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Marketing in Asia Group

AJBR
Asian Journal of Business Research Volume 15 Issue 2, 2025
ISSN 2463-4522 e-ISSN 1178-8933 DOI: https://doi.org/10.14707/ajbr.240197

Research Paper

Impact of Snack Packaging Colour on Perceptions of Healthiness and Tastiness

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Abstract

Packaging colour plays a crucial role in consumer communication and significantly influences purchase decisions. In snack food marketing, colour affects perceived healthiness and taste expectations. Consumers often rely on peripheral cues and have limited attention spans when selecting snacks. Understanding the relationship between packaging colour and consumer perception helps marketers communicate effectively and promotes healthier choices. This quantitative study, featuring 2,036 observations, tested perceptions of blue, green, red and yellow packaging colours using the elaboration likelihood model (ELM) (Petty and Cacioppo, 1986) as the conceptual framework. The results indicate that packaging colour significantly impacts perceptions of healthiness and tastiness. Blue and green are associated with higher healthiness perceptions among individuals with high restrained eating behaviours, while red and yellow enhance tastiness perceptions for those with high external eating behaviours. The study also reveals that packaging colour mediates the relationship between healthiness and tastiness perceptions. In addition, different eating behaviours also affect purchase decisions, and perception of healthiness has a significant positive relationship with purchase decisions. This study contributes to the existing literature on packaging colour, its influence on purchase behaviour in the Hong Kong context and provides insights for marketers to better understand consumer preferences and inform their marketing strategies.

Keywords: Packaging colour, Snacking behaviours, Consumer perception, Restrained eating, External eating, Experimental design.

Publication Details: Received 4 March 2024; Revised 30 October 2024, 27 January 2025; Accepted 15 June 2025

Introduction

Product packaging is a key element of a product's visual appeal. Studies show that consumers tend to have a "limited attention span" (Bartels et al., 2018) and spend just seconds looking at any product display (Dickson and Sawyer, 1990). Therefore, quick visual cues about a product are critical to modern marketing and communication. Among a product's visual cues, the colour of product packaging is one of its most easily perceived properties (Garber et al., 2000). Colour jumps out at consumers and has been shown to have psychological effects as well as associational meanings (Elliot and Maier, 2014; Labrecque et al., 2013). It can have a strong impact on purchase intention (Agrawal and Singh, 2017).

There is strong competition for consumers' attention at the point of sales (Bartels et al., 2018). According to the elaboration likelihood model (ELM) (Petty and Cacioppo, 1986), consumers' motivation to engage in the elaboration of information can be shaped by the relevance of the topic. In the snack food category, consumers are likely to be influenced by "peripheral cues" (O'Keefe, 2013) such as packaging colour. Packaging colours can attract consumer attention, differentiate products and evoke symbolic meaning (Mai et al., 2016). They can trigger "mental shortcuts" that affect consumers' understanding of a product (Mai et al., 2016). While there is a growing body of literature on the impact of colour on perceptions of healthiness and tastiness, to the best of our knowledge there have been few studies conducted in Asia (Spence et al., 2010; Wadhera and Capaldi-Phillips, 2014). Moreover, understanding the Asian context could add depth to the field of knowledge. This cultural difference would influence consumer perceptions and create emotional resonance with packaging colours, making it essential for marketers to consider cultural context when designing packaging for Asian markets.

The study serves as a first step in investigating the impact of packaging colour on perceptions of snack food healthiness and tastiness in the Hong Kong context. According to the Global Savory Snacks Market Report (2021-2027), the snacks market is projected to grow from 67 billion USD in 2020 to 102 billion USD by 2028 (Research and Markets, 2021). Asian countries like Japan and Hong Kong have witnessed a rise in snack consumption over the past decade, driven by widespread availability and the influence of the pandemic in 2019 (Ng et al., 2022). The increasing demand for packaged healthier food options, the spread of convenience-driven lifestyles (Chin et al., 2024) and the continuous growth of the snack market have been well documented (McCullough et al., 2003). In Hong Kong, snack foods are also considered an important element during recess for primary and secondary school students (Cho and Chan, 2020). According to a study about the intentions of Hong Kong adolescents regarding healthy eating (Chan and Tsang, 2011), it has been reported that over 40% of students take snacks at least three times a week. This presents a challenge as food packaging can influence both attitudes and purchase decisions toward healthier choices (Pires and Agante, 2011). Understanding the impact of packaging colour can help consumers make better purchase decisions and provide tools for marketers to encourage healthier consumer choices. This research therefore aims to investigate the influence of packaging colours in the Asian context: (1) Does packaging colour influence perceptions of snack food tastiness and healthiness? (2) How does packaging colour affect the relationship between perceptions of healthiness and tastiness, and purchase decision? and (3) How are these perceptions moderated by different eating behaviours?

Literature Review

Theoretical Framework

The elaboration likelihood model (ELM), introduced by Petty and Cacioppo (1986), provides a comprehensive framework for understanding how individuals process persuasive messages and form attitudes. According to the ELM, there are two distinct routes to persuasion: the central route and the peripheral route (Petty and Briñol, 2014). The central route involves careful and thoughtful consideration of the message content, leading to more stable and enduring attitude changes. In contrast, the peripheral route relies on superficial cues, such as the attractiveness of the packaging, resulting in more automatic processing and effortless attitudes (Shiffrin and Schneider, 1977). ELM has been extensively used in consumer research (Schumann et al., 2012) to examine how various marketing stimuli, such as advertisements and product packaging, influence consumer attitudes, motivations and behaviours.

