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Computer-Aided Design AND APPLICATIONS

Modeling and Analysis of Visual Preference in Edible Oil Packaging Digital Visual Art Design Based on Eye Tracking Technology

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Abstract. The present study investigated the visual preference and influencing factors in the packaging design of edible oils by employing a combination of eye-tracking technology and questionnaire survey. To this end, 12 products were selected and divided into three groups, where the first group served as the main experiment and the latter two groups were used for verification purposes. The study identified the saturation of the color area, font size and spacing of the text area, and degree of image integration as crucial factors that jointly impact the visual preference of the participants towards the product. Through the modeling analysis of the data obtained, the conclusion is drawn, the study derived a set of rules and design methods pertaining to the visual preference characteristics of edible oil packaging. It is hoped that these insights will contribute towards the development of better packaging designs that are more visually appealing to consumers.

Keywords: Information technology; Package design; Eye-tracking tests; Visual preference; Digital Visual Art Design.
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1 INTRODUCTION

Food packaging is a crucial advertising medium for products displayed on retail shelves, and it represents one of the final touchpoints for consumers to engage with brand promotions. Thus, the design of food packaging plays a pivotal role in realizing integrated marketing efforts. Consumers are influenced not only by the price and quality of a food product but also by the aesthetics, style, symbols, and other visual elements of its packaging design [1]. Packaging design is an essential aspect of brand visual identity and offers significant advantages in marketing and communication.

It encompasses every point of contact between the brand and the audience, making it one of the most extensive visual languages [2]. Effective food packaging design should quickly and accurately convey the product's characteristics and brand value, while also enhancing the user's emotional connection and cultural identity with the brand. Digital visual art design in edible oil packaging is to create designs that are modern and sleek, with clean lines and bold typography. This can be effective for communicating the brand identity of the product, as well as appealing to consumers who are looking for contemporary and innovative packaging designs. Therefore, it is essential to explore how the visual design of food packaging can establish an emotional bond with consumers and facilitate promotion [3].

2 RELATED RESEARCH METHOD

Implicit measurement is a method of obtaining users' unconscious behaviors through specific means and analyzing them using appropriate evaluation standards to reflect user needs and product performance. In recent years, implicit measurement has gained widespread use in various design fields, including product design, graphic design, and interactive interface layout and expression, primarily as a method to evaluate product appearance design and interactive interface design [4-5]. Typically, implicit measurement methods are used to study the visual effects and influencing factors of packaging by analyzing the entire process of "saccade-fixation-gaze" using an eye tracker to obtain user emotion, psychological needs, and evaluation criteria for the design [6-7]. To achieve this, various methods, including eye movement tests, EEG tests, and functional nuclear magnetic resonance, have been employed [8-9]. In respect of the designed research purposes and subjects, the current study adopted the eye movement experiment, which features a relatively simple operation of experimental equipment and more intuitive data performance, to capture the subconscious behavior of the audience, thus enabling the derivation of relevant conclusions.

3 EXPERIMENTAL APPROAC

Drawing on experimental methods from domestic and foreign literature, this study grouped experimental samples according to their characteristics and followed standard procedures for eye movement experiments to ensure experimental accuracy. To ensure the validity of the findings, the study was designed to conduct two experiments, with the first serving as the primary study and the second verifying the conclusions of the first. Consistent findings across both experiments will be considered universal and generalizable. Additionally, in-depth interviews were conducted to further understand the objective intentions of the participants. By extracting perceptual vocabulary and integrating experimental conclusions, the study derived visual preference rules and offer design recommendations in this field (see Figure 1).

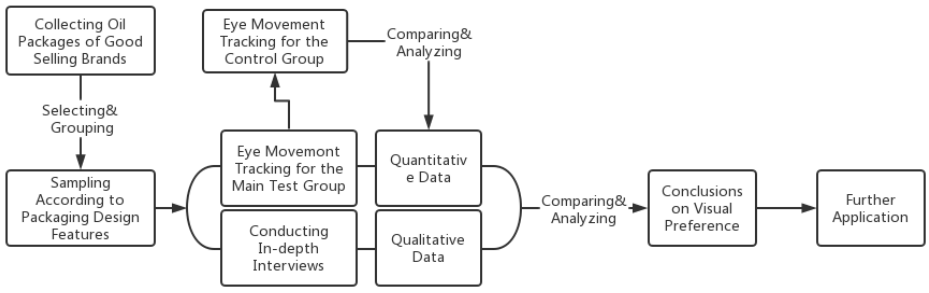


Figure 1: The Experiment Procedure.

