

Examining Consumer Attention to Environmental Labels on Food Packaging

Kaixin, Li

Abstract:

Plastic has been the most commonly used material in food packaging; however, its non-degradable nature poses significant environmental threats, polluting both soil and oceans and endangering human safety. In response to these challenges, eco-friendly packaging has gained prominence. Eco-friendly packages can be either degradable or recyclable, thus alleviating the environmental burden. While extensive research has focused on eco-friendly materials, understanding consumers' awareness and attitudes toward eco-friendly packaging is equally vital. This study aims to investigate consumers' responses to eco-friendly labels on packages. Participants were assigned a shopping task involving the examination of packaged food products. Some packages featured eco-friendly labels. An eye tracker was employed to gauge participants' attention to these labels. Eye tracking technology enabled precise tracking and quantification of individuals' gazes, yielding accurate and objective results. Data analysis revealed a general lack of attention to eco-friendly labels among the participants, with no noticeable increase in attention toward products utilizing environmentally friendly packaging. Notably, consumers were primarily drawn to product logos when viewing packages. This finding suggests a deficiency in consumers' awareness of eco-friendly packaging during their shopping experiences. To promote eco-friendly packaging, it is imperative to enhance consumers' understanding and awareness of relevant concepts. Comprehensive initiatives involving education and promotional activities are necessary to instill a greater sense of eco-friendly packaging among consumers.

Keywords: Eco-friendly, Environmental protection, Recycle, Packaging, Eye tracking, Attention, Gaze

1. Introduction:

Plastics have posed significant environmental hazards for an extended period. The annual cost of mitigating these plastic-related hazards exceeds 7500 billion dollars. Notably, food and beverage packaging is a major contributor, accounting for up to 23% of this issue (Julie Kurtz & Drew Sample, 2021). Food packaging, a critical aspect of preserving processed food products and safeguarding their nutritional value and integrity during transportation and storage, predominantly relies on plastic materials daily. Plastic's widespread use is attributed to its advantageous mechanical properties, high chemical stability, lightweight nature, and aesthetic appeal. In China, more than 50% of food packaging materials are composed of plastic (Hong, 2019). Globally, plastic consumption surpasses 240 million tons yearly (Browne M A, 2011). The environmental repercussions of plastic are exacerbated by the extensive transport of plastic residues through natural forces such as winds, rivers, and ocean currents, leading to contamination of remote corners of our planet (Cole M, 2011; Cózar A, 2014). Alarming levels of plastic debris pollution have been reported in the North Atlantic and Pacific Oceans, as well as in the deep sea (Law K L, 2014; Vanreusel A, 2013;

Eriksen M, 2013). Research has also revealed a prevalent presence of plastic debris in coastal regions of the South China Sea (Zhou P, 2011). Over time, these plastic residues undergo decomposition into smaller fragments or particles under the influence of long-term physical and chemical processes, further contaminating soil and oceans and ultimately entering the food chain, reaching back to human tables (Thompson R C, 2004). This cycle of pollution imposes severe damage on both the environment and human health.

The concept of "green packaging" has gained prominence to address the issues posed by plastic-based packaging. Green packaging pertains to packaging that neither contributes to environmental pollution nor poses risks to human health. The primary objective of green packaging is to foster sustainable development, which can be achieved through biodegradability, recyclability, or reusability. Recycling materials represent one of the most common green solutions (Wang, 2003). In January 1996, the International Organization for Standardization officially introduced the ISO14000 series of global environmental protection standards (Wang, 2003). Subsequently, major brands such as Coca-Cola, Unilever, McDonald's, and Nestle responded to the call to use and promote recyclable packaging (Wei, 2018). The Chinese government also

enacted The Law of the People's Republic of China on the Disposal of Solid Waste in 1996. Apart from imposing legislative requirements on businesses, the government and various social organizations have endeavored to instill environmental protection principles in the public. However, while consumer awareness of environmental protection is rising, this awareness hasn't significantly extended to food packaging. Whether the packaging is environmentally friendly is not critical for them when making purchasing decisions (Dai, 2002).

The present research aims to assess consumers' perceptions of eco-friendly packaging in the current context. In this research, participants will engage in a mock shopping activity. Images of various packaged food products displayed on shelves will serve as stimuli. Some of these packages will be labeled with recyclable symbols. An eye-tracker will be utilized to record their gaze patterns to determine if the participants pay attention to these symbols during shopping. In contrast to previous studies that relied on questionnaires (Liu, 2018; Deng, 2019), an eye-tracker can yield quantitative and objective data regarding people's attention. The findings can bring new insights into consumer behavior and preferences regarding eco-friendly packaging.

