
Psychophysiological Consumer Responses to Product Packaging Design: Insights for Strategic Marketing

Submitted 18/10/24, 1st revision 10/11/24, 2nd revision 26/11/24, accepted 15/12/24

Piotr Ogonowski¹, Bartłomiej Piwowarski²

Abstract:

Purpose: The article presents the findings of a study on the impact of visual packaging features on consumer perception and purchasing decisions.

Design/Methodology/Approach: The study involved 36 participants, whose visual responses to product packaging were measured using a calibrated eye-tracking system. The experiment was structured into four stages, analyzing the impact of shape, transparency, color, and eco-labeling of product packaging on consumer attention. A survey on consumer preferences and reasoning supplemented the findings.

Findings: The results indicate that non-standard shapes, carefully selected color schemes, and well-designed graphic elements can significantly enhance consumer engagement. Products with distinctive forms have a greater potential to attract attention on store shelves. Transparent elements proved less effective in capturing consumer attention due to the lack of distinct visual features that could engage consumers. Brands are advised to invest in unique visual elements.

Practical implications: It is recommended to improve the visibility of eco-labels, for example, by using larger symbols, applying contrasting colors, or placing labels in the most visible parts of the packaging.

Originality value: The study provides unique insights into consumers' psychophysiological responses to the visual features of product packaging, combining advanced eye-tracking methods with consumer preference analysis. The findings expand knowledge on the role of shape, color, and eco-labeling in shaping purchasing decisions and offer practical guidance for marketing strategies.

Keywords: Product packaging, eye-tracking, psychophysiological measurements, product marketing.

JEL codes: C91, L15, M31

Paper type: Research article.

¹Department of Decision Support Methods and Cognitive Neuroscience University of Szczecin Poland, ORCID: 0000-0001-9686-1056, e-mail: piotr.ogonowski@usz.edu.pl;

²Department of Decision Support Methods and Cognitive Neuroscience University of Szczecin, Poland, ORCID: 0009-0007-5666-4761, e-mail: bartlomiej.piwowarski@usz.edu.pl;

Acknowledgement: This research was co-financed by the Minister of Science under the "Regional Excellence Initiative".



1. Introduction

In today's fast-paced market, where competition between manufacturers is enormous, consumers have almost unlimited access to a wide range of products (Kotler and Keller, 2016). Every day, the consumer makes dozens of purchasing decisions, resulting not only from functional needs but also from a complex process in which emotions, perception, and physiological reactions play an inconsiderable role.

Customers are subject to profound social, psychological, and emotional influences (Babin *et al.*, 2004). Knowing and understanding consumer behavior has become very important for companies that want to effectively reach their audience and stand out in a crowd of competitors (Korneta and Lotko, 2021).

With the rise of self-service sales and the growth of retail, the function of packaging has changed. The customer "very often buys with their eyes," meaning the consumer's first contact with the product is through the packaging. It is usually the driving force behind the product selection decision. It is repeatedly the stimulus for purchasing decisions. Sometimes, consumers may not think very deeply about brands before they go to the shop to buy a product. In this context, product packaging is becoming increasingly important as one of the most important communication tools between brand and customer (Madhavaram *et al.*, 2005; Pawiński, 2021).

While functionality and content protection are the primary tasks of packaging, its role in creating a first impression, attracting consumer attention, and evoking emotions is becoming equally important. It is an important element that builds emotional ties with the consumer and conveys brand values (Mohebbi, 2014; Silayoi and Speece, 2007). Packaging attracts attention, facilitates product identification, and influences the product's perceived value, quality, or authenticity, directly impacting purchasing decisions (Chandon *et al.*, 2009).

The visual features of packaging, such as color, shape, graphics, font, or materials, constitute consumers' first impression of a product before they even decide to buy it. The emotions evoked by packaging can directly impact a product's perceived value, brand loyalty, and purchasing decisions. Increasingly, packaging is being treated as a

marketing tool supporting customer attachment to a brand (Clement, 2007).

As a result, packaging design has evolved beyond its primary function of protecting products and facilitating distribution to adapt to changing market needs, technology, consumer demands, and social trends. Changes in packaging design include various aspects, such as aesthetics, functionality, ecology, and how packaging communicates with the consumer. Packaging design has become an area where multiple fields of knowledge, from graphics and visual design to marketing, material engineering, ergonomics, anthropology, sociology, ecology, sustainability, psychology, and neuropsychology, are merging (Azzi *et al.*, 2012; Bloch, 1995).

Modern packaging, through its properties, can elicit psychophysiological responses from consumers that significantly affect a good's perceived value and attractiveness. The psychophysiological mechanisms involved in packaging perception include both emotional and cognitive processes that shape consumer behavior (Foxall, 2001; Szymusiak, 2022).

Researchers have begun to turn to brain science to study the pre-conscious, non-verbal stages of consumer behavior because some mental processes, especially those underlying conscious awareness, can be better understood by analyzing neurophysiological responses. Consumers' psychophysiological reactions to product packaging are an essential area of marketing research that allows for a deeper understanding of how a variety of visual, tactile, or olfactory stimuli affect purchase decision-making processes (Barney and Hesterly, 2019; Han, 2023; Wedel and Pieters, 2008).