4 METHOD

4.1 Sampling

This study comprehensively selected more than 70 brands of edible oils with better sales data and more typical packaging designs in the market through searches of supermarkets and shopping platforms. Based on this selection, the features were classified, and 12 brands of edible oils were ultimately chosen as experimental samples. Given the diverse packaging types for oil products, the samples were divided into three categories: barrels, spray bottles, and cans. Experiment 1 utilized barrel packaging picture material, including four pictures. Silhouette observation confirmed that the packaging shape in each sample was basically the same. The median product volume was controlled at 5L, and the pictures were guaranteed to be the same size across samples. Experiment 2 used spray bottles and tin cans for packaging pictures, with each category also containing four pictures. The picture selection followed the same method as Experiment 1, and the size and proportion of the pictures were also controlled.

4.2 Subjects

Based on the classic theory of statistical usability measurement, testing eight targets is sufficient to identify over 80% of a product's problems [10-11]. Considering various factors, 42 subjects were selected for this study, all of whom were experienced consumers with diverse backgrounds in purchasing edible oil. Of the 42 participants, 16 were male and 26 were female, with 4 males aged between 25 to 30 years, 8 between 31 to 45 years, and 4 over 45 years (excluded); 6 females were aged between 25 to 30 years, 14 between 31 to 45 years, and 6 over 45 years (excluded). To ensure the validity of the experiment, none of the subjects had been exposed to the experimental samples beforehand. All participants volunteered for the test, were right-handed, had good or corrected vision, and had no history of color blindness, mental illness, or other diseases.

4.3 Eye Movement Experiment

The experiment utilized the A See Glasses glasses-type eye tracker and a DELL notebook with a resolution of 2650*1600, along with the A See Glasses Studio software to record the visual behavior of all participants observing the samples. The software recorded fixation durations greater than 100 ms for each gaze [12].

4.3.1. Experiment procedure

Experiment 1 focused on the visual experience of barreled packaging, utilizing four typical packaging pictures in a large measurement image with a 12-second fixation time. Participants selectively focused on their preferred packaging type, after which interviews were conducted to understand their subjective visual experience of each package. Eye movement data was used to provide a comprehensive evaluation of the visual experience of the package.

Experiment 2 aimed to verify whether the results obtained from Experiment 1 were universal across different packaging types. Two new packaging types, spray bottles and tin cans, were added to the experiment. The procedure was mostly identical to Experiment 1, with the exception of the packaging pictures. To avoid mutual interference of different packaging visual experiences, participants were given a 3–5-minute rest before entering into the next visual packaging observation.

To ensure the experiment's rigor and objectivity, four packaging pictures were used for each category, and the size, aspect ratio, direction, and handle direction (barrels have handles) of all pictures were controlled to be the same to minimize differences that could affect the real visual experience of the experimental materials. Additional interference factors, such as the size, direction,

and angle of the picture, were also controlled to ensure consistency. To make the picture easier to visually process and avoid unnecessary errors caused by different picture spacing, each type of picture was arranged in a 2x2 grid. The spacing between pictures at the same position was controlled to be the same, except for the difference in size between the three packaging types.

4.3.2. Eye movement indicators

Eye movement research utilizes various eye movement indicators to represent different processing mechanisms of people's gaze. Based on previous studies, the following eye movement indicators were used in this study to measure the visual experience of packaging: (see Table 1).