In the context of snack consumption, when consumers are less inclined to process information deeply, the peripheral route of persuasion becomes more effective (Taylor, 1999). Peripheral routes are particularly influential when consumers are not highly involved or motivated to process detailed information about a product. In the case of packaged snack foods, colour becomes the first cue noticed by consumers (Danger, 1987). Research has demonstrated that consumers frequently rely on these superficial cues to form attitudes and make quick judgments (Chandon et al., 2009).

This study uses packaging colours as peripheral cues to examine their influence on the formation of attitudes toward perceived healthiness and tastiness. In addition, it analyses two eating behaviours as motivational factors that may affect consumers' purchasing decisions.

The Psychological Effects of Colour

From ancient times, humans have associated colour with meaning. Blue, green, red and yellow appearance play an important role in the colour language (Witzel and Gegenfurtner, 2018). Recent theories on the psychological effects of colour can be divided into theories of innate physiological effects and learned cultural responses (Aslam, 2006; Elliot and Maier, 2014). Theories of colour's physiological effects posit that via the arousing or calming functions of different wavelengths of light, colour directly stimulates physiological responses (Elliot and Maier, 2014). It has been theorized that longer wavelengths of light such as red, orange or yellow have arousing effects, while shorter wavelengths such as blue or green are relaxing (Elliot and Maier, 2014).

Colour's use in advertising and product packaging can significantly affect a consumer's perception of a product. Consumers often make decisions about snack purchases based on quick impressions, a major component of which is colour (Agrawal and Singh, 2017). Colour can arouse interest in a product and significantly influence product choice (Funk and Ndubisi, 2006). It also conveys culturally specific meanings (Aslam, 2006). Therefore, the improper use of colour in different cultures can be a major marketing faux pas, conveying the wrong messages to consumers (Aslam, 2006). The ability of colour to rapidly affect and convey meaning to consumers makes it a critical

consideration in modern-day marketing.

Colour and Perceived Tastiness

With respect to food, the effect of colour on taste perception is a rich field of study. The evidence suggests that colour affects both taste expectation and perception. Several classic studies have shown that consumers had difficulty identifying the flavour of a beverage when they were unable to see its colour, while manipulating the beverage colour led the majority of participants to misidentify the beverage's flavour (DuBose et al., 1980; Stillman, 1993; Spence et al., 2010). This occurred even when participants were aware that the beverage colour might be manipulated (Stillman, 1993). Meanwhile, the package or vessel colour food is served in can also affect taste perception. Hot chocolate served in orange or dark-cream-coloured cups was perceived as more chocolatey than that served in white cups (Piqueras-Fiszman and Spence, 2012), while a strawberry-flavoured dessert was perceived as sweeter when served on a white plate than on a black one (Piqueras-Fiszman et al., 2012). Additionally, red packaging was also tested and resulted in its contents being perceived as sweeter (Huang and Lu, 2015) while yellow enhanced liking (Ares and Deliza, 2010). Moreover, red is also considered to be associative with arousal and excitement, and increases perceptions of the intensity and sweetness of food tastes (Baptista et al., 2021). The perceived sweetness imparted by red packaging (including yellow) could be explained from the ripening skin of many fruits (Spence and Levitan, 2022).

Given that colours' effects on taste seem to be moderated by the perceived appropriateness of colour for a particular food type, differences can also be expected across food categories. Foods presented in packaging of the typically associated colour are perceived to have a more intense taste and aroma compared to foods in uncoloured or atypically coloured packaging (DuBose et al., 1980; Johnson et al., 1983). The following hypothesis was proposed based on the previous findings and discussions:

H1 Snack packaging colour has a significant impact on the perception of tastiness, red and yellow would be associated with a tastier perception.

Colour and Perceived Healthiness

The widespread use of different colours in packaging to distinguish between healthy and regular versions of products indicates that marketers are also aware of an association between perceptions of healthiness and colour (Huang and Lu, 2015). The colour green on the packaging is often perceived as a signal of healthiness and naturalness (Kauppinen-Räisänen and Luomala, 2010). Like studies on colour and taste, studies on the association between health and colour have produced mixed and sometimes contradictory results. This is likely also due to the different connotations of colour across cultures. A study by Reutner et al. (2015) in Switzerland and one by Schuldt and Hannahan (2013) in the United States found red to be associated with unhealthy food and green with healthy food.

Studies have also shown that consumer mentality modulates the effect of colour on perceived healthiness. Reutner et al.'s (2015) study found that red flagging only enhanced an avoidance effect when applied to white bread (perceived as unhealthy), whereas it had little effect on brown bread (perceived as healthy). Mai et al. (2016),

experimenting with shades of food packaging colour, found that light-coloured packaging sent signals of a product being both healthier and less tasty. However, these effects were modulated by the consumption orientation of the consumer (how health-conscious they were) and the product type (healthy or unhealthy).

The promotion of healthy eating has led to the use of colours like green and blue for fresh produce, dairy and organic products (Tijssen et al., 2017). Studies also show that green packaging is strongly associated with health, while red is often linked to tastiness. One possible explanation for the relationship between green and health is the low arousal these colours (e.g., green, blue) evoke and their associations with peace and rest (van Rompay et al., 2016). According to these studies, the following hypothesis was proposed:

H2 Snack packaging colour has a significant impact on the perception of healthiness, blue and green would be associated with a healthier perception.