In addition to the classic methods of interviews or preference analysis, tools are also used to directly record consumers' physiological reactions, such as measuring skin-galvanic reactions, EEG, eye-tracking, or heart rate analysis (Reimann *et al.*, 2010; Uddin, 2023).

The use of eye tracking is designed to see what the customer sees and what he completely disregards. This optimizes the advertising message and helps choose the best design possible. Eye tracking will show which elements attracted the eye and which were ignored; it allows us to determine the most often and longest viewed in order. Thanks to these technologies, marketers can gain valuable information about how specific packaging features - such as color, texture, shape, or smell - affect emotions, stress levels, interest, and willingness to buy.

Psychophysiological approaches to analyzing consumer responses to visual features of packaging are opening up new possibilities in designing product marketing strategies. Integrating findings from eye tracking, EEG, and other methods allows for a more informed and effective packaging design that attracts attention and builds an emotional connection with the consumer.

The aim of this article is to examine the impact of visual packaging characteristics on consumers' visual attention. Specifically, features such as shape, color, transparency areas, and typography of products of ecological origin were analyzed. The applied research method includes eye-tracking measurements, based on which metrics were determined to assess visual attention. The psychophysiological studies were complemented by a survey.

The structure of the article consists of five sections. Section 2 discusses psychophysiological studies in the evaluation of product packaging perception. Section 3 provides a description of the research experiment, the study group, the methods applied, and the analyses conducted. Section 4 presents the research results and includes a discussion of the findings. The final part of the paper presents the conclusions and practical implications of the research.

2. Psychophysiological Studies in the Evaluation of Product Packaging Perception

Psychophysiological reactions are the body's responses to psychological and emotional stimuli. Studying these reactions is a fundamental aspect of psychophysiology, which studies the relationship between physiological processes and behavior (Psychophysiology, 2002).

Consumers' psychophysiological reactions are an area whose analysis allows for a better understanding of the decision-making processes that occur when purchasing. In this context, psychophysiology refers to the study of the interaction between mental processes, such as emotions and perception, and physiological responses of the body, such as heart rate, skin-galvanic changes, or reactions to sensory stimuli. Various approaches and theories in the literature help explain how these mechanisms affect consumer purchasing decisions.

One of the critical aspects is emotion. Despite the many definitions related to this topic, it is commonly believed that emotion is a mental state of readiness that arises as a result of relevant events or thoughts and is often expressed physically, e.g., in various gestures, facial expressions, and body positions (Bagozzi *et al.*, 1999; Chamberlain and Broderick, 2007). Scherer (2005) defined emotion not only as a mental state but also as changes in the states of all or most of the body's subsystems: the central nervous system (CNS); the neuro-endocrine system (NES); the autonomic nervous system (ANS); and the somatic nervous system (SNS).

Research indicates that consumers' emotional reactions can significantly influence their choices, even more than rational evaluations. Many purchasing decisions are made intuitively and, whether conscious or automatic, often appear to be based on emotional cues rather than strictly rational ones (Ohme *et al.*, 2011). Recognizing the emotions associated with a product or brand can lead to stronger brand associations and greater willingness to buy (Li *et al.*, 2018).

According to the theory of “pleasant and unpleasant emotions” (Russell, 1980), consumers who feel positive emotions in the context of a brand or product are more likely to make a purchase, even if they do not have full knowledge of the product. Ekman and Friesen (1986) found that emotional expressions are similar in all people.

A critical manifestation of emotions is their impact on perceived product value and quality. Products that evoke positive emotions (e.g., joy, surprise) are perceived as more valuable and are more strongly motivated to purchase them. Research by Maklan and Klaus (2011) shows that a consumer's emotional involvement in an interaction with a brand can increase loyalty and repeat purchases. Intense emotional reactions to packaging can translate into higher purchase intentions (Bagozzi *et al.*, 1999).

Another factor influencing consumer decisions is the senses. Packaging influences the consumer's emotions and perception of the product through its shape, color, texture, and other elements. How a consumer perceives a product depends on its physical features and how those features are presented (Hagtvedt and Brasel, 2016).

For example, changing the color of a package can trigger different emotional responses and affect the product's perceived value. Consumers' senses are vital in shaping their perception of products and services. Sensory marketing, which engages the senses of sight, smell, touch, taste, and hearing, can elicit various psychophysiological responses that influence purchasing decisions.

Research on the sense of sight shows that packaging color and product design can influence the perception of a product's quality and emotional value. Colors can evoke specific emotions and associations. Kotler P. and Keller K. argue that colors can influence consumers' perception of product quality, value, and emotions, including levels of engagement and satisfaction (Kotler and Keller, 2016).

In their research, Elliot and Maier (2014) showed that color can influence consumers' emotional and cognitive perceptions and, thus, their purchasing decisions. Intense colors, such as red or orange, can elicit more robust emotional responses and attract attention in the context of advertising and marketing.