2. Methods

2.1 Participants

For this study, 25 participants were randomly selected from a shopping mall in Shanghai, China. The participants' mean age was 26.92, with a standard deviation of 11.28. This group consisted of 11 female and 14 male participants. They were assigned randomly to one of two groups: Group A (control group) and Group B (experimental group). All participants were provided with information about the experiment's general purpose, and they voluntarily agreed to take part by providing their consent through signed forms.

2.2 Stimuli

Two images served as stimuli in this study. Each image depicted a two-tier shelf with four sets of pre-packaged food arranged linearly on each tier. In Group A, the packages lacked an eco-friendly symbol. In contrast, in Group B, some of the packages featured an added recyclable packaging symbol, representing an eco-friendly concept. This green symbol comprised two components: a green recycling triangle with three arrows and the word "recyclable" positioned below the triangle. The symbol was placed in the corner of the pages, with a size comparable to other visual elements, to ensure its visibility. Notably, no green background packaging was

used to avoid any confusion. To eliminate any positional effects, the labeled products were positioned differently in the two images of Group B. In the first image, from left to right, the first product on tier one and the third product on tier two were labeled. In the second image, from left to right, the fourth product on tier one and the second product on tier two were labeled. To maintain consistency and control variables, the positions of each product remained the same between Group A and Group B.

2.3 Design and Procedure

The study employed a between-subject design in which all participants were randomly assigned to two groups. Participants were informed that they would be engaged in a shopping task and were instructed to sit upright in front of a screen while maintaining stable head positions. An eye tracker was positioned beneath the screen to capture their gaze accurately. All participants underwent a nine-point calibration process to ensure precise gaze tracking. Once the eye tracker calibration was completed, both participants were presented with corresponding images, each displayed for 20 seconds. After the experiment, a survey was conducted to gauge their environmental protection awareness and collect their views on recyclable packaging. Additionally, each participant received a small gift to acknowledge their participation.

In Group B, the areas of interest (AOIs) were defined as Target Product (products labeled with eco-friendly symbols), Logo, and Others (all other elements excluding the logo). The AOIs included Target Product (corresponding products in Group A without the label), Logo, and Others. Various eye-tracking parameters, such as Total Fixation Duration (TFD), First Fixation Duration (FFD), Fixation Count (FC), and Time to First Fixation Duration (TFF), were utilized to analyze participants' visual attention when viewing the stimuli. Once the data had been categorized, statistical analyses were conducted to examine the results.

2.4 Data Analysis

To compare participants' gaze behaviors regarding green packaging symbols between Group A and Group B, between-group t-tests were conducted for Total Fixation Duration (TFD), Fixation Count (FC), First Fixation Duration (FFD), and Time to First Fixation Duration (TFF). These tests aimed to determine whether a green packaging label had a significant impact. Further analyses were performed to identify the distribution of subjects' attention within the packaging.

3. Results

3.1 T-Test Analysis for TFD between Group A

and Group B on Target Product

As shown in Table 1, there was no significant difference ($t = 1.71, p > 0.05$) in TFD between Group A ($M = 1.72, SD = 0.50$) and Group B ($M = 1.67, SD = 0.54$).

3.2 T-Test Analysis for FC between Group A and Group B on Target Product

As indicated in Table 1, there was no significant difference ($t = 1.72, p > 0.05$) in FC between Group A ($M = 6.00, SD = 1.08$) and Group B ($M = 6.23, SD = 1.70$).

3.3 T-Test Analysis for FFD between Group A and Group B on Target Product

As presented in Table 1, the FFD for Group A ($M = 0.26, SD = 0.13$) and Group B ($M = 0.26, SD = 0.12$) did not exhibit a significant difference ($t = 1.71, p > 0.05$).

3.4 T-Test Analysis for TFF between Group A and Group B on Target Product

As demonstrated in Table 1, the TFF for Group A ($M = 3.59, SD = 1.43$) participants was not significantly different ($t = 1.74, p > 0.05$) from that of Group B ($M = 4.37, SD = 2.48$) participants.

3.5 T-Test Analysis for TFD between Logo

and Others

As presented in Table 2, the TFD of subjects to Logo ($M = 13.48, SD = 7.08$) was significantly greater ($t = 1.68, p < 0.05$) than that of Others ($M = 6.38, SD = 4.74$).

