Journal of Retailing and Consumer Services 50 (2019) 94–102

Contents lists available at ScienceDirect

Journal of Retailing and Consumer Services

journal homepage: www.elsevier.com/locate/jretconser

The effects of inner packaging color on the desirability of food

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ARTICLE INFO

Keywords:
Color
Desirability of food
Health consciousness
Inner packaging color
Packaging
Perceived pleasure
Moderated mediation

ABSTRACT

Product packaging plays a significant role in the interactions between manufacturers, retailers, and consumers. Marketers manipulate the exterior of the packaging to influence consumer expectations, experiences, and behaviors. Yet there has been limited, if any, research on the effects of inner packaging color (IPC) on post-purchase, pre-consumption behaviors. Study 1 explored interaction effects between IPC (white vs. red vs. blue) and health consciousness (HC) on the desirability of food. Study 2 explored interaction effects between IPC (red vs. blue) and health consciousness (HC) on the desirability of food. Study 3 explored whether perceived pleasure mediates the interaction effect of IPC and HC on the desirability of food. The results showed that merely changing the IPC of a food item can increase its desirability among high-HC individuals. In contrast, IPC increases the perceived pleasure of a food item for both low-HC and high-HC individuals, and perceived pleasure mediates the interaction effect of IPC and HC on the desirability of food. This study will assist marketers to explore a range of possibilities for inner packing color on both the physiological and cognitive aspects of consumer behavior relating to food products. For example, marketers could consider the relational effects of inner packaging with a range of different colors, as well as exploring internal and external color packaging combinations and their impact on post purchase pre-consumption behaviors.

1. Introduction

Packaging color entices and influences consumer perceptions, and it significantly affects the identification of products/brands (Labrecque and Milne, 2012). Due to its importance, companies may consider and carefully select the colors they use in the promotion of their products. Choosing an inappropriate color can result in misrepresentation of merchandise and potentially deter consumers from the product (Piqueras-Fiszman and Spence, 2015). Through packaging color, brands can create an effective visual identity (Kauppinen-Räisänen and Luomala, 2010), form strong bonds with a target audience, and position themselves advantageously amongst competitors (Kim et al., 2018). If this is the case, then it could be possible to alter the perceived pleasure and desirability of food by manipulating the color of the product packaging (inner and exterior) (Piqueras-Fiszman et al., 2012). Yet, there has been limited research on the effects of inner packaging color (IPC) on consumer behavior (e.g., avoidance, consciousness, pleasure, desirability) when related to food products. Packaging has a physical dimension, which is composed of either outer or inner packaging layers, as well as a functionality dimension, which is composed of either purchase or consumption packaging layers (for packaging design taxonomy, see Krishna et al., 2017). This research refers to the inside of the outer packaging of a product (e.g., consumption packaging), which mostly affects consumers at the time of consumption.

Considering that inner packaging has a more immediate impact on consumption (Spence and Velasco, 2018), a growing body of research has affirmed the impact that product packaging can have on both consumer expectations and actual product experiences. However, very little research has taken place on the visual effect inner packaging color may have on the desirability of food (Krishna et al., 2017). The contribution of this paper is two-fold. First, it shows that merely changing the IPC of a food item can increase its desirability among health consciousness (HC) individuals. Second, and in contrast, IPC increases the perceived pleasure of a food item for HC individuals, and perceived pleasure mediates the interaction effect of IPC and HC on the desirability of food.

This paper is organized as follows: first, the influence of the color of food packaging on a food item, second three studies: Study 1 explores interaction effects between IPC (white vs. red vs. blue) and health consciousness (HC) on the desirability of food. Study 2 explores interaction effects between IPC (red vs. blue) and health consciousness (HC) on the desirability of food and Study 3 explores whether perceived

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https://doi.org/10.1016/j.jretconser.2019.05.003
Received 30 October 2018; Received in revised form 16 March 2019; Accepted 2 May 2019
Available online 08 May 2019
0969-6989/

pleasure mediates the interaction effect of IPC and HC on the desirability of food. Third, a general discussion of additional benefits followed by, limitations and recommendations for future research.

2. Conceptual development

2.1. Food taste associations

Color involves many hues; however, blue and red are the two prominent colors tested in food and packaging research (Northey et al., 2018; Shermer and Levitan, 2014). As individual colors, both red and blue can have significant influence over consumer perceptions. Typically, red more than blue, has associations with arousal, excitement, and stimulation (Clarke and Costall, 2008). Moreover, because the influence of color (vs. taste) is so persuasive, consumers can experience changes in perceived taste without producers having to manipulate the color of the food item itself (Delwiche, 2004). Rather, changes in the color of the cutlery consumers use to eat the product (Harrar and Spence, 2013), the serving plate (Harrar et al., 2011) and the product packaging (Ares and Deliza, 2010) can result in significant changes in the perceived desirability of food and the perceived taste of the food item (Shankar et al., 2009). Koch and Koch (2003) found that red has a negative relationship with sour, bitter, and salty tastes. Conversely, at the other end of the light spectrum, blue has significant negative associations with citrus and syrup-type tastes. However, for adults, the perceived intensity of sweetness occurs with a change in color (red) saturation (Chylinski et al., 2015).