Eye Movement Indicators	*Definitions of Indicators*
Target Hit Ratio	*The ratio of the number of fixations falling on interest zones or specified objects to the total number of fixations*
Fixation Ratio	*the ratio of the subject's fixation time in a specific zone to the total zone*
Refixation Ratio	*The ratio of the number of times the subject looked back in a specific zone to the number of times the subject looked back in the total zone*
Duration before the First Fixation	*The fixation time before the first fixation point on interest zones*
First Fixation Duration	*The fixation time for the first fixation point on interest zones*
Cumulative Fixztion Time	*The sum of the subject's fixation time in the total zone*

Table 1: Eye Movement Indicators and Definitions.

5 RESULTS

5.1 Results and Analysis for Experiment 1

Statistical analysis of the experimental data involved using SPSS 25.0 to conduct descriptive statistics and analysis of variance for each eye movement indicator. Post-hoc comparison tests were performed on the results of variance analysis to further analyze the data.

Comparing the original image (see Picture 2), heat map (see Picture 3), and trajectory diagram (see Picture 4), it was observed that in the heat map, participants tended to focus on areas with brighter patterns on the package, particularly the main pattern areas, and gazed more at the larger text areas of the title. Overall, there were more fixations in the center area of the package. On packages with higher color saturation and more prominent theme text, prolonged fixation was significantly more evident than on other packaging, such as barrel Sample 4. In the trajectory diagram, the fixation point trajectory of the subject was mainly concentrated in the central area of the package. The main pattern and text were still the areas with the most fixation points. When the main pattern or text part of one package was moved to the main pattern or text part of another package, the fixation points between the main patterns were also obviously increased compared to other scattered pattern areas. However, almost all of the fixation points were fleeting, and there was not much staying or looking back. In the subsequent statistics of the fixation order of the trajectories, it was also found that the entry order of barrel Sample 4 was the earliest (i.e., the average entry time was the shortest), which was consistent with the intuitive results of the heat map.

The intuitive descriptive statistical results showed that Sample 4 had the highest target hit rate, fixation rate, and re-fixation rate, as well as the longest first fixation duration and cumulative fixation time. These results were consistent with the intuitive results of the heat map, indicating that there were more fixations on Sample 4, which had more saturated and brighter colors and more prominent theme fonts.

Repeated measures ANOVA was performed on the eye movement indicators for the four design samples in the barreled category, with the following results: (see Table 2)

The result of ANOVA for target hit ratio was not significant, $F=0.667$, $p>0.05$.

Figure 2: Original Image of the Barrelled Samples.

Figure 3: Heat Map of the Barrelled Samples.

Figure 4: Trajectory Diagram of the Barrelled Samples.

The result of ANOVA for fixation ratio was significant, $F=3.512$, $p<0.05$, and the post-hoc test showed that the fixation ratio of Sample 4 was significantly higher than that of Samples 1 and 2 ($p<0.05$).

The result of ANOVA for re-fixation ratio was not significant, $F=1.875$, $p>0.05$.

The result of ANOVA for duration before first fixation was significant, $F=4.214$, $p<0.05$, and the post-hoc test showed that the duration before first fixation of Samples 3 and 4 were significantly shorter than that of Samples 1 and 2 ($p<0.05$).

The result of ANOVA for first fixation duration was significant, $F=4.458$, $p<0.01$, and the post-hoc test showed that the first fixation duration of Sample 4 was significantly longer than that of Sample 2 ($p<0.05$).

The result of ANOVA for cumulative fixation time was significant, $F=3.034$, $p<0.05$, and the post-hoc test showed that the cumulative fixation time of Sample 4 was significantly longer than that of Samples 1 and 2 ($p<0.05$).

The ANOVA results were consistent with the results of the heat map, trajectory map, and descriptive statistics. Sample 4 had significantly higher fixation ratio, first fixation duration, and cumulative fixation duration than one or two other samples, indicating that participants were more interested in Sample 4 and paid more attention to it. The shorter first fixation duration of Sample 4 also showed that it captured attention faster than some other samples.

