

Design of Food Packaging Visual Experience Based on Eye-movement Experiment

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Abstract:

This study uses eye tracking technology to explore the visual experience characteristics of food packaging and its influencing factors, and summarizes the visual experience rules and design enlightenment of food packaging. Taking the packaging design of potato chips as an example, 8 packaging pictures of 4 typical brands on the market were selected as test samples, and the eye movement data of 30 subjects were collected in two times, and the experimental data were comprehensively analyzed. The results show that in food packaging design, people's attention and visual experience are mainly influenced by factors such as color, text and typesetting, and fragmented areas and packaging forms also play an important role in visual communication. Innovative color, text areas and typesetting design can effectively enhance the visual experience of consumers and better spread the brand value.

Keywords:

Packaging Design, Eye Movement Experiment, Brand Communication

1. Introduction

With the rapid development of modern society and the continuous improvement of people's living standards, food packaging design is playing an increasingly important role in consumers' decision-making processes. As the primary visual contact point between products and consumers, food packaging is not only a carrier for protecting products but also an important medium for brand communication and marketing [1]. Packaging should be rich in imagination and creativity to enhance its own innovative value [2]. Studies have shown that reasonable packaging design can positively promote healthy eating and food intake [3]. When choosing products, consumers are often strongly influenced by packaging design, including elements such as aesthetics and symbols, in addition to brand and price [4]. Looking at existing product packaging, best-selling ones always contain unique design symbols that enable information exchange between the product itself and its packaging design [5]. However, there are relatively few studies on how these visual elements specifically affect consumers' attention and visual experience, especially in specific food categories such as potato chips. This study aims to use eye-tracking technology to

explore the characteristics of visual experience in food packaging design and its influencing factors. As an advanced tool for psychological and behavioral research, eye-tracking technology can accurately record and analyze data such as subjects' eye movement trajectories, fixation points, and fixation durations when viewing packaging, thereby revealing the attractiveness and influence of various elements in packaging design on visual attention. Taking potato chip packaging as an example, eight packaging images from four typical brands on the market were selected as test samples. Through two experiments, eye movement data from 30 subjects were collected and comprehensively analyzed in combination with interview results. The research results show that in food packaging design, factors such as color, text, and layout significantly affect consumers' visual experience. In addition, the design of fragmented areas and packaging forms also play an important role in visual communication. By analyzing these influencing factors of visual experience in food packaging design, the laws of visual experience in food packaging are summarized, and design inspirations with practical application value are proposed. Excellent food packaging can provide users with accurate and clear product information, as well as a pleasant and comfortable consumption and use experience. At the same time, it can bring differentiated, personalized, and emotional shopping and use experiences, thereby increasing user stickiness and enhancing brand value [6].

2. Research Methods

By analyzing the entire process of “saccade - fixation - gaze” through an eye tracker, real reactions and behavioral data of users in an unconscious state can be obtained. Implicit measurement assessment methods include various approaches such as eye-tracking tests, electroencephalogram (EEG) tests, and functional magnetic resonance imaging (fMRI). Due to the particularity of the experimental purpose and objects of this study, we chose the eye-tracking test, which is relatively simple to operate and has intuitive data performance, to capture users' unconscious behaviors when observing food packaging, and then summarize the laws of visual experience in food packaging.

The importance of food in daily life is self-evident. There are a wide variety of colorful food packages on the market [7]. First, we selected common potato chip packages on the market as test samples and grouped them to ensure the diversity and representativeness of the samples. Screen-based eye-tracking test equipment was used to conduct eye-tracking experiments on subjects, recording their eye movement data when observing different packages. Secondly, we grouped and evaluated the visual experience characteristics of various packages, such as form, composition, color, shape, and font, and analyzed the specific impact of each element on users' attention and visual experience. On the basis of the preliminary experiment, we selected a single sample for a second eye-tracking experiment to further verify the initially discovered laws and conclusions. By comprehensively analyzing the eye movement data and interview results, we can fully understand the visual experience characteristics of potato chip packaging design. Through empirical research, it provides an objective basis for the selection and improvement of packaging design schemes, and helps to build a more complete packaging design evaluation system [8].