As a consequence, it would be interesting to see whether the consumer desirability of food alters if the inner surface color of packaging changes to either shorter wavelength hues (e.g., blue: 450 nm) or longer wavelength hues (e.g., red: 700 nm). For that reason, and due to their positions at opposite ends of the visual spectrum, this study focused on red and blue, and it examined their effects on the perceived pleasure and desirability of food.

2.2. Eliciting feelings

Colors can engage customers on an emotional level (Krishna et al., 2017). Considerable evidence suggests that colors elicit feelings (Labrecque et al., 2013); for example, red can elicit avoidance motivation (Mehta and Zhu, 2009; Genschow et al., 2012), flavor intensity, and sweetness (Tijssen et al., 2017), trigger dominance and enhance physical performance (Hill and Barton, 2005), and create strong expectations concerning the taste and flavor of food (Luisa Dematté et al., 2006). Red is a warm color and alternatively, blue is a cool color (Singh, 2006), stands for spirituality and tranquility (Morton, 1997), has a comforting effect that reduces blood pressure (Chang et al., 2010), and it elicits feelings of calmness, comfort, happiness, hope, and peace (Naz and Epps, 2004).

Koenigstorfer et al. (2014) suggested that red is arousing, easily detectable, and useful for signaling a need for vigilance (Moller et al., 2009). In a food consumption context, previous research has shown that humans consider red a warning, which may lead to a reduction in consumption (Gamberale-Stille and Tullberg, 2001). However, considering that nature uses red to indicate both edibility and inedibility, the assumption of red-induced avoidance would be dysfunctional and not always necessarily adaptive (Reutner et al., 2015). Product packaging plays a significant role in the interactions between manufacturers, retailers, and consumers (Giyahi, 2012). Marketers manipulate the color of the packaging to influence consumer expectations and experiences about desirability, feel, functionality, healthiness, pleasantness, price, quality, size, and taste (Ilyuk and Block, 2015; Simmonds et al., 2018), to the point where consumers should be able to recognize the packaging of a product and be able to differentiate it from competing brands without extraneous effort (Cronje et al., 2003).

2.3. Attracting attention

At present, there is limited research on the visual effects of IPC and HC on the desirability of food (van Rompay et al., 2016). In the 21st century, people have become more health conscious, making the study of IPC and the potential effects on pre-consumption behaviors even more relevant (Wansink and Chandon, 2014). As certain symbols or emotions have associations with specific packaging colors, marketers must use them with caution. There is no universal meaning for each color; rather, a person's culture determines their connotation (Lidwell et al., 2010). Hence, there are multiple characterizations of color traits and emotions that can influence product choice (Chang and Lin, 2010). Prior research has indicated that various shades and hues can be useful to capture consumers' attention, indicate meaning, and enhance aesthetics (Lidwell et al., 2010).

When it comes to the color of packaging, Aaker (1996) noted that consumers' responses to packaging depend on their learned associations and individual preferences, which can ultimately affect product popularity in today's marketplace (Kauppinen-Räisänen and Luomala, 2010; Labrecque et al., 2013; Harrar and Spence, 2013). Many consider taste perceptions a primary influencer of food selection, and they have a large role in forming one's food preferences and typical diet (Cicerale et al., 2012). There are substantial differences between packaging colors on perceptions of healthiness, flavor intensity, and sweetness. The darker, more saturated red package evokes the highest expectations of flavor intensity and sweetness (Schulte-Holierhoek et al., 2017). Blue packaging often has associations with cleanliness, eliciting positive responses including comfort and peace (Kumar, 2017).

2.4. Healthiness

Kikuchi et al. (1999) examined the big five personality traits relative to HC and healthy habits (e.g., eating regularly and receptivity to dietary advice). High-HC individuals avoided salty foods, were receptive to eating more vegetables, and had regular eating times. In a replicated study, Raynor and Levine (2009) found connections between high HC and a range of health-promoting behaviors, some of which included eating more fruit and vegetables (Lunn et al., 2014).

Prior research on consumer pre-consumption self-control highlighted that most attempts fail due to counteractive self-control strategies (Trope and Fishbach, 2000). Koenigstorfer et al. (2014) suggested that colored labelling based on a traffic light system (e.g., red, orange, green) on packaging enforces avoidance tendencies toward unhealthy food. Consumers use simple heuristics to guide their food choices, and they sort products by both health and taste factors (Raghunathan et al., 2006). Moreover, consumers with high levels of HC are less receptive to heuristic biases when deciding how much food to consume (Aydinoglu & Krishna, 2010). Emotions can trigger consumer judgments and consumption quantities, and in healthy individuals, food presentation is intrinsically related to positive emotions (Bublitz et al., 2013). Therefore, the color of the food (Madzharov et al., 2011), package design (Campos et al., 2011), package shape (Raghubir and Krishna, 1999), picture placement on the package (Deng and Kahn, 2009), size of the product label (Wilson et al., 2017), and units displayed on a package (Rebollar et al., 2017) can all be useful as pre-consumption interventions (Jia and Lubetkin, 2017).

