Can Digitally Displayed Product Packaging Evoke Emotions? A Neuromarketing Study

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ABSTRACT

The appealing design elements on the packaging are the key to capturing consumers' attention toward the product. Many methods can be used to study packaging design features that attract consumer attention and influence purchase behavior. Neuromarketing is a method that has gained attention in the marketing field. This research involves the design of natural skincare product packaging using neuromarketing eye-tracker and EEG techniques, which can capture visual attention and influence consumer purchase intention through emotional variables and visual-haptic perception. In addition, this study will also test different types of design elements, including shape, texture, layout, and eco-label. The research results indicate that texture and eco-label factors significantly differ in participants' visual attention. Heatmap analysis shows general information on the label, including brand, benefits, function, content, product volume, and eco-label, arranged in symmetric and asymmetric layouts, which can attract participants' attention to read or pay attention to the displayed information on the product. The EGG analysis results, represented through beta and gamma waves, show differences in emotional responses when different stimuli are presented. Spearman Rank correlation results show a positive correlation between visual attention to designs with glossy based on EEG indicators. The results of the research model tested using regression techniques indicate a significant influence between packaging features and purchase intention mediated by visual-haptic perception and emotion variables. The result of this research using the combination of neuromarketing and questionnaires shows that packaging features mediated by visual-haptic perception and emotion variables significantly affect purchase intention.

Keywords: packaging design, neuromarketing, heatmaps, eye-tracker, EEG, packaging features, purchase intention

1. INTRODUCTION

The development of the beauty and body care industry continues to grow every year. The growth of this sector in Indonesia is expected to continue to level up by around 8.9% until 2026 (Global Data, 2022) [1]. The results of a survey by Populix [2] show that around 77% of Indonesians regularly shop for skincare products at least once a month. Many types of skincare products are on the market, including natural skincare. Data provided by Research and Markets [3] shows an estimated growth in the global market for natural skincare products of 8.27% from 2022 to 2027. The COVID-19 pandemic has changed consumer preferences and made them more active in finding skincare products with natural ingredients. The change is also happening in Indonesia, where natural skincare products are one of the trends that Indonesians are looking for nowadays due to their increased awareness of the use of chemicals in their daily skincare products. Most consumers tend to buy products with the term natural or organic written on the packaging [3]. In addition, a positive trend is also shown in adopting a sustainable or eco-friendly lifestyle, especially among the younger generation. The trend is also supported by data stating that 66% of Gen Z in Indonesia are willing to spend more money to purchase sustainable or environmentally friendly products [4].

Companies need to continue innovating to keep their products competitive in the market. One of them is marketing through product packaging design. Packaging is one of the tools that have an impact on marketing a product, not only influencing consumer attention but also purchasing decisions [5]. Packaging is a communication tool between buyers and products, representing the first contact with consumers, so it plays an important role in convincing consumers to decide [6]. Approximately 60% of purchasing decisions are influenced by packaging, and it takes two to three seconds to convince potential customers [6]. Based on the results of a survey conducted by ZAP Clinic and MarkPlus.Inc [7], around 12.5% of participants chose packaging as one of the considerations before buying a product. In addition, packaging can also be a medium for campaigning sustainability.

Many features in packaging design need to be considered to attract consumers' attention when choosing products, convey messages effectively through products, and improve consumer experience [8]. The main elements that are generally considered in determining packaging design are visual attributes and textual attributes. A package's visual characteristics are shape, layout, and material texture. Packaging with a round shape is preferred because it is more appealing, less distracting, enjoyable, attractive, and indicates normalcy [9]. The position of images, logos, and attributes consistently alters consumers' attention levels [10]. Positioning aids in disseminating information on product labels [11]. The packaging surface represents texture effects. Glossy effects evoke positive reactions such as liking, elegance, and pleasure [12].

The textual attributes are information displayed on the packaging. Textual attributes can be associated with eco-labels in natural ingredients products [9] [10]. The existence of eco-labels on packaging also plays a significant role in providing information and educating consumers about green products [13]. Research conducted by Taufique et al.

[14] states that consumers concerned about environmental damage prefer products with the least potential adverse environmental impact. ZAP Clinic and MarkPlus.Inc [7] states that 44.2% consider the presence of labels such as cruelty-free in determining product purchasing decisions. Moreover, eco-labels can develop a positive brand image, which leads to consumers' purchase intention [15].

E-commerce has become the most widely used media for buying and selling transactions because it allows buyers and sellers to meet online easily and quickly [16]. Indonesia is one of the fastest-growing e-commerce countries in Asia Pacific, based on a 71.18% increase in businesses' use of e-commerce to sell their products over the past three years [15]. The product's visual appearance is an essential parameter in e-commerce as it determines the decision-making process before the consumer is willing to purchase [17].

Product visualization in e-commerce can elicit consumer reactions and attract visual attention, not only for its aesthetics but also for its haptic perception. Attention shapes the consumer's perception of the displayed product, which can influence purchase decisions [5]. The study by Peck et al. [18] shows that the mental image of touching an object has the same effect on the perception of ownership as the actual act of touching. Using the concept of cross-modal correspondence, consumers can infer haptic cues from an object without touching it. This inference also helps consumers judge whether an online store's atmosphere satisfies their inner emotional state based on product visualization, which can lead to purchase decisions [19].

The application of neuromarketing in packaging design has received considerable attention in academic and industrial settings. Neuromarketing is defined as the application of cognitive science and neuroscience in marketing. This method can be used to analyze consumer needs, motivations, and preferences, which cannot be done with traditional methods [20]. Several tools are commonly used in neuromarketing research, including eye-tracking and EEG (Electroencephalogram) methods. As one of the neuromarketing tools, the eye-tracker can help marketers understand the subconscious decision-making process in influencing consumer behavior [21]. Eye trackers can capture visual attention and objectively assess consumer perceptions of visual stimuli through eye movements to indicate consumer behavior in receiving displayed information [22]. Muse Headband is an electroencephalograph (EEG) device with sensors that detect brain indicator activity [21]. A study conducted by Casas-Frausto et al. [23] shows that EEG can measure emotions through brain indicator activity associated with consumer responses to advertisements, brands, products, and shopping experiences.

This study aims to investigate the packaging of a natural skin care product to attract visual attention and purchase intention mediated by emotion and visual-haptic perception with a neuromarketing technique using an eye-tracker and EEG. Two contributions can be generated from this study. First, this study closely resembles reality by considering four elements of packaging (shape, layout, texture, and eco-label), which are considered simultaneously. In reality, audiences are exposed to those four factors simultaneously. Second, an eye tracker and EEG are used to measure visual attention and emotion, in

addition to a self-reported questionnaire. Therefore, insight from this study is richer because it is generated from subjective and objective measurement instruments.