3. Experimental Design

3.1. Experimental Equipment

The study selected eye-tracking tests, which are relatively simple to operate and have intuitive data performance [9]. The experiment used the Asee Studio eye tracker produced by 7Invensun Information Technology Co., Ltd., with a sampling rate of 100 Hz. It obtains fixation point data through a 3D eye-tracking algorithm and an automatic parallax compensation algorithm, records the subjects' eye movement data, and simultaneously records the heat map trajectory and eye images. After the experiment, various eye movement data were exported and analyzed through the Studio analysis software that comes with the eye-tracking device.

3.2. Experimental Subjects and Samples

This experiment mainly took young users from a university in Yunnan as the test subjects, and a total of 30 subjects were invited to participate. Based on the subjects' own wishes, the actual number of participants in the experiment was 30. All subjects had normal corrected vision, no color blindness, and had not participated in eye-tracking experiments before. Through searching shopping networks and observing stores, we comprehensively selected potato chip packages from four typical brands on the market as observation samples. Since the main types of potato chip packages on the market are bagged and barreled, 4 standard 70g bagged potato chip packages and 4 100g barreled packages were selected and grouped for the experiment to facilitate more objective investigation and analysis.

3.3. Experimental Process

Using an eye tracker to analyze the entire process of "saccade - fixation - gaze" can obtain evaluation criteria for design [10]. With reference to experimental methods in domestic and foreign literature, after completing the selection and grouping of experimental samples, the experiment was conducted in strict accordance with the steps. To avoid interference from other people's eye gaze on the experimental data, only one subject was invited to enter the laboratory each time. Before the experiment, the subjects were introduced to the experimental process. They were seated 30 - 50 cm away from the screen, adjusted their sitting posture to ensure comfort, and then performed fixation point calibration. The calibration score was required to be no less than 90; a score lower than 90 was considered unqualified, and the subject could not proceed to the next part of the experiment. A score of 90 or higher was considered passed. After passing, the subject's head would not move during the eye-tracking test until the end of the experiment. Through verbal prompts, the subjects were asked to browse the given packaging images according to their daily habits and press the spacebar to end. Combining eye-tracking experimental data and interview data, we obtained eye movement heat maps, path maps, fixation maps, etc., to understand the subjects' visual focus, thereby summarizing the visual experience characteristics of packaging design and proposing inspirations for design applications. Then, a single sample was selected for a second eye-tracking experiment for further analysis and collation. During the experiment, the testers tracked the subjects' eye movement information throughout and adjusted for abnormal situations.

4. Experimental Results and Analysis

4.1. Results and Analysis of Group Experiments

Group experiments mainly focused on the path maps and fixation maps of potato chip samples. The path maps and fixation maps of the group experiments are shown in Figure 1. Through the path maps of the eye-tracking experiments, it was found that almost every subject's visual center first fell on products with higher color brightness or more obvious contrast. On each package in the two groups of packaging images, there were scattered bright spots in secondary hotspots, indicating that subjects would obtain information by fragmentally capturing key points of the packaging design. It can be inferred that the text title area is the focus area of the subjects' experiments, while other subheadings, explanatory content, and patterns become fragmented areas that attract attention.



Figure 1. Group experimental path diagram.

4.2. Results and Analysis of Individual Sample Experiments

Based on the results of the first group experiment, a second eye-tracking experiment was conducted further. In the second experiment, all packages were displayed to the subjects individually, targeting the same 30 subjects as in the first experiment. Special attention was paid to the experimental results in terms of heat maps, so as to understand more accurate design rules of potato chip packaging. The heat maps of the individual analysis group are shown in Figure 2.