Sample Number	*Eye Movement Indicators*						
	Entry Order	*Target Hit Ratio (%)*	*Fixation Ratio (%)*	*Refixation Ratio (%)*	*Duration Before First Fixation (ms)*	*First Fixation Duration (ms)*	*Cumulative Fixation Time (s)*
Sample 1	*3*	*20.80*	*21.03*	*17.42*	*503.49*	*882.6*	*2.43*
Sample 2	*4*	*21.44*	*20.78*	*16.26*	*515.61*	*854.42*	*2.39*
Sample 3	*2*	*20.43*	*23.60*	*16.15*	*458.21*	*894.81*	*2.82*
Sample 4	*1*	*22.04*	*25.41*	*18.3*	*441.37*	*915.24*	*2.98*

Table 2: Four Barrelled Samples with Their Statistical Results of Eye Movement Indicators.

5.2 Results and Analysis for Experiment 2

To ascertain the generalizability of the findings from Experiment 1, two additional experimental groups were included in Experiment 2, namely, the sprayed type and canned type (see Table 3). The procedures undertaken in Experiment 2 were identical to those in Experiment 1. Through this experiment, the trajectory diagram and heat map of the two groups will be obtained, thereby enabling a more precise identification of design principles.

	Original Image	*Heat Map*	*Trajectory Diagram*

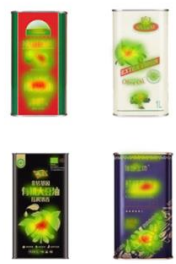
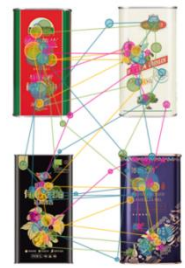
Sprayed Samples			
Canned Samples			
Barrelled Samples			

Table 5: Image Set for the Experiment.

The heat map analysis revealed that packaging designs featuring prominent main patterns and text, such as sprayed sample 4 and canned sample 1, tended to elicit longer gazes. Notably, when the pattern was more concentrated, the fixation point was also more focused, resulting in longer fixation times. Conversely, when the pattern was more scattered, fixations were more dispersed, and fixation times on the main pattern were relatively reduced. This trend was particularly evident in the heat map of canned sample 1 and other similar samples. Regarding color, the subjects showed a preference for packaging with more saturated and brighter tones, with darker areas of the packaging receiving less attention. In terms of layout and text arrangement, a better arrangement and more prominent main text were more likely to attract attention. Overall, the main pattern or text occupied the most significant hotspots, indicating that packaging primarily relied on these elements to capture people's attention.

The trajectory diagram analysis showed that the main pattern and text of sprayed samples and canned samples had more fixation points. During the scanning process of the eye movement trajectory, the line of sight tended to move from the main part of the pattern of the packaging design to the scattered patterns or text part, or directly scan from the main pattern part of one package to the main pattern of another package, thus skipping some edge patterns. The main pattern occupied a larger area, and clear packages attracted more attention and longer fixations.

The descriptive statistical analysis of the sprayed samples and canned samples revealed that sprayed sample 4 and canned sample 1 elicited a shorter duration before first fixation but higher fixation ratio, longer first fixation duration, and cumulative fixation time. These findings suggest that designs featuring more distinct patterns and text levels are more effective in quickly capturing attention and keeping people engaged.

Repeated measures ANOVA was carried out on the eye movement indicators of the 4 sprayed samples, and the results are as follows: (see Table4)

The ANOVA result of target hit ratio was not significant, $F=1.05$, $p>0.05$.

The ANOVA result of fixation ratio were significant, $F=5.042$, $p<0.05$, and the post-hoc test results showed that the fixation ratio of sample 1 and sample 4 were significantly higher than those of sample 2 and sample 3 ($p<0.05$).

The ANOVA result of refixation ratio was not significant, $F=0.851$, $p>0.05$.

The ANOVA result of duration before first fixation was significant, $F=3.854$, $p<0.05$, and the post-hoc test results showed that the duration before first fixation of sample 4 was significantly shorter than that of samples 1, 2 and 3 ($p<0.05$).

The ANOVA result of first fixation duration was significant, $F=5.144$, $p<0.05$, and the post-hoc test results showed that the first fixation duration of sample 4 was significantly longer than that of samples 2 and 3.

The ANOVA result of cumulative fixation time was not significant, $F=1.143$, $p>0.05$.