2.   LITERATUR REVIEW

2.1 Packaging

Packaging is a coordinated system consisting of various materials in diverse forms and serves as a medium for the storage, protection, handling, delivery, and presentation of a product [24]. Product packaging is generally used as a medium by companies to communicate with their consumers before making purchase decisions. Packaging effectively increases consumer perceptions of products and distinguishes one product from another [9]. Packaging has four main aspects, abbreviated as 'VIEW' (Visible, Informative, Emotionally Appealing, Workable) [25]. A key distinction can be made between packaging elements in the form of visual attributes and textual attributes. Determining visual attributes can attract attention, transmit non-verbal information, and influence consumer emotions. Textual attributes are intended to send verbal or numerical information and are more likely to affect one's cognition [26].

2.2 Visual-Haptic Perception

Visual-haptic perception combines visual and tactile information to understand an object and the environment [27]. It falls under one of the applications of Cross-Modal Correspondences Theory, which refers to the systematic relationships found in sensory features derived from other sensory modalities [28]. In this case, the two modalities refer to the relationship or correlation between the stimuli that are evoked from the two modalities that influence each other [27]. Sometimes, a person can perceive associations from basic perceived stimuli such as image brightness and audio volume or more complex stimuli such as shapes and words [29].

2.3 Visual Attention

Visual attention is related to actions or how people react to visual attention. Visual attention is described as two aspects, namely orientation and discovery [30]. Salient basic visual features influence visual attention. New objects with different basic visual features around them will attract consumers' attention. Attention is defined as the ability to focus on specific aspects of the environment while ignoring others [31]. Eye movements are associated with visual attention, making it a vital indicator of the visual attention process [32]. Visual fixation is the most used parameter to assess the focus of consumer attention on the displayed object [33]. Fixation is defined as a gaze pattern during which the eyes remain relatively still and during which the visual system gathers information [34] so that frequency (number of fixations) and duration (time spent on a particular stimulus) are measurable [5].

2.4 Emotion

According to the American Psychological Association (APA), the definition of emotion is a complex pattern of reactions, including experiences, behaviors, and psychological elements. Emotions are how individuals resolve problems or situations that are considered personally important [35]. Dr. Ekman identified seven basic emotions that humans feel. These emotions are anger, contempt, disgust, enjoyment, fear, sadness, and surprise [36]. Many studies are related to emotions in various disciplines, including marketing. The study by Li et al. [37] deals with the effect of emotions on purchase intention in the context of e-customized products. Research conducted by Gutierrez et al. [38] states that eco-labels on packaging can generate positive emotions for consumers.

2.5 Purchase Intention

According to Arslan and Zaman [39], purchase intention can be defined as the possibility of a consumer buying goods or services in the future. Purchase intention for green products is described as the likelihood and desire to buy environmentally friendly products [40]. Four factors influence consumer purchases: attention, interest, desire, and conviction [39]. Chen [41] shows an essential relationship between care, environmental knowledge, attitudes, social influence, and the intention to buy environmentally friendly products. This purchase intention refers to a product or service.

2.6 Neuromarketing

Neuromarketing focuses on understanding consumer behavior by studying the human brain's central and peripheral nervous systems. Neuromarketing researchers measure human responses to marketing stimuli [42], a method developed through neuroscience to contribute to understanding human behavior, particularly in marketing research. The main goal of commercial neuromarketing studies is to measure aspects important for understanding consumer behavior, not only in the subconscious domain (attention, emotional responses, and memory) but also regarding attitudes and preferences [43]. The most commonly used neuromarketing tools in research fields are Electroencephalography (EEG) and Eye-tracker. EEG is a technique that measures the activity of brain areas, revealing the state of cortical activation [43]. EEG records electrical activity in the brain expressed in five indicators, each characterized by a different frequency and amplitude: delta (0-4 Hz), theta (3-7 Hz), alpha (8-12 Hz), beta (13-30 Hz), and gamma (30-40 Hz), reflecting cognitive and affective differences [44]. This technique often measures subjects' unconscious responses to diverse marketing stimuli [45]. Eye tracking measures eye movements composed of fixation and movement based on attention directed to the subject using an eye-tracker device [46]. This technique is based on the hypothesis that what people see reflects the processes in their minds. This hypothesis makes this approach increasingly applied in consumer research and marketing to explore how consumers process visual information [33]. In addition, this technique has also been used in the field of packaging design to identify which packaging elements can attract consumers' attention [47].

3. RESEARCH MODEL AND HYPOTHESIS DEVELOPMENT

The conceptual model was developed based on four previous studies, namely Mehrabian and Russell [48], Gutierrez et al. [38], Briand Decré and Cloonan [27], and Li et al. [37]. The reference models reviewed relate to packaging attributes influencing visual attention, emotion, visual-haptic perception, and purchase intention.

The model developed by Mehrabian and Russell [48], known as the SOR model, explains the influence produced by individuals after being given external stimuli to their environment. This model consists of three aspects, namely Stimulus (S), which refers to all external factors or stimuli from the environment; organism (O), which refers to the organism or individual affected by the stimulus (including emotion, perception, understanding, and evaluation), and Response (R) refers to actions by individuals resulting from their interaction with the stimulus as well as the emotional response felt. Eco-labels, one of the packaging features of natural skin care products, have been proven to attract positive emotions and influence the purchase of environmentally friendly products. This effect is found in the research of Gutierrez et al. [38] and is a reference in building this research model based on packaging features, visual attention, and purchase intention. Briand Decré and Cloonan developed the visual-haptic perception variable [27] based on their research measuring products with matte and glossy effects on emotional responses leading to consumer purchase behavior. Research by Li et al. [37] developed a model consisting of multisensory perception, positive emotions, and purchase intentions toward e-customization marketing. The results showed a positive influence of visual and haptic perceptions, emotions, and consumer purchasing behavior on e-customization marketing. The conceptual model in this study can be seen in Figure 1.
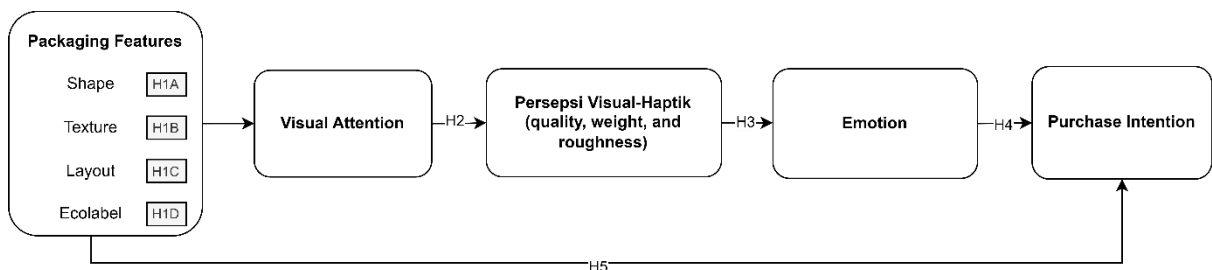

