy is affected by peripheral cues such as packaging. For example, pharmaceutical packaging color influences consumers' perceived efficacy, with darker colors producing stronger perceived drug effects (Roullet & Droulers, 2005). In summary, how product packaging element characteristics influence perceived product efficacy represents a hot topic in academic research.

In packaging design, ingredient images constitute a key element (Capelli & Thomas, 2021; Underwood & Klein, 2002). For instance, Thomas and Capelli (2018) investigated how the number of ingredient images (many vs. few) affects product efficacy, finding this effect moderated by motivation, cognitive load, and need for cognition. Huang et al. (2022) further discovered that larger (vs. smaller) food images positively influence purchase intention. These stud-

ies reveal that research on how ingredient images affect perceived product efficacy has concentrated on quantitative features like number and size, rarely focusing on presentation mode (dynamic vs. static). Through marketing practice insights, dynamic images in packaging design have become increasingly widespread and demonstrate positive effects. For example, dynamic food images can increase food attractiveness (Gvili et al., 2017) because they help consumers associate the food with freshness. Moreover, research shows that "dynamic" features are cognitively associated with "movement" and "activity" (Brasel & Hagtvedt, 2016; Cian et al., 2014). For example, Zhou et al. (2019) found that highly dynamic brand logos enhance consumers' perceived movement, thereby improving evaluations of product innovativeness.

Associative learning theory posits that memory consists of a network of nodes and connections representing associative relationships between nodes (Biswas et al., 2006). Its core principle is that people form new knowledge or memories by associating two or more stimuli, ideas, or behaviors (Wei, 2024). This theory is commonly used to explain celebrity endorsement mechanisms. Wei (2024) notes that celebrities and brands represent two information nodes; when repeatedly presented together in advertisements, both nodes are simultaneously activated in the audience's memory, establishing an associative connection. Emotions or meanings associated with the celebrity thus extend to the brand. Similarly, when ingredient images with different presentation modes are displayed through packaging, consumers form corresponding memory structure networks. Specifically, dynamic or static presentation modes and ingredient images represent nodes in this network. When combined through packaging presentation, both nodes are simultaneously activated, establishing an associative connection that strengthens with repeated exposure. Consequently, meanings associated with dynamism—such as activity and vitality—extend along the associative connection to product ingredients, leading consumers to associate product ingredients with energy and effectiveness, thereby enhancing perceived product efficacy. In contrast, static ingredient images, lacking visual dynamism and change, convey an impression of fixity and invariability. This visual "stagnation" may prevent consumers from connecting product ingredients with activity, making it difficult to trigger positive evaluations of product ingredients. Based on this reasoning, we propose:

H1: Ingredient image presentation mode (dynamic vs. static) significantly influences consumers' perceived product efficacy. Specifically, dynamic ingredient image presentation positively affects perceived product efficacy more than static presentation.

1.2 The Mediating Role of Mental Imagery

Mental imagery refers to a psychological process similar to imagination that consumers generate when exposed to external stimuli such as textual or pictorial descriptions during product attitude formation (Babin & Burns, 1997). Its essence is an information processing procedure (Macinnis & Price, 1987).

When consumers encounter visual information and other external stimuli, they tend to evoke mental imagery, with richer and more concrete visual information more likely to generate mental imagery (Lin et al., 2018). For example, Huang et al. (2022) found that larger food images, compared to smaller ones, display product details more vividly and clearly, thereby more easily generating mental imagery. Although existing research reveals the important role of ingredient image quantity and size in stimulating consumer mental imagery, these studies focus on static images, rarely addressing presentation mode. Dynamic (vs. static) ingredient images not only vividly demonstrate product ingredient movement and change but also convey product vitality through visual dynamism. Therefore, when consumers receive dynamically presented ingredient images, this visual dynamism stimulates their senses and emotions, making it easier for them to mentally imagine usage scenarios where product ingredients exert their effects, thereby inducing mental imagery generation. Static ingredient images, however, struggle to demonstrate ingredient dynamics and processes, making it difficult to awaken consumers' imagination of actual product usage scenarios. Thus, static presentation has limited effectiveness in triggering mental imagery. Accordingly, we propose:

H2: Ingredient image presentation mode (dynamic vs. static) significantly influences consumer mental imagery. Specifically, dynamic ingredient image presentation generates more mental imagery than static presentation.

Mental imagery can prompt individuals to engage in self-persuasion and form strong attitudes, thereby influencing behavior (Macinnis & Price, 1987). This process provides a reasonable explanation for how ingredient image presentation influences perceived product efficacy. Specifically, dynamic presentation conveys impressions of activity and vitality, more easily stimulating consumers to imagine usage scenarios where product ingredients exert their activity and effectiveness, thereby generating mental imagery. Simultaneously, mental imagery generation continuously activates and strengthens the connection between dynamic presentation and ingredient images, prompting consumers to extend meanings related to dynamism—such as vitality and activity—to product ingredients, enhancing positive attitudes toward product efficacy and ultimately improving perceived product efficacy. In contrast, static ingredient images, lacking dynamic change and visual dynamism, struggle to form rich mental imagery (Zhu et al., 2024), thereby limiting consumers' imagination of product ingredients and failing to enhance perceived product efficacy. We therefore hypothesize that mental imagery likely mediates the effect of ingredient image presentation mode (dynamic vs. static) on perceived product efficacy. In summary, we propose:

H3: Mental imagery significantly mediates the effect of ingredient image presentation mode (dynamic vs. static) on perceived product efficacy.

1.3 The Moderating Role of Perceived Performance Risk

Perceived performance risk refers to the possibility that a product will not function properly or that its quality and performance will fail to meet expectations (Lim, 2003). The elaboration likelihood model posits that central and peripheral cues influence individual decision-making. Central cues refer to quality-related information requiring greater cognitive effort, while peripheral cues relate to emotions or affective states requiring less processing effort (Dianne et al., 2018). In packaging marketing, features such as ingredient image presentation serve as peripheral cues that attract consumer attention through visual stimulation and play important roles in mental imagery generation (Liao et al., 2021). Research shows that consumers attend differently to these cues across contexts. For high perceived-risk products, consumers search more extensively for information and evaluate product quality to reduce outcome uncertainty (Casidy & Wymer, 2016). For low perceived-risk products, consumers' decision-making resembles habitual choice, relying more on affective experiences such as satisfaction (Cai et al., 2016). In other words, different levels of perceived performance risk elicit varying sensitivity to peripheral cues like ingredient image presentation.