Mediating Effect of Snack Packaging Colour

Moreover, the relationship between colour and consumer perception extends beyond mere initial impressions. Research (Aslam, 2006) indicates that colour can serve as a mediator in the decision-making process. The concept of colour psychology suggests that consumers may develop emotional responses to different colours, which can further impact their evaluations. For instance, colours that evoke positive emotions may enhance the perceived value of a product and vice versa (Elliot and Maier, 2014). Thus, understanding how colour operates as both an antecedent and a mediator is useful for marketers seeking to optimize product packaging and branding strategies. As explored in Mai et al.'s (2016) study, there are important relationships observed between perceptions of healthiness and tastiness. Scholars have found a tendency to associate unhealthy foods with tastiness (Mai et al., 2016; Raghunathan et al., 2006). Huang and Lu (2015) also found that perceptions of sweetness are negatively correlated with perceptions of product healthiness.

Packaging colour may send both health and taste messages about food, with the dominance of these messages depending on the consumer's eating behaviour and the product category (Keller et al., 2012). In this study, colour serves as an antecedent by influencing initial consumer perceptions, such as perceived healthiness and tastiness of products (Labrecque and Milne, 2012). In addition, we will explore how colours act as mediators between perceptions of healthiness and tastiness, and how these attitudes are motivated by consumers' eating behaviours and purchase decisions. Based on the literature, the following hypotheses emerged concerning how snack packaging colour might influence the perception of healthiness and tastiness. The dual role of packaging colour also serves as a mediator to explain the relationship between perceptions of healthiness and tastiness in the following hypothesis:

H3 Snack packaging colour mediates the relationship between perceptions of healthiness and tastiness, such that higher perceptions of healthiness are associated with lower perceptions of tastiness.

External and Restrained Eating Behaviours

The responsiveness of consumers to colours in food packaging is presumably influenced by their responsiveness to external food cues in general. In eating behaviour theories developed to explain overeating, both external and restrained eating behaviours have been linked to increased sensitivity to external food cues. External eating behaviour describes a susceptibility to eating in response to external stimuli, regardless of hunger (Strien et al., 1986). This includes a tendency to want to eat in response to seeing or smelling tempting food (Strien et al., 1986). People displaying external eating behaviour have been shown to pay more attention to external food cues (Brignell et al., 2009). Moreover, according to the previous discussion on perceived tastiness, red and yellow are considered indulgence colours. The following hypothesis is proposed:

H4a The impact of red and yellow packaging colours on the perception of tastiness is stronger for high external eating behaviour than low external eating behaviour.

Restrained eating theory describes a cycle of restricted eating, causing constant hunger, and overeating. People exhibiting restrained eating behaviour are more susceptible to peripheral cues (Strien et al., 1986). While they are sensitive to health and try to control their food intake (Strien et al., 1986), the evidence shows that those with high restrained eating behaviour respond more strongly to tempting foods than those with low restrained eating behaviour (Polivy and Herman, 2017). However, restrained eating behaviour has a more distinctive response to peripheral cues. Signals suggesting that a food is healthy may prompt restrained eaters to increase their intake of that food (Polivy and Herman, 2017). Based on the literature, the following hypothesis is proposed:

H4b The impact of blue and green packaging colours on the perception of healthiness is stronger for high restrained eating behaviour than low restrained eating behaviour.

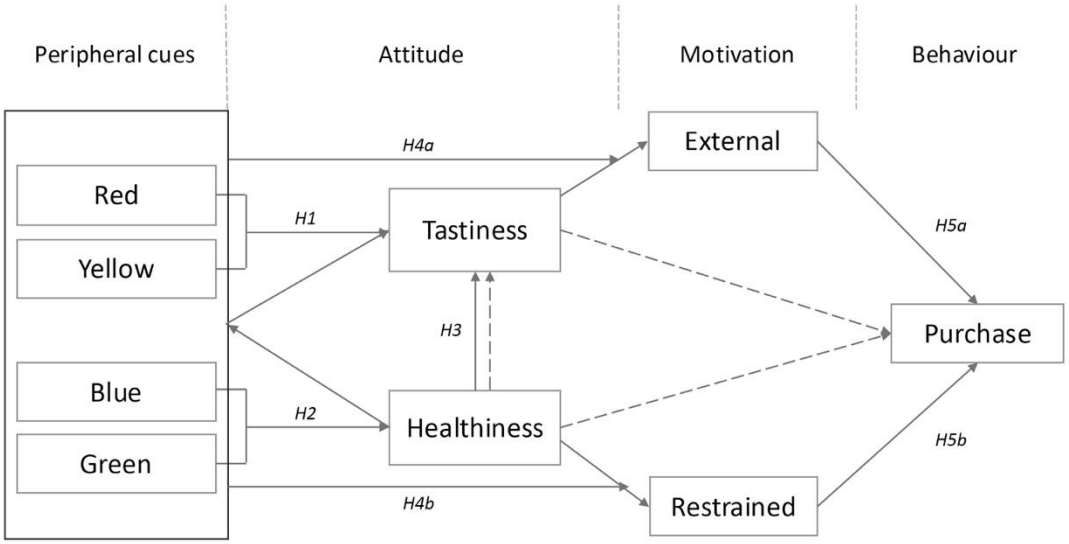
It can be supposed that both external and restrained eating behaviours are likely to lead to increased responsiveness to peripheral cues, but in restrained eating behaviour, this may also be counteracted by a response to health cues. The individual propensity for external and restrained eating behaviours moderates the impact of packaging colour on the perception of healthiness and tastiness. To get additional insights into the relationship between colours and perceptions of healthiness and tastiness, we use external and restrained eating behaviours as additional variables. This helps to test whether the relationship between colours and perceptions may change under different eating behaviours and affect purchase decision. The following hypotheses are proposed:

H5a Perceptions of tastiness positively influence purchase decisions, with external eating behaviour as a mediator and packaging colour as a moderator in this relationship.