Typically, in food packaging, light and pale colors often emphasize product healthiness (Mai et al., 2016). This coincides with the belief that food products that are closest to their natural form, or that are manufactured and treated with natural techniques, are healthier than processed alternatives (Hughner et al., 2007). Moreover, consumers are more likely to evaluate a product as healthy in both appearance and taste when the package color and the environment are congruent (García-Segovia et al., 2015). Tijssen et al. (2017) challenged the conventional colors for marketing healthy products by expressing the potential for using more vibrant colors (like red) to make healthier options

appear more attractive. This is because healthier options generally come in lighter, pale colors, which traditionally makes them less appealing. Therefore, it would be interesting to examine more vibrant colors (e.g., red) as the IPC, and to determine whether there is a positive interaction effect between IPC and consumers' HC on the desirability of food.

HC consumers, unlike their less HC counterparts, rely on packaging health cues differently when it comes to pre-purchase decisions. HC depicts the degree to which consumers are involved in behaviors to monitor, maintain, or improve their healthiness, and they are willing to make the necessary adjustments in relation to their state of health (Michaelidou and Hassan, 2008). When it comes to achieving HC goals, consumers with high levels of HC are more receptive to extrinsic cues representing health benefits (Mai and Hoffmann, 2012, 2015). Consequently, the positive effect of color-provoked health impressions is stronger with higher levels of HC (Mai et al., 2016).

2.5. Experiential

Color influences different taste/flavor expectations, and they can change the perceived pleasure of food (Spence et al., 2010). Clydesdale (1993) suggested that humans form associations between colors and food from birth, and they associate these colors with elements including acceptability, pleasure, and sweetness (Levitan et al., 2008). Food is also a source of hedonic pleasure (Berridge, 2009). The perception and evaluation of food is a multi-sensory experience. Therefore, our perceived pleasure of food undergoes influence from its look, oral texture, smell, sound, and taste (Zampini et al., 2007). Moreover, packaging can be an experiential and immediate sense of pleasure (Reimann et al., 2010). Because consumers associate colors with the pleasantness of foods, marketers have continued to use colors in unique ways to enhance the perceived pleasure of food (Chandon and Wansink, 2012). Colors that create strong, perceived pleasure expectations can influence consumers to discriminate between different foods, and the impact is sometimes greater than the effect of advertising, branding, promotions, and even taste (Elder and Krishna, 2009; Hoegg and Alba, 2006). Therefore, it would be interesting to test whether the perceived pleasure of food positively mediates the relationship between IPC and HC on the desirability of food.

The color of packaging is significant in determining a product's desirability and color. It is the first quality attribute of food that consumers evaluate (Piqueras-Fiszman and Spence, 2011; Wu and Sun, 2013). Prättälä and Keinonen (1984) suggested that color affects the desirability of food with different attributes, and therefore, a few specific colors may create certain presumptions about the perceived taste of a particular food, which, in turn, makes it less or more desirable (Koch and Koch, 2003).

Visual cues contribute the most in terms of consumer pre-consumption expectations of both the flavor and desirability of food (Shankar et al., 2010). In turn, marketers can use color on the outer surface of product packaging to establish unconscious expectations in relation to the sensory qualities of the food contents. New research is emerging on the effects of the color of the immediate surroundings of the food content (e.g., the packaging is open, and the food product is protruding from the package) (Spence, 2018). To date, no evidence of the phenomenon of simultaneous contrast, specifically, the effect of the inner-surface color of product packaging on the desirability of food, has emerged (Piqueras-Fiszman et al., 2012). Therefore, the inner-surface color of packaging may affect the desirability of the food product (Simmonds and Spence, 2017).

3. Methodology

In this study, we tested for the color of the inside of the outer packaging on the desirability of food. Moreover, we used yoghurt as the food product for this study, because most consumers eat this product (Mai and Hoffmann, 2015), as well as its extensive use by innovative chefs and restaurateurs, by those working in the food and beverage industries and the packaging sector, and by scientists in sensory research (Spence et al., 2013; Schulte-Holierhoek et al., 2017; van Rompay et al., 2016). Specifically, we tested the assumption of a positive interaction effect between IPC (white vs. red vs. blue) and consumers' HC on the desirability of food. Next, we tested the effect of IPC and HC on the perceived pleasure of a food product. Finally, we assessed whether perceived pleasure mediated the interaction effect of IPC and HC on the desirability of food.

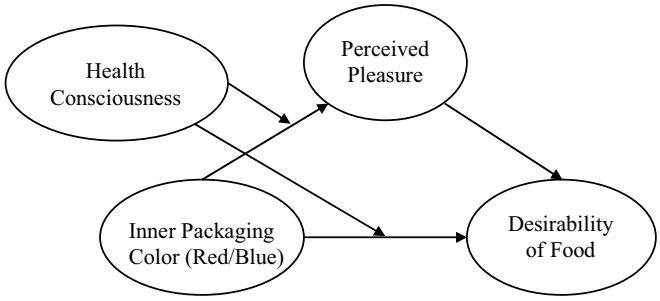

Fig. 1. Conceptual framework.

