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# Color Inside and Outside the Lines: Evidence From Eye-Tracking Studies on Conformity to and Differentiation From Category Color Codes

Ernesto Cardamone | Gaetano "Nino" Miceli | Maria Antonietta Raimondo

Department of Business Administration and Law, University of Calabria, Rende, CS, Italy

**Correspondence:** Gaetano "Nino" Miceli (g.miceli@unical.it)

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## ABSTRACT

Category color codes are commonly used hues in packaging within a specific product category. These colors establish visual standards for new products and influence consumer perception and product categorization. Product managers face a challenging decision: Should they conform to or differentiate from these established color norms? For example, should flour packaging adopt the typical white category color code or stand out with a distinctive color like purple? Retailers face a similar dilemma: Where should they place products that conform to or differ from these color norms to capture consumer attention effectively? Despite the relevance of category color codes for both manufacturers and retailers, the literature on this topic remains limited. Building upon the Limited Capacity Model of Motivated Mediated Message Processing, this paper examines how conformity or differentiation of main and secondary packaging colors from category codes impacts consumer attention. Findings from lab and field eye-tracking studies reveal a negative interaction between the conformity of main and secondary colors with category codes on both the duration and number of fixations. Hybrid color combinations—where either the main or secondary color conforms while the other differentiates—are most effective in attracting consumer attention, which, in turn, influences consumer choice. This research expands the understanding of the trade-off between conformity and differentiation in packaging color, offering theoretical contributions to the role of visual stimuli in attracting attention and providing practical guidance for managers in selecting optimal color combinations for their products.

## 1 | Introduction

Packaging color is a key element in marketing, capturing consumer attention and shaping product evaluations (Labrecque, Patrick, and Milne 2013; Mai, Symmank, and Seeberg-Elverfeldt 2016; Labrecque 2020; Marozzo et al. 2020). Product managers must base packaging color selection on factors, such as established category leaders (e.g., Kellogg's in the cornflakes category—Labrecque and Milne 2013) and natural color associations with certain categories (e.g., orange for orange juices—Garaus and Halkias 2020). These factors contribute to establish *category color codes* (or *norms*)—commonly used colors in a product category that set visual standards for consumer perception and categorization (Spence and Velasco 2018). For example, yellow and green identify the olive oil category.

Managers must decide whether to *conform to* or *differentiate from* these category color codes. In the cola category, for instance, brands may adopt colors like Coca-Cola's red or Pepsi's blue, to align with the leaders, or select a distinctive hue to attract attention. Similarly, in categories like feminine deodorants, where white and pink are dominant, a new product manager can either conform to these color codes or pursue differentiation. This decision is strategic and complex: Should

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firms differentiate their packaging colors to stand out, embracing atypicality (Cutolo and Ferriani 2024), but risking consumer confusion? Or should they align with the dominant colors, following consumer expectations (Ward et al. 2024), even if it means potentially going unnoticed?

To gather industry insights on this decision, we interviewed a brand manager from a leading confectionery company and a store manager from a major supermarket chain (details are provided in the Appendix). The brand manager highlighted the strategic dilemma of whether to preserve a brand's distinctive color when entering new categories or to align with established color category norms. Similarly, the store manager observed that shelves often become dominated by similar hues, raising questions about how to capture attention through color without appearing out of place. These perspectives underscore the broader challenge of deciding whether to follow or deviate from established color conventions.

In spite of the importance for managers of selecting the "right" packaging colors, research on category color codes is scant. Previous studies have emphasized a trade-off between color conformity, which ensures familiarity sacrificing distinctiveness (Labrecque and Milne 2013), and differentiation, which promotes visual "pop-up" but also confusion and skepticism (Garaus and Halkias 2020). These conflicting results on the advantages of different packaging strategies originate from studies that have primarily focused on single-color packaging. However, He and Lv (2021) pointed out that most packages incorporate at least two colors. To explore this issue, we conducted an ancillary study using image mining techniques to scrape a retailer's website and process the packaging of 1653 stock-keeping units (SKUs) from 10 product categories. Based on the Google Cloud Vision API (Villarroel Ordenes and Silipo 2021; Wang, Bendle, and Pan 2024), we identified the top 10 colors in each image and measured the area occupied by each color. Results showed that the first color alone accounted for 48.97% of the packaging surface, with the top two colors capturing 68.05%. Since the incremental contribution from the third color onward was on average ≤10%, we infer that a two-color analysis represents the ideal balance between parsimony and completeness. A full description of the method and detailed results are available in the Appendix.

This paper examines two dimensions of packaging color: The conformity of the main and secondary colors to the category norms. By considering two packaging colors simultaneously, we analyze the effects on consumer visual attention of hybrid solutions, where one packaging color aligns with and the other deviates from the category codes. We build upon the Limited Capacity Model of Motivated Mediated Message Processing (LC4MP; Lang 2006) to analyze these effects. This framework posits that cognitive resources are limited, influencing how stimuli are processed and how attention is allocated (Lang 2006), and provides a theoretical basis for investigating how hybrid color strategies—combining conforming and differentiating colors—might effectively balance the trade-off between familiarity and distinctiveness. In circumstances where colors serve as a relevant signal (Detenber and Lang 2010), such as category norms, the assumptions of LC4MP provide valuable insights.

We conducted a controlled lab study with desktop eye-tracking and a field study in a supermarket using mobile eye-tracking, assessing eye fixations to measure the relevance and the interest for SKUs (Casado-Aranda and Sanchez-Fernandez 2022). Findings show that conformity of the main color and conformity of the secondary color to the category norms negatively interact in determining consumer attention, suggesting that combining a conforming color with a differentiating color defines hybrid solutions and maximizes visual attention.

This paper contributes to packaging color literature (e.g., Labrecque 2020; Marozzo et al. 2020) along two directions. First, we introduce a conceptual model of category color codes using a two-color approach explaining which color combinations can effectively attract consumer attention. Second, our research extends to color analysis of the conformity-differentiation trade-off from other research contexts, such as design esthetics (Berlyne 1970), social group dynamics (Chan, Berger, and Van Boven 2012), and brand positioning (Kotler, Keller, and Chernev 2021). Our conceptual model and findings integrate the packaging color literature by demonstrating the higher effectiveness of hybrid solutions that are able to mix color assimilation and distinction. Furthermore, this paper contributes to the LC4MP literature by advancing the analysis of attention in environments with multiple competing stimuli (Fisher, Hopp, and Weber 2023). It also integrates the examination of visual components (e.g., Simmonds et al. 2020) within this framework, with a specific focus on the role of colors. From a managerial perspective, these insights provide strategic guidance for manufacturers on packaging color choices and for retailers on shelf arrangement to enhance visual attention in highly competitive environments.

## 2 | Conceptual Analysis

### 2.1 | Visual Attention and Colors

Consumer attention, a fundamental concept in marketing and consumer behavior, refers to the selective focus on certain environmental elements while ignoring others (Kahneman 1973). In an age of information overload, capturing and retaining consumer attention has become increasingly challenging for marketers (Davenport and Beck 2001). Due to the limited capacity of human attention, consumers cannot process all available stimuli, and instead concentrate selectively on particular elements (de Fockert et al. 2001).

Understanding consumer attention is essential for effectively communicating messages, designing products, and shaping marketing strategies that resonate with the target audience (Pieters and Wedel 2004). By capturing and retaining consumer attention, managers can enhance information processing, improve memory retention, and influence decision-making processes (MacInnis and Jaworski 1989).

