






# IDENTIFICATION OF GAZE PATTERNS IN THE OBSERVATION OF FONT-WEIGHT AND ILLUSTRATION SIZE ON THE PACKAGING USING EYE-TRACKING ANALYSIS

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**Abstract:** Nowadays, manufacturers across various sectors, including food, cosmetics, pharmaceuticals, and other industries, are continually expanding the range of products available in the market. Given this expansion of products, branding, and packaging have become critical differentiating factors. To effectively influence consumer behaviour and encourage brand preference, packaging designers must thoroughly understand the challenges faced by existing products and the needs of consumers. By employing various graphic elements, such as colour palettes, illustrations, typography, and others, designers can effectively present products and communicate with consumers, thereby enhancing product recall. To achieve these objectives, it is essential to investigate whether specific patterns exist in consumer perception regarding packaging. This is precisely why this preliminary research was conducted. A total of 40 participants, divided into two groups, aged 20 to 25, from the same demographic group (students) participated in this eye-tracking analysis. Each group of participants had a different set of stimuli, depending on whether the subject of the test was logo font-weight variation or illustration size variation. The results of this preliminary research show that logo font weight has no statistically significant effect. Also, the results of this research show that the specific graphic element - illustration is observed the longest, regardless of the size change.

**Key words:** font-weight, packaging, graphic design, eye tracking, illustration

## 1. INTRODUCTION

Packaging holds significant importance for consumers today, particularly in influencing their purchasing decisions. Regardless of the product type, packaging serves as a representation of the product itself and often constitutes the initial point of interaction between the consumer and the product. Packaging has several different roles such as protecting the product, enhancing usability, and increasing functionality (Robertson, 2012). Furthermore, the role of packaging in sales and promotion has become increasingly significant. Packaging serves as a distinctive and highly effective means of informing consumers and promoting products within the marketplace (Moskowitz et al., 2009; Riaz et al., 2015; Shehzadi et al., 2016). In the era of consumerism, where the market is saturated with similar competing products available in various retail environments, both physical and online, packaging serves as the sole means of product differentiation. Effectively designed packaging has the potential to capture consumer attention, generate interest, and ultimately foster a desire to purchase, thereby influencing consumer preferences for specific products (Shrestha, 2024; Zekiri & Visoka Hasani, 2015; Ahmed et al., 2014). Additionally, packaging can evoke a range of emotions, including pleasure and desire, as well as negative responses such as aversion toward a product. According to Yaqub (2024), nearly 81 percent of consumers report that they purchased a product specifically due to its attractive and engaging packaging. Furthermore, 72 percent of respondents assert that packaging design significantly influences their purchasing decisions. Niv and Harris (2018) indicate that the purchase decisions of younger adults, who tend to be more educated and possess higher earnings and purchasing power than other demographic groups, are particularly influenced by both the design of the packaging and the materials utilized in its construction. Product packaging plays a vital role in the growth and marketing strategy of any company today. First impressions are crucial, and packaging often serves as a consumer's initial introduction to the product. It allows consumers to familiarize themselves with newly launched products and their features, marking the beginning of their interaction with them. The branding of packaging can significantly influence consumer responses; designs that contain excessive information may overwhelm consumers, leading them to overlook the packaging entirely. Conversely, packaging that lacks sufficient branding may fail to differentiate itself from competing brands, resulting in consumers overlooking the product altogether.

(Roggeveen et al., 2015; Spence, 2016). This interaction is critical in shaping consumer perceptions of the product's quality and functionality. Therefore, product packaging is an essential aspect that manufacturers should never underestimate. Numerous factors can influence consumer preferences regarding packaging, including its shape (Chitturi et al., 2019; Koo & Suk, 2016), material (Purwaningshi et al., 2019), ergonomics, the presence or absence of graphic representations (such as images or illustrations of the product) (Chitturi et al., 2021; Hasibuan & Nuraeni, 2023; Spence, 2021), typography choices, and more. Despite this complexity, it remains challenging to definitively ascertain what makes packaging attractive and how its various elements, particularly the graphic components, contribute to the formation of consumer preferences for specific products. An additional critical inquiry revolves around how respondents engage with the packaging, specifically which graphic elements capture their attention most frequently and for the longest duration, as well as which elements are deemed less significant during their initial encounter with the packaging.