The mediating variable (i.e., perceived pleasure) specified the causal mechanism (i.e., effect) of IPC for desirability of food. The moderating variable (i.e., HC) did not specify a causal relation, only that the relationship between IPC and desirability of food differed across levels of HC (Fairchild and MacKinnon, 2009; MacKinnon, 2011). Therefore, the aim of this study was to test the assumption of a positive interaction effect between IPC (red vs. blue) and consumers' HC on the desirability of food. Next, we tested the interaction effect between IPC and HC on perceived pleasure of food (see Fig. 1). Finally, we tested whether perceived pleasure mediates the interaction effect of IPC and HC on the desirability of food, all of which may influence post-purchase, pre-consumption behaviors (Erevelles et al., 2016; Hernandez et al., 2015).

4. Study 1

4.1. Sample and method

The purpose of Study 1 was to explore the possibility of positive interaction effects between IPC (white vs. red vs. blue) and health consciousness (HC) on the desirability of food. White being the baseline condition, red and blue as the manipulation.

In total, 271 adults (54.3% female, average age: 35.70 years) from a national Amazon Mechanical Turk (MTurk) sample participated in an online study, and they received US$0.10 for successfully completing the survey, a reasonable rate of pay compared to similar survey tasks (Casler et al., 2013; Hauser and Schwarz, 2016; Smith et al., 2016). The study had a between-subjects design, with a presentation format (IPC conditions: white vs. blue vs. red) of a food item as a manipulated variable and HC as a measured individual difference (continuous variable). We included the white inner packaging color condition as a baseline condition that matched the color of the food product itself.

We randomly assigned participants to one of the three conditions (white vs. red vs. blue) and showed them a picture of a plain (white) yogurt cup of which the lid had been removed (Fig. 2). Thus, participants were able to see the outside of the package (white), the yogurt itself (white) as well as the color of the inside of the package (white vs. red vs. blue). Participants in each of the conditions then rated the stimuli on a series of health consciousness and desirability of food attributes (adapted from Fedorikhin and Patrick, 2010; Haws and Winterich, 2013). Last, to assess whether the IPC manipulation functioned as intended, participants also rated the visual appeal of the IPC

Fig. 2. Stimuli – Study 1 (white vs. red vs. blue), Study 2 and 3 (red vs. blue). (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

condition they saw (adapted from Deng and Srinivasan, 2013). Participants in the red condition rated the visual appeal of the food significantly higher than participants in the blue or white condition (*M*White = 2.86, *M*Red = 3.32, *M*Blue = 2.87). The results indicate that IPC has a significant effect on visual appeal (F (1,268) = 3.91, p < 0.05) while the post-hoc test reveals a significant difference between red and blue (*M*Red = 3.32 vs. *M*Blue = 2.87, p < 0.05) as well as red and white (*M*Red = 3.32 vs. *M*White = 2.86, p < 0.05) but no significant difference in visual appeal between the white and blue condition (*M*White = 2.86, *M*Blue = 2.87, p > 0.1).

4.2. Results and discussion

We used PROCESS Model 1 with IPC as categorical independent variable and HC as moderator and regressed it on the dependent variable desirability of food. We found a significant interaction effect for the red condition and the continuous moderator HC on the desirability of food ($\beta = 0.937$, t (265) = 2.843, $p < 0.01$; 95% CI: 0.288, 1.586). No significant main effects of IPC or HC emerged and neither did HC interact with the white or blue color condition. The conditional effects of the focal predictor indicate a significant interaction for the red condition for high levels of HC (+1SD) ($\beta = 1.291$, t (265) = 3.704, $p < 0.01$; 95% CI: 0.605, 1.977) but not for low levels of HC (-1SD) ($\beta = -0.702$, t (265) = −0.221, $p > 0.1$; 95% CI: −0.726, 0.585. These results suggest that merely changing the IPC of a food item can increase the desirability of that item among high-HC individuals (see Fig. 3).

5. Study 2

The purpose of Study 2 was to replicate the results found in Study 1 without the baseline condition (white). The goal was to replicate the positive interaction effect between IPC (red vs. blue) and consumers' HC on the desirability of food.

5.1. Sample and method

In total, 400 adults (52.5% female, age: 42.8% between 26 and 35 years, 18–65 range) from a national MTurk sample participated and received US$0.10 for successfully completing the survey.

Similar to Study 1, we randomly assigned participants to one of the two IPC conditions (red vs. blue). We replicated the design from Study 1 and employed the same measurement scales. Again, to assess whether the IPC manipulation functioned as intended, participants also rated the visual appeal of the IPC condition they saw. Participants in the red condition rated the visual appeal of the food significantly higher than participants in the blue condition (*M*Red = 4.28, *M*Blue = 4.02, t (398) = 2.193, $p < 0.05$).