Specifically, when facing high perceived performance risk, consumers adopt quality-related cues while ignoring peripheral cues like packaging (Chung, 2013) to reduce purchase decision risk and uncertainty. Under such conditions, consumers tend to overlook packaging element presentation modes, making it difficult to establish memory associations between dynamism and ingredient images, imagine usage scenarios where ingredients are active and effective, and smoothly awaken mental imagery. Consequently, meanings associated with dynamism—such as activity and vitality—fail to extend to product ingredients, reducing perceived product efficacy. Conversely, under low perceived performance risk, consumers hold optimistic attitudes toward product quality and efficacy and are more willing to rely on affective experiences like satisfaction for decision-making (Cai et al., 2016). Dynamic visual elements may provide pleasure and novelty, so consumers are more likely to attend to peripheral cues like dynamically presented ingredient images. This further activates the memory association network between dynamism and ingredient images, making mental imagery easier to generate and allowing meanings associated with dynamism to transfer to product ingredients, ultimately enhancing perceived product efficacy. In contrast, meanings associated with static presentation—such as fixity and stability—do not readily generate rich mental imagery or trigger positive perceptions of product efficacy. In summary, under high perceived performance risk, consumers tend to ignore ingredient image presentation, making it difficult to awaken mental imagery and enhance perceived product efficacy; under low perceived performance risk, consumers attend more to dynamically presented ingredient images, more easily awakening mental imagery and significantly improving perceived product efficacy. Based on this, we propose:

H4: Perceived performance risk significantly moderates the effect of ingredient image presentation on mental imagery. Specifically, under high perceived per-

formance risk, the effect of ingredient image presentation on mental imagery is not significant; under low perceived performance risk, ingredient image presentation significantly influences mental imagery.

H5: Perceived performance risk significantly moderates the effect of ingredient image presentation on perceived product efficacy. Specifically, under high perceived performance risk, the effect of ingredient image presentation on perceived product efficacy is not significant; under low perceived performance risk, ingredient image presentation significantly influences perceived product efficacy.

H6: Perceived performance risk significantly moderates the mediating effect of mental imagery in the relationship between ingredient image presentation and perceived product efficacy. Specifically, under high perceived performance risk, neither dynamic nor static ingredient images easily awaken mental imagery, thus failing to significantly improve perceived product efficacy, rendering the mediating effect of mental imagery non-significant; under low perceived performance risk, the mediating effect of mental imagery is significant.

1.4 The Chain Mediating Role of Mental Imagery and Perceived Product Efficacy

Previous research shows that when consumers' perceived product efficacy increases, so does purchase intention (Chen, 2016). For example, Lee et al. (2020) found that sustainability labels and plasticity reduce product categorization ambiguity and increase perceived product efficacy, further enhancing purchase intention. Similarly, Woodroof et al. (2020) discovered that influencer transparency perceptions affect consumers' perceived product efficacy, which in turn influences purchase intention. Accordingly, we hypothesize that perceived product efficacy significantly influences purchase intention. Combined with the aforementioned arguments that ingredient image presentation affects mental imagery and perceived product efficacy, ultimately influencing purchase intention, we propose that mental imagery and perceived product efficacy serve as chain mediators in the effect of ingredient image presentation on purchase intention. Thus, we propose:

H7: Mental imagery and perceived product efficacy chain mediate the effect of ingredient image presentation mode (dynamic vs. static) on purchase intention.

The theoretical framework model of this paper is shown in Figure 1 [Figure 1: see original paper].

1.5 Overview of Studies

Figure 1 Theoretical Framework Model

This research aims to explore the effect of ingredient image presentation mode (dynamic vs. static) on perceived product efficacy based on associative learning theory, introducing mental imagery and perceived performance risk to examine

the psychological mechanism and boundary conditions. We propose that dynamic (vs. static) ingredient image presentation significantly affects perceived product efficacy, with mental imagery and perceived performance risk serving as mediator and moderator, respectively. Study 1 verifies whether ingredient image presentation affects perceived product efficacy. Study 2 changes the stimulus material category to further validate the effect of ingredient image presentation on perceived product efficacy and the mediating role of mental imagery. Study 3 builds on Study 2 by examining the boundary condition of this mediating process—namely, the moderating role of perceived performance risk. Study 4 conducts a laboratory experiment to rule out alternative mediating effects of processing fluency and goal focus while measuring actual purchase behavior.

Study 1

Study 1 aimed to test the effect of ingredient image presentation mode (dynamic vs. static) on consumers' perceived product efficacy, verifying H1. This experiment employed a single-factor two-level (ingredient image presentation: dynamic vs. static) between-subjects design.

2.1 Method

2.1.1 Participants We distributed questionnaires on the Wenjuanxing platform using a paid recruitment method. After removing respondents who failed attention check questions, we collected data from 203 university student participants (104 male, 51.2%; Mage = 22.18). Using G*Power to calculate statistical power for one-way ANOVA with two groups, an effect size of 0.25, and significance level of 0.05, the power for a sample size of 203 was 0.94, meeting statistical requirements.

2.1.2 Manipulation Considering our participant pool comprised university students and following Zhu et al. (2012) who selected stimuli where efficacy perception is particularly critical for product choice, we chose whitening toothpaste—a product familiar to students. Following Rymarczyk et al. (2019), we manipulated ingredient image presentation as dynamic versus static. Specifically, the dynamic presentation group viewed a dynamic video by scanning a QR code on the toothpaste package, while the static presentation group viewed a single frame from this video. Participants were randomly assigned to one of two conditions and told they planned to purchase a whitening toothpaste. They were informed that scanning the QR code on the package would provide clearer, more comprehensive ingredient information, and they would see a product display in a store. Participants then viewed a whitening toothpaste package display (see Figure 2 [Figure 2: see original paper]). In the dynamic condition, product ingredients were presented dynamically (i.e., whitening molecules actively diffusing); in the static condition, ingredients were presented

statically (i.e., whitening molecules in a static state).