This preliminary research seeks to identify potential patterns in packaging perception that are characteristic of consumers, as well as to determine whether variations in font-weight impact the visibility of the product and, consequently, consumer preferences. Furthermore, the research investigates whether the size of the illustration representing the product influences the duration of observation, which may subsequently lead to the development of consumer preferences.

## **2. METHODS**

Within this study, two main independent factors were defined: the font-weight modification of the product title displayed on the front of the packaging (primary font-weight of the title, secondary and tertiary font-weight of the product title), and the illustration size alterations on the front of the packaging, representing product (primary illustration size, secondary and tertiary illustration size), therefore, it was necessary to prepare two different sets of stimuli for two different groups of participants. Dependent variables in this study included Time Viewed in seconds, Number of fixations, and Revisits number for each area of interest.

### **2.1 Participants**

Eye tracking analysis was conducted within two distinct groups, each comprising 20 participants, resulting in a total sample size of 40 individuals. The participants, aged between 20 and 25 years, were exclusively drawn from student demographics. The first group, focusing on font-weight modification of the product title, comprised 80% female and 20% male participants. In contrast, the second group, emphasizing alterations in illustration size representing the product, included 50% male and 50% female participants. It is important to note that, due to the accuracy and objectivity of the research itself, the participants were intentionally kept unaware of the purpose of the study. Participants were informed, however, that the presented samples represented prototypes of the front-facing packaging design for five distinct dietary supplements.

### **2.2 Samples**

It was necessary to prepare samples of the front of the packaging for five different dietary supplements (Figure 1) so that they would be adequate for eye-tracking research. Although many studies prove the importance of the shape of the packaging in creating consumer preferences and making purchase decisions (Westerman et al., 2013; Shen et al., 2015; Koo & Suk, 2016; Velasco et al., 2018; Chitturi et al., 2019), for the purposes of this research, we decided to show only the front side of the cardboard rectangular packaging for five different dietary supplements. This decision was made in order to exclude the influencing factor of the material and shape of the packaging, as well as the factor of displaying additional information on the side of the packaging, which would undoubtedly draw the attention of the participants and therefore negatively affect the results of the experiment. For the purposes of this preliminary research, a fundamental colour palette comprising five shades was established, with each colour representing a specific dietary supplement (supplements intended for women, men, women in menopause, and individuals with gastrointestinal disorders). Research conducted by Wan et al. (2015) highlights the significance of colour in influencing the perceived effectiveness of dietary supplements. Also, for the purpose of this preliminary research, a logo composed solely of typography, devoid of illustrations, lines, or other graphic elements, was selected to enhance visibility and readability. The

stimuli representing the front of the packaging included an illustration, logo, product title, and supplementary information, such as the product quantity and a description of the product.



Figure 1: The primary set of samples used in the research

The first group of samples involved modifications to the font-weight of the product title. All samples were created using the Audrey typeface, available in regular, regular italic, medium, medium italic, and bold weights. For the purposes of this research, the regular variant was employed for the primary samples, medium for the secondary samples, and bold for the tertiary samples (Figure 2). Other elements, such as the manufacturer's logo and information about the quantity and product description, remained unchanged in terms of font-weight, size, or position. These elements were not taken into consideration when defining areas of interest and during statistical data processing.



Figure 2: Font-weight variations used in the research

The second group of samples involved altering the size of the product illustration displayed on the front of the packaging. The original illustration dimensions of 80x75 mm were used for the primary samples. In the secondary samples, the illustration was reduced to a 1:1.5 scale relative to the original, while in the tertiary samples, it was scaled down to 1:2 (Figure 3). This scaling was chosen to ensure the illustration remained visible on the display device, allowing participants to view it without difficulty. The colour and position of the illustration on the packaging front were kept constant. Additionally, other elements of the packaging, including the product title, manufacturer's logo, and product information (such as quantity and description), were unchanged in terms of size, colour, and typography. It is important to note that all samples were created and prepared using Adobe Illustrator software.