Labrecque and Milne (2013) presented that colors are essential in creating brand identity and attracting consumer attention. Intense colors, especially those with high saturation, can increase the noticeability of advertising and improve brand recall. In addition to color, other visual elements, such as typography and graphics, also play an essential role in creating consumer emotions. Underwood and Klein (2002) point out that fonts and type styles on packaging can communicate different emotions. For example, elegant, thin fonts can be associated with luxury and sophistication, while thicker, more expressive fonts can attract attention and create a sense of energy and power.

Scents are also crucial in purchasing decisions, activating consumers' emotional responses (Chebat and Michon, 2003). According to Spangenberg *et al.* scents can contribute to well-being and create positive brand associations. Appropriate fragrances, especially those associated with relaxation or pleasure (e.g., floral or citrus scents), can increase consumer engagement and attract attention to packaging and advertisements (Spangenberg *et al.*, 2006).

Fragrances in ads and packaging play an important role in capturing consumers' attention, reinforcing their attachment and positive perceptions of products, which can result in higher sales and brand loyalty (Krishna *et al.*, 2016). On the other hand, Hagtvedt and Brasel (2016) indicate that the use of sounds, such as music in the store, has an impact on consumers' emotions, increasing their engagement and time spent in the store, resulting in higher sales. Spence and Gallace (2011) outline how different senses, including touch and taste, can influence consumer responses to food packaging.

Many consumers prefer packaging that offers textures and shapes that can evoke emotions related to the pleasure of touching the product, particularly with cosmetic or luxury products (Krishna, 2013). The texture of the packaging material, such as a matte or glossy surface, can affect the product's perceived quality and evoke corresponding emotions, such as satisfaction or excitement (Hoyer and MacInnis, 2008). According to the theory of "aesthetic appeal" (Bloch, 1995), unusual shapes or innovative packaging can attract consumers' attention and influence their positive perception of a product.

A breakthrough in the study of psychophysical reactions of consumers was the development of neuromarketing which deals with the direct study of psychophysiological responses of consumers and introduced modern technologies. They help analyze psychophysiological reactions of activated brain areas (Uddin, 2023). In neuromarketing, such techniques are used as:

- eye-tracking - tracking eye movements;
- skin-galvanic response (GSR) testing - analysis of skin sweating;
- electroencephalography (EEG)-analysis of brain waves and brain responses to stimuli;
- functional magnetic resonance imaging (fMRI) - real-time analysis of the activity of brain areas;
- Face-tracking(FT) - is a technique for detecting and analyzing the emotions of the human face.

Neuromarketing primarily uses a technique for measuring brain waves, or encephalography (EEG), first used by Hans Berger in 1924 (İnce *et al.*, 2021). EEG makes it possible to identify the activated brain areas when viewing a package. Reimann *et al.* (2010) found that aesthetically pleasing packaging significantly

increases consumer response time to choice, that it is chosen over well-known brand products in standard packaging despite higher prices, and that it results in increased activation in the semi-lateral nucleus accumbens and ventral medial prefrontal cortex, according to functional magnetic resonance imaging (fMRI).

Meanwhile, the measurement of GSR and heart rate variability allows for assessing consumers' level of emotional arousal. FT is a method to interpret and analyze a person's facial expressions to understand their emotional state, attitudes, or reactions (Clark *et al.*, 2020; Piwowarski and Wlekły, 2022).

In 2007, Lee *et al.* (2007) conducted a study that found that consumers are often unconsciously attracted to ads that evoke positive emotions and that changes in brain activity can predict their future purchasing behavior. Plassmann *et al.* show that consumers who experience positive physiological responses to advertising or product packaging are likelier to purchase (Plassmann *et al.*, 2007).

For example, changes in heart rate may indicate increased emotional involvement, which in turn may result in a purchase decision. In addition, the physiological side associated with the skin-galvanic response (e.g., an increase in skin sweating in response to emotional stimuli) can indicate levels of stress or excitement, which also play a role in the decision-making process.

Eye tracking - eye tracking in marketing, on the other hand, is widely researched because it enables an accurate understanding of how consumers react to various elements of advertising, packaging, or websites. Eye-tracking technology allows it to analyze which parts of an advertisement or packaging attract the most attention and which elements are overlooked. Feng (2011) has shown that eye-tracking technologies allow companies to understand better what aspects of an ad attract consumers' attention and how their attention changes over time. Eye tracking helps design more effective advertising campaigns better tailored to audience preferences.

In their paper "Eye tracking for visual marketing" (Wedel and Pieters, 2008), they pointed out that analyzing eye movements can help optimize the layout and design of ads and understand which elements of an ad attract consumers' attention and which are ignored. Pieters *et al.* (2002) conducted eye-tracking experiments to analyze how consumers respond to various aspects of advertising, such as colors, text, and images. Their research shows eye-tracking analysis can help identify the most effective advertising elements. Their paper "Does In-Store Marketing Work?" (Chandon *et al.*, 2009) used eye-tracking technology to analyze how consumers react to different product elements in-store.