Figure 1. Conceptual Model

The reference to packaging shape may depend on the 'image mold' theory. According to this theory, some products are associated with packaging [49]. Innovation in packaging form can help make products more attractive and distinguish them from their competitors [9]. The form of packaging with product messages can affect customer perceptions [50]. This effect is also supported by research conducted by Riskos et al. [9], Clement et al. [30], and Grüner et al. [51]. Therefore, the hypotheses proposed in this study are:

Hypothesis 1a: There are differences in visual attention based on the type of packaging shape design.

Products with certain packaging effects can attract and increase consumer attention. In studies that observe visual attention, participants will direct their attention to the various

attributes available [52]. Visual texture can be a medium for processing information about an object's material, shape, and texture [53]. Other studies also mention that the glitter effect provides attractiveness and haptic features that can be used to evaluate the material properties, such as the object's texture, roughness, and hardness [26] [52]. The result is also supported by Chadwick and Kentridge [12], Marckhgott and Kamleitner [54]. Therefore, the hypotheses proposed in this study are:

Hypothesis 1b: There are differences in visual attention based on the type of texture design.

The layout of information on a product's packaging is one of the determinants of consumers' attitudes towards the product. Studies with eye trackers suggest that areas of visual clarity, such as layout, affect the distribution of visual attention [55]. Information symmetry reduces visual complexity and gives an aesthetic impression; the symmetry position is a configuration that is easier for humans to capture and plays an important role in creating an aesthetic effect on eco-packaging, affecting perceived quality and purchase intention [11]. This statement is in line with research by Kootstra et al. [56], Lacoste-Badie et al. [57], and Romeo-Arroyo et al. [58]. Therefore, the hypotheses proposed in this study are:

Hypothesis 1c: There is a difference in visual attention based on the design of the product label layout.

Eco-labels are a clue for consumers when choosing environmentally friendly products. In addition, buying eco-friendly products creates emotions for consumers because they think they have played a role in saving the environment [38]. Eco-labels provide consumers with visual information about what they need when they examine a product [9]. Eco-labels as verbal information can also have a more significant impact than eco-labels with visuals [59]. The effect of eco-label is supported by other studies that have been conducted by Celhay and Trinquecoste [60] and Wang et al. [61]. Therefore, the hypotheses proposed in this study are:

Hypothesis 1d: There are differences in visual attention based on the type of eco-label.

Humans can use various sources of sensory information to estimate objects shown to them. For example, the eyes and hands can provide information related to the shape of an object [62]. Visual perception of texture provides information about the surface of an object and indirectly encourages tactile sensors to further investigate surface properties based on that texture [63]. In the digital environment, haptic features are becoming increasingly important because they can connect consumer interactions with their products to create an emotional experience in shopping [64]. These results align with the research of Briand Decré and Cloonan [27], Helmefalk and Berndt [65]. Therefore, the hypothesis proposed in this study is as follows.

Hypothesis 2: There is a significant influence between packaging features and visual-haptic perception.

The results of research conducted by Briand Decré and Cloonan [27] show a relationship between visual-haptic perception and emotions. The study states that the gloss's impact on the product can provide an internal reaction (liking). In addition, research by Li et al. [37] states that the effects of visual and haptic perception can increase positive emotions and show that multisensory perception is possible to apply in influencing consumer purchase behavior. Packaging design can be a medium for designers to convey emotions through haptic design to product users. This argument is supported by research by Meert et al. [66], Briand Decré and Cloonan [27], and Kjellerup et al. [67]. Therefore, the hypothesis proposed in this study is as follows.

Hypothesis 3: There is a significant influence between visual-haptic perception and emotion.

Emotion can significantly mediate between a factor and purchase intention [68]. Shopping experiences include interactions between consumers and products, interfaces (both offline and online), and brands on an emotional as well as sensory level [69]. Positive emotions triggered by a product can influence consumer purchase behavior. This is shown by research conducted by Gutierrez et al. [38], Briand Decré and Cloonan [27], and Li et al. [37]. Therefore, the hypothesis proposed in this study is as follows.

Hypothesis 4: There is a significant influence between emotions and purchase intention.

Several factors, including product packaging, influence consumer decisions to buy a product. Packaging features such as shape, size, color, material, fonts, information labels, and so on trigger responses that impact product purchases. In research built by Yeo et al. [70], packaging features such as color, material, and graphics significantly impact purchase intention. Other studies, such as Waheed et al. [71] and Oliver et al. [72], support this statement. Therefore, the hypothesis proposed in this study is as follows.

Hypothesis 5: There is a significant influence between packaging features and purchase intention.

4. METHODOLOGY

The sampling technique used in this experiment was purposive sampling, where participants were selected based on specific characteristics and information considered relevant by the researcher. The participants' criteria in this experiment were male or female, over 18 years old, using skin care products, having an interest in natural skin care products, and not having vision problems. The information about the participant recruitment were distributed through various social media platforms. Referring to the previous study [73], the minimum number of participants is 39. The data collection process was carried out in the Laboratory of Innovation and Corporate System Development using Eye-Tracker Gazepoint Analysis 3 (GP3) and a Muse Headband. Four factors were manipulated: shape, texture, layout, and eco-label. Each factor had two levels: square and round (shape), matte and glossy (texture), asymmetrical and symmetrical

(layout), and text and logo (eco-label). Product brand, color, font, and type of eco-label were the same for all stimuli. The packaging was designed using Canva, Smartmockups, and Adobe Photoshop 2021. The following pictures (Fig. 2) illustrate the sixteen stimuli used in the experiment.