Color is a crucial factor in capturing consumer attention and influencing perceptions and behaviors (Elliot and Maier 2014). Specific colors evoke emotions, convey meanings, and impact moods, shaping consumer responses to products, packaging,



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and marketing materials (Labrecque and Milne 2012). Bright, highly saturated colors draw visual attention due to their prominence (Gegenfurtner and Rieger 2000). Warm colors like red and orange convey excitement and energy, while cool colors like blue and green evoke calmness and trust (Valdez and Mehrabian 1994). Strategic use of color can enhance brand identity, esthetic appeal, and purchasing decisions (Bottomley and Doyle 2006). Recent research highlights the complex ways color influences consumer psychology. For instance, personal factors such as social exclusion (Kwon, Jeon, and Han 2024) and embarrassment (Zhang et al. 2025) drive preferences for analogous color combinations and low-saturation designs, respectively. Pichierri and Pino (2023) found that low saturation in green marketing unconsciously signals eco-friendliness, appealing to environmentally conscious consumers. Conversely, high saturation is associated with greater perceptions of product effectiveness for both consumable and durable goods (Labrecque et al. 2024).

A key yet under-explored area in the relationship between color and attention is how packaging colors that either align with or deviate from category codes affect consumer perception.

## 2.2 | Category Color Codes

A consumer category consists of products that consumers group within the same perceptual or semantic space (Loken, Barsalou, and Joiner 2008). Consumers categorize products by encoding similarities and differences between target products and a benchmark (e.g., a category leader or a representative product). According to Gregan-Paxton and John (1997) model of learning by analogy, consumers exposed to a new product map its features and retrieve available information on known product categories from memory to facilitate categorization.

Visual codes in packaging designs help consumers define product categories. These visual codes, such as colors, materials, shapes, and typefaces, represent design features that appear more frequently within a specific product category (e.g., Celhay and Trinquecoste 2015). For instance, a supermarket shelf of flour products predominantly displays white packaging (category color code), while a shelf of canned tuna brands mostly features aluminum packaging (category material code).

Color plays a significant role in package design (Kunz, Haasova, and Florack 2020; Labrecque 2020) and often serves as a category code that influences a company's packaging color choices. Companies may choose to conform to or differentiate from these category color codes. Conformity involves adopting a category color code such as the color used by the category leader, the natural color of the product, or a color culturally associated with the category (Garaus and Halkias 2020). Conversely, visual differentiation involves using an atypical color that deviates from the category code (Husić-Mehmedović et al. 2017).

Consumers learn to associate certain colors with product categories due to cumulative marketing efforts. The more brands that use the same color, the stronger the link between that color and the product category (Labrecque and Milne 2013). Conformity to color codes can strengthen these associations (Bottomley and Doyle 2006), but may make it challenging to distinguish a package from competitors (Van der Lans, Pieters, and Wedel 2008). Building upon studies on product category visual norms (e.g., Schoormans and Robben 1997), Garber, Burke, and Jones (2000) found that highly distinctive packaging colors attract consumer attention, particularly at the point of purchase, and especially among non-loyal shoppers in highly competitive categories. However, distinctiveness may reduce the advantages of category identification (Celhay and Trinquecoste 2015). Labrecque and Milne (2013) observed that conformity can be advantageous in categories with a dominant leader, especially for high-involvement products, while color differentiation can benefit brands in categories without a clear leader. Garaus and Halkias (2020) found that brands benefit more from conformity, as perceived atypicality in packaging colors can increase consumer skepticism and, unexpectedly, reduce interest. In turn, these reactions negatively impact attitude and purchase intention.

Previous research (Table 1), which generally focused on a single color at a time, has primarily investigated either conformity to or differentiation from category color norms as separate strategies, showing a trade-off between the increased attention drawn by highly differentiated stimuli and their diminished ability to foster familiarity (Schoormans and Robben 1997). Greater assimilation to category codes produces the opposite effect.

Based on these contributions, some researchers have claimed that to achieve strong positioning, brands should share some associations with the product category to benefit from assimilation, while differentiating other features to communicate uniqueness within the category (Labrecque and Milne 2013), suggesting that using multiple colors could balance these effects. However, little research has examined the effects of multiple colors and their relationship with category codes. Reflecting this gap, previous studies have invoked more research aimed to identify optimal color strategies that can maximize consumer attention (Garaus and Halkias 2020). In response to this call, we propose a bifactorial strategy that considers both the main and secondary packaging colors to determine ideal color combinations that effectively attract consumer attention.

## 2.3 | Hypotheses Development

Building on color research indicating that most products use at least two colors in their packaging (He and Lv 2021) and the results of an ancillary study (see the Appendix), our dual-factor scheme considers the conformity of both the main and secondary packaging colors to category codes. The main color of a package is defined as the one that covers the majority of its surface, while the secondary color is the next most dominant color on the packaging surface. Conformity of the packaging's main (secondary) color to category codes refers to the extent to which that color appears in the product category. For the sake of readability, hereafter, we use "conformity" and



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**TABLE 1** | Advantages and drawbacks of conformity to and differentiation from category color codes.

| Color strategy | Number of colors considered | Definition | Example | Advantages | Drawbacks |
|---|---|---|---|---|---|
| Conformity | One packaging color | Using a color that is commonly used by most other products in the category. | A pack of flour with white packaging. | Familiarity and category identification (e.g., Labrecque and Milne 2013). | Assimilation makes it difficult to differentiate from other brands (e.g., Van der Lans, Pieters, and Wedel 2008). |
| Differentiation | One packaging color | Using a color that is rarely used by other products in the category. | A pack of flour with purple packaging. | Brand distinction, increased attention, visibility at the point of purchase (e.g., Garber, Burke, and Jones 2000). | Reduced category identification, potential consumer confusion, skepticism (e.g., Garaus and Halkias 2020). |
| Conformity + Differentiation | Two packaging colors | Using one color common in the category, and one color that is rarely used by other products within the category. | A pack of flour with white and purple packaging. | This paper | |

*Note:* Authors own elaboration.

"differentiation" to refer to "high levels of conformity to category color codes" and "low levels of conformity to category color codes," respectively. Figure 1 summarizes the four possible scenarios that emerge from combining the conformity levels of the main and secondary colors.

To analyze the effects of packaging color conformity to category codes, we draw on the LC4MP (Lang 2006). This model explains how individuals process stimuli, accounting for cognitive limitations and personal motivations.

LC4MP posits that cognitive resources are limited, which directly relates to visual attention, as the processing of stimuli depends on the capacity to focus and maintain attention on specific visual elements. This limited capacity means that visual attention can be easily overwhelmed when multiple stimuli compete for cognitive resources. As a result, consumers tend to select the most relevant visual stimuli and disregard irrelevant ones, especially during the encoding phase, which involves selecting stimuli for further processing (Casado-Aranda, Sánchez-Fernández, Bigne, et al. 2023a). The LC4MP framework highlights the importance of motivationally relevant signals in guiding consumer attention. Color functions as both a perceptual and symbolic feature that influences cognitive and emotional responses (Valdez and Mehrabian 1994; Lichtlé 2007) and can therefore serve as a relevant signal, particularly in contexts with multiple competing stimuli (Detenber and Lang 2010). Consequently, packaging color combinations play a crucial role in capturing and sustaining attention.

A SKU's packaging featuring both a main and a secondary color typical of the product category results in "full conformity." This strategy supports category recognition, facilitates fluent product processing (Labrecque and Milne 2013), and potentially fosters favorable evaluations (Bottomley and Doyle 2006). However, this strategy limits opportunities to capture consumer attention, as attention is constrained by selective focus and competition among products (Bays and Husain 2008). Thus, while full conformity aids category recognition, it may reduce differentiation among alternatives—an effort that consumers often avoid due to limited cognitive capacity and motivation.