They indicated that the technology helps better understand how purchasing decisions are made based on the visibility of products and packaging. The use of eye tracking in advertising - the study of advertising creativity is aimed at finding out what the customer sees and what he completely disregards. This makes it possible to optimize

the advertising message and choose the best design option (Scott *et al.*, 2016; Wedel and Pieters, 2008).

Using neuroscience tools, such as functional magnetic resonance imaging (fMRI), electroencephalography (EEG), and eye tracking, in a marketing context contributes to a better understanding of the course of processes such as emotions and memory, which affect consumer preferences, decision-making (Alvino *et al.*, 2020).

In his work “Neuromarketing: The New Science of Consumer Behavior,” Morin C. emphasizes that neuroimaging research has made it possible to directly measure consumers' brain activity when responding to products and advertising, which has provided new perspectives in understanding consumers' psychophysical responses (Morin, 2011). These studies show how visual (e.g., the color of packaging) and auditory or olfactory stimuli affect consumers' emotions, which can translate into preparing an effective product marketing strategy.

3. Research Methodology

3.1 Participants

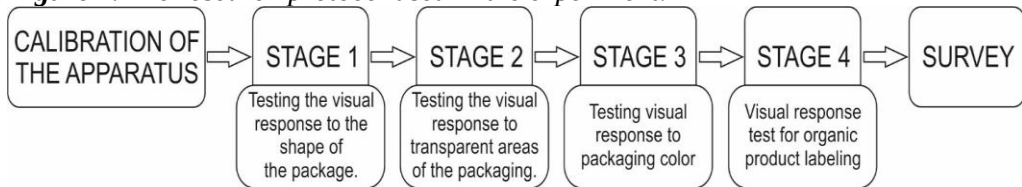
The study involved 36 participants, 19 women and 17 men. The participants were aged between 18 and 45 years, with an average age of $M=23.69$ years and a standard deviation of $SD=5.52$. Measurements from two female participants were excluded due to issues with signal recording. The sample consisted of both students and employed individuals. The core of the group was made up of students, accounting for 83.33% of the participants, while employed individuals represented 16.67% of the group.

Participation in the study was voluntary. Each participant was informed about the study's procedures without providing detailed information about its purpose and course. The research experiment was conducted in accordance with the principles outlined in the Helsinki Declaration (2013 version) (World Medical Association 2013). The study was reported to and approved by the Bioethics Committees at Regional Chamber of Physicians in Szczecin.

3.2 Research Protocol and Stimuli

The research protocol included 5 stages (Figure 1). Before the study was conducted, a 9-point eye-tracker calibration was performed. In stages 1 to 4, the impact of consumer visual perception on product packaging stimuli was examined. In each of these stages, three panels (screens) were presented, containing varying numbers of the tested products. In stage 1, 6 products were displayed on each panel—on the first panel, there were muesli flakes, on the second, ketchup, and on the third, perfumes.

Figure 1. The research protocol used in the experiment.



Source: Own elaboration.

In stage 2, 8 products were presented—on the first panel, tea packaging, on the second, dark chocolate, and on the third, pasta. Among the presented products, some packaging had transparent areas. In stage 3, 6 products were shown—on the first panel, coffee packaging, on the second, ice cream bars, and on the third, liquid soap. In stage 4, 3 products were shown. The first panel presented jam in a glass jar, the second displayed face cream, and the third showed chicken egg packaging.

Each panel was shown for 15 seconds. Stage 1 focused on analyzing the visual perception of product packaging with various shapes. Stage 2 involved the analysis of packaging with transparent areas. Stage 3 concentrated on studying the perception of packaging colors. Stage 4 aimed to examine the visual response to packaging labeled with products from organic farming.

Stage 5 involved a survey in which respondents answered questions regarding the items presented in stages 1-4. The respondents identified a product from each category and provided reasons for their choice. The responses provided by the respondents included the following: it is the most well-known brand on the market, this brand offers high-quality products, the selected product is the best quality, the selected product was offered at the most favorable price for me, the packaging caught my attention, the selected product was on promotion, I know this product and always choose it. The last question in the survey was an open-ended question in which respondents provided another reason for their product choice.

3.3 Research Apparatus

The reaction of consumers to visual stimuli was measured using the Tobii Pro X3-120 device. It allows for recording eye movements with a sampling frequency of 120 Hz. The optimal distance between the device and the respondent's eyes was 60–65 cm, ensuring the highest accuracy of measurements. The eye-tracker used has a wide angular range: $\pm 20^\circ$ vertically and $\pm 20^\circ$ horizontally relative to the center of the screen. This enabled precise tracking of eye movements across the entire study area.