H5b Perceptions of healthiness positively influence purchase decisions, with restrained eating behaviour as a mediator and packaging colour as a moderator in this relationship.

A conceptual framework based on the ELM was created (Figure 1) to illustrate the study on the impact of packaging colours on attitudes through the perceptions of healthiness and tastiness, motivation of external and restrained eating behaviours and behaviours of purchase decision.

Figure 1: Conceptual framework for testing the hypotheses in Peripheral cues, Attitude, Motivation and Behaviour stages



Methodology

Research Design and Procedure

The study went through an internal ethical review process by the university's Research Ethics Committee. All respondents were required to read the research information sheet and consent to participate in this study. The questionnaire was developed by the authors and edited in English and then back-translated into Chinese by a bilingual copywriter. This study used an online questionnaire to collect participants' data. The data collection was conducted from September 2021 to June 2022. The convenience data sampling collection process was conducted by university students who distributed the online questionnaire through personal networks and connections. The survey was completed via the online platform voluntarily. In total, 603 questionnaires were collected. The collected data were carefully reviewed by two research assistants to filter out those with incomplete answers and those who failed the colour validation test, resulting in a total of 509 valid responses.

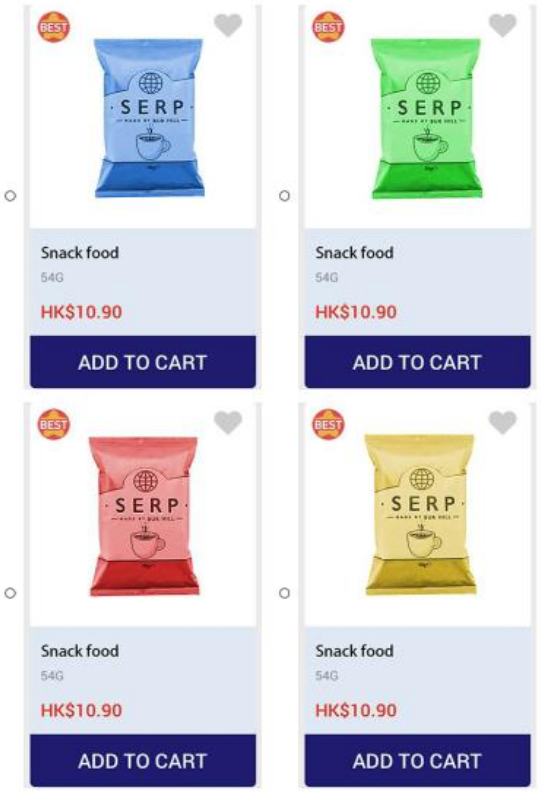
The research was designed using a within-subject experimental design. The bilingual questionnaire consisted of five parts. The first section served as a colour validation test, asking respondents to identify one of four randomly assigned colours. The second section addressed broader lifestyle choices and contained 20 randomized items used to measure restrained and external eating behaviours (Strien et al., 1986). These items were rated on a five-point Likert scale ranging from "never=1" to "very frequently=5". The consistency of the items was assessed using Cronbach's alpha, with an overall alpha of .921, indicating excellent internal consistency. The items were then combined

into composite scores for data analysis.

The third section consisted of fictitious snack food packages (shown in Figure 2) in four main colours (blue, green, red, and yellow) to serve as stimuli for testing respondents' perceptions of tastiness and healthiness. Respondents were presented with each of the four snack packages one by one, in an order assigned randomly by the system. The stimuli resembled a type of chip-like snack in four main colours. The package was designed to be a generic snack labelled with a fictional brand name such that the product would not evoke associations with existing brands (Boudreaux and Palmer, 2007). Respondents were asked to rate each packaging colour according to its healthiness and tastiness using three randomized items. These items were rated on a seven-point Likert scale ranging from "strongly disagree=1"; to "strongly agree=7"). The internal consistency of the items was assessed using Cronbach's alpha, with an overall alpha of .922 indicating good reliability of the scale. The items were then combined into composite scores for data analysis.

The fourth section asked respondents to make a purchasing decision on an imitated popular online shopping platform offered by a local supermarket. In the online shopping environment, the placement of the snack food packages was randomly rotated to avoid position bias. Respondents were required to select one of the four snacks. Finally, the fifth section collected demographic information on the respondents, including their gender, age and occupation.