Alternatively, packaging featuring both a main and a secondary color atypical for the product category results in "full differentiation." Although atypical colors can initially grab attention through the *pop-out* effect (Schoormans and Robben 1997; Van der Lans, Pieters, and Wedel 2008), they may hinder continued attention due to disfluent processing. Consumers generally focus on objects consistent with their visual working memory (Downing 2000). Consequently, they are more likely to pay attention to new objects that are color-consistent with those in memory (Olmos-Solis, van Loon, and Olivers 2018). The disfluency of atypical packaging can result in less favorable evaluations (Husić-Mehmedović et al. 2017), and perceptions of manipulative intent (Obermiller and Spangenberg 1998). Garaus and Halkias (2020) found that atypical colors in packaging negatively correlate with consumer interest and positively correlate with skepticism, suggesting that unusual colors can cause sensory incongruence. Consumers may rely on color-based visual search strategies, rooted in pre-existent associations, making incongruent objects harder to locate



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| | | Secondary Color Conformity to Category Codes | |
|---|---|---|---|
| | | Low | High |
| Main Color Conformity to Category Codes | Low | Full differentiation | Hybrid solution |
| | High | Hybrid solution | Full conformity |

**FIGURE 1** | Strategies derived from the combination of main and secondary color conformity to category codes. *Source:* authors own elaboration.

(Huang, Peng, and Wan 2021). In summary, while full differentiation ensures visibility, it requires cognitive effort for consumers to accept objects inconsistent with their visual memory (Olmos-Solis, van Loon, and Olivers 2018).

Given these insights and the continuous influence of environmental stimuli on attention in a cycle of actions, reactions, and interactions (Lang 2009), we propose that hybrid strategies effectively balance the trade-off between conformity and differentiation. Hybrid color combinations (using a dominant color from the category and one nondominant color) generate familiarity, due to the conforming color, while the differentiating color adds interest. The conforming color anchors the product to its category, and the differentiating color increases its visual salience. This idea aligns with Berlyne (1970) concept of moderate atypicality, which suggests that individuals favor stimuli that moderately deviate from category norms rather than those that are entirely congruent or highly atypical. This rationale suggests that consumer attention, measured as the duration and number of eye fixations on a specific product, increases when the conformity of the main (secondary) color is high while the conformity of the secondary (main) color is low, resulting in a negative interaction effect between main and secondary color conformity on consumer attention. In other terms, the effect of one color's conformity on consumer attention depends on the level of conformity of the other color. While acknowledging the potential for a symmetrical interaction effect, we designate main color conformity as the independent variable and secondary color conformity as the moderating variable. Formally, we hypothesize:

**H1.** *Main color conformity and secondary color conformity negatively interact in determining consumer attention. Specifically:*

**H1a.** *When secondary color conformity is low, the effect of main color conformity on consumer attention is positive.*

**H1b.** *When secondary color conformity is high, the effect of main color conformity on consumer attention is negative.*

Previous research indicates that visual attention influences in-store product choices (Chandon et al. 2009). Manufacturers design new products and retailers manage shelving and displays to capture consumer attention toward the items they aim to sell (Behe et al. 2015). These marketing efforts rest on the principle that visual attention precedes choice and that increasing consumer attention toward a product enhances the likelihood of its purchase (Janiszewski, Kuo, and Tavassoli 2013). As established in the visual attention literature, consumer attention is a prerequisite for product purchase (e.g., Pieters and Warlop 1999). Therefore, we hypothesize:

**H2.** *Consumer attention toward a product has a positive effect on the likelihood of choosing that product.*

## 3 | Empirical Evidence

To test our research hypotheses, we conducted two eye-tracking studies, adopting different, yet complementary designs.

Eye-tracking technology has emerged as a valuable tool for studying consumer attention, providing objective measurements of eye movements and visual focus (Duchowski 2007). This methodology allows researchers to record eye fixations and thus goes beyond self-reported data by offering precise, real-time observations of attentional processes (Holmqvist et al. 2011). Fixations—the moments when the eyes are relatively stationary and focused on a specific point—are key indicators of where attention is directed and how information is processed (Rayner 1998). In particular, the number of fixations indicates how frequently a respondent looks at a particular area of interest (Casado-Aranda, Sánchez-Fernández, and Ibáñez-Zapata 2023b). By analyzing fixations, researchers can determine which elements of a visual stimulus attract attention, how long consumers engage with specific areas of interest, and how visual information influences preferences and choices (Orquin and Mueller Loose 2013).

Eye-tracking research has provided insights into various aspects of consumer behavior, including how consumers interact with advertisements, packaging, and visual displays (Wedel and Pieters 2008). Such studies have revealed that factors like placement, size, color, and movement of marketing stimuli can significantly impact where and how long consumers fixate on certain elements (Pieters and Wedel 2007). For example, eye-tracking studies reveal that color significantly affects fixation behavior, with certain hues increasing visual attention (Lichtlé 2007).

Study 1 was a lab study using a desktop eye-tracking system, where we show participants a mock supermarket shelf featuring two-colored, abstract packaging for a hypothetical product category. This study provided a controlled test of our conceptual model. Study 2 was a field study conducted in a supermarket using a mobile eye-tracking system. This study aimed to generalize our findings to a real-world context involving multiple product categories and actual customers of a supermarket.

To improve the readability of the following sections, we outline a few elements common to both studies. The main color of a package is the one covering the majority of its surface, while the secondary color is the next most dominant color. Conformity of the packaging main (secondary) color to category color codes is the extent to which that color is used within the product



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category. Specifically, we calculated main color conformity (Main Color Conformity$_{jk}$) and secondary color conformity (Secondary Color Conformity$_{jk}$) for SKU$_j$ in category $k$ using the following formulas:

$$\text{Main Color Conformity}_{jk} = \frac{\text{Number of SKUs in category } k \text{ using SKU}_j\text{'s main color as main color}}{\text{Number of SKUs in category } k}$$

$$\text{Secondary Color Conformity}_{jk} = \frac{\text{Number of SKUs in category } k \text{ using SKU}_j\text{'s secondary color as main color}}{\text{Number of SKUs in category } k}$$

where $j$ = the SKU; $k$ = the category. Crossing $j$ and $k$ implies comparing the main and secondary packaging colors of the packaging of SKU $j$ with the other products in the category $k$. For example, consider a SKU "$x$" with white as the main color in the salty snacks category. If this category contains six SKUs—four with white, one with green, and one with orange as main colors—then, the SKU "$x$" would have a main color conformity of $4/6 = 0.667$. For SKU "$y$" with green as the secondary color in the salty snacks category, secondary color conformity would be $1/6 = 0.167$.

In both Study 1 and Study 2, we used fixation durations and fixation counts as measures of visual attention (Casado-Aranda, Sánchez-Fernández, and Ibáñez-Zapata 2023b).