The device operates by emitting infrared light pulses, which reflect off the retina of the respondent's eye. The analysis of these reflections allows for the calculation of coordinates on the screen, determining the exact fixation points. The data collected for analysis was processed using the I-HMM (Hidden Markov Model) fixation

filtering algorithm. The minimum fixation duration was set at 60 ms, while the maximum break time between fixations was set at 75 ms. A Moving Average algorithm was also applied to reduce noise, and interpolation was performed to fill in gaps with a maximum length of 75 ms.

3.4 Indicators of Evaluation

The data collected from the eye-tracker was visualized and analyzed using gaze paths, heatmaps, and metrics based on Areas of Interest (AOI). For each product, an Area of Interest was defined, for which appropriate metrics were calculated during the results analysis stage (Table 1). Heatmaps and AOI metrics were determined for aggregated data from the entire study group.

Table 1. AOI metrics used in the study.

AOI metrics	Metric description
Respondent ratio %	The percentage of participants who looked at the AOI.
Revisit count	The average number of gaze revisits to the AOI by the participants.
Fixation count	The average number of fixations detected within the AOI.
Dwell time (ms)	The average duration for which participants fixated on the AOI relative to the time the AOI was active.
First fixation duration (ms)	The average duration of the participants' first fixation within the AOI.

Source: Own elaboration.

4. Research Results and Discussion

4.1. Analysis of Visual Perception of Product Packaging with Various Shapes (Stage 1)

The analysis of the Area of Interest (AOI) metrics for the three panels presented in the study (Table 2) showed that products with unconventional shapes were characterized by a higher number of fixations and longer viewing times. For the first panel, the AOI 2 product, muesli flakes in a transparent plastic jar, was particularly attractive to the respondents, as evidenced by an average of 38 fixations and a viewing time exceeding 1200 ms.

Similarly, on the second panel, the AOI 2 product (ketchup in a squeezable, twist-cap sachet) also stood out from the others, with an average viewing time of approximately 1350 ms. Finally, for the third panel, the AOI 1 product, perfume in a teddy bear-shaped bottle, elicited the highest average number of fixations (38.6), indicating strong interest from the participants in this unusual packaging.

Table 2. AOI metrics determined for Stage 1 of the study.

	Board	AOI 1	AOI 2	AOI 3	AOI 4	AOI 5	AOI 6
Respondent ratio (%)	1	100	100	100	100	100	100
	2	100	100	100	100	100	100
	3	100	100	100	100	100	100
Revisit count	1	1,4	2,4	1,2	0,8	2	1
	2	1,8	1,6	0,6	0,8	1,2	1
	3	1,7	1,6	0,8	0,8	0,9	1,2
Fixation count	1	27,6	38	27	28	23	22,2
	2	31,8	33,8	19,4	20,4	26,8	24,4
	3	38,6	27,2	16,2	20	17,4	31,8
Dwell time (ms)	1	1184,7	1233,1	1124,2	841,6	1027,2	606,6
	2	1014,7	1350,5	808,7	746,7	1056,9	622,5
	3	1417,6	1305,3	660,9	635	724,3	1253,3
First fixation duration (ms)	1	38,4	51,6	41,5	80,1	75,6	18,2
	2	42,8	71,7	38,3	63,3	15,1	50,5
	3	21,2	60,1	49,8	75	57,7	61,7

Source: Authors' calculations.

Indicators such as revisit count and fixation count clearly confirm that products with unusual shapes are more effective at attracting consumer attention. The average number of fixations on a product with a shape distinct from competing items was significantly higher, and the time spent viewing it was longer, suggesting that consumers may be more likely to consider purchasing products with such packaging.

Metrics such as first fixation duration also provide valuable insights into consumers' initial reactions to the presented products. Products that captured respondents' attention early on typically had a more distinctive shape or color. For example, ketchup in a twist-cap sachet (AOI 2, panel 2) had an average first fixation duration of 71.7 ms, suggesting it caught respondents' attention from the very first moment of contact.

In summary, the study results clearly indicate that packaging shape is one of the key factors influencing visual perception of a product. Products with unconventional shapes not only attracted more attention but also generated longer interest, which could directly influence consumer purchasing decisions. Particular interest was generated by products in packaging that is rarely seen on the market, such as perfume in a teddy bear-shaped bottle or ketchup in a twist-cap sachet.

These findings suggest that packaging that stands out from the competition can more effectively capture consumer attention, which may be important from a marketing strategy perspective.

4.2. Analysis of the Perception of Product Packaging with Transparent Areas (Stage 2)

In Stage 2, the analysis focused on the impact of transparent areas of packaging on the perception of the product contained within. The experiment examined the participants' visual response to transparent areas of low-involvement products. Three groups of product packaging were presented to the consumers. In the presented group, there were packages with transparent areas as well as those where the product was depicted graphically.

The analysis of the results from the first panel (tea packaging) showed that graphic stimuli in the Areas of Interest (AOI) 1, AOI 6, and AOI 3 (packaging without transparent areas) had a greater impact on consumers than the visibility of the product itself (Table 3).

Table 3. AOI metrics determined for Stage 2 of the study.