2.1.3 Measures Participants responded to perceived product efficacy items adapted from VanBergen et al. (2020), consisting of four items: "How effective do you think this toothpaste is at whitening?" "Do you think this toothpaste can help whiten your teeth?" "To what extent do you think this toothpaste is effective at removing yellow stains?" and "How potent do you think the active ingredients in this toothpaste are?" ($\alpha = 0.90$). The scale ranged from 1 ("not at all") to 7 ("very effective"). Additionally, because dynamic ingredient image presentation might generate emotions such as pleasure and innovation that could affect results, we measured participants' emotional responses to the packaging and personal innovativeness. Emotional response items were adapted from Kim et al. (1996), consisting of three items asking participants to rate their viewing experience: "unpleasant–pleasant," "dislike very much–like very much," and "gave me bad feelings–gave me good feelings" ($\alpha = 0.78$), with 1 indicating stronger agreement with the left anchor and 7 indicating stronger agreement with the right anchor. Personal innovativeness was measured using three items adapted from Chang and Chan-Olmsted (2010): "I like to try new products," "I like to learn about current trendy ideas," and "I am willing to take certain risks to try new products" ($\alpha = 0.79$), with 1 = "strongly disagree" and 7 = "strongly agree." An attention check question followed. Finally, participants provided demographic information including gender, age, grade level, and monthly personal expenditure.

2.2 Results

2.2.1 Participant Demographics The grade distribution showed that seniors (61 participants) were most common, accounting for 30.0%, while freshmen (7 participants) and doctoral students (7 participants) were least common, each representing 3.4%. Regarding monthly personal expenditure, the highest proportion (115 participants, 56.7%) fell between 1,001–2,000 RMB, while the smallest proportion (7 participants, 3.4%) spent less than 1,000 RMB monthly.

2.2.2 Main Effect Analysis We conducted ANOVA to test the main effect, with ingredient image presentation (dynamic vs. static) as the independent variable, perceived product efficacy as the dependent variable, and emotional response and personal innovativeness as covariates. Results showed that ingredient image presentation significantly affected perceived product efficacy ($F(1, 199) = 5.23$, $p = 0.003$, $\mathrm{p}^2 = 0.03$). The dynamic presentation group reported significantly higher perceived product efficacy ($M = 6.05$, $SD = 1.06$) than the static presentation group ($M = 5.79$, $SD = 0.91$), supporting H1. After adding demographic variables, the effect of ingredient image presentation (dynamic vs. static) on perceived product efficacy remained significant ($F(1, 195) = 4.56$, $p = 0.034$, $\mathrm{p}^2 = 0.02$).

2.3 Discussion

Study 1 examined the effect of ingredient image presentation on perceived product efficacy. Results showed that compared to static ingredient image presentation, dynamic presentation significantly enhanced consumers' perceived product efficacy, validating H1. We further considered: First, how exactly do dynamic ingredient images influence perceived product efficacy through building memory association networks? We infer that ingredient images, as visual packaging elements, can vividly and graphically display product ingredients exerting their effects, enabling consumers to easily imagine the product usage process and ultimately associate this with perceived product efficacy. Therefore, it is necessary to examine whether mental imagery mediates the effect of ingredient image presentation (dynamic vs. static) on perceived product efficacy. Second, this study used common whitening toothpaste as the product stimulus. Given that consumers pay more attention to efficacy perception for health products (VanBergen et al., 2020), Study 2 will test our effects in a health product consumption context. Third, to increase the generalizability of our findings, Study 2 will recruit non-student participants.

Study 2

Study 2 aimed to examine the effect of ingredient image presentation mode (dynamic vs. static) on perceived product efficacy and test whether mental imagery mediates this relationship (H3), while excluding perceived vitality as an alternative mediator. This experiment used a single-factor two-level (ingredient image presentation: dynamic vs. static) between-subjects design.

3.1 Method

3.1.1 Participants We recruited 205 adult consumers (109 male, 53.2%; Mage = 27.48). Using G*Power for one-way ANOVA with two groups, an effect size of 0.25, and significance level of 0.05, the power for a sample size of 205 was 0.94, meeting statistical requirements.

3.1.2 Manipulation Compared to daily necessities like whitening toothpaste, adult consumers are more concerned about health product efficacy. To further verify whether the effect of ingredient image presentation on perceived product efficacy exists for health products, we selected probiotics as the stimulus material following VanBergen et al. (2020). The manipulation of ingredient image presentation was identical to Study 1.

3.1.3 Measures Participants completed the perceived product efficacy scale ($\alpha = 0.87$) using the same items as Study 1. Next, they completed the mental imagery scale adapted from Skard et al. (2021), consisting of three items: "To what extent does this packaging image help you associate with the product's

efficacy in your mind?" "To what extent does this packaging image help you imagine the product's efficacy?" and "To what extent does this packaging image help you imagine the product's effects?" ($\alpha = 0.88$), with 1 = "not at all" and 7 = "very much."

Kim and Lakshmanan (2015) found that dynamic advertisements lead consumers to perceive greater vitality in the ads. We thus inferred that consumers might associate vitality with dynamic ingredient images, leading to higher perceived ingredient vitality that influences perceived product efficacy. To rule this out, we measured perceived vitality as an alternative mediator using Kim and Lakshmanan's (2015) 7-point scale: "This packaging looks energetic," "This packaging looks full of vitality," and "This packaging looks energetic" ($\alpha = 0.92$).

Because the stimulus material was probiotic capsules, consumers' perceptions relate to their health consciousness. Therefore, we added health consciousness as a control variable, measured using Yamim et al.'s (2020) four-item scale: "I reflect on my health condition," "I care about my health condition inwardly," "I pay attention to my health," and "I monitor my health condition" (1 = "does not describe me at all," 7 = "describes me very well"; $\alpha = 0.76$). An attention check question identical to Study 1 was included. Finally, participants provided demographic information.