(a)   (b)   (c)   (d)
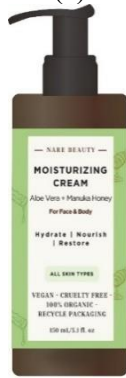
(e)   (f)   (g)   (h)

(i)   (j)   (k)   (l)

(m)   (n)   (o)   (p)

Figure 2. (a) Stimulus 1, (b) Stimulus 2, (c) Stimulus 3, (d) Stimulus 4, (e) Stimulus 5, (f) Stimulus 6, (g) Stimulus 7, (h) Stimulus 8, (i) Stimulus 9, (j) Stimulus 10, (k) Stimulus 11, (l) Stimulus 12, (m) Stimulus 13, (n) Stimulus 14, (o) Stimulus 15, (p) Stimulus 16

Several steps were involved in the data collection process. First, participants were asked to read the experiment protocol and sign the consent form. Then, they sat in front of a computer screen, and an eye tracker, and the Muse band was placed on their heads with assistance from the researcher. Calibration was performed to ensure both devices were recording accurate data. Each stimulus was presented on the computer screen, following the order determined by the partial counterbalancing method, specifically the Latin Square counterbalancing. The within-subjects method was used for stimulus presentation, meaning that all stimuli were presented to each participant. Each stimulus was displayed for 15 seconds, followed by a 45-second questionnaire session. Data were recorded using the Gaze Analysis and Mind Monitor applications.

The questionnaire assessed visual-haptic perception, emotions, and purchase intention (Table 1). Visual-haptic perception was evaluated based on quality perception, weight perception, and roughness perception [27]. Emotions were measured by selecting one of the emotions experienced when viewing the displayed stimulus [74]. Purchase intention was assessed using a Likert scale [11]. Validity and reliability testing were conducted using IBM SPSS 27 software. The validity test results indicated that each question item produced a p-value less than 0.05, confirming the overall instrument's validity (sig.<0.05) [75]. The reliability test showed a Cronbach's Alpha value of 0.730, indicating that the questionnaire was reliable.

Table 1. Questionnaire Items

Variable	Item	Scale	Validity Test
Visual-Haptic Perception	Perception of product quality	1-5: low to high quality	0.00
	Perception of product weight	1-5: light to heavy	0.00
	Perception of material roughness	1-5: rough to smooth	0.00
Emotion	What do you feel after looking at the packaging design of natural skincare products?	- Angry - Sad - Confused - Neutral - Happy	0.00
Purchase Intention	This packaging makes me want to try this product	1-5: Strongly Disagree to Strongly Agree	0.00
	This packaging makes me want to buy this product		0.00

5. DATA ANALYSIS

The data were obtained from 43 respondents. Table 2 presents the demographics and behaviors regarding the natural skin care products of the participants. Participants involved in this experiment consisted of 14 males (32.56%) and 29 females (67.44%). The participants in this study were predominantly female, although this research presents

genderless objects. This phenomenon can occur because skincare products have been aligned with the needs of women, and there is a societal stigma that using skincare products by men can diminish their masculinity. This perception is also supported by the abundance of skincare products specifically targeted towards women. The entire participants are aged over 18 years old with various professions, in which students or university students dominate the participants with a percentage of 60.50% were predominantly aged 24-29 years old (83.70%), which is considered the productive age group and is assumed to have a budget allocation for purchasing skincare, followed by respondents aged 18-23 years old (14%) and > 40 years old (2.3%). The selection of respondents aged at least 18 is based on considerations regarding the research object and cognitive maturity. The considerations regarding the research object are related to the design of packaging for natural skin care products aimed at prospective users of the products; in this case, participants aged over 18 years old are considered to have more mature skin conditions and are deemed capable of providing rational responses and easy to follow experiment instructions. Most participants (41.90%) spent Rp 1.000.001 - Rp 2.000.000 for monthly bills. Respondents' composition based on educational levels is divided into five categories: 1 participant (2.30%) had a Diploma education background, 36 participants (83.70%) had a Bachelor's Degree, and 6 participants (14%) had completed a Master's/Doctoral Degree. Thus, throughout the data collection process, all participants were assumed to be capable of understanding and following the entire data collection process well and tend to know about natural products and the environment, which are associated with the use of environmentally friendly products. This study found that 8 participants had never purchased natural skincare products, while 35 other participants had purchased natural skincare products in the last year. Twenty-seven respondents (62.80%) said they had purchased natural skincare 1-5 times a year. Additionally, four respondents stated that they purchased natural skincare products 6-10 times a year. One respondent (2.30%) was found to have purchased natural skincare products 11-15 times, and three respondents (7.0%) stated they had purchased products more than 15 times a year. Meanwhile, eight respondents (18.60%) stated they had never purchased natural skincare products. This statement also correlates with questions about attitudes towards natural skincare products, with most participants choosing the answer "agree" that natural skincare products do not have adverse effects on living beings, with a response percentage of 39.53%. In comparison, the rest chose "neutral" and "strongly agree," with percentages of 30.23% each. Additionally, statements regarding the use of natural skin care products not having adverse effects on the environment resulted in the highest number of "agree" responses, with a percentage of 39.53%. In comparison, the remaining respondents answered "neutral" and "strongly agree," with percentages of 32.56% and 27.91%, respectively. Furthermore, it is also known that the aspects observed or needed to be displayed on the packaging of natural skin care products when seeking information, according to the participants, are the layout of information (32.11%), eco-label (29.36%), packaging shape (23.85%), packaging material texture (12.84%), and other options (1.83%). Based on the points mentioned above, it was known that 43 participants qualified to participate in the experiment data collection process. This result indicates that all the data were processed.

Table 2. Profile of Respondents

Variable	Category	Frequency	Percentage
Gender	Male	14	32.56%
	Female	29	67.44%
	Total	**43**	**100%**
Age	18-23 years old	6	14%
	24-29 years old	36	83.70%
	30-35 years old	0	0
	36-40 years old	0	0
	> 40 years old	1	2.30%
	Total	**43**	**100%**
Education	Middle school	0	0
	High school	0	0
	Diploma	1	2.30%
	Graduate	36	83.70%
	Postgraduate	6	14%
	Total	**43**	**100%**
Occupation	Student	26	60.50%
	Public Servant	1	2.30%
	Employee	12	27.90%
	Entrepreneur	0	0
	Freelancer	4	9.30%
	Total	**43**	**100%**
Monthly Bill	< Rp 1.000.0000	2	4.70%
	Rp 1.000.001 - Rp 2.000.000	18	41.90%
	Rp 2.000.001 - Rp 3.000.001	12	27.00%
	Rp 3.000.001 - Rp 4.000.000	8	18.60%
	> Rp 4.000.000	3	7%
	Total	**43**	**100%**
Frequency of purchasing natural skincare products	0 Times	8	18.60%
	1-5 Times	27	62.80%
	6-10 Times	4	9.30%
	11-15 Times	1	2.30%
	>15 Times	3	7.00%
	Total	**43**	**100%**
I am interested in natural skincare products	Strongly Disagree	0	0%
	Disagree	0	0%
	Neutral	6	13%
	Agree	20	47%
	Strongly Agree	17	40%
	Total	**43**	**100%**

