

The Influences of Background Colors of Live-streaming E-Commerce Channels on Viewers' Attention

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Abstract

Live-streaming e-commerce has developed dramatically in recent years. This study investigated how the background colors of live-streaming channels affect viewers' attention to products presented. An eye-tracking experiment including 35 participants was conducted, in which participants watched pre-recorded live-streaming sessions with background colors of red, blue, and green. The results indicate that, in the red background, participants showed significantly longer average fixation duration on products, which suggested greater attention. The findings of this study can be applied to live-streaming e-commerce to improve prospective buyers' attention and, therefore, increase merchants' sales volume.

Keywords

Live-streaming E-commerce; Background Colors of Live-streaming; Increase Merchants' Sales.

1. Introduction

Live-streaming e-commerce is a new form of e-commerce surging in China over the past few years. By December 2021, the number of online shoppers in China accounted for 81.6% of the total internet users. Half of the online shoppers reported purchase history in live-streaming channels (Cyberspace Administration of China, 2021). In live-streaming e-commerce, employees of retailers, brand owners, and manufacturers, along with internet celebrities, sell products and services directly to prospective customers. This business model enables the host to present products thoroughly and respond to potential consumers' questions in real-time. A live-streaming session could take place on traditional e-commerce platforms like Alibaba and social media apps such as TikTok. The large customer base of Alibaba, of more than 100 million users, makes live-streaming shopping grow dramatically (China Internet Networking Information Center, 2022). According to a report, in the first six months of 2021, China's live-streaming e-commerce transactions totaled 1094 billion RMB ("2021 Report on China's Livestreaming E-commerce Industry - Research Report Body _ Data Center _ Oriental Fortune", 2022). At the same time, the development of live-streaming e-commerce has been spreading beyond mainland China. Merchants in the United States and Europe are adopting this new fashion in the retail industry. For example, Amazon launched Amazon Live in 2019 ("Wuhan Star Tao Hui, amazon live with goods effect? _ User _ Traffic _ Platform", 2022). The rapidly rising importance of live-streaming e-commerce calls for more scholarly investigations, but most studies on e-commerce focused on traditional online shopping. For example, website content, design and system usability were widely discussed (Zhou et al., 2007).

Different live-streaming sessions use different background colors. According to previous studies, background colors could impact people's behaviors in various circumstances. For instance, Jadhao concluded that background color could affect memory and learning abilities (Jadhao et al., 2020). In color psychology, researchers find that white is the most appropriate

backdrop color for PowerPoint, followed by yellow, whereas blue is the worst background color (An, 2017). Another study reported that when designing GUI components, the white background color could keep greater users' attention, while the green and yellow ones could grasp users' attention at first glance (Lewandowska, 2022). This research leverages eye-tracking technology to investigate the potential impacts of background colors on prospective consumers' attention to the product presented in live-streaming e-commerce.

2. Method

2.1. Participants

The study included 35 subjects ($M_{age}=26.6$, $SD=8.23$) who were randomly recruited from a plaza in Shanghai, of which 16 were females and 19 were males. Participants were divided into three groups. Each group contains 11 or 12 participants. Before the experiment, participants were told that the task was to watch several video clips, and they would be awarded small gifts at the end of their trials.

2.2. Design and Procedure

The study used a between-subjects design, with the background color of live-streaming sessions as the controlling variable. Each group of participants watched videos with one background color.

An eye tracker (7Invensun, A6) was used to record participants' eye movements during the experiment. Eye movement data could help researchers understand participants' attention distribution when watching live-streaming sessions.

The entire procedure of the experiment took less than five minutes. After signing the consent form and answering a questionnaire of basic personal information (i.e., age, gender), participants were led to sit in front of a screen (13.3 inches) connected to an eye tracker and a laptop. After a successful five-point calibration procedure, the experiment started. During the whole experiment, participants were asked to wear noise-canceling headphones to eliminate the potential effects of ambient noises.

Products in all video clips are marked as areas of interest (AOI). Two eye tracking parameters were used for analysis: First Fixation Duration (FFD) and Total Fixation Duration (TFD).

2.3. Stimuli

Stimuli are six video clips corresponding to two live-streaming sessions, each modified to have three background colors of red, blue, and green. The two videos were downloaded from Taobao, Alibaba's e-commerce platform in mainland China, presented by two different hosts, A and B. Both A and B wore black clothes and demonstrated cooking utensils in their sessions. Beyond that, both hosts are not internet celebrities. The main difference between these two live-streaming sessions is the size of cooking utensils relative to the screen.