3.2 Results

3.2.1 Participant Demographics Participants ranged in age from 18 to 45 years ($M = 27.48$, $SD = 5.202$). The education distribution showed that college and undergraduate students (150 participants) were most common (73.2%), while junior high school and below (6 participants) were least common (2.9%). Regarding monthly personal income, the highest proportion (96 participants, 46.8%) fell between 5,000–10,000 RMB, while the smallest proportion (8 participants, 3.9%) earned more than 30,000 RMB monthly.

3.2.2 Main Effect Analysis To test H1, we conducted one-way ANOVA with ingredient image presentation as the independent variable, perceived product efficacy as the dependent variable, and emotional response, personal innovativeness, and health consciousness as covariates. Results showed that ingredient image presentation (dynamic vs. static) significantly affected perceived product efficacy ($F(1, 200) = 12.53$, $p < 0.001$, $\mathrm{p}^2 = 0.06$). The dynamic presentation group reported significantly higher perceived product efficacy ($M = 6.15$, $SD = 0.77$) than the static presentation group ($M = 5.61$, $SD = 0.92$), again supporting H1. After adding demographic variables, the effect remained significant ($F(1, 196) = 11.61$, $p = 0.001$, $\mathrm{p}^2 = 0.06$).

3.2.3 Mediation Analysis With ingredient image presentation as the independent variable, mental imagery as the dependent variable, and emotional response, personal innovativeness, and health consciousness as covariates, results

showed that ingredient image presentation (dynamic vs. static) significantly affected mental imagery ($F(1, 200) = 4.15$, $p = 0.043$, $p^2 = 0.02$). The dynamic presentation group reported significantly higher mental imagery ($M = 6.07$, $SD = 0.93$) than the static presentation group ($M = 5.57$, $SD = 1.10$), supporting H2. After controlling for demographic variables, the effect remained significant ($F(1, 196) = 4.20$, $p = 0.042$, $p^2 = 0.02$).

We used PROCESS Model 4 to test whether mental imagery mediates the effect of ingredient image presentation on perceived product efficacy. The dynamic presentation group was coded as 1 and the static group as -1, with 5,000 bootstrap samples. With ingredient image presentation as the independent variable, perceived product efficacy as the dependent variable, mental imagery as the mediator, and emotional response, personal innovativeness, and health consciousness as covariates, mediation analysis revealed a significant indirect effect ($\beta = 0.05$; 95% CI [0.01, 0.13]), supporting H3. Specifically, ingredient image presentation significantly positively affected mental imagery ($\beta = 0.12$, $SE = 0.06$, $p = 0.043$), and mental imagery significantly positively affected perceived product efficacy ($\beta = 0.46$, $SE = 0.05$, $p < 0.001$). After controlling for demographic variables, the mediating effect remained significant ($\beta = 0.05$, 95% CI [0.01, 0.13]).

Finally, to rule out perceived vitality as an alternative mediator, we conducted ANOVA with ingredient image presentation as the independent variable and perceived vitality as the dependent variable. Results showed no significant effect of ingredient image presentation (dynamic vs. static) on perceived vitality ($F(1, 203) = 0.49$, $p = 0.48$, $p^2 = 0.00$). The dynamic group's perceived vitality ($M = 5.94$, $SD = 1.34$) did not differ significantly from the static group's ($M = 5.82$, $SD = 1.14$). Parallel mediation analysis with both perceived vitality and mental imagery as mediators showed that perceived vitality's indirect effect was not significant ($\beta = 0.013$, 95% CI [-0.02, 0.06]), while mental imagery's mediating effect remained significant ($\beta = 0.11$, 95% CI [0.05, 0.19]). Thus, Study 2 ruled out perceived vitality as an alternative mediator.

3.3 Discussion

Study 2 replicated the positive effect of ingredient image presentation on mental imagery (H2) and verified the mediating role of mental imagery in the relationship between ingredient image presentation and perceived product efficacy (H3) within the health product domain. It also excluded perceived vitality as an alternative mediator. Collectively, the first two experiments confirm that ingredient image presentation influences perceived product efficacy. However, this effect cannot occur under all circumstances, necessitating investigation of its boundary conditions. Revisiting our earlier reasoning, the process by which ingredient image presentation influences perceived product efficacy involves consumers' processing of visual information. When consumers face high perceived performance risk, they often ignore peripheral cues like visual information (Chung, 2013), making it difficult to generate mental imagery and subsequently affect-

ing perceived product efficacy. Therefore, Study 3 introduces perceived performance risk as a boundary condition. Additionally, Study 3 examines whether perceived product efficacy significantly influences subsequent purchase intention.

Study 3

Study 3 had two primary objectives: First, to test whether perceived performance risk moderates the mediating effect of mental imagery in the relationship between ingredient image presentation (dynamic vs. static) and perceived product efficacy, verifying H4, H5, and H6. Second, to examine the downstream effect of perceived product efficacy on purchase intention, verifying H7. The main experiment employed a 2 (ingredient image presentation: dynamic vs. static) × 2 (perceived performance risk: high vs. low) between-subjects design.

4.1 Pretest

The pretest aimed to validate the manipulation of high versus low performance risk stimuli. First, for product category selection, we referred to VanBergen et al. (2020) and selected health products. Considering the influence of stimulus familiarity, we needed to choose a familiar health product with perceived performance risk. We surveyed familiarity with six health products (lutein tablets, melatonin tablets, coenzyme Q10 soft capsules, milk thistle liver protection tablets, astaxanthin soft capsules, and β-carotene soft capsules) among 30 adult consumers on Wenjuanxing (1 = "completely unfamiliar," 7 = "very familiar"). Melatonin tablets were selected as the stimulus product due to relatively high familiarity ($M = 4.17$, $SD = 2.04$, $t(29) = 1.82$, $p < 0.001$).