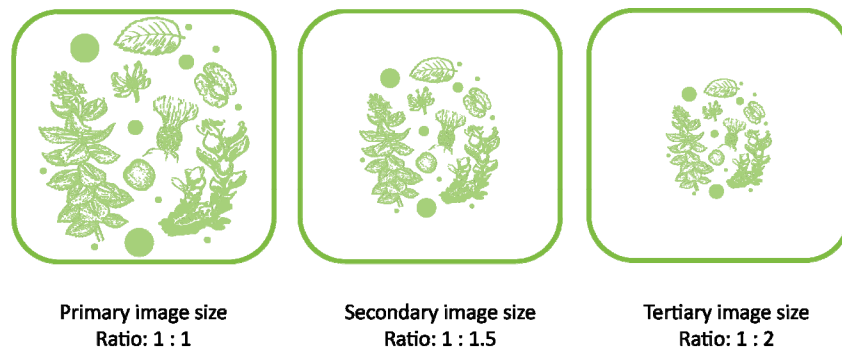


Figure 3: Illustration size alterations used in the research

## 2.3 Procedure

The data presented in this study was gathered using the Gazepoint eye-tracking device. All participants have undergone a 9-point screen-based calibration to ensure accurate test performance, after which they were presented with samples from the subordinate group. Each group consisted of 15 samples, with each sample being displayed for 6 seconds. Preliminary testing indicated that this duration was sufficient to allow participants to observe the front of the packaging adequately. The samples were presented in a randomized order to further ensure the examination's objectivity. After viewing all the samples, it was necessary to define the areas of interest for each specific graphic element (logo, product title, and illustration) and collect data on the gaze movements of all participants.

## 3. RESULTS

One-way ANOVA tests were used to examine for statistically significant differences in the alteration of the position and colour variations across the experimental comparisons. Differences with p-values less than 0.05 were considered statistically significant.

### 3.1 The influence of graphic design element type on participants' perception

A one-way ANOVA was first performed in order to compare the effect of each area of interest, representing graphic design elements, such as logo, product title, and illustration, on gaze duration, number of fixations, and number of revisits (Table 1).

Table 1: One-way ANOVA results for defined areas of interest that represent each graphic element

		Sum of Squares	df	Mean Square	F	Sig.
Gaze Duration	Between Groups	169.983	2	84.992	141.708	.000
	Within Groups	334.069	557	.600		
	Total	504.052	559			
Number of fixations	Between Groups	2610.657	2	1305.328	183.982	.000
	Within Groups	3951.842	557	7.095		
	Total	6562.498	559			
Number of Revisits	Between Groups	136.671	2	68.336	26.662	.000
	Within Groups	1427.615	557	2.563		
	Total	1564.286	559			

A one-way ANOVA revealed that there was a statistically significant effect of defined areas of interest on time viewed at the  $p < 0.05$  level for the three conditions [ $F(2,557) = 141.708, p = 0.000$ ]. One-way ANOVA also revealed that there was a statistically significant effect of defined areas of interest on fixation number at the  $p < 0.05$  level for the three conditions [ $F(2,557) = 183.982, p = 0.000$ ]. Finally, one-way ANOVA revealed that there was a statistically significant effect of defined areas of interest on revisits number at the  $p < 0.05$  level for the three conditions [ $F(2,557) = 26.662, p = 0.000$ ]. Post hoc comparisons using the Tukey HSD test indicated that the illustration ( $M = 1.6139, SD = 1.134$ ) was significantly ( $p = 0.000$ ) longer gazed upon than the logo ( $M = 0.483, SD = 0.588$ ), and the title ( $M = 0.409, SD = 0.413$ ). Post hoc comparisons using the Tukey HSD test also indicated that the illustration ( $M = 7.14, SD = 3.700$ ) had a significantly ( $p = 0.000$ ) higher number of fixations than the logo ( $M = 3.07, SD = 2.266$ ) and the title ( $M = 2.17, SD = 1.580$ ). Finally, Post hoc comparisons using the Tukey HSD test indicated that the illustration ( $M = 2.31, SD = 1.611$ ) had a significantly ( $p = 0.000$ ) higher number of revisits than the logo ( $M = 1.73, SD = 1.730$ ) and the title ( $M = 1.10, SD = 1.450$ ). The results of the post hoc test revealed no statistically significant difference in the gaze duration time for the logo compared to the product title.