Repeated measures ANOVA was also performed on the eye movement indicators of the 4 canned samples, and the results are as follows: (see Table 4)

The ANOVA result of target hit ratio was not significant, $F=0.746$, $p>0.05$.

The ANOVA result of fixation ratio was significant, $F=4.62$, $p<0.05$, and the post-hoc test results showed that the fixation ratio of sample 1 was significantly higher than that of sample 2, sample 3 and sample 4 ($p<0.05$).

The ANOVA result of refixation ratio was not significant, $F=1.32$, $p>0.05$.

The ANOVA result of duration before first fixation was significant, $F=4.724$, $p<0.05$, and the post hoc test results showed that the duration before first fixation of sample 1 was significantly shorter than that of samples 2, 3 and 4 ($p<0.05$).

The ANOVA result of first fixation duration was not significant, $F=1.334$, $p>0.05$.

The ANOVA result of cumulative fixation time analysis was significant, $F=9.034$, $p<0.05$, and the time test results showed that the cumulative fixation time of sample 1 was significantly longer than that of samples 2 and 3 ($p<0.05$).

In the results of variance analysis, consistent with the intuitive numerical results of descriptive statistics, sprayed sample 4 and canned sample 1 showed statistical differences among one or several other design samples, in respect of fixation ratio, duration before first fixation, first

fixation duration and cumulative fixation time, further support the notion that packaging designs featuring prominent overall color, text, typesetting, and pattern themes are more visually appealing and engaging for people.

Sample Types	Sample Number	Eye Movement Indicators						
		Entry Order	Target Hit Ratio (%)	Fixation Ratio (%)	Refixation Ratio (%)	Duration Before First Fixation (ms)	First Fixation Duration (ms)	Cumulative Fixation Time (s)
Sprayed Sample	Sample 1	2	19.85	24.18	18.42	575.82	803.22	2.21
	Sample 2	4	20.46	21.33	16.71	607.94	780.26	2.44
	Sample 3	3	21.06	20.51	16.55	596.21	710.45	2.37
	Sample 4	1	21.41	24.57	17.93	511.25	821.57	2.55
Canned Sample	Sample 1	1	20.17	23.51	16.82	475.23	751.23	2.72
	Sample 2	3	21.49	21.04	17.63	550.61	703.46	2.33
	Sample 3	4	22.35	20.85	15.41	594.36	698.5	2.2
	Sample 4	2	21.57	21.31	18.96	531.92	736.52	2.65
Barreled Sample	Sample 1	3	20.80	21.03	17.42	503.49	882.6	2.43
	Sample 2	4	21.44	20.78	16.26	515.61	854.42	2.39
	Sample 3	2	20.43	23.60	16.15	458.21	894.81	2.82
	Sample 4	1	22.04	25.41	18.3	441.37	915.24	2.98

Table 4: Statistical Results of Eye Movement Indicators for Three Types of Samples.

5.3 Interview Results and Analysis

To gain a more comprehensive understanding of the subjects' objective visual perception of the samples, in-depth interviews were conducted on two aspects: real purchase intention and visual preference. The 12 samples mentioned previously were divided into three groups and presented to 42 subjects in a predetermined order of barrels, spray bottles, and tin cans. The research groups recorded their evaluation preferences and reasons for each sample, taking into account gender and different age groups. Figure 5 displays the results of the study, with the barrel group serving as the primary experimental sample and the other two groups serving as verification groups. Among the barreled samples as the main test group, sample 4 had the highest popularity rate, accounting for 38.1%, followed by sample 3 with a preference ratio of 26.2%. Sample 2 and sample 1 had preference ratios of 14.3% and 12%, respectively.