Variable	Category	Frequency	Percentage
I believe using natural skin care products does not harm the surroundings	Strongly Disagree	0	0.00%
	Disagree	0	0.00%
	Neutral	13	30.23%
	Agree	17	39.53%
	Strongly Agree	13	30.23%
	Total	**43**	**100%**
I believe using natural skin care products does not harm the environment	Strongly Disagree	0	0.00%
	Disagree	0	0.00%
	Neutral	14	32.56%
	Agree	17	39.53%
	Strongly Agree	12	27.91%
	Total	**43**	**100%**
In your opinion, what features should be displayed on the natural skincare packaging product?	Shape	26	23.85%
	Eco-label	32	29.36%
	Information layout	35	32.11%
	Packaging Texture	14	12.84%
	Others	2	1.83%
	Total	**109**	**100.00%**

5.1 Result on Visual Attention

The stimuli tested using the eye tracker were visually analyzed through heatmaps. The appearance of heatmaps indicated that the eye tracker was able to read the participants' eye movements toward the stimulus. The various colors on the heatmaps indicate the length of focus given to the Area of Interest (AOI) on the stimulus. Blue or green indicates a "cold" color, which means the focus on the area is low. In addition, there are yellow and orange colors and red, referred to as "hot" colors, meaning that the area receives a long focus of attention [76]. Figure 3 shows the average fixation duration for each AOI.

(a)   (b)   (c)   (d)

(e)   (f)   (g)   (h)

(i)   (j)   (k)   (l)

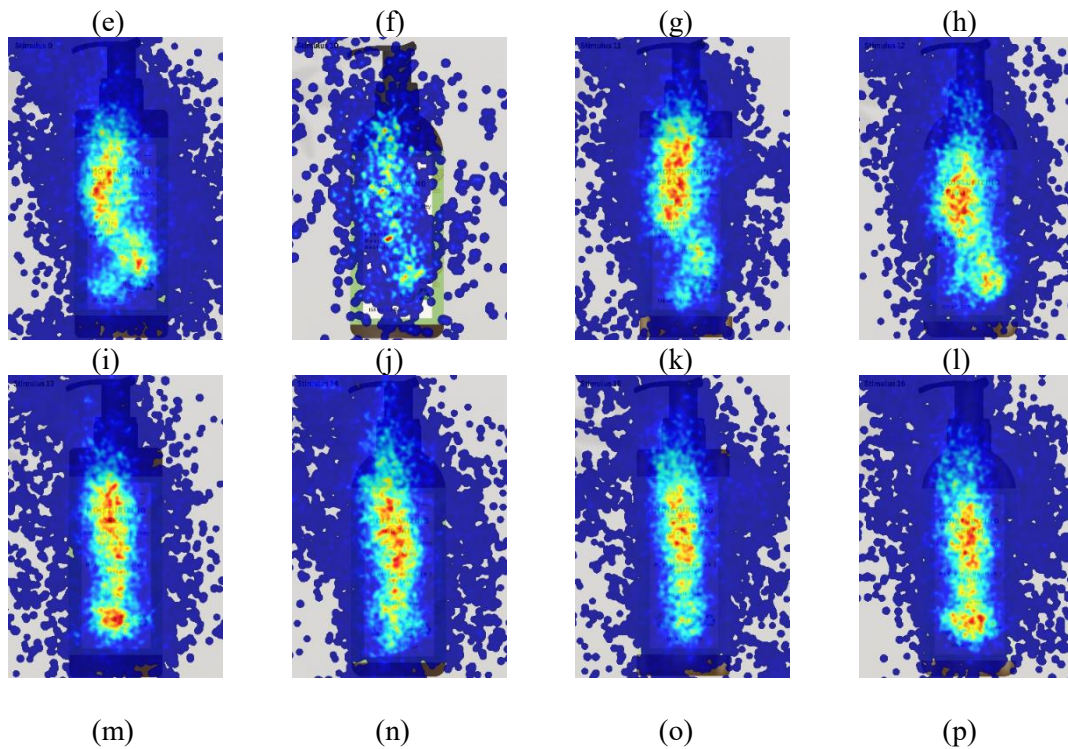(m)   (n)   (o)   (p)
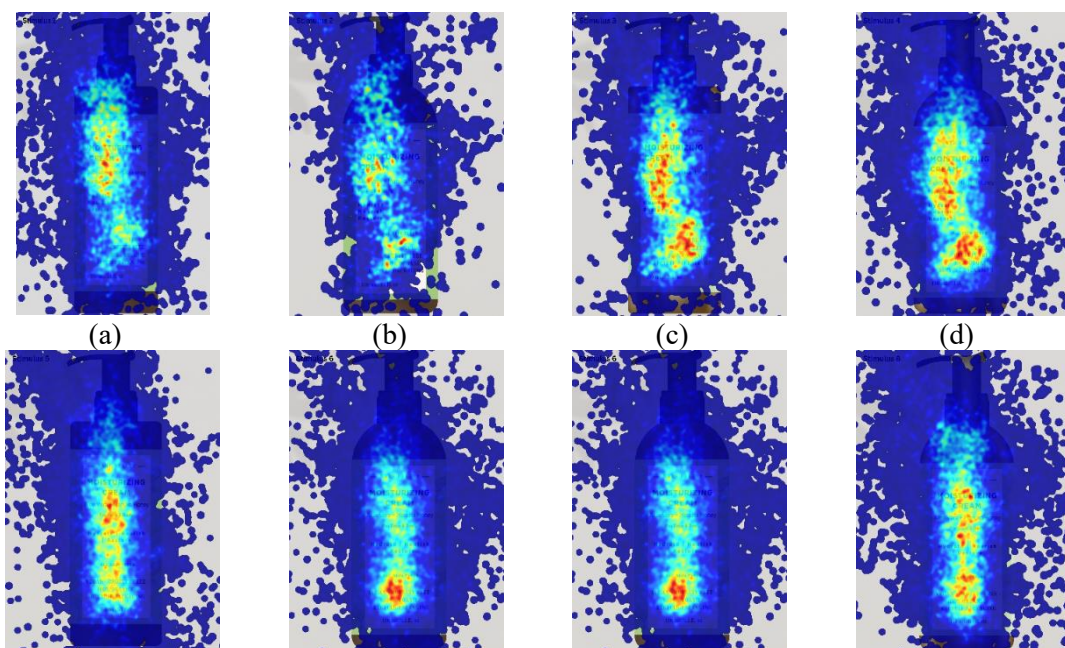
Figure 3. Heatmaps of Stimulus 1, (b) Stimulus 2, (c) Stimulus 3, (d) Stimulus 4, (e) Stimulus 5, (f) Stimulus 6, (g) Stimulus 7, (h) Stimulus 8, (i) Stimulus 9, (j) Stimulus 10, (k) Stimulus 11, (l) Stimulus 12, (m) Stimulus 13, (n) Stimulus 14, (o) Stimulus 15, (p) Stimulus 16