## 3.1 | Study 1: A Lab Eye-Tracking Study

### 3.1.1 | Participants and Procedure

Management and Marketing students ($N = 131$; $M_{age} = 23.2$, $SD_{age} = 2.83$; 60% males, 40% females) from a large European university participated in an eye-tracking session in exchange for course credits. During the session, participants were exposed, in random order, to a set of visual stimuli (e.g., products, ads, shelves) related to various projects. The target screenshot (Figure 2) displayed a mock supermarket shelf with 20 rectangular packaged products for 10 s. All the products displayed a

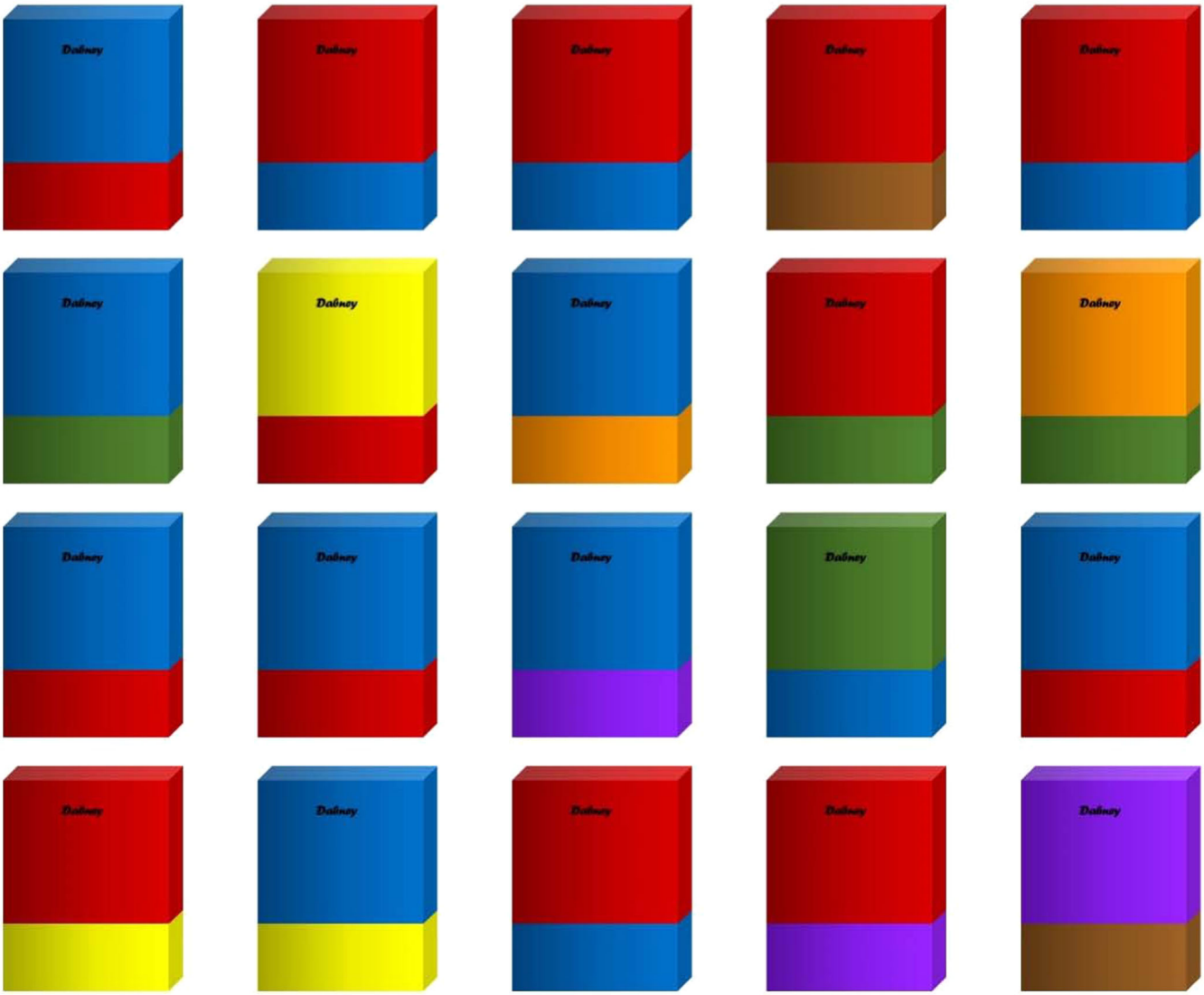


**FIGURE 2** | The 20 packages (Study 1).



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fictitious brand called "Dabney" in the same position and size. All participants were exposed to the same experimental stimulus. To minimize any potential influence from prior knowledge and preconceived opinions, we did not inform participants about the product category, thus reducing the likelihood of color expectations within the category (e.g., Ward et al. 2024).

We carefully designed each package to feature a main color (covering about 70% of the packaging) and a secondary color (covering about 30% of the packaging). We manipulated the distribution of colors to include two dominant colors (blue and red), acting as category codes, along with five filler colors (yellow, orange, purple, brown, and green), to create packages that were fully conforming packaging, partially conforming, and fully differentiated. Two research assistants collected data using an SMI eye-tracking system (60 Hz). A preliminary calibration stage ensured a margin of error below 0.5°.

#### 3.1.2 | Data

We recorded eye-tracking data ($M_{\text{tracking_ratio}} = 98.29\%$) for a total of 3841 fixations on areas of interest (AOI) corresponding to the 20 packages. Fixation duration, in milliseconds, summed per participant-package, served as our dependent variable ($N = 2620$). The independent variable was the conformity of packaging $j$'s main color (Main Color Conformity$_j$), and the moderating variable was the conformity of packaging $j$'s secondary color (Secondary Color Conformity$_j$), computed using the previously specified formulas.

We included the vertical position of packaging $j$ on the shelf as control variable, coded as dummies (from 1, the lowest, to 4, the highest). We mean-centered all variables but the dependent variable. Given that the data are inherently heteroskedastic (White Test: $\chi^2(10) = 52.25$, $p < 0.001$), we estimated models using standard errors robust to heteroskedasticity.

#### 3.1.3 | Results

A regression analysis (Table 2) indicated a negative interaction between Main Color and Secondary Color Conformity ($b = -2543.22$, $p < 0.001$) on fixation duration. This finding suggests that the effect of Main Color Conformity on fixation duration decreases as Secondary Color Conformity increases. Simple slope analysis (Figure 3) revealed that when Secondary Color Conformity is low the effect of Main Color Conformity on fixation duration is positive ($b_{\text{low}} = 433.34$, $p = 0.001$). Conversely, when Secondary Color Conformity is high, the same effect becomes negative ($b_{\text{high}} = -583.95$, $p < 0.001$).

To gain deeper insights from these results, we conducted planned comparisons by setting Main Color Conformity and Secondary Color Conformity to low versus high values ($M \pm 1$ SD) and comparing the four combinations. We found that hybrid color combinations led to significantly longer fixation duration than fully conforming or fully differentiating combinations ($b = 128.89$, $p < 0.001$).

The two hybrid combinations were equally effective in influencing fixation duration ($b = 30.93$, $p > 0.51$). The hybrid High Main Color Conformity–Low Secondary Color Conformity combination was more effective than both the High Main Color Conformity–High Secondary Color Conformity combination ($b = 195.15$, $p < 0.001$) and the Low Main Color Conformity–Low Secondary Color Conformity combination ($b = 93.56$, $p = 0.004$). Likewise, the hybrid Low Main Color Conformity–High Secondary Color Conformity combination was more effective than both the High Main Color Conformity–High Secondary Color Conformity combination ($b = 164.22$, $p < 0.001$) and the Low Main Color Conformity–Low Secondary Color Conformity combination ($b = 62.63$, $p = 0.17$). The latter comparison, while directionally aligned our expectations, did not reach significance.