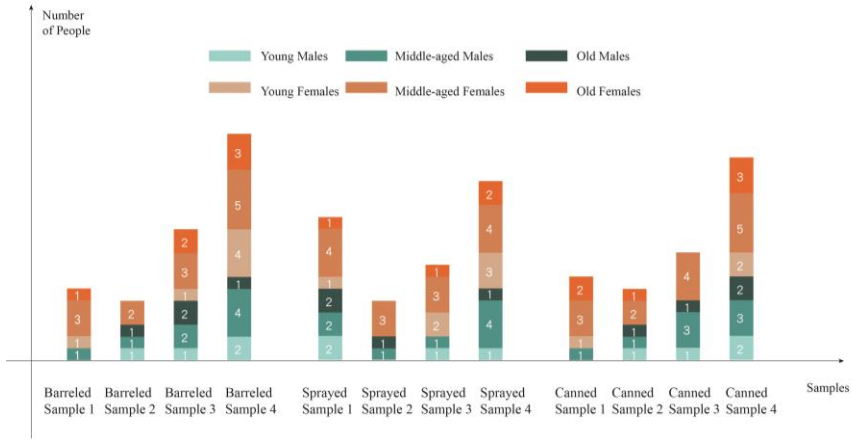


Figure 6: Interview Result.

During the interviews, emotional words such as "straightforward", "clear", and "delicate" were used 14 times to explain the reasons for the popularity of sample No. 4. Compared to the other three samples, its visual design is simpler, with a clearer division between graphics and text. The use of a more realistic peanut image highlights the product's selling point and reflects a higher sense of quality. These may be why subjects were more willing to choose sample 4.

Sample 2 used illustrations, rich colors, and a centered arrangement in the layout order, making it eye-catching and interesting. During the interviews, 17 of the audience members rated the sample as "interesting" and "clear", while 26 audience members expressed varying degrees of perception that they did not receive the key information conveyed by the packaging. Therefore, although the sample is excellent in terms of design, it seemly falls short in terms of information transmission.

The preferences for samples 3 and 1 were relatively weaker, with the main evaluations of the audience being "lack of impression", "failure to convey product information at the first glance", and "cheap". Thus, the current research identified the design of these two packages to be weak. Sample 2 has a large span in overall color, lightness, and purity, and the layout is relatively loose, which may have led to its poor audience evaluations.

In the verification group for the sprayed samples, sample 4 had the highest popularity rate, accounting for 35.7% of the preference intention, followed by sample 1 with 28.6%. Samples No. 2 and No. 3 had preference ratios of 12% and 19%, respectively. During the interviews, 36 of the subjects rated sample 4 as "straightforward". Compared to the other three samples, the layout of sample 4 is intuitive and clear, and the distribution of color blocks is clear. Both are symmetrically distributed, leading to its better preference evaluation. The audience's evaluation of sample 1 was also similar to sample 4.

Among the canned sample groups, sample 4 had the highest popularity rate, accounting for 40.5%, while the other three samples had average preferences, accounting for 16.7%, 14.3%, and 21.4%, respectively. During the interviews, the audience thought that the design of sample 4 was "connotative", "textured", and "straightforward", and they could understand the information conveyed by the product at a glance. All the colors of the sample present a "sense of luxury". In the design of sample 4, the text layout was left-aligned, the text area and the pattern were located in the upper left corner and the lower right corner of the screen, respectively, and the layout and color

blocks were clear and distinct. The audience evaluation and results obtained from the two verification groups were consistent with the barreled group in the main experiment.

In summary, the layout sequence, material texture, color, text area, and other design elements in the packaging, as well as the comprehensive product positioning and marketing, are all key factors that can influence the subjects' choices. Therefore, designers need to accurately and efficiently convey the selling point information of products while meeting consumer preferences.

6 DISCUSSION

In Experiment 1, the eye movement data of the four barreled samples were compared, and the results demonstrated that Sample 4 was viewed for a longer duration, indicating that it could capture the subjects' attention more quickly and be more attractive. The results then obtained from the verification experiments of Experiment 2 and the latter Interview were consistent in conclusions with the previous one.

6.1 Oil Packaging Colored Sections' Influence on Fixation

In Experiment 1, by comparing the original image, heat map, and trajectory diagram of the barreled samples, it was observed that in the heat map, the subjects tended to focus on areas with brighter patterns on the package. This conclusion was further verified in Experiment 2. From these results, it can be inferred that designs with high color saturation and strong color area distribution contrast are more likely to attract consumers' attention. According to the principle of visual balance, areas with high contrast in color will generate stronger gravity in a picture, so the brighter the color used, the stronger the visual impact [3].