Based on the overall stimulus results, red areas generally appeared around the information displayed on the label, including the brand name, ingredients, function, and eco-label— blue and green areas predominated in other features, such as shape and texture illusions.

The data used to generate heatmaps were derived from the fixation duration on the stimulus's Area of Interest (AOI). Fixation duration results were obtained from 43 respondents for sixteen stimuli (see Table 3).

Table 3. Fixation Duration for each Factor

Factor	Level	Average Duration
Shape	Square	0.8855
	Round	0.9005
Texture	**Matte**	**4.9377**
	Glossy	4.1952
Layout	Asymmetry	4.0972
	Symmetry	4.2093
Eco-label	Verbal	0.8838
	Visual	0.5787

Overall, the matte texture AOI has the largest average duration value of 4.834 seconds. The average duration of the round shape AOI is 0.901, which attracts attention longer than the square shape. In terms of layout, the symmetric layout produces an average duration that is longer in attracting visual attention than the asymmetric one. Verbal eco-

labels produced an average AOI duration of 0.884 seconds, longer than visual eco-labels. In addition, stimulus 4 produced the longest fixation duration compared to other stimuli, which was 3.063 seconds. Stimulus 4 contained a round-shaped packaging design, glossy texture, asymmetrical information layout, and verbal eco-label.

5.2 Result on Brainwaves

Brainwave data collected from EEG was recorded using Mind Monitor software and processed with Microsoft Excel using Muse Graph Macros. The processed data represented the average value for each beta and gamma indicator. The data used in statistical processing were cleaned of noise, such as voice from the external environment, poor signal quality, participants' movement, or device malfunction. The average value for each stimulus was obtained by separating the brain indicators for each participant. The beta waves detected within the 13-32 Hz range indicate active thinking, heightened awareness, and a sense of pleasure. The gamma waves range from 32 to 100 Hz, representing cognitive processes, perception, problem-solving, and optimal mental states [77]. Table 4 displays the mean values of the beta and gamma indicators when participants viewed the stimulus and during rest periods.

Table 4. EEG Mean Values

Stimuli	Beta		Gamma	
	Viewing stimuli	Rest	Viewing stimuli	Rest
1	0,4512	0,108	0,5099	0,123
2	0,5031	0,194	0,4757	0,194
3	0,4446	0,209	0,4136	0,242
4	0,4557	0,220	0,4162	0,214
5	0,4225	0,118	0,4760	0,128
6	0,5423	0,144	0,4879	0,149
7	0,6248	0,157	0,6224	0,164
8	0,4714	0,158	0,4195	0,160
9	0,6406	0,176	0,6366	0,204
10	0,5071	0,126	0,4979	0,148
11	0,4638	0,158	0,5227	0,162
12	0,4368	0,142	0,4295	0,162
13	0,4978	0,160	0,4766	0,181
14	0,6165	0,160	0,5938	0,207
15	**0,6777**	0,185	**0,6894**	0,192
16	0,4109	0,131	0,4275	0,136

The table above presents the results of brainwave responses to each stimulus under two conditions, highligting differences in brainwave responses between when participants viewed the stimulus and during the rest condition. In this case, brain wave activities increased when respondents viewed the stimulus. Furthermore, the results indicated that stimulus 15, characterized by a squared shape, glossy texture, symmetrical layout, and visual eco-label, elicited the highest brainwave responses in both beta and gamma waves. Additionally, the obtained results demonstrate that all indicators produced varied and fluctuating responses.

5.3 Correlation Between Visual Attention and Brainwaves

In addition to its utilitarian function, packaging should feature attractive designs that evoke emotions to enhance product success [78]. Shape significantly influences the subconscious mind. For example, horizontal lines create a sense of calm, peace, and relaxation. Conversely, diagonal lines evoke interest, and curved lines depict feelings of joy. When observing an object, other components, such as size, texture, and color, are evaluated simultaneously. Research conducted by Trautman [79] indicates that texture and layout significantly impact perception generated by various prototype shapes, stimulating participants' creativity, interest, and positive feelings. Additionally, the Gestalt principles applied in packaging design refer to an individual's psychological approach to the tendency to see unity and patterns as a whole [80].

Therefore, this study measures the correlation between the two measurements. This study assessed the correlation between the two measurements by conducting correlation tests for each level of the measured factor. The data used consisted of fixation durations from an eye tracker and brainwave recordings from an EEG. Spearman's Rank correlation test was chosen due to the non-normal distribution of the data as indicated by the normality test (sig.<0.05). Table 5 summarizes the results of the Spearman's Rank correlation test.

Table 5. Spearman's Rank Correlation Test Result

Factor	Level	P-Value	Rho	Correlation
Shape	Square	0.077	0.096	No
	Round	0.950	0.003	No
Texture	Matte	0.076	0.096	No
	Glossy	**0.005**	**0.152**	Yes
Layout	Asymmetry	0.179	0.073	No
	Symmetry	0.054	0.104	No
Eco-label	Verbal	0.231	0.065	No
	Visual	0.066	0.099	No

Three factors—shape (square vs. round), layout (asymmetry vs. symmetry), and eco-label (verbal vs. visual)—showed no significant correlation (sig. > 0.05) between visual attention and brainwaves. The fixation duration for matte texture did not correlate with brainwaves (sig. > 0.05), whereas glossy texture did (sig. < 0.05, r = 0.139). This result suggests an increase in brainwave activity when participants directed their visual attention to glossy packaging.

5.4 Hypothesis Test

Hypothesis 1 suggests differences in visual attention related to packaging factors with varying levels. Normality tests conducted beforehand indicated that the data for all factors were not normally distributed. Data used included the fixation duration of each packaging feature from the eye-tracker. The hypothesis was tested using the non-parametric method, specifically the Mann-Whitney test. The results are presented in Table 6.