After determining the product category, we conducted a pretest to validate the perceived performance risk manipulation. We recruited 93 adult consumers (44 male, 47.3%; Mage = 25.99) via Wenjuanxing. G*Power calculations confirmed adequate statistical power. Participants were randomly assigned to high or low perceived performance risk conditions. Following DelVecchio (2005), we manipulated perceived performance risk through two different text descriptions. Participants imagined planning to purchase melatonin tablets and saw a test result description. The high-risk group saw: "Most melatonin tablets on the market have quality differences" (see Figure 4 Figure 4: see original paper). The low-risk group saw: "Most melatonin tablets on the market have almost no quality differences" (see Figure 4 Figure 4: see original paper). Participants then completed the perceived performance risk scale (Stone & Grønhaug, 1993): "I worry that the quality of this melatonin tablet is not reliable," "I worry that this melatonin tablet cannot achieve my expected effect," and "I worry that this melatonin tablet cannot perform its intended function" ($\alpha = 0.94$), with 1 = "strongly disagree" and 7 = "strongly agree."

Independent samples t-test analysis revealed that the high perceived performance risk condition ($M = 5.21$, $SD = 1.36$) scored significantly higher than the low-risk condition ($M = 2.69$, $SD = 1.13$; $t(91) = 9.77$, $p < 0.001$, Cohen's $d = 2.02$). These results confirmed the validity of our perceived performance risk manipulation for the formal experiment.

4.2 Method

4.2.1 Participants We recruited 409 adult consumers (246 male, 60.1%; Mage = 27.83). G*Power analysis showed that with an effect size of 0.25 and significance level of 0.05, a sample size of 409 achieved a power of 0.9, meeting statistical requirements.

4.2.2 Manipulation Participants read experimental materials describing a scenario where they planned to purchase melatonin tablets to improve sleep. They were told that scanning the QR code on the package would provide clearer ingredient information to better understand product functions. Participants searched online for melatonin information and saw a test report from the "Product Quality Inspection Association." We manipulated perceived performance risk using the same materials as the pretest. Ingredient image presentation manipulation was identical to Study 1.

4.2.3 Measures Participants evaluated purchase intention for the melatonin tablets using three items adapted from Hwan and Kim (2012): "How likely are you to purchase this melatonin tablet?" "How much do you tend to purchase this melatonin tablet?" and "How willing are you to purchase this melatonin tablet?" ($\alpha = 0.95$) on a 7-point scale (1 = "not at all," 7 = "very much"), with higher scores indicating stronger purchase intention. Next, participants completed the perceived product efficacy assessment using VanBergen et al.'s (2020) scale ($\alpha = 0.95$) with items identical to Study 1. Mental imagery was measured using Skard et al.'s (2021) scale ($\alpha = 0.94$) with items identical to Study 2. To ensure successful manipulation of perceived performance risk, we included the same risk measurement items as the pretest. Health consciousness was again included as a control variable. An attention check question was included, followed by demographic information.

4.3 Results

4.3.1 Participant Demographics Participants ranged in age from 16 to 54 years ($M = 27.83$, $SD = 6.832$). The education distribution showed that college and undergraduate students (310 participants) were most common (75.8%), while junior high school and below (6 participants) were least common (1.5%). Regarding monthly personal income, the highest proportion (208 participants, 50.9%) fell between 5,000–10,000 RMB, while the smallest proportion (8 participants, 2.0%) earned more than 30,000 RMB monthly.

4.3.2 Experimental Results **Manipulation Check:** We used independent samples *t*-test to verify the perceived performance risk manipulation. Results showed that the high perceived performance risk group ($M = 4.67$, $SD = 1.67$) scored significantly higher than the low-risk group ($M = 4.05$, $SD = 1.78$, $t(407) = 3.64$, $p < 0.001$, Cohen's $d = 0.36$), confirming successful manipulation.

Mediation Analysis: We used PROCESS to test whether mental imagery mediates the effect of ingredient image presentation on perceived product efficacy. Using Model 4 with 5,000 bootstrap samples, with ingredient image presentation as the independent variable, perceived product efficacy as the dependent variable, mental imagery as the mediator, and emotional response, personal innovativeness, and health consciousness as control variables, results showed a significant mediating effect ($\beta = 0.17$, 95% CI [0.08, 0.28]), again supporting H3. Specifically, ingredient image presentation (dynamic vs. static) significantly positively affected mental imagery ($\beta = 0.24$, $SE = 0.07$, $p < 0.001$), and mental imagery significantly positively affected perceived product efficacy ($\beta = 0.72$, $SE = 0.03$, $p < 0.001$). After controlling for demographic variables, the mediating effect remained significant ($\beta = 0.16$, 95% CI [0.07, 0.27]).

Moderated Mediation Analysis: We conducted ANOVA to examine differences in mental imagery and perceived product efficacy across the two presentation modes under high versus low perceived performance risk. First, with ingredient image presentation as the independent variable, perceived performance risk as the moderator, mental imagery as the dependent variable, and emotional response, personal innovativeness, and health consciousness as covariates, results showed a significant main effect of ingredient image presentation on mental imagery ($F(1, 402) = 12.02$, $p < 0.001$, $\mathrm{p}^2 = 0.029$), a non-significant effect of perceived performance risk ($F(1, 402) = 0.57$, $p = 0.45$, $\mathrm{p}^2 = 0.014$), and a significant interaction between ingredient image presentation and perceived performance risk ($F(1, 402) = 5.73$, $p = 0.017$, $\mathrm{p}^2 = 0.014$). Simple effects tests revealed that under high perceived performance risk, mental imagery scores did not differ significantly between dynamic ($M = 5.00$, $SD = 1.53$) and static presentation groups ($M = 4.72$, $SD = 1.54$; $F(1, 402) = 0.58$, $p = 0.45$, $\mathrm{p}^2 = 0.00$). Under low perceived performance risk, the dynamic group reported significantly higher mental imagery ($M = 5.50$, $SD = 1.50$) than the static group ($M = 4.76$, $SD = 1.91$; $F(1, 402) = 17.25$, $p < 0.001$, $\mathrm{p}^2 = 0.04$). These results support H4, as shown in Figure 6 [Figure 6: see original paper].