Figure 2: The four snack package stimuli on an online shopping environment



Data Analysis

A within-subjects study design was employed, where each person was tested on 4 randomly assigned packages. The total number of observations was thus 2,036 (4 package stimuli x 509 respondents). The independent variables included packaging colour (within-subject, 4-level: blue, green, red and yellow); external eating behaviour (high versus low); and restrained eating behaviour (high versus low). The perceptions of healthiness and tastiness served as dependent or independent variables depending on the hypothesis being tested, while purchase decisions were the dependent variable. Multicollinearity was checked, and all tolerance values were above 0.1 and VIF values below 10, suggesting there are no multicollinearity concerns in this model.

To test the hypotheses outlined in Hypotheses H1 and H2, multivariate analysis of variance (MANOVA) in SPSS was used to analyse the effects of multiple independent variables on multiple dependent variables.

Hypothesis H3 regresses the mediate variable (packaging colours) on the dependent variable (perception of tastiness), and the independent variable (perception of healthiness) using PROCESS macro, Model 4 in SPSS for mediation analysis.

Hypotheses H4a and H4b were tested using separate MANOVA and ANOVA with packaging colour (blue, green, red and yellow) and restrained eating and external eating behaviours as the independent variables and the perception of healthiness and tastiness as the dependent variables.

Hypotheses H5a and H5b regress the mediating variables (external and restrained eating behaviours), the moderating variable (packaging colours), the independent variable (perceptions of healthiness and tastiness, respectively) and the dependent variable (purchase) using PROCESS macro, Model 7 in SPSS for the mediation analysis. Given the categorical nature of the dependent variable of purchase, multinomial logistic regression was used to examine the dataset for outliers by inspecting the standardized residuals. No significant outliers were detected.

Results

The characteristics of the sample are summarized in Table 1. The sample consisted of 509 participants, with a higher proportion of females (64.64%) compared to males (35.36%). The age distribution reveals a majority of younger individuals, particularly in the 20-24 age group (48.72%) and the 25-29 age group (13.56%), while older age groups (40+) constitute a smaller fraction of the sample. In terms of occupation, the largest segment of participants is students (55.60%), followed by white-collar workers (20.43%) and professionals (11.98%). Regarding questionnaire language, the majority (84.67%) of respondents chose to reply in Chinese, which suggests that they mostly come from Hong Kong or mainland China. This distribution indicates that the sample is predominantly youthful and primarily composed of students, suggesting that the findings may reflect the perspectives and preferences of a younger demographic regarding perceptions of healthiness and tastiness.

Table 1: Characteristics of the sample (gender, age, questionnaire language, occupation)

	Frequency (n=509)	%
Gender		
male	180	35.36
female	329	64.64
Age		
15-19	40	7.86
20-24	248	48.72
25-29	69	13.56
30-34	28	5.50
35-39	41	8.06
40-44	15	2.95
45-49	35	6.88
50+	33	6.48
Questionnaire language		
Chinese	431	84.67
English	78	15.33
Occupation		
white collar	104	20.43
professional	61	11.98
blue collar	20	3.93
student	283	55.60
other	41	8.06

In testing H1 and H2, which examine whether snack packaging colours impact perceptions of healthiness and tastiness, a MANOVA test was conducted. The results indicated a statistically significant difference in these perceptions among different colours, Wilks' $\Lambda = 0.68$, $F(6, 4062) = 146.38$, $p < 0.001$, partial $\eta^2 = 0.18$, observed power = 1.00. These findings provide strong evidence against the null hypothesis, showing that packaging colours significantly influence consumers' perceptions of both healthiness and tastiness.

Table 2 shows that packages with red and yellow colours (means = 5.25 and 4.09, respectively) were rated as significantly tastier than those with blue and green colours (means = 3.30 and 3.16, respectively). Univariate test results for tastiness revealed significant differences between all four colours, $F(3, 3108.69) = 304.95$, $p < 0.001$, partial $\eta^2 = 0.31$, observed power = 1.00. Similarly, packages with blue and green colours (means = 4.21 and 4.41, respectively) were rated as significantly healthier than those with red and yellow colours (means = 3.50 and 4.30, respectively). Univariate test results for healthiness also showed significant differences between all four colours, $F(3, 1023.57) = 156.24$, $p < 0.001$, partial $\eta^2 = 0.19$, observed power = 1.00. These results suggest that packaging colour significantly affects perceptions of healthiness and tastiness, thus supporting H1 and H2.

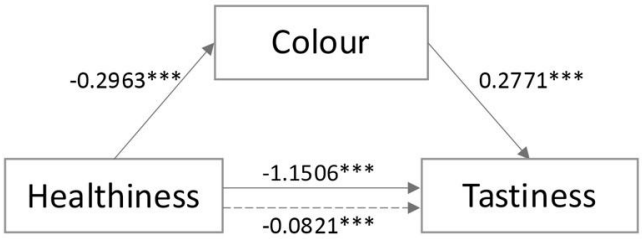
Table 2: MANOVA results in colours and perceptions of tastiness and healthiness

Measure	blue		green		red		yellow		*F(3,2032)*	η2
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*		
Tastiness	3.30	1.23	3.16	1.26	5.25	1.24	4.09	1.22	304.95***	0.31
Healthiness	4.21	0.70	4.41	0.78	3.50	0.69	4.03	0.67	156.24***	0.19

Notes: * Indicates significance at the p < 0.05; (**p, 0.01; ***p< 0.001) level of confidence

For H3, mediation analysis (see Figure 3) showed that the perception of healthiness negatively predicted packaging colour (β = -0.2963, p < 0.001), while packaging colour positively affected the perception of tastiness (β = 0.2771, p < 0.001). The indirect effect of healthiness on tastiness through packaging colour was significant, with confidence intervals based on 5,000 bootstrap samples (β = -0.0821, 95% CI [-0.1009, -0.0649]). Additionally, healthiness had a significant direct effect on tastiness in the mediation model (β = -1.1506, p < 0.001), indicating partial mediation. The model accounted for 65% of the variance in the dependent variable. Thus, H3 is supported, showing that higher perceptions of healthiness correspond to lower perceptions of tastiness, providing valuable insights for marketers and health professionals.