Figure 2. Hot spot map of the individual case experiment.

In the experiment with typical samples of potato chip packaging, as shown in Figure 2, Sample 7 features a vertical layout. The subjects' fixation hotspots radiate from the central axis as the visual center to both sides, and then further radiate from the central axis or central point to the sides and surrounding areas. The hotspots are basically concentrated in the large text title area. For Sample 3, the visual center of the subjects first falls on the large-sized text in the middle. The subjects will first notice its independently enlarged brand name, and then expand their sight from the brand as the center to observe other surrounding texts and patterns. Samples 1, 2, 3, and 4 all adopt a horizontal layout. The subjects' sight first falls on the product name in the upper part of the packaging, and then gradually moves downward. The blank area above the product name generally receives less attention.

In the experiment with bagged potato chip samples, Sample 3 has a horizontally typeset product name. The subjects' sight first falls on the product name and then gradually moves downward. Compared with other samples, the subjects' sight when observing Sample 3 is relatively disordered. In addition to the text area of the product name, the product selling points and English areas also attract high attention. In the experiment with barreled potato chip Sample 8, the subjects' sight points first fall on the largest category text area, and then read the content downward from this area. Since Sample 8's product name is set with text sizes of different levels, it can be seen from the heat map that this design is more likely to attract the subjects to observe its content carefully. In the experiment with barreled potato chip Sample 5, the subjects' sight points first fall on the product name area, and then read the content from the center to the upper and lower sides. Compared with other samples, Sample 6 uses characteristic graphic text, which is more able to attract the subjects' sight.

To sum up, the subjects have high visual sensitivity to elements such as the product name, text, color, pattern, and symbols in packaging design, as well as their size and layout order. In food packaging design, the product name can be highlighted through design methods such as position, size, and symmetry, and memory can be strengthened with the help of reasonable patterns and trademark symbols. Design symbols represent the progress and diversification of designers' thinking and methods, and also benefit from the special carrier of symbols [11]. Special attention should be paid to the hierarchical processing of information, consciously guiding consumers to

first see the main product name and category, and then understand secondary content such as specifications and usage methods. Try not to adopt average text sizes and typesetting orders. Avoid redundant interfering information; unnecessary patterns, symbols, or text descriptions in packaging design may affect the visual communication of main information and impair the visual experience.

5. Conclusions

The experiment found that subjects have high visual sensitivity to elements such as product names, words, colors, patterns, symbols in packaging design, as well as their sizes and layout order. Therefore, in packaging design, different design techniques can be used to enhance visual effects and user experience [12].

Firstly, regarding the design of product names. The product name is the first element that consumers notice when observing the packaging. Therefore, it is necessary to highlight it through reasonable position, size, and symmetrical design. For example, place the product name in the center of the packaging or a prominent position near the top, use a larger font size to ensure that it visually occupies a dominant position, so as to quickly catch consumers' eyes and strengthen brand memory.

Secondly, reasonable patterns and trademark symbols can significantly enhance the visual appeal and memorability of the packaging. In the experiment, packages with clear patterns and trademark symbols were more likely to be remembered by consumers. Therefore, in design, patterns related to product characteristics and brand image should be selected, and overly complex or irrelevant graphics should be avoided. Trademark symbols should be concise and placed in a prominent position, forming a visually harmonious unity with the product name.

Thirdly, reasonable arrangement of brand colors is also an important part of packaging design. Colors should follow the principle of overall unity with partial vitality in color design to enliven the picture and enhance the theme effect, forming a fixed color and tone in consumers' minds to facilitate their further judgment of the product's nature [13]. The sense of hierarchy and comfort brought by excellent color matching can stimulate people's consumption psychology, and at the same time, the plasticity that colors bring to packaging design can invisibly improve the grade of goods [14]. The application of colors can give people a new and unique visual experience, and even make consumers associate with a certain product or even its taste [15].