Second, with ingredient image presentation as the independent variable, perceived performance risk as the moderator, perceived product efficacy as the dependent variable, and emotional response, personal innovativeness, and health consciousness as control variables, ANOVA revealed a significant main effect of ingredient image presentation ($F(1, 402) = 7.13$, $p = 0.008$, $\mathrm{p}^2 = 0.017$), a non-significant effect of perceived performance risk ($F(1, 402) = 0.49$, $p = 0.48$, $\mathrm{p}^2 = 0.014$), and a significant interaction ($F(1, 402) = 6.38$, $p = 0.012$, $\mathrm{p}^2 = 0.016$). Simple effects tests showed that under high perceived performance risk, perceived product efficacy did not differ significantly between dynamic ($M =$

4.92, $SD = 1.42$) and static groups ($M = 4.76$, $SD = 1.47$; $F(1, 402) = 0.01$, $p = 0.92$, $p^2 = 0.00$). Under low perceived performance risk, the dynamic group reported significantly higher perceived product efficacy ($M = 5.59$, $SD = 1.21$) than the static group ($M = 5.00$, $SD = 1.78$; $F(1, 402) = 13.54$, $p < 0.001$, $p^2 = 0.03$). These results support H5, as shown in Figure 7 [Figure 7: see original paper]. After controlling for demographic variables, the interaction effects on mental imagery ($F(1, 398) = 5.53$, $p < 0.05$, $p^2 = 0.01$) and perceived product efficacy ($F(1, 398) = 6.49$, $p = 0.011$, $p^2 = 0.02$) remained significant.

We used PROCESS to test the moderated mediation effect. To examine whether perceived performance risk moderates the mediating effect of mental imagery, we coded the high-risk group as 1 and low-risk group as -1. Using Model 8 with 5,000 bootstrap samples, with ingredient image presentation as the independent variable, perceived performance risk (high vs. low) as the moderator, perceived product efficacy as the dependent variable, mental imagery as the mediator, and emotional response, personal innovativeness, and health consciousness as covariates, results showed a significant interaction effect (β = -0.23, 95% CI [-0.45, -0.04]), supporting H6. Specifically, under high perceived performance risk, the mediating effect of mental imagery was not significant ($\beta = 0.05$, 95% CI [-0.08, 0.18]); under low perceived performance risk, mental imagery showed a significant mediating effect ($\beta = 0.29$, 95% CI [0.15, 0.45]). After adding demographic variables, mental imagery remained a significant mediator in the interaction between ingredient image presentation and perceived performance risk (β = -0.23, 95% CI [-0.45, -0.04]).

4.3.3 Chain Mediation Analysis We first used linear regression to verify the effect of perceived product efficacy on purchase intention. Results showed that perceived product efficacy significantly influenced purchase intention ($\beta = 0.922$, $t(407) = 34.54$, $p < 0.001$). To further test the influence of ingredient image presentation on purchase intention through mental imagery and perceived product efficacy, we used PROCESS Model 6 to examine the chain mediation model. Results showed a significant chain mediation effect ($\beta = 0.16$; 95% CI [0.08, 0.26]), supporting H7. Additionally, using PROCESS Model 85, we tested the moderating effect of perceived performance risk on this chain mediation. Results showed that perceived performance risk significantly moderated the chain mediation process (β = -0.18; 95% CI [-0.35, -0.32]), further supporting H7.

4.4 Discussion

Study 3 replicated the mediating effect of mental imagery found in Study 2 using melatonin as the health product stimulus. Furthermore, it validated perceived performance risk as an important boundary condition for the effect of ingredient image presentation (dynamic vs. static) on perceived product efficacy, supporting H4 and H5. The study also confirmed that perceived performance risk significantly moderates the mediating effect of mental imagery (H6) and verified the downstream effect of perceived product efficacy on purchase intention

(H7), providing a useful supplement to the first two experiments. Additionally, previous literature suggests that processing fluency and goal focus influence how consumers process ingredient images (Chen et al., 2023; Li et al., 2018), thereby affecting product efficacy perception and judgment. Therefore, Study 4 aims to further rule out these alternative mediating explanations.

Study 4: Ruling Out Alternative Mediators of Processing Fluency and Goal Focus

Study 4 had three main objectives: First, to exclude alternative explanations involving processing fluency and goal focus. Second, to measure actual purchase behavior and test the effect of perceived product efficacy on real purchase behavior. Third, to increase ecological validity by conducting a laboratory experiment where participants physically scanned QR codes, enhancing the practical marketing implications of our findings. This experiment used a single-factor two-level (ingredient image presentation: dynamic vs. static) between-subjects design, with manipulation identical to Study 1.

5.1 Pretest

Given that previous studies did not verify whether participants actually scanned QR codes, we included this manipulation check in the formal experiment. Previous research shows that consumers are more willing to spend time and effort understanding high-involvement products (Jin et al., 2018). We thus hypothesized that consumers would be more willing to scan QR codes for high-involvement products. We needed to measure stimulus product involvement in the pretest. Since Study 4 planned to recruit university students in a laboratory setting to test QR code scanning behavior, we continued using whitening toothpaste from Study 1 as the product stimulus.

The pretest recruited 100 university students (42 male, 42%; Mage = 21.3). Product involvement was measured using four items adapted from Laurent (1985): "This product is very important to me," "If I am dissatisfied with this product I purchased, I would regret my choice," "When purchasing products, I generally shop carefully to make the right decision," and "I value the functional benefits this product brings me" (1 = "strongly disagree," 7 = "strongly agree"). Results showed high involvement with whitening toothpaste ($M = 4.65$, $SD = 0.74$). A one-sample t-test comparing involvement to the scale midpoint of 4 revealed significantly higher involvement ($t(99) = 8.77$, $p < 0.001$). We thus selected high-involvement whitening toothpaste for the formal experiment.