	Board	AOI 1	AOI 2	AOI 3	AOI 4	AOI 5	AOI 6	AOI 7	AOI 8
Respondent ratio (%)	1	100	100	100	100	100	100	100	100
	2	100	100	100	100	100	100	100	100
	3	100	100	100	100	100	100	100	100
Revisit count	1	1,5	1,2	1,3	1	1,1	1,7	1	0,7
	2	1,2	1,8	1,1	1,3	1,3	1,4	1,4	1,1
	3	1,3	1,4	1,1	0,9	1	1,1	1,1	1,2
Fixation count	1	15,3	12,4	13,6	9,4	9,8	14,8	8,7	11,1
	2	14,3	15,5	10,3	9,7	12,3	11,5	12,6	10,4
	3	20,8	18,5	12,3	9,3	10,6	11,2	11,8	12,9
Dwell time (ms)	1	1427,3	1041,9	1330,7	586,2	920,5	1517,1	961,7	637,4
	2	1095,4	1687,2	847,8	1193,1	1142,9	1053,3	1162,3	840,2
	3	1153,3	1327,1	1017,3	998,4	743,7	1045,2	846,7	1148,1
First fixation duration (ms)	1	27,8	30,6	97,3	106,2	24,8	199,2	233,4	72,1
	2	87,6	99,9	140,1	143,7	54,1	72,8	141,3	106,2
	3	147,9	135,3	52,3	158,6	50,9	106,2	116,6	98,1

Source: Authors' calculations.

The metric indicators suggest that packaging without transparent elements was more effective in capturing attention. In the areas AOI 1, AOI 3, and AOI 6, which did not contain transparent areas, the average fixation duration was 1427.3 ms, 1330.7 ms, and 1517.1 ms, respectively. These values were higher than those for areas containing transparent elements, such as AOI 2 (1041.9 ms), AOI 4 (586.2 ms), and AOI 5 (920.5 ms).

The analysis of the second panel (dark chocolate packaging) revealed the highest number of fixations in the Area of Interest (AOI) 2, which contains a transparent

area covering about 8.2% of the packaging surface. The heatmap analysis indicated that the participants mainly focused their attention on the graphic area of the packaging.

The Area of Interest (AOI) 1, which had an average fixation duration of 1193.1 ms, corresponds to the packaging without any transparent area. The product in the AOI 5 area, where the transparent area exceeded 50% of the packaging surface, had an average fixation duration of 1142.9 ms, ranking fourth in terms of fixation duration at this stage.

The results of the analysis of the third panel (pasta packaging) were consistent with the findings from the analysis of the first and second panels. The packaging with over 80% transparent area (AOI 4) had a fixation duration of 998.4 ms in the study. The analysis of the Area of Interest (AOI) for the product without transparent areas (AOI 3) showed an average fixation duration of 1017.3 ms. The median average viewing time for the Areas of Interest in the third panel was 1031.25 ms. This means that the average fixation time for AOI 4 is below the median, indicating that this area attracted less attention.

The conclusions from the study suggest that transparent areas in packaging do not always attract consumer attention more than packaging in which the product is presented graphically. In the analyzed panels (tea, dark chocolate, pasta), packaging without transparent areas more frequently captured consumers' attention, which may suggest that the presence of graphics and visual design elements can more effectively influence purchasing decisions than the visibility of the product itself.

4.3 Study of the Perception of Product Packaging Colors (Stage 3)

The results of the third stage of the study, focused on analyzing the impact of product packaging colors on consumer perception, highlighted the importance of color tone in shaping attention. The experiment used three product categories: coffee (typically consumed hot), ice cream bars (consumed cold), and liquid soap. The calculated metrics for each product are presented in Table 4.

Table 4. *AOI metrics determined for Stage 3 of the study.*

	Board	AOI 1	AOI 2	AOI 3	AOI 4	AOI 5	AOI 6
Respondent ratio (%)	1	100	100	100	100	100	100
	2	100	100	100	100	100	100
	3	100	100	100	100	100	100
Revisit count	1	0,8	1,4	0,6	1	1,2	0,4
	2	1,8	1,6	1,4	1,2	1,2	1
	3	1,2	1,6	1	1	1,6	1,2
Fixation count	1	31,6	25,2	32,4	34,6	24,8	28,8
	2	3,4	32,8	35	20	16,2	19,6

	3	17	22,4	19,8	21,2	28,4	44,8
Dwell time (ms)	1	1105,7	726,8	1153,3	1492,7	714	763,7
	2	1321,6	755	1476,4	685,8	866,9	447,3
	3	656,4	830,3	738,4	543,4	1618,6	1255,5
First fixation duration (ms)	1	20,1	48,2	58,3	61,7	55,6	45,2
	2	101,3	20,1	35	45,5	98,4	70,3
	3	83,3	60,3	48,3	31,6	86,4	71,6

Source: Authors' calculations.