Figure 3: Mediation analysis of colour and the perceptions of healthiness and tastiness



Note: *p≤0.05, **p≤0.01, ***p≤0.001

For H4a and H4b, to understand the relationships between different packaging colours (Col) and the propensity for restrained and external eating behaviours, two MANOVAs were also conducted to examine the effects of packaging colour, restrained (R_HL, high vs low), and external (E_HL, high vs low) eating behaviours on respondents' perceptions of healthiness and tastiness.

The results listed in Table 3 indicate a significant multivariate effect of packaging colour and restrained eating behaviours, Wilks' Λ =0.96, F(6,4054)=14.14, p<0.001, partial η2=0.02. This result suggests that the packaging colour and restrained eating behaviours significantly affected respondents' perceptions of healthiness. The mean healthiness ratings of high restrained eating behaviour versus low restrained eating behaviour for packages with blue and green colours were 4.43, 4.55, 4.04, and 4.30, respectively. In short, H4a is supported: respondents with high restrained eating behaviour perceived blue and green colours as healthier than those with low restrained eating behaviour.

Likewise, with the results for the relationship between packaging colour and external eating behaviours, Wilks' Λ =0.97, F(6,4054)=10.65, p<0.001, partial η2=0.01. This

result also suggests that the packaging colour and external eating behaviours (high or low) significantly affected respondents' perceptions of tastiness. The mean tastiness ratings of high external eating behaviour versus low external eating behaviour for packages with red and yellow colours were 5.54, 4.96, 3.99, and 4.18, respectively. The results showed that red was perceived as tastier by respondents with high external eating behaviour compared with low external eating behaviour. However, yellow was perceived as tastier by respondents with low external eating behaviour instead. Thus, H4b is only partially supported.

Table 3: Relationships between the effects of colours on perceptions of healthiness/tastiness and propensity for restrained/external eating behaviours

Effect	Wilks' Λ	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power
Col	0.65	159.56	6	4054	<.001***	0.19	957.36	1.00
R_HL	0.99	13.62	2	2027	<.001***	0.01	27.23	0.99
Col * R_HL	0.96	14.14	6	4054	<.001***	0.02	84.89	1.00
Col	0.67	151.31	6	4054	<.001***	0.18	907.91	1.00
E_HL	1.00	2.98	2	2027	0.051	0.00	5.97	0.58
Col * E_HL	0.97	10.65	6.	4054	<.001***	0.01	63.94	1.00

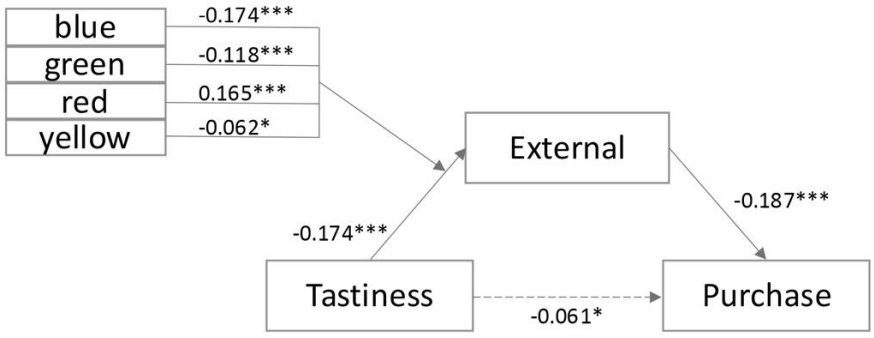
Notes: df = degrees of freedom and Sig. = significance level. * Indicates significance at the $p < 0.05$; (**p, 0.01; ***p< 0.001) level of confidence. Col = Colour; R_HL = restrained eating behaviour (high versus low); E_HL = external eating behaviour (high versus low)

Two mediation analyses for testing H5a and H5b were conducted to examine the mediating role of external eating behaviour and restrained eating behaviour in the relationship between perception of healthiness and tastiness towards purchase decision separately.

The first mediation analysis explored the relationship between tastiness and purchase behaviours using external eating behaviour as a mediator and packaging colour as a moderator (multicategorical) to see if perception of tastiness impacts purchase decision, and how the relationship might be mediated and moderated by external eating behaviour and colour respectively. The results displayed in Figure 4 indicated that higher tastiness causes lower external eating behaviour (β=-0.174, p<0.0001). Moreover, all of the categorical colour moderators were significant in their interaction with tastiness, showing negative relationships in blue (β=-0.174, p<0.001), green (β=-0.118, p<0.001) and yellow (β=-0.062, p<0.044), while red had significant positive interaction (β=0.165, p<0.001). Additionally, external eating behaviour also displayed a negative effect on purchase behaviours (coefficient = -0.187, $p < 0.001$), suggesting that increased external eating behaviour is linked to decreased purchase. The direct effect of tastiness on purchase behaviours was negative (β=-0.061, p<0.049), indicating a negative relationship between perception of tastiness and purchase decision. The

results highlight that perception of tastiness has no influencing power on purchasing decisions, particularly in external eating behaviour groups. Thus, H5a is not supported.