5.2 Procedure

The experiment was conducted in a university laboratory, recruiting 160 university students. The procedure consisted of several parts. Following Dhar et

al. (2007), participants completed an ostensibly unrelated survey for compensation. At the end, they were told: "Regarding compensation, you have two choices: either receive 10 RMB directly, or use 4.2 RMB of the 10 RMB compensation to purchase a whitening toothpaste." Simultaneously, experimenters presented the whitening toothpaste product, with ingredient images on the package presented in either dynamic or static form. Participants were randomly assigned to one of the two groups and made their compensation choice. During this process, experimenters observed whether participants actively scanned the QR code, tracked and counted scanner numbers via the backend system, and recorded purchase behavior as a behavioral outcome measure. Participants then completed measures of perceived product efficacy ($\alpha = 0.92$), mental imagery ($\alpha = 0.92$), processing fluency ($\alpha = 0.84$), and goal focus. Processing fluency was measured using Graf et al.'s (2018) five-item 7-point scale: "I think the information on this product package is simple," "I think the information on this product package is consistent and coherent," "I can clearly understand the information on this product package," "I find it difficult to understand the information on this product package," and "I think the information on this product package is easy to understand." Goal focus was measured using Chun et al.'s (2011) single item: "I think this whitening toothpaste's goal focuses on solving functional problems" (1 = "strongly disagree," 7 = "strongly agree"). Finally, participants reported experimental purpose and demographics.

5.3 Results

5.3.1 Participant Demographics The experiment recruited 160 university students. Backend statistics showed that 134 participants scanned the QR code (83.8% scanning rate), while 26 did not. After excluding non-scanners, we collected 134 valid questionnaires. The average age was 21.4 years, with 54 males (40.3%) and 80 females (59.7%). Regarding monthly personal expenditure, the highest proportion (61 participants, 45.5%) fell between 1,001–2,000 RMB, while the smallest proportion (6 participants, 4.5%) spent less than 1,000 RMB monthly.

5.3.2 Mediation Analysis With ingredient image presentation (dynamic vs. static) as the independent variable, mental imagery, processing fluency, and goal focus as simultaneous mediators, emotional response and personal innovativeness as control variables, and perceived product efficacy as the dependent variable (Model 4, 5,000 bootstraps), results showed a significant mediating effect of mental imagery ($\beta = 0.12$; $SE = 0.05$, 95% CI [0.05, 0.23]). The indirect effects of processing fluency ($\beta = 0.01$; $SE = 0.02$, 95% CI [-0.01, 0.55]) and goal focus ($\beta = 0.06$; $SE = 0.04$, 95% CI [-0.01, 0.16]) were non-significant. After controlling for demographic variables, mental imagery's mediating effect remained significant ($\beta = 0.08$; $SE = 0.04$, 95% CI [0.06, 0.28]).

Additionally, with ingredient image presentation as the independent variable, mental imagery and perceived product efficacy as mediators, emotional response

and personal innovativeness as control variables, and purchase behavior (0 = no purchase, 1 = purchase) as the dependent variable (Model 6, 5,000 bootstraps), chain mediation analysis revealed a significant indirect effect (β = 0.25; SE = 3.36, 95% CI [0.09, 0.68]). After controlling for demographic variables, the result remained significant (β = 0.23; SE = 2.42, 95% CI [0.08, 0.83]).

5.4 Discussion

Study 4 ruled out alternative explanations involving processing fluency and goal focus, again confirming the mediating role of mental imagery. It also measured actual purchase behavior, demonstrating the effect of perceived product efficacy on real purchase behavior.

General Discussion

6.1 Research Conclusions

Product packaging is an important factor influencing consumer judgment and decision-making. How to efficiently transmit product information through packaging has become a concern for both academia and industry. Based on associative learning theory, this paper cleverly connects ingredient image presentation with perceived product efficacy and explores the mediating mechanism and boundary conditions of this effect from the perspective of mental imagery. The research draws the following conclusions: First, ingredient image presentation significantly influences consumers' perceived product efficacy. Second, mental imagery plays a significant mediating role in the relationship between ingredient image presentation and perceived product efficacy. Third, the effect of ingredient image presentation on perceived product efficacy is moderated by perceived performance risk. When facing high perceived performance risk, consumers focus more on central cues related to product quality and ignore peripheral cues like ingredient image presentation, making it difficult for presentation mode to promote mental imagery and influence perceived product efficacy. Under low perceived performance risk, consumers attend more to peripheral cues like dynamically presented ingredient images, more easily generating mental imagery and thereby enhancing perceived product efficacy. Fourth, consumers' perceived product efficacy significantly influences purchase intention.

6.2 Theoretical Contributions

This research offers several theoretical innovations. First, based on associative learning theory, it reveals the positive effect of ingredient image presentation on perceived product efficacy. In research on how packaging images influence consumer perception, packaging images are often viewed as visual cues that promote healthy food choices (Ignacio et al., 2020). For example, López et al. (2024) validated the positive effect of implied motion in packaging imagery on product

liking. Although these studies confirm that dynamic images influence consumer perception, they typically rely on implied motion effects in static images. In contrast, this paper verifies the effect of ingredient image presentation mode (dynamic vs. static) on perceived product efficacy, supplementing previous research on how images influence consumer perception. Moreover, prior literature on ingredient images and product evaluation often adopts an information processing perspective, treating ingredient images as information cues (Li & Liu, 2022). Given that this research deeply examines how different presentation modes of ingredient images differentially affect consumer perception, we introduce associative learning theory to explain the effect, innovatively proposing a theoretical perspective on how images influence consumer perception while enriching and expanding the theoretical connotations and applications of associative learning theory in packaging dynamic design and perceived product efficacy research.