The results for the first category, coffee, indicate that packaging color significantly impacts attracting the respondents' attention. Products packaged in cool colors, such as AOI 5, AOI 6, and AOI 1, exhibited the fewest fixations and the shortest time spent observing them. For example, AOI 5 had an average fixation time of 714 ms, and AOI 6 only 763.7 ms. The exception was the product in AOI 4, which captured the respondents' attention for a longer period than the others, with an average fixation time of 1492.7 ms, possibly due to brand recognition. The heatmap analysis showed that respondents focused mainly on the product name, suggesting that brand familiarity might have influenced these results.

The second category, ice cream bars, confirmed the findings from the previous stage. Packaging with warm color tones, such as AOI 6, AOI 4, and AOI 2, attracted the least attention, which might be contrary to consumers' expectations for such products. AOI 6 had an average fixation time of 447.3 ms, and AOI 4 had 685.8 ms, confirming the lower interest in these products. Ice cream is typically associated with freshness and coldness, so packaging in warm colors might have attracted less interest. During this stage of the experiment, the most attention was drawn to the first product (AOI 1) and the third (AOI 3).

The last category of products was liquid soap. The results of this stage suggest that for products related to cleanliness and hygiene, packaging color is crucial. Products with warm and dark-colored packaging (AOI 1, AOI 3, and AOI 4) attracted the least attention. AOI 1 had an average fixation time of 656.4 ms, and AOI 4 only 543.4 ms, clearly suggesting that consumers preferred products with more subdued, cool color schemes, which are associated with sterility and freshness. The heatmap analysis confirmed that areas dominated by cool colors were preferred by the respondents, indicating the influence of aesthetic associations on purchasing decisions.

The analysis of the results indicates that packaging color has a significant impact on how consumers perceive a product, and the effectiveness of this color depends on the type of product and the context in which it is used. Products such as coffee, typically consumed hot, attracted more attention from respondents when packaged in warm color tones. In contrast, ice creams on sticks, associated with coldness, were less appealing when packaged in warm colors. For hygiene products, such as liquid

soap, consumers preferred cool, light colors that evoke associations with freshness and sterility.

4.4 Study of Visual Response to Packaging with Labeling of Products from Organic Farming

Stage 4 of the study involved examining the extent to which consumers pay attention to information regarding the organic origin of a product. To measure visual sensitivity to such stimuli, three product categories were used: jam in a glass jar with a graphic label, face cream, and packaging for chicken eggs. Of the three products presented on the board, one came from organic farming and had a clearly displayed label indicating its organic origin.

On boards 1 and 2, the organic product was marked as area of interest (AOI) 1, while on board 3, it corresponded to AOI 3. The area of interest metrics for all three boards are presented in Table 5.

Table 5. *AOI metrics determined for stage 4 of the study.*

	Board	AOI 1	AOI 2	AOI 3
Respondent ratio (%)	1	100	100	100
	2	100	100	100
	3	100	100	100
Revisit count	1	1,4	1,8	0,6
	2	1,3	2	0,6
	3	1,6	1,3	0,9
Fixation count	1	60,1	50,8	47,2
	2	54	68,2	42,9
	3	41,4	56,9	42,2
Dwell time (ms)	1	2613,3	2461,3	2064,3
	2	2372,1	2989,1	1661,6
	3	2682,8	2293	2005,8
First fixation duraton (ms)	1	121	66,6	104
	2	68,5	43,4	44,7
	3	59,6	102	68,3

Source: *Author's calculations.*

The analysis of the results showed that respondents paid limited attention to ecological labels on packaging. For example, the average fixation time for AOI 1, which represented the ecological product on the first board, was 2613.3 ms, slightly higher than for AOI 2 (2461.3 ms) and AOI 3 (2064.3 ms). Similarly, analysis of metrics such as fixation count and first fixation time did not show significant differences between ecological products and others. The fixation count for AOI 1 was 60.1, which did not significantly differ from the fixation count in AOI 2 (e.g., 50.8 on the first board).

For the second board, the average fixation time for the ecological product (AOI 1) was 2372.1 ms, while AOI 2 had a higher value of 2989.1 ms. These results suggest that ecological labels were not the main factor attracting the respondents' gaze. On the third board, the average fixation time for the ecological product (AOI 3) was 2005.8 ms, which was lower compared to AOI 1 (2682.8 ms) and AOI 2 (2293.0 ms). The revisit count analysis did not confirm greater interest in ecological products. On the second board, the ecological product (AOI 1) had a revisit count of 1.3, while product AOI 2 achieved a value of 2, and AOI 3 a value of 0.6. These results indicate that labeling a product as ecological did not have a decisive impact on attracting the consumers' visual attention.

The analysis of the survey responses clearly indicates that the main motivation for selecting products is familiarity with the product and brand. The three parameters examined, which focused on the respondent's attachment to these attributes, accounted for a total of 57.9% of the responses confirming the choice of product. Choosing a product based on its packaging was declared by 19.7% of respondents. The survey responses suggest that packaging plays an important role in the choice of a product to be given as a gift. The analysis of the survey results also revealed that packaging is a key decision-making factor for less familiar products or those that are less frequently purchased by consumers. The choice of product based on price, quality, and promotional sales was important for 22.4% of respondents.