3.6 T-Test Analysis for FC between Logo and Others

As displayed in Table 2, participants exhibited significantly higher ($t = 1.68, p < 0.05$) FC in the logo area ($M = 44.48, SD = 19.49$) compared to other areas ($M = 26.08, SD = 19.72$).

3.7 T-Test Analysis for FFD between Logo and Others

As revealed in Table 2, the subjects demonstrated significantly higher ($t = 1.68, p < 0.05$) FFD in the logo area ($M = 3.37, SD = 1.60$) in comparison to other areas ($M = 1.86, SD = 1.01$).

3.8 T-Test Analysis for TFF between Logo and Others

As depicted in Table 2, the TFF of subjects in the logo area ($M = 5.36, SD = 2.32$) was significantly smaller ($t = 1.68, p < 0.05$) than in other areas ($M = 6.73, SD = 2.31$).

Table1: The Result of TFD, FC, and FFD for Target Product

	TFD (s)	FC	FFD (s)	TFF (s)
Group A	1.72	6.00	0.26	3.59
Group B	1.67	6.23	0.26	4.37

Table2: The Result of TFD, FC, and FFD for Logo and Others

	TFD (s)	FC	FFD (s)	TFF (s)
Logo	13.48	44.48	3.37	5.36
Others	6.38	26.08	1.86	6.73

4. Discussion

In this experiment, the primary goal was to evaluate consumers' responsiveness to green packaging labels when making purchasing decisions. The study used images of various packaged foods to replicate the shopping experience. Participants were divided into two groups, with eco-labels on food packaging as the independent variable, while eye-tracking parameters were the dependent variables of interest. Specifically, the research focused on analyzing Total Fixation Duration (TFD) and Fixation Count (FC) to measure participants' overall attention to Areas of Interest (AOIs) during the trial. Time

to First Fixation (TFF) provided insights into the speed at which participants noticed AOIs, while First Fixation Duration (FFD) revealed the initial allocation of attention to AOIs. The findings from the data analysis demonstrated that introducing eco-friendly labels did not lead to a significant shift in participants' focus toward the products. No statistically significant differences were observed in TFD, FC, FFD, or TFF, regardless of the presence or absence of the eco-label. Furthermore, additional analyses were conducted to explore participants' gaze patterns on the packages. These analyses involved comparing the logo area with other elements on the packages. The results revealed a consistent pattern: participants consistently

directed their initial and primary attention to the product logo areas. These areas exhibited the shortest TFF and the highest values for TFD, FC, and FFD, indicating that consumers predominantly focused on these key elements while evaluating the products.

The experiment results reveal that most individuals do not pay attention to environmental labels when they view food packaging, which is consistent with previous research (Zhang, 2018). However, in the post-trial survey, all participants indicated their preference for choosing products with environmentally friendly packaging materials, even if they were more expensive than conventional ones. The survey results are inconsistent with the experiment's findings. This inconsistency may be attributed to the gap between people's awareness of environmental protection and their ability to take action in their daily lives. Numerous organizations have made efforts to promote environmental protection, and over time, people have gradually come to recognize the importance of environmental preservation (Tong, 2009). Nevertheless, while the public has developed this awareness, there may be a lack of specific knowledge on how to translate this awareness into concrete actions. In this study, the contrasting results between participants' subjective responses and objective gaze data could also reflect this phenomenon. People express a willingness to contribute to ecological protection. Yet, this sentiment has not been fully extended to food packaging, an aspect closely intertwined with their daily lives.

In further analyses, the present study discovered that participants paid the most attention to product logos when purchasing. The logo was the first element they typically sought when seeking information on packaging. Furthermore, it was the component they spent the most time reading. This preference for logos is attributed to their ability to help consumers quickly identify crucial information, such as the brand and product category (Qu, 2017). Additionally, merchants thoughtfully designed product logos, featuring vibrant colors and engaging graphics that naturally attract customers. Typically positioned in the center of the product packaging, logos occupy a significant area, ensuring consumers' immediate notice.

Brand owners could consider refining their package designs to enhance the visibility of eco-friendly information. Instead of placing eco-friendly symbols or related information in the corners, positioning them close to the logo is a strategic choice. Consumers are more likely to notice the accompanying eco-friendly symbol when they focus on the logo. On the other hand, aside from promoting the general concept of environmental protection, offering more specific guidance to the public

is essential. For example, guidance on how to take practical eco-friendly actions in daily life. If consumers are more inclined to choose eco-friendly products, brand owners may find increased incentives to transition toward sustainable solutions. This could initiate a positive and self-reinforcing cycle.