**TABLE 2** | Results of fixation duration models (Study 1).

| | Fixation duration (ms) | | | |
|---|---|---|---|---|
| | Direct-effects model | | Interaction-effect model | |
| **Independent variable** | **Parameter** | **Robust s.e.** | **Parameter** | **Robust s.e.** |
| Intercept | 374.84** | 11.81 | 376.17** | 11.80 |
| Main Color Conformity | −65.60 | 98.12 | −126.17 | 100.42 |
| Secondary Color Conformity | −148.03 | 93.52 | −183.03* | 91.02 |
| Shelf2 | 199.35** | 43.76 | 146.48** | 42.68 |
| Shelf3 | 138.41** | 29.72 | 104.25** | 29.69 |
| Shelf4 | −55.04 | 29.64 | −64.85* | 29.64 |
| Main Color Conformity × Secondary Color Conformity | — | | −2543.22** | 501.92 |
| $F$ | 14.44** | | 14.34** | |
| df1 | 5 | | 6 | |
| df2 | 2614 | | 2613 | |
| $R^2$ | 0.03 | | 0.04 | |
| $\Delta R^2$ | — | | 0.01** | |

*$p < 0.05$; **$p < 0.01$.



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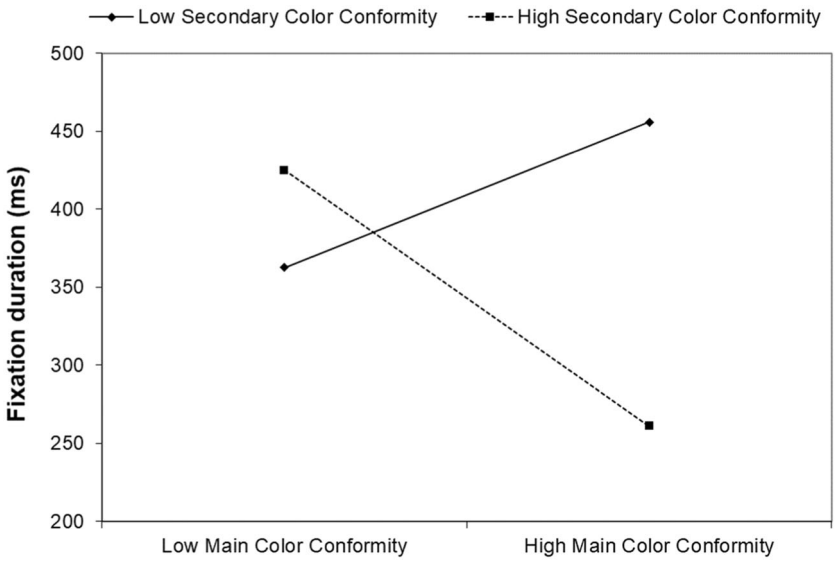



**FIGURE 3** | The Main Color Conformity × Secondary Color Conformity interaction effect on fixations' duration (Study 1).

#### 3.1.4 | Assumptions Checks and Robustness Analyses

To ensure the stability of these results, we conducted several additional analyses. First, VIFs were all below 2.2, indicating no multicollinearity issues. Second, the use of a robust estimator ensured accurate inference in the face of heteroskedasticity. Third, we believe the risk of endogeneity is minimal as the dependent variable is a physiological response to exposure to the manipulated independent variables.

Additionally, results remained stable when varying the dependent variable and analytical approach. Regression analyses with robust standard errors on *i*) the logarithm of fixation duration and *ii*) fixation count produced consistent results. Moreover, multilevel regressions with random intercepts for participants, used as an alternative method to account for heteroskedasticity, yielded virtually identical results when using both fixation duration and fixation count as dependent variables. Full results of these additional models are reported in Tables 3 and 4.

#### 3.1.5 | Discussion

The results of Study 1 provide support to H1, indicating that the effect of Main Color Conformity on consumer attention increases as Secondary Color Conformity decreases. This evidence suggests that hybrid color combinations, featuring one conforming and one differentiating color, enhance consumer attention. Simple slope analyses showed that using an optimal combination of packaging colors (either low Main Color Conformity with high Secondary Color Conformity, or vice versa) can attract consumer attention for an additional half second on average.

While evidence from a laboratory setting provides strong internal validity, we deemed it important to test our conceptualization in a real-world consumer environment, a goal which we pursued in Study 2.

### 3.2 | Study 2: A Mobile Eye-Tracking Study

To test H1 and H2 in a real shopping environment with regular customers, we partnered with a large supermarket European chain to conduct a field study using an SMI mobile eye-tracking system by SMI (sampling rate of 30 Hz).

#### 3.2.1 | Participants and Procedure

Sixty-nine customers participated in the study in exchange for a 10-euro shopping voucher redeemable at the supermarket. We excluded two participants due to unexpected social interactions that ended their participation early, and seven participants due to technical issues with the eye-tracking system, which failed to register their eyes movements correctly. This resulted in a final sample of 60 participants ($M_{age} = 33.88$, $SD_{age} = 11.36$; 42% males, 58% females; $M_{tracking_ratio} = 99.14\%$).

Data collection took place over 10 days, alternating between morning and afternoon, and excluding weekends to avoid excessive crowding. Two research assistants approached customers at the supermarket entrance and invited them to participate in the study. Upon agreement, participants underwent a calibration phase. Then, a research assistant accompanied each participant to the target area in the supermarket. Following discussions with the supermarket management, we selected the organic products section for data collection due to its growing importance (Tarkiainen and Sundqvist 2009; Van Herpen, Van Nierop, and Sloot 2012; Van Doorn and Verhoef 2015) and its convenient layout on a 12-m linear shelf (see the Appendix—Study 2, Figure A).

The section included products belonging to 14 categories, defined by the supermarket management, allowing us to effectively measure the constructs of our conceptual model,



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**TABLE 3** | Results of models on the logarithm of Fixations' duration and Fixation count models (Study 1).

| | Ln of fixation duration | | | | Fixation count | | | |
|---|---|---|---|---|---|---|---|---|
| | Direct-effects model | | Interaction-effect model | | Direct-effects model | | Interaction-effect model | |
| **Independent variable** | ***b*** | **Robust s.e.** | ***b*** | **Robust s.e.** | ***b*** | **Robust s.e.** | ***b*** | **Robust s.e.** |
| Intercept | 3.40** | 0.13 | 3.60** | 0.06 | 1.19** | 0.03 | 1.20 | 0.03 |
| Main Color Conformity | −0.28 | 0.47 | −0.55 | 0.46 | 0.00 | 0.24 | −0.14 | 0.25 |
| Secondary Color Conformity | 0.09 | 0.41 | −0.06 | 0.41 | −0.44* | 0.21 | −0.53* | 0.21 |
| Shelf2 | 0.76** | 0.20 | 0.52* | 0.21 | 0.40** | 0.11 | 0.27* | 0.11 |
| Shelf3 | 0.42* | 0.17 | 0.27 | 0.17 | 0.35** | 0.09 | 0.27** | 0.08 |
| Shelf4 | −0.38* | 0.19 | −0.42* | 0.19 | −0.28** | 0.08 | −0.31** | 0.08 |
| Main Color Conformity × Secondary Color Conformity | — | | −11.21** | 2.38 | | | −6.10** | 1.16 |
| $F$ | 10.97** | | 13.52** | | 18.02** | | 17.45** | |
| df1 | 5 | | 6 | | 5 | | 6 | |
| df2 | 2614 | | 2613 | | 2614 | | 2613 | |
| $R^2$ | 0.02 | | 0.03 | | 0.03 | | 0.04 | |
| $\Delta R^2$ | — | | 0.01** | | — | | 0.01** | |

*$p < 0.05$; **$p < 0.01$.