Table 6. Mann-Whitney Test Result

Hypothesis	Factor	Sig.
H1a	Shape	0.597
H1b	Texture	0.014
H1c	Layout	0.884
H1d	Eco-label	0.037

The results indicated differences in visual attention related to texture and eco-label (sig.<0.05). Therefore, the texture and eco-label of the packaging influenced participants' visual attention. In conclusion, hypothesis 1 was partly supported.

MANOVA test examined the relationship between packaging features (shape, texture, layout, and eco-label) and visual-haptic perception (Hypothesis 2). Visual-haptic perception was assessed using three measurement indicators: quality perception, product weight perception, and surface roughness perception. Table 7 summarizes the MANOVA calculations. The results indicated that p-values for all factors (shape, texture, layout, and eco-label) related to visual-haptic perception were greater than 0.05. The data consisted of fixation durations for packaging features and questionnaire responses measuring participants' perceptions. These results suggested that packaging features do not significantly impact visual-haptic perception (H2 is rejected). Detailed results can be found in Table 7 below.

Table 7. MANOVA Test Results

Variables		F	Sig.
Independent	**Dependent**		
Shape	Quality Perception	0.751	0.386
	Weight Perception	0.362	0.548
	Roughness Perception	0.275	0.600
Texture	Quality Perception	0.004	0.952
	Weight Perception	0.434	0.510
	Roughness Perception	0.434	0.036
Layout	Quality Perception	0.978	0.160
	Weight Perception	t0.237	0.266
	Roughness Perception	0.914	0.339
Eco-label	Quality Perception	0.293	0.256
	Weight Perception	0.491	0.948
	Roughness Perception	0.279	0.598

Hypothesis 3, measuring the relationship between visual-haptic perception and emotion, was tested using the regression method. The data used were the questionnaire measuring visual-haptic perception and emotions. The equation between the emotion and visual-haptic perception can be expressed as follows:

$$Y_i = \beta_0 + \beta_1 X_{1i} \qquad (5\text{-}1)$$

Y_i = Emotion
β_0 = Constant
β_1 = Parameter
X_{1i} = Visual-Haptic perception

The ANOVA calculation yielded a significance value of less than 0.001, indicating a significant relationship between visual-haptic perception and emotion (Hypothesis 3 is accepted). The coefficient of determination (R^2) was 0.101 or 10.1%. This value suggests that approximately 10.1% of the variance in emotion can be explained by visual-haptic perception, while other factors account for the remaining variance. The equation is expressed as follows:

$$\text{Emotion} = 2.339 + 0.171 \, \text{Visual\_Haptic Perception} \qquad (5\text{-}2)$$

The parameter value (β_1) of 0.171 suggests that an increase of one unit in visual-haptic perception corresponds to an additional influence of 0.171 on emotion.

Hypothesis 4 assesses the significance of the relationship between emotion and purchase intention using regression method. Data were collected from a questionnaire measuring emotions and purchase intention. The relationship between emotions and purchase intention was examined using the following equation:

$$Y_i = \beta_0 + \beta_1 X_{1i} \qquad (5\text{-}3)$$

Y_i = Purchase Intention

β_0 = Constant

β_1 = Parameter

X_{1i} = Emotion

The ANOVA results yielded a significance value of less than 0.001 (sig. < 0.05), indicating a significant relationship between emotion and purchase intention (Hypothesis 4 is accepted). The coefficient of determination (R^2) is 0.287 or 28.7%. This value signifies that approximately 28.7% of the variance in purchase intention can be explained by emotion, with the remaining variance attributed to other factors. The equation is expressed as follows::

$$\text{Purchase Intention} = 2.678 + 0{,}979 \times \text{Emotion} \qquad (5\text{-}4)$$

The parameter value (β_1) of 0.979 suggests that an increase of one unit in emotion corresponds to an additional influence of 0.979 on purchase intention.

Hypothesis 5 examines the relationship between packaging features and purchase intention using the ANOVA method. The relationship equation between packaging features and purchase intention can be expressed as follows:

$$Y_i = \beta_0 + \beta_1 X_{1i} \qquad\qquad (5\text{-}5)$$

Y_i = Purchase Intention

β_0 = Constant

β_1 = Parameter

X_{1i} = Packaging Features

β_1 = Parameter

X_{1i} = Fixation Duration of Packaging Features

At this stage, the independent variables (packaging features) were represented by dummy variables (0 or 1) for the two levels of each factor. In contrast, the dependent variable data (purchase intention) were obtained from the questionnaire. As shown in Table 8, it was found that the significance value for all packaging features on purchase intention was greater than 0.05. Therefore, there was no direct relationship between packaging features and purchase intention (Hypothesis 5 is rejected).

Table 8. ANOVA Result

Variable		F	Sig.
Independent	**Dependent**		
Shape		0.252	0.616
Texture	Purchase	0.001	0.978
Layout	Intention	0.871	0.351
Eco-label		0.144	0.704

6. DISCUSSION

Heatmaps and fixation are two metrics generally used in eye-tracker data processing. Overall, the heatmaps show that the information on the label received the most attention from the participants because that area was covered with red, orange, and yellow colors. This result indicated that participants were reading or looking at the information written on the label. Information on the packaging label includes brand name, ingredients, functions, benefits, skin type, product volume, and eco-label.

The heatmaps also reveal patterns that correspond to the layout, indicating that participants were reading or focusing at the information on the label. Labels on packaging can attract visual attention, particularly information that creates a positive perception of the product, such as terms or logos related to green products or sustainability. These perceptions can be seen as reality because they reflect what consumers believe to be true and can shape attitudes that influence consumer product choices [9] [81].

The duration of eye fixations at specific positions indicates the information processing process. The fixation duration can be utilized to observe differences in the length of visual attention participants give to stimuli. This study shows that Stimulus 4 yielded the highest average duration value of 3.06 seconds. This result indicates that among all stimuli,

stimulus 4 was able to attract visual attention for the longest duration. A round-shaped design, glossy texture, asymmetric layout, and verbal eco-label characterize stimulus 4.

However, calculations of the average duration for each factor level generate a different result. The fixation duration of texture consisting of matte and glossy shows that matte texture results in a higher average value of 4.94 seconds, while glossy texture duration yielded 4.20 seconds. Studies by Marckhgott and Kamleitner [54], Chen [55], and Spence [82] indicate that product packaging with a matte texture can attract attention for a longer period compared to the glossy one. These differences could be attributed to the comfort of viewing matte designs, as they have low contrast and do not reflect light excessively.