5. Discussion of the Results

The findings presented in this study suggest that visual packaging features, such as its shape, color scheme, and the presence of transparent areas, play a significant role in attracting consumer attention and can significantly influence their purchasing decisions. An analysis of the research indicates that products with non-standard shapes generated more fixations and longer viewing times compared to products with traditional packaging, confirming the hypothesis that non-standard forms can more effectively engage consumer attention (Bloch, 1995).

It is worth noting that these results are consistent with previous studies on psychophysiological responses to visual stimuli, which showed that stimuli that stand out from competing products have a greater potential to attract attention (Wedel and Pieters, 2008).

In particular, products such as ketchup in a twist-off sachet and perfume in a bear-shaped bottle attracted more consumer attention. This was reflected in higher metrics such as the number of fixations and the total viewing time. These data suggest that consumers may be more inclined to consider purchasing products in packaging that deviates from market standards. This represents a significant implication for marketing strategy designers.

The literature supports these results, which emphasizes the importance of the first

impression and its influence on purchasing decisions (Chandon et al., 2009). In the context of a strategic approach to product marketing, the use of non-standard shapes can help brands stand out from the competition. It can also build stronger associations with the product, leading to greater brand recognition and potentially higher customer loyalty.

Packaging color proved to be a key factor influencing consumers' visual perception. The results of the study showed that products with packaging colors matching the character of the product (e.g., coffee packaging in warm hues) received longer fixation times. This suggests that consumers attribute expected qualities to colors, such as warmth, freshness, or quality (Labrecque *et al.*, 2013).

On the other hand, products like ice cream bars, packaged in warm colors, received less interest. This may be due to the discrepancy between the perception of the product's coldness and the warm colors of the packaging. These findings indicate that packaging color should be tailored to the type of product and consumer expectations, confirming previous research on the importance of colors in marketing (Kotler and Keller, 2016). From a marketing strategy perspective, aligning packaging colors with consumers' emotional expectations can significantly enhance the effectiveness of marketing efforts and improve sales performance.

An interesting aspect of the discussed results is the role of transparent areas in packaging. Despite the assumption that transparent packaging elements could effectively attract consumer attention, the study results suggest that for the analyzed low-engagement products, these areas did not have a significant impact on consumer decisions.

Most respondents focused on typography and graphics placed on the packaging. This suggests that packaging with clear, attractive graphics is more effective in attracting attention than those with transparent areas (Silayoi and Speece, 2007). These results are understandable in the context of visual perception theory. People are naturally drawn to more detailed and interesting visual stimuli (Foxall, 2001).

From the perspective of effective marketing strategy management, packaging designers should focus on creating visually attractive projects. Such designs can effectively attract consumer attention and make a product stand out on the shelf.

The conducted analysis showed that consumers responded poorly to packaging with ecological labels, relatively rarely paying attention to this type of information. This could be due to unclear or poorly visible labels. Consumers were guided by other purchasing priorities, such as brand or packaging aesthetics. The survey suggests that the main motive for product selection was brand recognition and the visual attractiveness of the packaging.

Ecological labels had limited influence on purchasing preferences. This may be because ecological information is often not prominently displayed. Improvements could be made by increasing label size, changing colors to make them more contrasting, or placing them in more visible areas of the packaging. Consumers also do not assign them the same importance as other features such as brand or quality (Maklan and Klaus, 2011).

These results indicate that marketers should consider more effective ways of communicating ecological values. Better highlighting of certifications or combining such information with attractive graphic elements may prove effective. It can be assumed that properly emphasizing ecological values may increase consumer loyalty. Additionally, it can show that the brand cares about the environment and is socially responsible, which may translate into a long-term competitive advantage.

6. Conclusions, Proposals, Recommendations

The conducted research provided significant insights into the impact of visual packaging features on consumer perception and their purchasing decisions. The findings indicate that non-standard shapes, carefully selected color schemes, and well-designed graphic elements can significantly enhance consumer engagement. Products with distinctive forms have a greater potential to attract attention on store shelves, whereas transparent elements showed a limited impact, particularly for products with lower consumer interest.

Well-designed packaging can be a key element in building a competitive advantage. Companies investing in visually engaging projects have a better chance of building positive brand associations. At the same time, ecological labels are often poorly visible, which results in consumers not paying enough attention to them.

Based on these conclusions, brands should introduce unique visual elements, such as non-standard shapes, well-chosen colors, and emotionally engaging graphics, to effectively attract attention and stand out in the market. It is also advisable to better highlight ecological labels by using larger, more contrasting symbols placed in visible locations.

The recommendation for companies is to adopt an approach that combines aesthetic aspects with functional ones. The packaging design should align with the brand message and consumer preferences. Marketers and designers should work closely together to ensure the packaging effectively communicates the key features of the product.

Companies promoting sustainability should integrate ecological messaging into the product narrative to make it more compelling for consumers. Such an approach can increase consumer loyalty and strengthen brand image.

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