**TABLE 4** | Results of multilevel regression models (Study 1).

| | Fixation duration | | | | Fixation count | | | |
|---|---|---|---|---|---|---|---|---|
| | Direct-effects model | | Interaction-effect model | | Direct-effects model | | Interaction-effect model | |
| **Independent variable** | ***b*** | **s.e.** | ***b*** | **s.e.** | ***b*** | **s.e.** | ***b*** | **s.e.** |
| Intercept | 374.84** | 11.79 | 376.17** | 11.73 | 1.19** | 0.03 | 1.20** | 0.03 |
| Main Color Conformity | −65.60 | 91.15 | −126.17 | 91.34 | 0.00 | 0.23 | −0.14 | 0.23 |
| Secondary Color Conformity | −148.03 | 81.31 | −183.03* | 81.12 | −0.44* | 0.21 | −0.53* | 0.21 |
| Shelf2 | 199.35** | 40.05 | 146.48** | 41.01 | 0.40** | 0.10 | 0.27** | 0.10 |
| Shelf3 | 138.41** | 33.95 | 104.25** | 34.34 | 0.35** | 0.09 | 0.27** | 0.09 |
| Shelf4 | −55.04 | 38.45 | −64.85 | 38.28 | −0.28** | 0.10 | −0.31** | 0.10 |
| Main Color Conformity × Secondary Color Conformity | — | | −2543.22** | 470.17 | — | | −6.10** | 1.19 |
| Var($u_j$) | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| Var($e_{ij}$) | 364,386.00 | | 360,361.60 | | 2.34 | | 2.31 | |
| $\chi^2$ (against the null model) | 83.79** | | 113.98** | | 86.67** | | 113.81** | |
| LR Test(1) | — | | 29.10** | | — | | 26.14** | |

*$p < 0.05$; **$p < 0.01$.

across multiple types of products. Participants were instructed to view the products as they normally would while shopping. On average, they completed the task in 81 s. After the eye-tracking phase, each participant was asked to choose a product they would hypothetically buy from the organic section (without the obligation to actually purchase) and provided sociodemographic information.

### 3.2.2 | Data

The system recorded a total of 15,796 fixations. Unlike desktop eye-tracking systems used in lab settings, data collected with mobile systems requires manual assignment of fixations to AOIs. A trained research assistant, with support from the supermarket management when needed, coded the recorded



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fixations, frame by frame, to assign each fixation to a specific SKU, which were our AOIs, or to "white space." The coding process covered 349 SKUs, from the 14 product categories (see the Appendix—Study 2, Table A, for details). After coding, 10,514 fixations were assigned to specific SKUs, while the remaining 5282 fixations were classified as white space. Additionally, the research assistant coded other SKU characteristics, that we used as control variables, based on information provided by the supermarket management.

We collected images of each SKU and coded the packaging main and secondary colors. For color coding, we used the list of colors proposed by Berlin and Kay (1969) and Labrecque and Milne (2013), although gray, silver, and gold were absent in the analyzed SKUs. The colors present in our sample were orange, brown, white, blue, yellow, black, pink, red, green, and purple (see the Appendix—Study 2, Table B, for details). For about 90% of the SKUs we were able to clearly identify the main and secondary colors. For a few SKUs with ambiguous color coding, we used the Image Color Summarizer (http://mkweb.bcgsc.ca/color-summarizer/?analyze) to identify predominant colors.

#### 3.2.3 | Results

We estimated a series of regression models using SKU Main Color Conformity and Secondary Color Conformity as the independent and moderating variables, respectively. We also controlled for SKU characteristics, including average price (in euro), promotion (dummy-coded), shelf (dummy-coded from 1, the lowest, to 7, the highest), and packaging material (dummy-coded: paper, glass, and plastic). To test $H_1$ (see the Modeling Fixations section), we specify fixation duration in milliseconds summed per participant-SKU as the dependent variable ($N = 20{,}940$). In a subsequent analysis, to test $H_2$ (see the Modeling Choices section), we considered the count of choices for each SKU made by participants as an additional dependent variable, analyzing data the SKU-level ($N = 349$).

#### 3.2.4 | Modeling Fixations

To account for multiple levels of observations, we estimated a multilevel regression with a random intercept for participants and brand-fixed effects. This allowed us to control for potential effects of individual participant characteristics and brand features within the product assortment. All variables, except the dependent variable, were mean-centered. Results of the direct-effects and interaction-effect models are presented in Table 5.

In the interaction-effect model, we found a negative Main Color conformity × Secondary Color conformity interaction ($b = -447.04$, $p < 0.001$). This finding confirms that the effect of Main Color Conformity on fixation duration decreases as Secondary Color Conformity increases. When probing the interaction effect, we found that when Secondary Color Conformity

**TABLE 5** | Results of fixation duration models (Study 2).

| | Fixation duration (ms) | | | |
|---|---|---|---|---|
| | Direct-effects model | | Interaction-effect model | |
| **Independent variable** | **Parameter** | **s.e.** | **Parameter** | **s.e.** |
| Intercept | 86.81** | 5.04 | 81.95** | 5.17 |
| Main Color Conformity | 21.19 | 16.50 | −16.49 | 18.75 |
| Secondary Color Conformity | −22.02 | 19.26 | −57.04** | 20.97 |
| Average price | −4.49* | 1.82 | −4.48* | 1.82 |
| Promotion | 83.76** | 18.20 | 94.52** | 18.37 |
| Shelf2 | 23.50 | 13.07 | 16.69 | 13.17 |
| Shelf3 | 11.67 | 12.23 | 15.04 | 12.25 |
| Shelf4 | 18.88 | 12.74 | 13.23 | 12.80 |
| Shelf5 | −17.45 | 13.33 | −15.23 | 13.33 |
| Shelf6 | −16.30 | 13.21 | −16.96 | 13.20 |
| Shelf7 | −20.44 | 13.66 | −20.70 | 13.66 |
| Material: paper | 23.89** | 6.55 | 22.16** | 6.56 |
| Material: glass | 30.51** | 9.94 | 27.15** | 9.97 |
| Main Color Conformity × Secondary Color Conformity | — | | −447.04** | 106.04 |
| Brand fixed effects | Included | | Included | |
| Var($u_j$) | 1145.43 | 278.20 | 1146.11 | 278.27 |
| Var($e_{ij}$) | 131,986.10 | 1291.75 | 131,873.80 | 1290.65 |
| $\chi^2$ (against the null model) | 207.68** | | 225.63** | |
| Likelihood ratio test | — | | 17.77** | |

*$p < 0.05$; **$p < 0.01$.



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is within its 25th percentile (i.e., lower values), the effect of Main Color Conformity is positive. Conversely, when Secondary Color Conformity is beyond its 82nd percentile (i.e., higher values), the effect of Main Color Conformity is negative. Table 6 synthesizes simple slopes at relevant values of the moderator, and Figure 4 illustrates the interaction effect. These results provide further support for H1.

In both the direct-effects and interaction-effect models (Table 5), the effect of Promotion is significant and positive. This finding is particularly relevant, as prior eye-tracking research has demonstrated how the presence of a promotional price can significantly capture consumers' visual attention (Ye et al. 2020). Importantly, our focal interaction remains significant even when controlling for promotional effort, which bolsters confidence in our main hypothesis.

To gain additional insights from these results, we conducted planned comparisons by setting Main Color Conformity and Secondary Color Conformity to low versus high values (M ± 1 SD) and comparing the four combinations. We found that hybrid color combinations led to significantly longer fixation duration than fully conforming or fully differentiating combinations ($b = 34.22$, $p < 0.001$).