### 3.2 Impact of title font-weight on participants' perception

A one-way ANOVA was conducted to compare the impact of font-weight variations on participants' gaze patterns. The analysis also explored the effect of font-weight variation on gaze duration, the number of fixations, and the number of gaze revisits. However, one-way ANOVA revealed that there wasn't any statistically significant effect of defined areas of interest (product title font-weight variations) on gaze duration [ $F(2,557) = 0.980, p = 0.376$ ], number of fixations [ $F(2,557) = 1.067, p = 0.345$ ], or number of revisits [ $F(2,557) = 1.655, p = 0.192$ ]. On the other hand, a comparison of the average gaze duration values, as illustrated in Figure 4, indicates that the product title was observed for the longest duration in the samples where the product title was presented in bold font-weight.

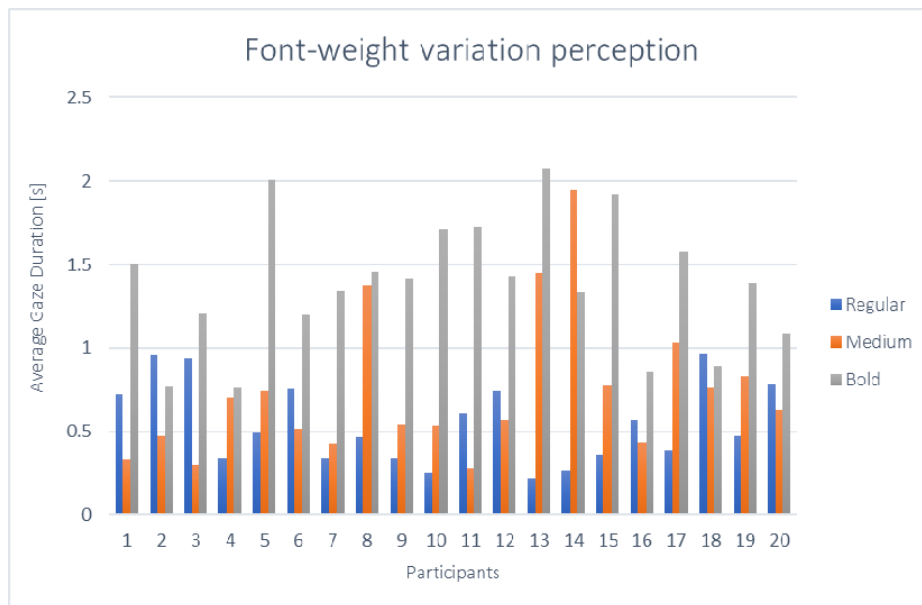


Figure 4: Average gaze duration for each font-weight

### 3.3 Impact of illustration size on participants' perception

A one-way ANOVA was performed in order to compare the effect of illustration size alteration on gaze duration, number of fixations, and number of revisits (Table 2). A one-way ANOVA revealed that there was a statistically significant effect of a defined area of interest (illustration size) on the number of revisits at the  $p < 0.05$  level for the three conditions [ $F(2,297) = 6.730, p = 0.001$ ]. Post hoc comparisons using the Tukey HSD test indicated that the primary illustration size ( $M = 2.74, SD = 1.784$ ) has a significantly ( $p = 0.001$ ) higher number of revisits than the tertiary illustration size ( $M = 1.82, SD = 1.702$ ). In other instances, the results of the one-way ANOVA did not reveal statistically significant differences resulting from alterations in illustration size (primary, secondary, and tertiary adjustments). Additionally, no significant effect of these alterations on gaze duration or the number of fixations was observed.

Table 2: One-way ANOVA results for illustration size alteration

		Sum of Squares	df	Mean Square	F	Sig.
Gaze Duration	Between Groups	5.094	2	2.547	2.358	0.096
	Within Groups	320.863	297	1.080		
	Total	325.957	299			
Number of fixations	Between Groups	40.609	2	20.304	1.307	.272
	Within Groups	4614.386	297	15.537		
	Total	4654.995	299			
Number of Revisits	Between Groups	42.560	2	21.280	6.730	.001
	Within Groups	939.160	297	3.162		
	Total	981.720	299			