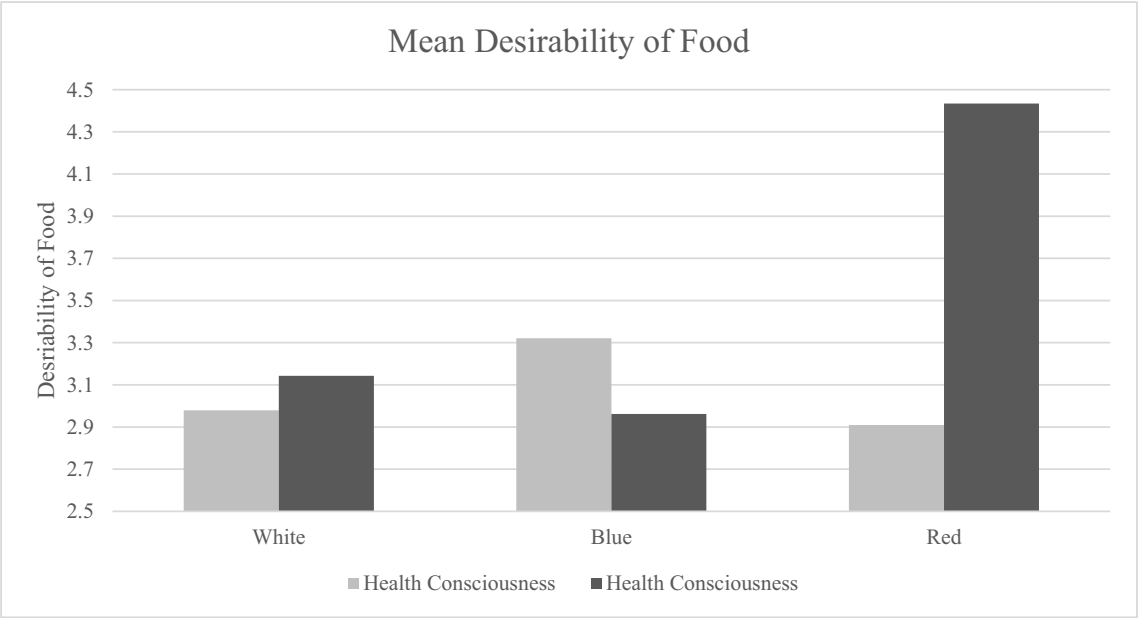

Fig. 3. Desirability of food as a function of HC and IPC (Study 1).

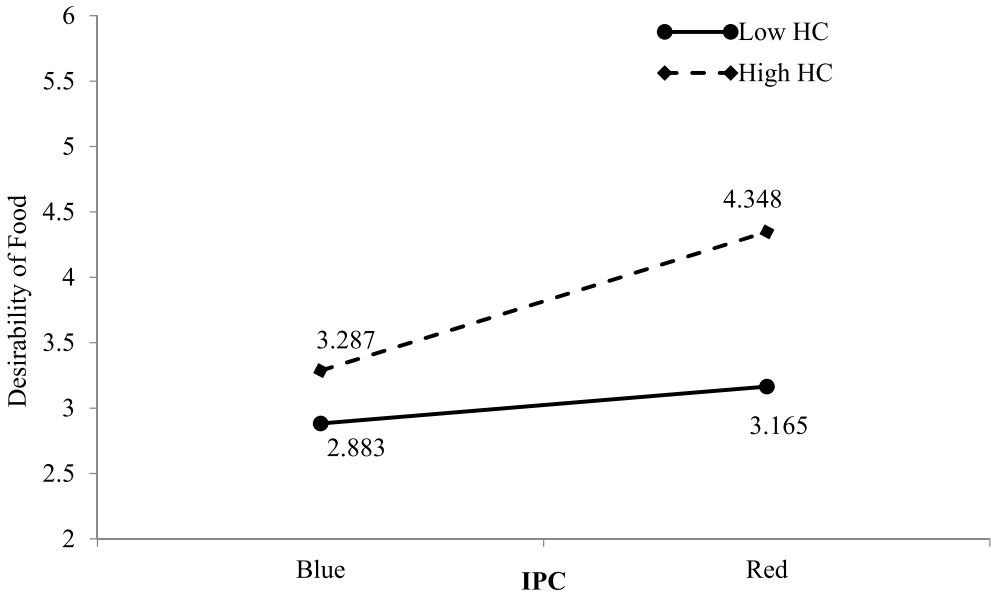

Fig. 4. Desirability of food as a function of HC and IPC (Study 2).