The two hybrid combinations were equally effective in influencing fixation duration ($b = 12.28$, $p > 0.10$). The hybrid High Main Color Conformity–Low Secondary Color Conformity combination is more effective than both the High Main Color Conformity–High Secondary Color Conformity combination ($b = 53.84$, $p < 0.001$) and the Low Main Color Conformity–Low Secondary Color Conformity combination ($b = 26.88$, $p = 0.001$). Likewise, the hybrid Low Main Color Conformity–High Secondary Color Conformity combination is more effective than both the High Main Color Conformity–High Secondary Color Conformity combination ($b = 41.56$, $p = 0.003$) and the Low Main Color Conformity–Low Secondary Color Conformity combination ($b = 14.60$, $p = 0.08$).

**TABLE 6** | Simple effects of Main Color Conformity at values of Secondary Color Conformity (Study 2).

| Secondary Color Conformity (Moderating variable) | | Simple effect of Main Color Conformity on Fixation duration | |
|---|---|---|---|
| Percentile | Actual value (mean-centered) | Effect | s.e. |
| 5th | −0.172 | 60.19** | 18.91 |
| 16th | −0.146 | 49.01** | 17.76 |
| 50th | −0.044 | 3.42 | 17.02 |
| 84th | 0.136 | −77.36** | 28.61 |
| 95th | 0.288 | −195.26** | 53.92 |

*$p < 0.05$; **$p < 0.01$.

### 3.2.5 | Assumptions Checks and Robustness Analyses

We conducted a series of additional analyses to verify the stability of the results. First, apart from related to the brand dummies (used to control for fixed effects), all VIFs were lower than 2.14, suggesting that the model does not suffer from multicollinearity. Second, we estimated regression models with standard errors robust to heteroskedasticity as an alternative approach to control for the inherent heteroskedasticity in our multilevel model, obtaining the same evidence for the hypothesized interaction ($b = -446.48$, $p < 0.001$). Third, the risk of endogeneity remains minimal in this model, as the dependent variable is a physiological response to exposure to the independent variables.

Additionally, results remained stable when changing the dependent variable and the level of observation. Results of a multilevel model on fixation count showed the same interaction effect ($b = -2.50$, $p < 0.001$—see the Appendix—Study 2, Table C). Finally, we estimated a regression model at the SKU-level with brand-clustered standard errors ($N = 349$). We found again

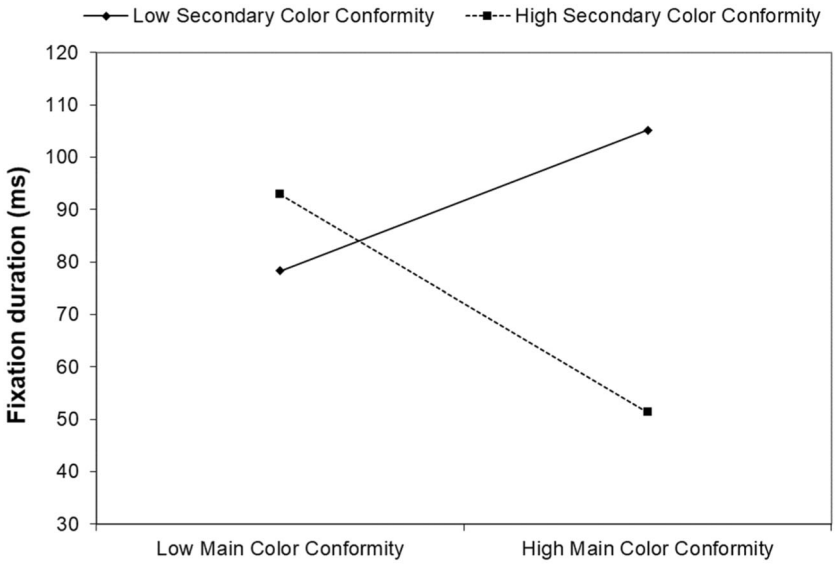



**FIGURE 4** | The Main Color Conformity × Secondary Color Conformity interaction effect on fixation duration (Study 2).



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a negative Main Color Conformity × Secondary Color Conformity interaction on both fixation duration ($b = -29{,}598.83$, $p < 0.001$) and count ($b = -169.76$, $p < 0.001$). More details on results of analyses at SKU-level data are available in the Appendix—Study 2, Table D.

#### 3.2.6 | Modeling Choices

To test H2, we estimated a generalized structural equation model with observed variables on the SKU-level data. We specified the same effects tested in the interaction-effect model on fixation duration (using fixation count does not change the results), which, in turn, influenced customer choice. As the aggregated participant choices at the SKU-level ranged between zero and three, we set a Gaussian identity link function for fixation duration and a Poisson logarithmic link function for customer choice, clustered standard errors on brands. The model showed a good fit to the data (Likelihood Ratio test: $\chi^2(26) = 144.40$, $p < 0.001$). Results (Figure 5) confirmed the negative Main Color Conformity × Secondary Color Conformity interaction on fixation duration ($b = -29{,}598.83$, $p < 0.001$) and supported the expected positive effect of fixation duration on customer choices ($b = 0.01$, $p < 0.001$). These findings provide support for H2.

#### 3.2.7 | Discussion

The results of Study 2 further support H1 and confirm H2. Unlike the controlled but somewhat artificial design used in Study 1, the findings of Study 2 validate the increasing effect of the Main Color Conformity on consumer attention as the Secondary Color Conformity decreases (and vice versa) in a realistic shopping environment. This evidence reinforces the notion that hybrid color combinations, featuring a conforming color and a differentiating color, are particularly effective at capturing consumer attention.

It seems particularly significant that this predicted pattern emerged in a naturalistic, noisier context, with multiple product categories and hundreds of SKUs competing for consumer attention. Overall, the results of Study 2 enhance the external validity of our conceptualization and strengthen the confidence in the stability of our findings.

## 4 | General Discussion

This paper investigates the interaction effect of main and secondary packaging color conformity to category codes on consumer attention. Results from lab and field eye-tracking studies reveal that the effect of the main color conformity on consumer attention increases as secondary color conformity decreases (and vice versa). Therefore, hybrid color combinations—featuring one conforming color and one differentiating color—are more effective in attracting consumer attention, which in turn influences consumer choice. These findings offer a viable solution for managers facing the challenge of selecting packaging colors that balance assimilation with differentiate.

### 4.1 | Implications for Theory

Our research contributes to the ongoing discussion on the role of color in influencing consumer behavior and its impact on visual attention. Positioned within the debate on design atypicality and color expectations (e.g., Cutolo and Ferriani 2024; Ward et al. 2024), our study examines the trade-off between color conformity and differentiation. The question of how to attract consumer attention, leveraging conformity or differentiation remains open. Our research addresses this issue by considering a two-color model and recommending a hybrid strategy—employing one dominant color and one nondominant color within the category—to maximize visual attention. By testing this hybrid strategy with both lab and in-store eye-tracking systems we provide unique insights into consumer attention analysis, balancing internal and external validity, a distinctive feature of our research shared by only a few studies (e.g., Bialkova, Grunert, and van Trijp 2020).