#### 4. DISCUSSION

The predominance of visual representation over textual representation in the context of packaging design is a widely recognized phenomenon. According to Bateman (2014), typography, or textual content displayed on packaging without the integration of images or illustrations, can be retained in short-term memory by observers or consumers. However, there is a high likelihood that such information will not be transferred to long-term memory. In contrast, visual representation is the dominant means of acquiring new information and recognizing objects and products in the environment. Visual content is more easily retained in long-term memory, enhancing the potential for easier product identification (Kahn, 2017; Gil-Pérez et al., 2020). Many studies show that the visual representation can be related to the taste of a product, the smell of the product, the properties of the product, the material from which it is made, the tactile experience of the product, the amount of product in the packaging, and the like (Dematte et al., 2006; Ares et al., 2011; Balzarotti et al., 2015; Krishna et al., 2017; Carvalho et al., 2020). A multimodal approach to product presentation, incorporating images, illustrations, or similar elements, has the potential to engage consumer interest and facilitate long-term memory retention related to the packaging, the product itself, and even the brand (Bateman, 2014). This multimodal strategy conveys additional product information, enabling the manufacturer to effectively communicate the narrative they wish to share with their target audience. Support for this theory can be observed in Figure 4, which presents the heat map results for the stimuli used in this preliminary research. While statistical data highlight the dominance of pictorial representation, participants also allocated attention to other textual elements on the packaging, such as the product title, logo, and additional information.



Figure 4: Heat map results of participants' gaze patterns

With regard to the font-weight used for the product title, the greater contrast in colour and surface area, along with the bolder stroke, indicates the dominance of the bold font-weight compared to the medium and regular font-weights. When it is necessary to emphasize specific information, such as the product name, warnings, usage instructions, or composition, bold font variants are generally a more effective option compared to other font-weights (Spence, 2016). Additionally, older consumers and those with visual impairments tend to prefer products where the specifications and essential information are clearly visible on the packaging (Braun et al., 1992). According to Grohmann et al. (2013), selecting appropriate typography can significantly influence the message a manufacturer aims to convey to its target audience, thereby playing a crucial role in shaping the brand's image.

The size of the image or illustration that represents the product is also extremely important. With larger displays, details are clearly displayed and emphasized, which facilitates the transfer of information from the packaging to the user. A greater number of clearly displayed details can attract and retain the attention of consumers, which can further result in cognitive processes and the creation of preferences regarding a certain packaging or product. Many studies and research point to the importance of this phenomenon (Childers & Houston, 1984; Nelson, 2004; Berning et al., 2008; Zinko et al., 2020). The findings of this preliminary research suggest that the higher frequency of repeated glances in samples with the primary illustration size (1:1 scale), compared to those with the tertiary illustration size (1:2 scale), can be attributed to the richness and quality of details in the illustrations presented to the respondents. These details likely stimulated curiosity and a general inclination to re-examine the illustration further.

## 5. CONCLUSIONS

Packaging plays a crucial role in shaping and influencing consumer purchasing behaviour and can significantly impact a product's market positioning. Consequently, manufacturers invest considerable resources in improving and rebranding their products, with particular emphasis on packaging design. This includes considerations of the materials used, the packaging shape, and, importantly, how information is displayed, to effectively communicate the manufacturer's message. As a result, packaging has become one of the most important marketing tools for product promotion, regardless of the product type or industry.

As trends in packaging design evolve over time, it is essential to continuously conduct tests and research to better understand how consumers perceive products and develop preferences based on packaging design. This preliminary research aimed to investigate whether there are statistically significant differences in consumer responses to various graphic elements displayed on the front of the packaging, which often serves as the first point of contact in retail environments. Specifically, the study explored whether differences exist in the font-weight used to present information, as well as in the three predefined sizes of the product illustration. The findings revealed statistically significant differences between the illustrations and the text elements displayed on the packaging. While the illustrated graphic element clearly dominated the overall packaging content, the size of the illustration did not have a statistically significant impact on participants, except when it came to revisiting the graphic element in samples with the original illustration size. Additionally, no statistically significant differences were found between the three font-weights used for product titles, although the bold font-weight was observed for a longer duration than the others.

The results of this preliminary research, while confirming certain theories regarding the influence of graphic elements in packaging design on consumer preferences, also highlight the lack of established rules governing consumer behaviour and preferences toward specific graphic elements. This insight may prove valuable for designers and marketing professionals when approaching packaging redesign or the development of new product packaging for market introduction. Moreover, these findings provide designers with a degree of creative freedom in their approach to packaging design. In the future, this research could be expanded to include a larger and more diverse sample of participants, along with additional variables such as packaging shape, the mode of stimuli presentation, stimuli orientation, and the inclusion of information about the material and texture of the packaging.

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