INFLUENCES OF VISUAL ATTRIBUTES OF FOOD PACKAGING ON CONSUMER PREFERENCE AND ASSOCIATIONS WITH TASTE AND HEALTHINESS

Abstract

Two experiments designed to investigate how the shape and colour of packaging, and product category, conjointly impact consumers' product and packaging expectations are reported. In Experiment 1, the shape (rounded vs. angular) and visual appearance (greyscale, red-to-yellow, and blue-to-green colour schemes) of the packaging were manipulated. Dependent measures were preference (willingness to purchase the product, how attention-capturing the packaging is, and the pleasantness of the design) and any taste associations. In Experiment 2, shape (rounded vs. angular), colour (red-to-yellow vs. blue-to-green colour schemes), and product category (buttery vs. cereal cookies) were manipulated. In this case, the dependent measures were the perceived product healthiness and the preference of consumers. The results of Experiment 1 revealed that packaging colour influenced product preference. Red-to-yellow and blue-to-green colour schemes and angular packaging were preferred over greyscale and round packaging. Colour also influenced taste associations, while shape only influenced ratings of expected sweetness. In Experiment 2, packaging shape and product category influenced product preference. In particular, rounded packaging and the packaging of buttery cookies were preferred over angular packaging and the cereal cookies packaging. The healthiness of the product was rated higher for the rounded and red-to-yellow packaging containing a buttery product. Taken together, these results highlight the important role played by colour, shape, and category on the expectations and associations elicited by viewing product packaging.

Keywords - Consumer Experience, Packaging Design, Shape, Colour, Perception, Product Expectations.

Introduction

The 'language' of visual stimuli and its design aspects have been studied since at least the birth of the Bauhaus in the early 20th century (Lupton and Miller, 2008). As highlighted by Da Cruz Landim (2010), design works by managing people's perception, using established strategies to influence visual expectations that thereafter may affect the consumer's product experience (see Gómez, Martín-Consuegra, and Molina, 2015; and Piqueras-Fiszman and Spence, 2015, for a review). In addition, and as discussed by Aktas, Tas, and Gürgah (2016), visual clues on the packaging may help people remember brand names and products.

Several consumer studies have focused on design elements of product packaging, such as shape and colour, in order to try to positively influence the consumers' expectations/experience of a given product (e.g., Fenko *et al*., 2016; Rebollar *et al*., 2012; *Tijssen et al*., 2017; Velasco *et al*., 2014; Westerman *et al*., 2013). This study contributes to the existing literature by simultaneously manipulating packaging shape, packaging colour, and product category. Although there is not a clear and highly consistent basis on which to draw any hypotheses concerning the possible interaction effects that might be seen across the manipulated variables, color and shape might be expected to operate additively. Here we report on two experiments designed to measure the combined influence of the packaging shape (round vs. angular), the visual appearance of the packaging (grayscale, blue-to-green, or a red-to-yellow colour palate), and product category (buttery cookies vs. cereal cookies) in setting

people's product expectations (preference, taste associations, and expected healthiness of the product).

In the literature, measures of preference and willingness-to-buy, or willingness-to-pay, are typically used interchangeably. Therefore, preference was measured on three scales: Preference for the packaging, attractiveness of the packaging design, and willingness-to-buy. In our first study, the within-participant independent variables were the shape of the packaging (angular vs. rounded) and the visual appearance of the packaging (greyscale images, red-to-yellow, and blue-to-green colour palates). The dependent measures were preference and taste associations. In the first experiment, we deliberately chose to use generic packaging formats/images without any clearly-defined associations with a given product category. This was done in order to try and gather generalizable data that would not be restricted to a specific type of food. In a second experiment, the within-participant independent variables were shape (angular vs. rounded), colour (red-to-yellow vs. blue-to-green), and product category (buttery vs. cereal cookies). The dependent measures were preference and expected product healthiness. With the objective of making the packaging more realistic, we identified fictitious cookies as the product category. We created buttery and cereal cookie packages by adding the product category to the anonymous images used in Experiment 1. The main studies giving rise to our specific hypothesis are summarized below.