This research contributes to the packaging color literature by introducing a bifactorial model of category color codes that considers both main and secondary packaging colors. Packaging comprises multiple design elements (Silayoi and Speece 2007; Orth and Malkewitz 2008), and examining two-color related

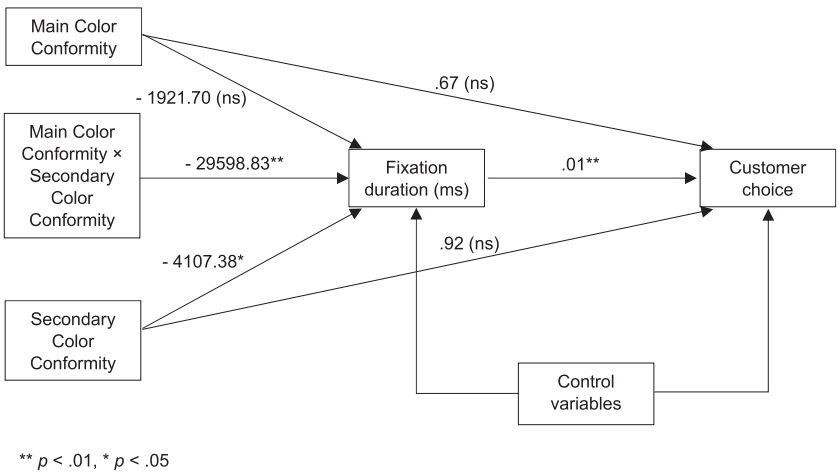



**FIGURE 5** | Results of generalized structural equation model (Study 2).



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variables together aids in analyzing this complexity. Unlike previous research focusing on a single color, our multicolor approach reflects the real-world nature of packaging (He and Lv 2021) and combines the benefits of color conformity (Labrecque and Milne 2013; Huang, Peng, and Wan 2021) with those of differentiation (Garber, Burke, and Jones 2000), minimizing their respective risks (Van der Lans, Pieters, and Wedel 2008; Garaus and Halkias 2020).

Our research elaborates on and extends the conformity-differentiation trade-off into color analysis, a trade-off investigated in fields, like esthetics. The hybrid solutions proposed in our research align with Berlyne (1970) concept of moderate atypicality. When applied to colors in our bifactorial approach, moderate atypicality (1970) is achieved by balancing one color that conforms to category codes with another one that differentiates, generating both familiarity and interest.

Similar multidimensional approaches to resolving the conformity-differentiation trade-off can be found in the literature on social groups. Chan, Berger, and Van Boven (2012) showed that consumers often balance assimilation and differentiation by adopting group-identifying yet distinct traits. Consumers decide to assimilate on one dimension (e.g., the brand used by the target group), and stand out on another dimension (e.g., a distinctive color). Another example is related to positioning strategies, in which points of difference (PoD) and points of parity (PoP) with competitors (Kotler, Keller, and Chernev 2021) allow brands to communicate uniqueness while signaling category belonging. In our study, the dominant packaging color acts as a PoP, while the nondominant color serves as a PoD.

With reference to the LC4MP framework (Lang 2006), this research significantly contributes to a deeper understanding of how attention resources—limited by definition—are allocated in contexts where multiple stimuli are simultaneously present (Fisher, Hopp, and Weber 2023). Specifically, our research focuses on conformity to category color codes, investigating how visual attention is influenced by combinations of conforming versus differentiating colors. Our approach, which examines the similarity/dissimilarity of competing stimuli, can be applied in settings where various media operate concurrently, such as advertising in public spaces like airports and train stations. Furthermore, while much of the research in the LC4MP tradition has investigated textual elements (e.g., message framing, DiRusso, and Myrick 2021), as well as visual and auditory components (e.g., Simmonds et al. 2020), the role of color has received comparatively little attention. Particularly in contexts where color serves as a relevant factor—for commercial or cultural reasons—our research contributes to the LC4MP literature by providing valuable insights into visual attention patterns related to color (Detenber and Lang 2010).

## 4.2 | Implications for Managers

Beyond extending studies on packaging colors and the conformity-differentiation trade-off, this research provides insights for manufacturers and retailers. First, we recommend an optimal color strategy for packaging: within a given a category using a dominant color alongside a secondary, differentiating color helps the product stand out. Second, for categories with a leading brand that sets the category standards, managers might consider a subtle imitation strategy. Copycat products often adopt colors associated with the category leader (Van Horen and Pieters 2017). Assimilating to the category leader upon one color (main or secondary), while differentiating with the other one can be an effective strategy, aligning with the notion that subtle copycats are more effective than blatant ones (Miceli and Pieters 2010). Third, referring back to the interview with the brand manager reported in the introduction, our research can help manufacturers in managing brand extensions. In this scenario, managers can use the brand's identifying color alongside a category-conforming color. If the brand's identifying color is not a standard in the category, this approach would allow the product to stand out with a distinctive color, also recalling the brand's visual identity. At the same time, using a secondary color that conforms to the new product category can facilitate identification with the new product category.

Retailers can also use our findings to optimize visual attention to specific SKUs of interest. For instance, placing target SKUs near products that share either the main or secondary packaging color—but not both—can attract consumer attention effectively. For example, to highlight a cereal brand with brown and red packaging, retailers could place it near products that are predominantly brown or red, but not both. This hybrid strategy avoids the challenges of full assimilation or excessive differentiation. Effective shelf positioning is crucial, as it can influence purchase behavior (Drèze, Hoch, and Purk 1994; Sayman, Hoch, and Raju 2002; Kim and Moon 2021), but guidance from previous research on this issue is limited. In this context, our findings provide directions that offer an important alternative to price promotions for drawing attention. Our research has also implications for e-tailers. In online shopping, consumers often browse by category. In this case, to attract attention toward specific SKUs, e-tailers can manage product positioning by placing the target SKU near products with which it shares one color (main or secondary) while differing in the other color. On this point, Chocarro, Cortiñas, and Villanueva (2022) demonstrated that younger online shoppers (under 30) pay less attention to product images compared to older visitors. Positioning products according to our proposed strategy—placing them near products that share only one color with the target SKU—could help capture the visual attention of younger shoppers.

## 4.3 | Limitations and Directions for Future Research

Our research has some limitations, offering opportunities for future studies. First, the sample in Study 1 (lab setting) consisted exclusively of students. Although Study 2 (field setting) involved a more heterogeneous sample, future research could benefit from using controlled lab settings with broader participant demographics. Second, like many eye-tracking studies, our samples were not large. While adequate for hypothesis testing, thanks to the high number of fixations referred to the analyzed AOIs, these sample sizes limited our ability to examine the



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potential moderating effects of individual-level variables. Considering that our hypothesized effects are based on the assumption that individuals have limited capacity to process external stimuli, future research could explore individual-level factors like cognitive load, which might impact color processing, as discussed in frameworks like the Elaboration Likelihood Model (Petty and Cacioppo 1986) and Cognitive Load Theory (Sweller 1988). It could be that individuals with low cognitive load may process low or high color conformity stimuli differently due to the availability of more cognitive resources. Other personal factors that could have similar impacts are time pressure (Hahn, Lawson, and Lee 1992) and motivation (Garbarino and Johnson 2001. Third, our bifactorial approach could be expanded to include variables related to product (Huang, Peng, and Wan 2021), or store design elements, like shelves or wall colors (Huang et al. 2020; Martinez et al. 2021). Forth, our conceptualization does not take into account cultural variables that can influence color perceptions (e.g., Spence and Velasco 2018). Future research may want to explore if effects of main and secondary color conformity can change conditional to the cultural context. Finally, future research could investigate the processes that explain the increased visual attention drawn by hybrid color combinations. For example, Guo et al. (2016) demonstrated a relationship between esthetic components and visual attention and found that products designed with high user experience receive longer fixations. Future research could test whether hybrid color combinations capture more attention because they elicit expectations of a better user experience.

Despite these limitations, this research represents an initial attempt to study consumer attention to category color codes using eye-tracking systems. Category codes are crucial for both manufacturers and retailers, yet empirical research on this phenomenon remains limited. Our research aims to address this gap leveraging the conformity-differentiation trade-off with a two-factorial, hybrid approach.


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### Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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