In addition, the hierarchical processing of information is also a key factor in design. The experimental results show that consumers are greatly affected by the hierarchical processing of information when obtaining packaging information. In design, we should consciously guide consumers to first pay attention to the main product name and category, and then understand secondary content such as specifications and usage methods. Avoid using text information of the same size and typesetting order, as this will make it difficult for consumers to quickly distinguish between important and secondary information. Through hierarchical processing, the efficiency and clarity of information transmission can be improved.

Furthermore, redundant interfering information will affect the visual communication of main information and reduce the overall visual experience of the packaging. The experiment found that packages containing a large number of

irrelevant patterns, symbols, or text descriptions often make consumers feel visually fatigued and confused. Therefore, in design, unnecessary decorative elements should be minimized to keep the information concise and intuitive. Only retain the information that is actually helpful for consumers' decision-making to ensure that the main information can be conveyed to consumers quickly and accurately.

Finally, the layout order of packaging design directly affects consumers' visual flow and information acquisition efficiency. Experiments show that an orderly layout design can effectively guide consumers' visual path and improve the effect of information transmission. In design, we should follow the natural laws of visual flow, ensure that all elements are arranged in order with distinct layers. Through design principles such as symmetry, contrast, and spatial layout, a clear and attractive visual structure can be created.

Through these design strategies, food packaging design can not only enhance visual appeal but also improve the efficiency and accuracy of information transmission, thereby enhancing consumers' purchasing desire and brand memory.

Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this article.

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References

- [1] Tian, F.M. Personalization and Customization Become the New Trend of Consumption. Packaging and Printing Industry Will Usher in New Changes. *Digital Printing*, 2018, 10, 61-63.
- [2] Zhao, H.; He, D. A Brief Analysis of Innovative Methods of Beverage Packaging Design. *Public Art*.
- [3] Chu, R.; Tang T.; Mm Hetherington. The Impact of Food Packaging on Measured Food Intake: A Systematic Review of Experimental, Field and Naturalistic Studies. *Appetite*, 2021, 9, 1055.
- [4] Kim, T.J.; Petitjean, M. Atypical Package Design and Product Category Prestige. *Journal of Product Innovation Management*, 2021, 38(3), 379-397.
- [5] Xin, C.X. The Symbolization in Packaging Design. *Packaging Engineering*, 2018, 39(22), 310-312.
- [6] Francesca, Z.; Matthew, P. Food Design Thinking: A Branch of Design Thinking Specific to Food Design. *Journal of Creative Behavior*, 2016, 50(3), 203-210.
- [7] Zhang, Y. Talking about the Taste Implied in Food Packaging Design. *Literary Life: Literary Theory*, 2011, 2, 51.
- [8] Song, P. Research on Package Design Evaluation System. Jinan: Shandong University, 2010.

- [9] Zhao, W.J. The Function of Research on Measuring Eye Movement in the Value Evaluation of Packaging Design. *Zhuangshi*, 2009, 9, 102-103.
- [10] Tang, Z. Review and Outlook of Packaging Design Evaluation. *Packaging Engineering*, 2019, 40(10), 52- 58.
- [11] Wang, H.Y.; Wang, Y. The Application of Font Design in Package Design. *West Leather*, 2019, 41(11), 90.
- [12] Liu, Y.; Yan, Q.S. Color Matching in Packaging Design. *Modern Communication(Academic Edition)*, 2017, 24, 114-115.
- [13] Wang, W.J. Analysis of Traditional Patterns in Packaging Design. *Modern Decoration (Theory)*, 2014 , 81.
- [14] Deng, C.Y.; Jin, D.R. The Application of Multisetting Techniques with Channel Setting in Jewelry Design. *Art and Design*, 2016, 2(4), 41-43.
- [15] Li, W. Discussion on the Application of Color in Packaging Design. *Modern Business and Industry*, 2009, 21(4), 123-124.



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