5.2. Results and discussion

We regressed the IPC and HC interaction on the dependent variable desirability of food. We found a significant interaction effect of the independent variable IPC (0 = blue, 1 = red) and the continuous moderator HC on the desirability of food (β = 0.451, t (396) = 2.365, p = 0.019; 95% CI: 0.076, 0.826). No significant main effects of IPC or HC were present. We used spotlight analysis (Aiken et al., 1991) to test the effect of IPC when HC was "high" (+1 SD) and "low" (−1 SD). Among low-HC participants, IPC did not influence the desirability of food (β = 0.281, t (396) = 1.208, p = 0.228; 95% CI: −0.177, 0.739). Among high-HC participants, the desirability of food was higher in the red than the blue condition (β = 1.062, t (396) = 4.570, p < 0.001; 95% CI: 0.605, 1.520). Furthermore, to identify the range of HC for which the simple effect of IPC was significant, we used the Johnson-Neyman technique (floodlight analysis; Spiller et al., 2013). The analysis revealed a significant effect of IPC on the desirability of food for any HC value larger than 2.936 (79.2% of participants; b = 0.396, t = 1.966, p = 0.050. These results suggest that merely changing the IPC of a food item can increase the desirability of that item among high-HC individuals (see Fig. 4).

6. Study 3

In Study 3, we replicated Study 2 with a larger sample size. Another objective of Study 3 was to test for a positive effect of IPC and HC on the perceived pleasure of food. Finally, we assessed whether perceived pleasure mediated the interaction effect of IPC and HC on the desirability of food, resulting in a moderated mediation.

6.1. Sample and method

In total, 1006 participants (53.5% female, age: 49.5% between 26 and 35 years, 18–65 range) from a national MTurk sample participated and received US$0.20 for successfully completing the survey. We used the same design as Study 2, and participants rated the stimuli on the same health consciousness and desirability of food attributes. Then, in addition, participants rated their perceived pleasure (adapted from Sweeney and Soutar, 2001) on the desirability of the food item (see Table 1).

6.2. Results and discussion

We replicated Study 2, and we again regressed the IPC and HC interaction on the dependent variable desirability of food. Similarly, the IPC manipulation functioned as intended. Participants in the red condition found the food significantly more appealing than participants in the blue condition (MRed = 4.65, MBlue = 4.36, t (1004) = 4.19, p = 0.00).

We found a significant interaction effect of the independent variable IPC (0 = blue, 1 = red) and the continuous moderator HC on the desirability of food (β = 0.303, t (1002) = 2.445, p = 0.015; 95% CI: 0.059, 0.545). There is a significant main effect of HC on Desirability of Food (β = 0.443, t (1002) = 5.084, p = 0.001; 95% CI: 0.272, 0.614).

A spotlight analysis showed that for low-HC individuals (−1 SD), IPC had no significant effect on the desirability of food (β = 0.276, t (1002) = 1.934, p > 0.05; 95% CI: −0.004, 0.721). For high-HC individuals, the desirability of food was higher in the red than the blue condition (+1 SD; β = 0.770, t (1002) = 5.400, p < 0.001; 95% CI: 0.490, 1.050). A floodlight analysis revealed a significant positive effect for any HC value greater than 2.830 (86.08% of the sample; b = 0.279, t (1002) = 1.963, p = 0.050, see Fig. 5).

Next, we regressed the IPC and HC interaction on Perceived Pleasure. We found a significant interaction effect of the independent variable IPC (0 = blue, 1 = red) and the continuous moderator HC on Perceived Pleasure (β = 0.245, t (1002) = 2.290, p = 0.022; 95% CI: 0.349, 0.454). No significant main effects of IPC were present; however, HC had a significant main effect on perceived pleasure (β = 0.149, t (1002) = 1.976, p = 0.049; 95% CI: 0.001, 0.296). A spotlight analysis showed that for low-HC individuals (−1 SD), IPC had a significant effect on perceived pleasure (β = 0.377, t (1002) = 3.060, p = 0.002; 95% CI: 0.135, 0.619). For high-HC individuals, their perceived pleasure was higher in the red than the blue condition (+1 SD; β = 0.776, t (1002) = 6.302, p < 0.001; 95% CI: 0.535, 1.018). A floodlight analysis revealed a significant positive effect for any HC value greater than 2.488 (90.5% of the sample; b = 0.296, t = 1.962, p = 0.050, see Fig. 6).

Last, we conducted a moderated-mediation analysis (Model 8, Hayes, 2013) to examine whether perceived pleasure mediates the effects of IPC and HC as independent variables on desirability of food as the dependent variable. The results showed a significant effect of perceived pleasure on the desirability of food (β = 0.810, t (1001) = 30.962, p < 0.001; 95% CI: 0.759, 0.862). More

Table 1
Wording of scales and descriptive statistics.