Second, this paper introduces mental imagery to clarify the mediating mechanism through which ingredient image presentation influences perceived product efficacy. Previous research demonstrates that mental imagery is an important information processing strategy that directly participates in cognitive processes such as memory, association, and decision-making (Ye et al., 2018). For example, in retail settings, VR more effectively evokes mental imagery than static images, thereby influencing purchase intention (Zhang et al., 2024). Other studies show that pictorial (vs. textual) information (Silva et al., 2021) and AR (vs. VR) (Hilken et al., 2022) more readily stimulate mental imagery. Building on this literature, our research investigates the differential effects of dynamic versus static ingredient image presentation on mental imagery, which in turn affects perceived product efficacy. Thus, this paper reveals the internal "black box" of how ingredient image presentation influences perceived product efficacy from the mental imagery perspective. Results show that dynamic (vs. static) ingredient image presentation awakens greater mental imagery, leading to higher perceived product efficacy. This research extends the study of ingredient image dynamism to mental imagery arousal, supporting the view that vivid images can positively awaken mental imagery (Su et al., 2016) and enriching current theoretical contributions on mental imagery. Additionally, we find that high (vs. low) perceived performance risk inhibits mental imagery generation, thereby affecting perceived product efficacy. Thus, this research identifies the inhibitory effect of high perceived performance risk on mental imagery generation. In summary, this study reveals the internal mechanism of how ingredient image presentation influences perceived product efficacy from the novel perspective of mental imagery while expanding literature on perceived performance risk.

Finally, this research extends and enriches studies on antecedents of perceived product efficacy. Previous research has examined various factors influencing perceived product efficacy, such as packaging simplicity/complexity design (Chen et al., 2023) and price (Díaz-Lago et al., 2022). Recent scholars found that sharing products with strangers reduces product identification, leading to lower perceived product efficacy (Lteif et al., 2023), while calling for more research on

this important consumer perception variable. Compared to prior studies, product ingredient information represents a more direct dimension for consumers' functional understanding of products and plays a more immediate role in product efficacy judgment. As a beneficial supplement, this research focuses on ingredient image presentation as an antecedent, discovering and confirming its positive effect on perceived product efficacy. These conclusions not only enrich research on how packaging visual elements influence perceived product efficacy but also provide a new perspective for antecedent research on perceived product efficacy, deepening understanding of how visual information presentation modes affect consumer perception.

6.3 Practical Implications

As consumers increasingly focus on product efficacy, this research provides valuable guidance for how companies can enhance perceived product efficacy through marketing communications and how to reasonably design dynamic packaging elements, offering strong practical significance.

First, this research provides important practical guidance for corporate packaging design. Our findings show that ingredient image presentation significantly influences consumers' perceived product efficacy and purchase intention. With proliferating homogeneous products, enhancing consumers' perceived product efficacy is crucial for companies. Based on our conclusions, companies can collaborate with technology firms to develop interactive packaging content, using AI or AR technologies to present dynamic ingredient images that closely integrate dynamic effects with product functions. This facilitates consumers' construction of memory association networks related to product efficacy. For example, scanning Schwarzkopf hair oil packaging to display the smooth flowing effect of oil molecules can enhance perceived product efficacy and promote purchase behavior. In summary, this research offers practical insights for using dynamic packaging design to increase perceived product efficacy.

Second, this research provides marketers with strategies for activating consumer mental imagery to enhance perceived product efficacy. Our results demonstrate that enhanced mental imagery improves perceived product efficacy and purchase intention. Marketers can leverage marketing elements to facilitate smoother mental imagery generation, thereby strengthening product efficacy perception. For instance, advertising and social media content can focus on describing ingredient effects to help consumers form clear mental imagery.

Finally, marketers can manipulate consumers' perceived performance risk to maximize the benefits of ingredient image presentation applications. According to our findings, companies can reduce consumers' perceived performance risk to ensure the positive effects of dynamic presentation are maximized, achieving better promotional outcomes. Specific strategies include: (1) Establishing trust and authoritative endorsements by collaborating with third-party authoritative institutions to obtain product ingredient and efficacy certifications, displaying

these certifications through packaging or advertising channels; (2) Providing risk-free purchase guarantees such as unconditional return policies; and (3) Real-time customer feedback and communication through online customer service and social media channels to promptly address consumer questions and uncertainties about product efficacy, regularly sharing authentic positive user feedback to reinforce positive expectations.

6.4 Limitations and Future Directions

This research has several limitations that future studies could address. First, the mechanisms through which ingredient image presentation influences perceived product efficacy could be further explored by examining additional boundary conditions. This paper tested the moderating role of perceived performance risk in the process. Future research could investigate other moderators, such as product knowledge (Cowan et al., 2021). Research indicates that consumers with higher (vs. lower) knowledge have stronger semantic mapping, so consumers with less product knowledge may gain more product information from digitally supported dynamic effects (Cowan et al., 2021). Thus, product knowledge may moderate the effect of ingredient image presentation on perceived product efficacy and warrants further investigation.

Second, this research's external validity has certain limitations, necessitating field experiments to validate conclusions. Consumers' perceived product efficacy and purchase behavior were measured in laboratory rather than real consumption contexts. Moreover, this research focused on offline shopping scenarios, using QR code scanning to achieve dynamic ingredient image presentation—effective but lacking simplicity. With the prevalence of online shopping, future research could implement dynamic ingredient image presentation directly on webpages in online shopping contexts to observe consumers' real reactions and purchase behaviors toward different packaging types, thereby improving external generalizability.

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Study 3: Text Descriptions

High Perceived Performance Risk: According to Consumer Reports, extensive testing of melatonin tablets on the market, comprehensively examining manufacturing processes and product efficacy, reveals that quality varies across different brands of melatonin tablets. We found inconsistent production standards in the melatonin tablet industry, leading to varying melatonin content across brands. When consumers ingest products with excessive melatonin content, they are prone to adverse reactions such as dizziness, headaches, and nausea.

Low Perceived Performance Risk: According to Consumer Reports, extensive testing of melatonin tablets on the market, comprehensively examining manufacturing processes and product efficacy, reveals that most melatonin tablet brands have almost no quality differences. We found that manufacturers of melatonin tablets mostly adopt unified national production standards, with melatonin content across brands remaining within safe ranges. When consumers ingest products with melatonin content within safe ranges, they almost never experience side effects.

Note: Figure translations are in progress. See original paper for figures.