The results of fixation duration for the layout factor, namely asymmetric and symmetric, showed a symmetric layout design, which obtained a higher average of 4.21 seconds compared to an asymmetric layout design with an average value of 4.10 seconds. Symmetrical layouts attract more attention than asymmetrical ones because they are easily perceived, reducing visual complexity, particularly when reading product information, and can convey an aesthetic impression of eco-packaging that influences quality perception and purchase intention [11] [57].

The average value of the round shape feature is higher than the square shape feature, resulting in an average duration value of 0.90 seconds for round shape and 0,89 for square-shaped packaging. Risks et al. [9] and Salem [50] state that these differences depend on participants' preferences and perceptions, such as round shapes being more attractive, pleasing, and warm. The fixation duration for the eco-label factor showing the verbal eco-label design obtained a higher average duration of 0.88 seconds compared to the visual eco-label design with a fixation duration of 0,58 seconds. Verbal eco-label design is easier to attract attention and understand because it provides direct information [59]. According to research by Vogel et al. [83], the human brain processes information through writing or verbal communication more efficiently than visually, which is more helpful for participants unfamiliar with eco-label terms [55].

Although stimulus 4 generates the highest fixation duration, different results were revealed in terms of brain wave activation. Beta and gamma waves showed fluctuating average values across all stimuli. This fluctuation proves that when respondents were presented with varied stimuli, they try to understand the context or information provided. Stimulus 15 showed the highest beta and gamma waves amongst all stimuli, averaging 0,68 and 0,69, respectively. Beta wave activity is associated with active thinking conditions, happiness, or alertness [74]. An increase in beta indicates increased attention, cognitive analysis, or specific focus on stimuli. This response is associated with successful attention capture of consumers [84]. Gamma wave activity is linked to emotions related to happiness and love, perception, learning, and cognitive processes [74] [85]. Increased gamma waves may indicate a deeper response related to the message on the stimulus, creativity, or interest given to the stimulus.

This study also showed a weak correlation between visual attention to glossy texture and brain waves. This result implies that an increase in visual attention to glossy texture design would increase beta and gamma indicators. Increased responses in beta and gamma

indicators can be associated with increased attention, cognitive analysis, or specific emotions and perceptions toward stimuli. A study conducted by Trautman [79] shows that texture significantly impacts perceptions from various prototype forms displayed and stimulates participants' creativity, interest, and positive feelings.

Regarding the hypothesis testing result, the relationship between visual attention and visual-haptic perception was insignificant. This result may be generated because visually captured attention leads to different perceptions rather than haptically perception. Visual perception is related to exploring the geometric properties of the stimulus. This visual perception has not been able to generate perception related to exploring material properties depicted on the stimulus [52]. In addition, applying visual and haptic modalities when digesting information from stimuli can be redundant or contradictory— redundant information results in only one modality being noticed or felt. Contradictory information can lead to lost perceptions or deviating from the actual meaning [86].

Nevertheless, there is a significant relationship between visual-haptic perception and emotions. Li et al. [37] state that there is a relationship between multisensory and emotions leading to consumer purchase behavior. In that study, it is mentioned that applying multisensory can trigger positive emotions, thus affecting consumer decision-making that can benefit the company. Packaging design serves as a medium for designers to evoke emotions in product users through haptic design. The tactile qualities of materials can triggers emotions such as satisfaction, joy, or disgust [67]. Research conducted by Spence and Gallace [82] states that multisensory elements, such as visual and haptic, provide a strong emotional influence on consumers. Elements such as color, texture, and sound are integrated to provide a sensory experience that affects consumers' emotional responses and perceptions.

In addition, the relationship between emotion and purchase intention is found to be significant. The study by Li et al. [37] mentioned that positive emotions triggered by multisensory perception contribute to increased purchase intention. Vaidya and Kalita [87] explain how emotions can affect consumer purchase intention, by impacting customer satisfaction, product attractiveness, brand, and value formation. The influence on customer satisfaction is related to positive emotions from consumers' interaction with the product. Customers who are satisfied with the product are likely to buy it and recommend it to others. Gutierrez et al. [38] demonstrate a significant relationship between emotions and the desire to buy environmentally friendly products that include an eco-label on the packaging. This internal reaction can mediate the relationship between sensory stimulus and purchase [27].

Moreover, the insignificant relationship between packaging features and purchase intention proves the presence of mediating variables between these two factors. Therefore, an effective design should elicit emotional responses ooted in consumers' subconscious desires upon initial visual contact with the product, thereby cultivating a desire and inclination to purchase a product that aligns with their values and identity [88]. Li et al. [37] explain that multisensory stimuli can trigger the presence of visual, haptic, and

auditory stimulation. This stimulation causes an effect on arousal and emotions that impact the decision to buy a product.

7. PRACTICAL IMPLICATION

Based on the findings of this study, companies can apply several takeaways, especially in the personal care sector. Firstly, this research demonstrates that the use of neuromarketing tools, which measure subconscious responses and provide real-time feedback, can inform the optimal packaging design for natural skincare products. Such tools offer more accurate and direct insights into consumer responses compared to traditional marketing approaches. From this study, it can be concluded that packaging design should align with specific marketing objectives. A round-shaped design, glossy texture, asymmetric layout, and verbal eco-label are recommended to attract visual attention. Conversely, if the objective is to stimulate cognitive processing in the brain, a square shape, glossy texture, symmetrical layout, and visual eco-label would be more suitable. Regarding the individual effects of packaging elements, marketers should prioritize the information displayed on the label over shape, layout, and texture.

Secondly, marketers should design packaging that can trigger customer emotions because it ultimately increases purchase intention. Visual-haptic perception is one factor that can generate emotions. However, further studies need to be done to identify packaging characteristics that can generate positive emotions.

8. LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

This research has limitations that could be addressed in future studies. Firstly, the study focused solely on four factors: shape, texture, layout, and eco-label. Future research could explore the effects of additional factors that were considered as control variables in this study, such as font type, font size, bottle size, colors, and information displayed on the label. Secondly, this study did not conduct a stimulus manipulation check before the experiment. Therefore, in future studies, a manipulation check can be carried out innitialy to ensure that participants comprehend the aspects displayed in the stimulus. Thirdly, exploring the use of modalities beyond visual-haptic could be beneficial for assessing their impact on visual attention and emotion. Furthermore, incorporating other neuromarketing tools and techniques, such as face recognition and MRI, could be considered for future research endeavors.

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