Variable	Wording	Mean (SD)			Cronbach's Alpha			R^2		
		S1	S2	S3	S1	S2	S3	S1	S2	S3
Health Consciousness Haws & Winterich (2013) (1 = Describes me not at all; 5 = Describes me very well)	"I reflect about my health a lot" "I'm very self-conscious about my health" "I'm generally attentive to my inner feelings about my health" "I'm constantly examining my health" "I'm alert to changes in my health" "I'm usually aware of my health" "I'm aware of the state of my health as I go through the day"	3.87 (0.73)	3.55 (0.87)	3.64 (0.82)	0.87	0.92	0.9			
Desirability of Food Fedorikhin & Patrick (2010) (1 = Very unlikely; 7 = Very likely)	"From the picture above: I would feel an impulse to eat the yoghurt as soon as I saw it" I would feel a strong irresistible urge to at the yoghurt when I saw it" When I saw the yoghurt, I would feel a desire to grab it and eat it" I would begin to salivate as soon as I saw the yoghurt"	3.28 (1.69)	3.42 (1.73)	3.92 (1.70)	0.97	0.97	0.96	0.09	0.11	0.55
Visual Appeal Deng & Srinivasan (2013) (1 = Strongly disagree; 7 = Strongly agree)	"From the picture above: this yoghurt is visually appealing" this yoghurt is visually plain" this yoghurt is colorful."	3.04 (1.26)	4.15 (1.20)	4.50 (1.13)	0.78	0.79	0.77			
Perceived Pleasure Sweeney & Soutar (2001) (1 = Strongly disagree; 7 = Strongly agree)	"The yoghurt in the picture above: is one that I would enjoy" would make me want to crave it" would make me feel good" would give me pleasure" is one that I would feel relaxed about eating."	–	–	4.71 (1.43)	–	–	0.95	–	–	0.07

importantly, the interaction effect of IPC x HC on the desirability of food was no longer significant. In addition, we found a significant main effect of HC on the desirability of food ($\beta = 0.323$, t (1001) = 5.167, $p < 0.001$; 95% CI: 0.200, 0.445). We conducted a bootstrapping analysis to test for conditional effects (Indirect, 10,000 samples, Hayes, 2015, 2018). This process generates a 95% confidence interval, whereby we can determine mediation if zero falls outside the confidence interval (Preacher et al., 2007; Zhao et al., 2010). The results showed a significant indirect effect for IPC on the desirability of food for low HC ($\beta = 0.306$; 95% CI: 0.105 to 0.515) and a stronger effect for high HC ($\beta = 0.629$; 95% CI: 0.411 to 0.839). The index of moderated mediation is significant, resulting in a moderated mediation (95% CI = 0.003 to 0.401). Study 3 shows that IPC changed the desirability of food for high-HC individuals. In addition, IPC influenced the perceived pleasure of food for both low-HC and high-HC individuals, and perceived pleasure mediated the moderating effects of HC and IPC on the desirability of food (see Table 2).

7. General discussion

The effect of color on external packaging is well known; however, there has been limited research on the effects of IPC on the desirability of food. With the aim of relying less on external packing to influence pre-consumption behaviors, the present research has explored how changing the IPC of a food product can change post-purchase, pre-consumption behaviors. Across three studies, we find that among high-HC individuals, presented with a food product with IPC that is red (vs. blue) results in an increased desirability of the food item (Study 1) and increases the item's perceived pleasure (Study 2). The results are in line with recent findings that show that the use of more vibrant packaging colors (like red), rather than conventional colors (like blue), makes food products appear more desirable (Tijssen et al., 2017). Moreover, given that perceived pleasure significantly affects the desirability of food (e.g., mediation), we found that HC specifies the range of the perceived pleasure-desirability of food relationship (e.g., boundary conditions, see Gonzalez-Mulé and Aguinis, 2018) and for both low- and high-HC individuals, IPC indirectly increased the desirability of the food item (Study 3).

Our research suggests that one way to increase the desirability of packaged food items for low-HC individuals is not to highlight the IPC or their HC, but rather just to focus on the perceived pleasure of the food item itself. Our results indicate that low- and high-HC individuals differ in their responses to IPC. Specifically, for low-HC individuals, IPC positively influenced their perceived pleasure, yet they did not discern between red and blue. For high-HC individuals, IPC also positively influenced their perceived pleasure of food; however, they discerned between the colors, and their perceived pleasure of food was even higher when the IPC was red.

Thus, our research suggests that HC is linked to the ability to control certain aspects of both perceived pleasure and the desirability of food, and that identifying differences in these abilities through IPC (e.g., red vs. blue), may aid post-purchase, pre-consumption behaviors. Additional research is necessary to explore this avenue further. For example, marketers could consider the relational effects for the range of different yet individual colors, internal and external packaging color combinations, and the impact on pre-consumption as well as health and dietary behaviors.

Our research has practical implications for changing pre-consumption behaviors of consumers, as it allows manufacturers, retailers, and marketers to explore a range of possibilities for IPC on both the physiological and cognitive aspects of consumer behavior relating to packaged food products.

8. Limitations and suggestions for future research

Our studies have limitations that future research could address.