This experiment still has some limitations, such as the relatively small sample size. Future studies, including more subjects, could address this issue. Additionally, this study exclusively involved participants from Shanghai, China. People from different cities, provinces, or countries may yield varying results. Therefore, further research should encompass a broader geographic scope. Last but not least, exploring additional demographic characteristics, such as age and education level, is important. It could help generate a more detailed understanding.

5. Conclusion

This study aims to assess the extent of people's attention to eco-friendly packaging when making purchasing decisions. Recyclable labels on product packaging are considered the independent variable, while participants' gaze behaviors are considered the dependent variable. Although participants were willing to select products with eco-friendly packaging, the experimental results reveal that they do not significantly focus on environmentally friendly information when shopping. This finding suggests that people generally value environmental protection. However, a lack of specific knowledge or guidance may hinder translating this concept into everyday actions. To bridge this gap, it is crucial to provide the public with more education and promote detailed information on implementation. In essence, the concept of environmental protection needs to evolve into concrete behaviors.

Reference

- Browne M A, Crump P, Niven S J, et al. Accumulation of microplastic on shorelines worldwide: Sources and sinks. *Environ Sci Technol*, 2011, 45: 9175–9179
- Cole M, Lindeque P, Halsband C, et al. Microplastics as contaminants in the marine environment: A review. *Mar Pollut Bull*, 2011, 62: 2588–2597
- Cózar A, Echevarría F, González-Gordillo J I, et al. Plastic debris in the open ocean. *Proc Natl Acad Sci USA*, 2014, 111: 10239–10244
- Dai Hongmin (2002) The current situation and development trend of green and environmentally friendly packaging in China *Packaging Engineering*, 23 (1), 3
- Deng Yingyi (2019). Empirical Analysis of Green Packaging and Green Consumer Behavior *Journal of Qiqihar University (Philosophy and Social Sciences Edition)* (05), 67-69 Doi:

10.13971/j.cnki.cn23-1435/c.2019.05.020

Eriksen M, Maximenko N, Thiel M, et al. Plastic pollution in the South Pacific subtropical gyre. *Mar Pollut Bull*, 2013, 68: 71–76

Hong Menghan, Chen Jinyang, Gu Jie. Analysis of the problems and development trends of food packaging materials in China [J]. *Shanghai Packaging*, 2019 (4): 22-25

Julie Kurtz & Drew Sample (2021). Issue Post To build food security and reduce plastic use, *Ifpri.org*. Available at: <https://www.ifpri.org/blog/build-food-security-reduce-plastic-use> (Accessed: 02 August 2021).

Lan Minyi, Li Huiru, Hu Lixin, Yang Yuanyuan, & Ying Guangguo (2021) Overview of environmental pollution caused by plastic food packaging materials *Journal of Ecotoxicology*, 16 (5), 25

Law K L, Morét-Ferguson S E, Goodwin D S, et al. Distribution of surface plastic debris in the eastern Pacific Ocean from an 11-year data set. *Environ Sci Technol*, 2014, 48: 4732–4738

Law K L, Morét-Ferguson S, Maximenko N A, et al. Plastic accumulation in the North Atlantic subtropical gyre. *Science*, 2010, 329: 1185–1188

Liu Yiqing (2018). Research on the impact of green and environmentally friendly packaging on green consumption behavior *Ecological Economy* (03), 122-125

Qu Hongyang (2017) The embodiment of packaging design in

visual communication - Taking food packaging as an example *Tomorrow's Fashion* (22), 1

Thompson R C, Olsen Y, Mitchell R P, et al. Lost at sea: Where is all the plastic? *Science*, 2004, 304: 838

Tong Mei (2009) Are you willing to pay for 'greener' China *Economic Weekly*, 000 (050), 63

van Cauwenberghe L, Vanreusel A, Mees J, et al. Microplastic pollution in deep-sea sediments. *Environ Pollut*, 2013, 182: 495–499

Wang Anxia (2003) *Green Packaging Design - Sustainable Packaging Design Journal of Zhengzhou University of Light Industry: Social Science Edition*, 4 (4), 3

Wei Zhengying (2018). Unilever and Veolia will collaborate on recyclable packaging *Modern Plastic Processing Applications* (06), 38

Zhang, L. J. (2018). Research on the influence of green product logos packaging environmental attributes on consumers' willingness to purchase green products. (Doctoral dissertation, Shandong University).

Zhou P, Huang C, Fang H, et al. The abundance, composition, and sources of marine debris in coastal seawaters or beaches around the northern South China Sea (China). *Mar Pollut Bull*, 2011, 62: 1998–2007