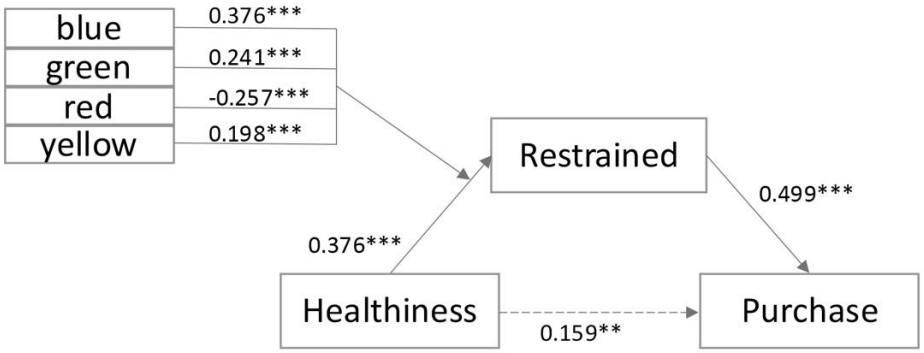
Figure 4: Mediation analysis of external eating behaviour and the perception of tastiness and purchase decision



Note: *p≤0.05, **p≤0.01, ***p≤0.001

The second mediation analysis explored the relationship between healthiness and purchase behaviours, using restrained eating behaviour as a mediator and packaging colour as a moderator (multicategorical) to see if healthiness impacts purchase decision, and how the relationship might be mediated and moderated by restrained eating behaviour and colour respectively. The results displayed in Figure 5 indicate that higher healthiness significantly increased restrained eating behaviour (coefficient = 0.376, $p < 0.0001$). Moreover, all of the colour categorical moderators were significant in their interaction with healthiness, particularly strong in blue ($\beta=0.376$, $p<0.001$), green ($\beta=0.241$, $p<0.001$), and yellow ($\beta=0.198$, $p<0.001$), while red had significant negative interaction ($\beta=-0.257$, $p<0.001$). Additionally, restrained eating behaviour had a strong positive effect on purchasing behaviours ($\beta=0.499$, se=0.59, $z=8.514$, $p<0.008$), which suggests that an increased restrained eating behaviour is linked to increased purchase behaviours. The direct effect of healthiness on purchase behaviours was significant ($\beta=0.159$, $p<0.008$), which indicates a significant relationship between healthiness and purchase decision. The results highlight the importance of healthiness in influencing purchase decisions, particularly in restrained eating behaviour groups. Thus, H5b is supported.

Figure 5: Mediation analysis of restrained eating behaviour and the perception of healthiness and purchase decision



Note: *p≤0.05, **p≤0.01, ***p≤0.001

Overall, these findings provide a good first step in understanding how the perception of healthiness and tastiness is influenced by packaging colour and the propensity for restrained and external eating behaviours in mediating perceptions and purchase decisions. Further research is needed to confirm these findings and explore other potential mediators of the relationships between the perception of healthiness, the perception of tastiness, and purchase decisions.

Conclusion and Discussion

The key findings of this study provide insights from a youthful sample into how the role of packaging colour in consumer attitudes toward perceptions of healthiness and tastiness, and consumers' eating behaviour, serve as motivation variables for snack purchase. According to the conceptual framework, attitudes toward snack packaging are shaped during a lower level of cognitive information processing, where elaboration likelihood of information relies on superficial cues, as outlined in the ELM (Petty and Cacioppo, 1986). According to the literature, consumers often rely on peripheral cues from the snack packaging and make purchase decisions quickly. Therefore, a lack of understanding of consumer attitudes and motivations poses significant risks and potential costs for marketers. Colour signals are one of the most important visual devices for communication in the consumption process and helping products stand out among competitive options. The understanding and appropriate use of colour cues could promote informed consumer decisions and mitigate financial losses associated with stagnating sales.

Overall, this study supports the proposed hypothesis that packaging colour influences consumers' perceptions of the healthiness and tastiness of snacks. Consumers may perceive products with green and blue packaging as healthier options, while products with red and yellow packaging may be seen as more delicious or appetizing.

This study also supports the previous research (Mai et al., 2016) that suggests a common perception that "healthier products are less tasty". This presents a challenge for snack food packaging, as general consumers would desire snacks that are both healthy and tasty. Although there are varying levels of perceived tastiness, the notion that healthier

snacks may be perceived as less tasty could lead to a decline in purchases due to inappropriate packaging colours.

Moreover, blue and green packaging appeals to individuals with high restrained eating behaviour. In contrast, red and yellow packaging influences individuals with high external eating behaviour to perceive the packaged snacks as tastier. These findings reinforce the importance of targeted marketing strategies. Interestingly, this study found that yellow is the colour that was perceived as both healthy and tasty by individuals with low restrained eating behaviour. Hence, the effective use of yellow could present a promising option for marketers and designers to balance the contrasting perceptions of healthiness and tastiness.