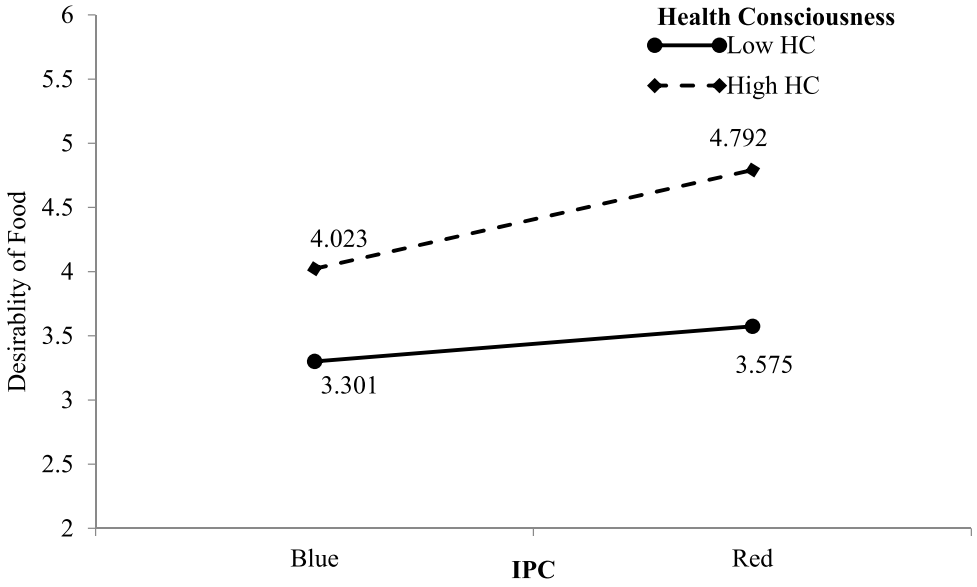

Fig. 5. Desirability of food as a function of HC and IPC (Study 3).

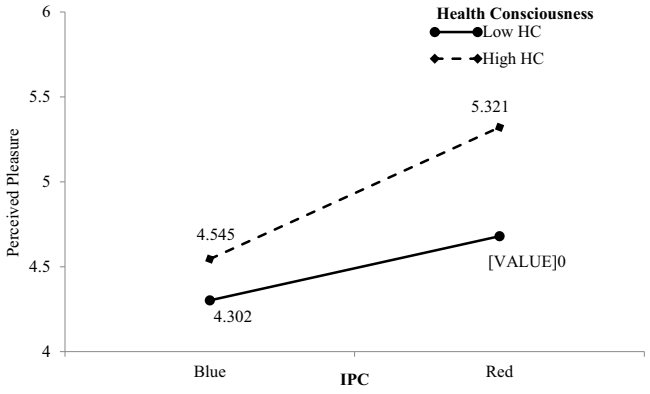

Fig. 6. Perceived pleasure as a function of HC and IPC (Study 3).

Table 2
Regression results (Study 3).

Independent variables	Perceived Pleasure	Desirability of Food
Constant	3.883***	−1.097***
Inner Packaging Color (IPC)	.313	-.324
Health Consciousness (HC)	.149	.323***
IPC x HC	.245*	.104
Perceived Pleasure	–	.810***
R^2	.072	.548
MSE	1.905	1.307
F	23.903***	367.027***
df	1002	1001

Note: Unstandardized coefficients are shown; ***p = 0.00 **p < 0.01 * p < 0.05.

First, the study only focused on one particular packaged food item (yoghurt), and it did not evaluate differences between different packaged food products/segments, which reduces the generalizability of the study.

Second, for managers, decisions to change the IPC will require a change management process to onboard consumers with the new product look. Such changes have the potential to influence long-term consumer acceptance of the product (Chung and Vickers, 2007). The danger in modifying the IPC is that the more consumers are exposed to a particular stimulus, the more they will prefer the specific stimuli (Chung et al., 2010). Conversely, consumers may become bored with the stimulus and use the product less frequently, and therefore, return to the familiarity of products with a more traditional IPC (Zandstra et al., 2004).

Third, potential challenges for product manufacturers include that if they modify the IPC of food products, the colored surface must continue to prevent microbial contamination, extend shelf life, improve quality, reduce the need for preservatives in food formulations, as well as meeting regulatory requirements and simplifying production processes. Pending the application, this could have either a positive or negative effect on the cost to produce the packaging, all of which could have a cascading effect on the overall price of the product. Future research could examine the effect of IPC on actual food choices and consumption while accounting for those factors. Moreover, future research could also include the evaluation of different food segments with different IPC variations to determine whether the generalizations hold across the entire food category or within individual food product categories/segments, or they could elucidate differences and marketing requirements across the different products/categories/segments.

Relatedly, research that measures both perceived pleasure and desirability of food could investigate whether changes in IPC can instigate actual changes in post-purchase, pre-consumption among low-HC individuals beyond merely eating a food product for its perceived pleasure, desirability, taste, and healthiness. Despite these limitations, our research elucidates the effect of IPC and HC on the perceived pleasure and desirability of food, since it suggests that consumers may have specific expectations of certain foods to begin with, which makes the use of IPC even more effective for those particular food products. Ironically, this also means that IPC could be useful in terms of the advertising/promotion of different types of foods, regardless of their perceived healthiness, pleasantness, and desirability.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://

doi.org/10.1016/j.jretconser.2019.05.003.

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