The two videos were muted and their background colors were photoshopped to red, blue, and green. Then each video was timed into 15-second clips. Two blue background videos of host A and B, two green background videos of host A and B, and two red background videos of host A and B are considered type I. Blue, green, and red background videos of host A videos are type II. Blue, green, and red background videos of host B videos are type III.

2.4. Data Analysis

ANOVA (Analysis of Variance) is used to analyze the FFD and TFD of subjects in the areas of interest (AOI). The analysis was carried out on type I, type II, and type III. Based on the above analysis, it could be concluded that background colors affect people's attention to products.

3. Result

One-way between-subjects ANOVA was conducted to compare FFD and TFD of types I, II, and III.

Blue, green and red are referred as 1, 2 and 3 in corner marks. For TFD in type I on products, there is a significant difference [$F = 3.27, p < 0.05$] among the three colors. Post comparisons using LSD test indicates that the blue background group ($M_1 = 1.28, SD_1 = 2.05$) is significantly different from the red background group ($M_3 = 3.09, SD_3 = 2.29$) with $p = 0.02$. However, there is no difference from between the blue and green background groups ($M_2 = 2.80, SD_2 = 2.65, p = 0.08$). The green background group doesn't show significance from the red background group ($p = 0.74$). For TFD in type II on product, there is no significance [$F = 0.00, p = 1.00$] among three colors ($M_1 = 2.83, M_2 = 2.90, M_3 = 2.77$). While for TFD in type III on products, it shows significant difference [$F = 10.97, p < 0.01$]. Post comparisons using the LSD test indicated that the blue background ($M_1 = 0.01, SD_1 = 0.05$) is significantly different from the green background ($M_2 = 2.71, SD_2 = 1.87$) with $p = 0.04$ and the red background ($M_3 = 3.38, SD_3 = 2.45$) with $p < 0.01$. However, the green background did not show significance from the red background ($p = 0.46$). For FFD in type I on products, there is no significance among the three colors [$F = 0.38, p = 0.68$]. At the same time, For FFD in type II and type III on product, there is also no significance for three colors [$F_{II} = 0.14, p_{II} = 0.87, F_{III} = 1.58, p_{III} = 0.22$]. Table 1 shows TFD and FFD of participants in different background colors.

Table 1. The total TFD and FFD of participants on products

	TFD (s)		FFD (s)	
	Male anchor	Female anchor	Male anchor	Female anchor
blue	0.01	2.83	1.68	0.87
green	2.71	2.90	0.89	1.25
red	3.38	2.77	0.78	1.09

4. Discussion

The results show that the FFDs of three background colors don't significantly differ, meaning background colors don't change substantially people's initial attention to products. The initial visual attention may depend more on other visual attributes of the product presented. The TFD under the red background is significantly longer than that of the blue background in type I, which indicates that people tend to spend a longer time looking at products in the red background. This result is the same as that of type III. However, there is no significant difference in TFDs in type II. It is hypothesized that the red color may help people stay concentrated and elicit positive emotional responses. Therefore, the audience kept focusing on the critical information – displayed products – when watching the live-streaming channels. Several previous studies have reached a similar conclusion through different mechanisms. Yoto attributes elevated attention under red background to a higher level of brain activities in perception and attention (Yoto et al., 2007). Another study finds that a red background can significantly improve potential buyers' product evaluation during a presentation (Zou, 2017). As emotional responses can influence consumer behaviors, consumers might be willing to pay more attention to products associated with positive emotional symbols (Elliott, 1998). Indeed, red color's emotional and symbolic connotations are higher in Japan and China, where red is

believed to associate with good luck (Mohr et al., 2018). Therefore, subjects in this investigation who are all Chinese may pay more attention to products presented under a red background.

Besides, the inconsistent results between type II and III need to be explained. In type I and III, the TFDs on products in the red background are significantly longer than those of blue and green, while there is no significant difference in type II. It has been mentioned previously that the critical difference between type II and type III is the size of the products. In type II (host A) videos, multiple products were presented simultaneously, which occupied a much bigger area than that of type III (host B) videos. Therefore, it is hypothesized that the size of products presented is a dominant factor over background colors on viewers' attention.

Further research should be carried out to investigate the impacts of other variables of interest on viewers' attention during a live-streaming session. First, the participants in this study are all Chinese. Colors can have different emotional and symbolical connotations in different cultures. The Chinese people associate red with luck, while Americans associate it with anger (Mohr et al., 2018). Further research could explore if the background color of red can have different impacts on people of Western origins. In addition, the effects of the number of products presented could also be investigated. Under an ideal scenario, video clips of the same host can be used as stimuli. Last but not least, more colors could be included for a more comprehensive conclusion.

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