Color design plays a crucial role in edible oil products. As oil products are closely related to our daily lives, the color of its raw materials needs to meet the audience's basic understanding of the product. Designers need to make good use of the product's natural and other prominent information elements in the product appearance design, and use the contrast relationship of strong colors to highlight the subject information. For the packaging design of oil products, it is essential to emphasize the relationship between color saturation and lightness contrast, express color blocks more regularly, and adopt simple and easy-to-understand color relationships to cater to a wider range of age groups. Further, the color design should exude a natural and ecological joy tone to improve the positive effect of color on consumer emotions.

6.2 Oil Packaging Text Areas' Influence on Fixation

In Experiment 2, the heat map showed that the spacing between Chinese characters and the density of layout design can affect the fixation ratio of the subjects. By analyzing the target hit ratio of sprayed sample 4, canned samples 3 and 4, and barreled sample 4, it was observed that clearer and more concise font information is easier for consumers to catch their attention. Furthermore, within a reasonable range, larger horizontal and vertical spacing between words can positively impact consumers' information collection efficiency.

In the design of the text area for oil packaging, designers can focus on the main aspects of font, font size, and line spacing for overall design. For font size selection, the font size can be associated with the importance of the product information content, and the core content fonts can be capitalized and bolded to a certain extent within a reasonable range of packaging size. Regular typesetting of font sizes is conducive to guiding consumers to establish an objective and logical brand image for the brand and enhance brand value.

Regarding line spacing, the distance between the main information and other text information can be appropriately greater than that of the second-level and other text information. Using a

relatively loose spacing distance without affecting consumers' visual reading can play a role in improving the legibility of product information, leading to positive effects.

6.3 Oil Packaging Image Areas' Influence on Fixation

In Experiment 1, the heat map analysis of the barreled samples revealed that the subjects' gaze centers were primarily concentrated in the central area of the packaging design, with minimal attention paid to other areas. Conversely, the larger pattern area and diverse content of sample 3 of the barreled packaging resulted in scattered gaze points in the heat map, with no positive impact on the target hit rate and re-attention rate data. In Art and Visual Perception, Arnheim (1998) posited that objects appearing independent and suspended in the open sky, such as the sun or moon, appear larger than those surrounded by different constituent objects but with a similar form to the shape of the image. Therefore, it can be inferred that the smaller the cognitive gap between the image created through artistic creation and consumers' perception, the clearer and more understandable the image will be, making it easier for consumers to capture.

Based on the above experiments, designers can approach pattern design and layout from two perspectives in this product category. In pattern design, the design concept of concise lines and clear patterns can be adopted based on product characteristics. Additionally, combining brand regional characteristics or traditional elements can highlight brand personality while beautifying the product under the prerequisite of enhancing brand memory points. In pattern layout, the central layout composition technique can be used to positively guide consumers using the pattern's illustrative advantage while avoiding clutter and disorder in the composition, highlighting key points while beautifying the product.

7 CONCLUSION

Despite the valuable insights gained from the study, several limitations still exist due to the experimental conditions. Firstly, the study used processed photos as samples for experimental analysis, which may not fully restore the visual effect of real samples in the physical world. Secondly, due to the difficulty of controlling variables in the experimental sample, the conclusions drawn from the experiment can only demonstrate the law of visual preference under the synergistic effect of multiple factors rather than the influence of a single factor. Lastly, the order of the samples was not scientifically verified during the experiment, ignoring the influence of reading habits on the experimental results, which may affect the objectivity of the results.

Food packaging design plays a crucial role in conveying brand value, displaying the characteristics of food, and connecting with consumers. Through eye-tracking experiments and interview analysis, the study proposed design principles that align with consumers' visual preferences in the color area, text area, and image area of oil food packaging. The empirical research provides an objective factual basis for oil packaging design, helps to build a more comprehensive packaging design evaluation system, and provides a more accurate design paradigm for the packaging design evaluation system. Overall, this study contributes to the advancement of packaging design research and can inform the development of effective design strategies that enhance consumer engagement with products.

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