The results of this study indicate that red is perceived as the least healthy yet tastiest colour in packaging for individuals with external eating behaviour. This finding suggests that respondents tend to choose less tasty snack options during the purchasing process, and also indicates that conveying a healthy image is more important for respondents. The study also shows that external eating behaviour has a significant negative relationship with purchase decisions; hence, tastier options do not necessarily boost purchases. Conversely, restrained eating behaviour has a direct relationship with purchases. Packaging colours such as blue, green and yellow have significant positive interactions with perceived healthiness among those with restrained eating behaviour, leading to increased purchases.

In conclusion, this study illustrates how the ELM is applied to consumer perceptions of snack packaging colour and its impact on purchasing decisions. It reveals that consumers often engage in low-level cognitive processing, relying on superficial cues like packaging colour to form attitudes about healthiness and tastiness. Colours such as green and blue are linked to perceptions of healthiness, while red and yellow evoke tastiness. The findings suggest that marketers can use blue and green strategically to influence consumer decisions, particularly among different eating behaviours in a health-conscious era, thereby enhancing the effectiveness of their packaging strategies.

Limitations and Further Research

While this study provides insights and contributes to the existing literature, it is important to acknowledge its limitations. First, the use of fictitious packages may not fully represent every snack category. Different types of snacks may elicit different associations and perceptions, which could impact the role of packaging colour. Further research could consider testing different snack categories such as confectionery to examine the generalizability of the findings.

Secondly, the study utilized an online questionnaire, and the purchase decision was made based on an online shopping environment. It is important to recognize that the colour perception of respondents may vary depending on the monitors they use to view the stimuli. Future research could consider conducting experiments in physical store settings to further validate the impact of packaging colours on consumer perceptions and purchase decisions.

Further research could explore additional variables or factors that may interact with packaging colour and influence perceptions and the purchase decision process. Snack

packaging encompasses various design elements, such as graphics, fonts and imagery, in addition to colour. Acknowledging this limitation, future research could explore a more comprehensive representation of snack packaging to gain a deeper understanding of the role of packaging colour in purchase decisions.

Practical Implications for Asian Business

Asian markets are incredibly diverse, with distinct cultural associations linked to colours. Cultural sensitivity in colour choices is essential; for example, while green may universally signify healthiness, blue could be a favourable alternative for marketers, especially to avoid overwhelming consumers with excessively green products. In many Asian cultures, red symbolizes good fortune and celebration. Marketers could strategically incorporate red into their green- and perhaps blue-packaged healthy snack products to enhance the perception of tastiness, particularly during festive occasions such as Chinese New Year and Mid-Autumn Festival. By aligning packaging colours with festive consumer preferences, companies can create deeper emotional connections, enhancing brand loyalty and product appeal.

As health and wellness become greater priorities for Asian snack consumers, brands can enhance their packaging strategies by using health-associated colours and offering portion-controlled formats, such as multi-packs. This study indicates that green and blue colours resonate particularly well with health-conscious consumers, especially among individuals with high restrained eating behaviour who are more sensitive to health and food intake. Marketers can take advantage of more targeted strategies and communicate health benefits effectively, such as placing blue- and green-packaged snacks in gyms or similar health-related facilities, where consumers are more likely to go for healthier options. Moreover, strategically placing blue and green packaging on the shelves of supermarkets or convenience stores can synergise the power of colour during consumers' quick purchases.

However, the negative correlation between perceptions of healthiness and tastiness presents a unique challenge for marketers. Striking a balance between these perceptions is crucial. Based on this study's findings, using yellow in packaging can enhance perception of tastiness while also conveying a sense of healthiness. An astute use of yellow in snack packaging could attract a broader audience, appealing to both health-conscious consumers and those seeking indulgent snacks.

Additionally, an integrated marketing communication campaign can provide knowledge to customers. By leveraging the concept of the ELM, innovative marketing strategies can be developed along the persuasion route by utilizing both central and peripheral cues of persuasion. While consumers rely on peripheral cues during snack selection, integrating social media communication showcasing customer experiences and testimonials can encourage deeper cognitive processing of detailed product information and foster brand loyalty.

Generally, understanding of the various eating behaviours prevalent in Asia can significantly aid businesses in tailoring their marketing strategies. For example, targeting urban millennials who prioritize healthiness can be effectively achieved through minimalist blue and green packaging that emphasizes organic ingredients. In

contrast, when conducting marketing activities in a more leisurely environment like movie theatres, it may be necessary to include more vibrant packaging that highlights taste and enjoyment. By segmenting their audiences, businesses can deliver targeted marketing messages, thereby increasing the likelihood of purchase.

Moreover, with the increasing concern for sustainability among consumers, businesses should consider eco-friendly packaging options with the right packaging colours that align with health-conscious branding. Utilizing recyclable materials and prominently showcasing these efforts in packaging design can enhance brand image and attract environmentally aware consumers. This approach not only addresses consumer preferences but also positions the brand as a responsible market player.

In summary, this study provides some insights for marketers to use strategically. Marketers can first relate their existing packaging strategies to the study and then refine their packaging and marketing strategies to resonate more effectively with consumers. Marketers can improve their consumer engagement by adopting digital and social media communication, integrating online and offline marketing strategies to drive consumers to the purchase decision and drive sales growth in an increasingly competitive marketplace. As consumer preferences continue to evolve, adaptability and a keen understanding of market dynamics will be essential for sustained success and to ensure that products stand out in the crowded snack food category.

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