Literature Review and Hypothesis

In order to study how packaging graphics influence consumer behaviour, Westerman *et al*. (2013) manipulated the labels appearing on bottles of water and vodka so as to study the consequences of varying the shape angularity, orientation, and left-right alignment. The results revealed that participants expressed a preference for rounded shapes and for upward-pointing orientation forms on the front of the packaging. Furthermore, the interaction between these variables suggested that people would probably be more inclined to buy the products that had a congruence between graphical and product form. The authors also identified that participants' evaluation of non-experiential constructs (e.g., taste) were influenced by the manipulations of the visual attributes of the packaging.

Velasco *et al*. (2014) studied how rounded vs. angular shapes, typefaces, brand names, and high- vs. low-pitched sounds could be combined to set expectations concerning a product's dominant taste (namely, sweet vs. sour). The results revealed that "sweet tastes" were better expressed by means of rounded shapes, rounded typefaces, rounded names, and relatively low-pitched sounds, whereas "sour tastes" were associated with angular shapes, angular typefaces, angular names, and relatively higher-pitched sounds.

Elsewhere, Rebollar *et al*. (2012) evaluated the influence of packaging colour and shape on people's expectations concerning chewing gum and their willingness to buy this product. The shape of the packaging influenced people's expectations concerning the product's functional, experiential, and sensory (textural) attributes, while its colour was found to influence the expected overall experience and expected taste. The researchers found that notions of preference based on shape may have been influenced by past experiences (i.e., by associative learning). Rebollar *et al.*'s results also indicated that the relationship between shape and willingness to buy was less significant than the relationship between willingness to buy and colour.

More recently, Fenko, Lotterman, and Galetzka (2016) investigated the effects of unknown brand names, packaging shapes (rounded vs. angular) and product types (butter vs. muesli cookie) on perceived product healthiness (low vs. high), taste expectations, product

evaluation, and purchase intent. The participants in this study thought that muesli cookies and cookies in angular packaging to be healthier than buttery cookies and those presented in round packaging. In this sense, it is possible to understand that packaging shape and product type influenced people's expectations regarding how healthy the products would be. Furthermore, the results indicated that brand name familiarity (known vs. unknown) exerted no effect on consumers' expectations. That said, the congruent combination of shape and brand name (Ramune butter cookie and Asahi muesli cookie), was preferred over incongruent combinations (Ramune muesli cookie and Asahi butter cookie). The latter finding led the authors to conclude that considering the congruence between product type, brand name, and packaging design is important when creating a successful brand strategy is concerned.

Tijssen *et al*. (2017) obtained similar results when studying various combinations of packaging colour (hue, brightness and saturation) and how consumers associated the manipulated packaging with the healthiness of the product and attractiveness of the packaging. First, the researchers manipulated packaging hue (dairy drink: blue, purple, red; sausage: blue, green, or red), brightness (high, low), and saturation (high, low), using 2D packaging images. In a second experiment, images of the packaging were transformed into 3D 360-degree rotating animations. An experimental design for hue (blue and red for a dairy drink and sausage), level of brightness (high vs. low), and saturation level (high vs. low) were used. The overall results from the two experiments revealed that packaging colour played an important role in terms of setting both participants' sensory expectations (e.g., expected sweetness, flavour intensity) and actual sensory evaluation (tasting) of the food products. The authors used a variant of the Implicit Association Test (IAT) in order to measure the strength of associations between packaging colour and perceived attractiveness and healthiness of the products (cf. Parise & Spence, 2012). The results indicated that by combining hue, brightness, and saturation with less vibrant, watered-down packaging colours, stronger associations with 'healthiness' were made in the mind of the consumers, when compared to attractiveness to the product. The results also indicated that none of the colour properties (hue, brightness, or saturation) rendered packaging to be more attractive and/or enhanced people's sensory perception when seen in isolation. It was only when combined with one another that improvements were seen (e.g., *"red hue combined with high saturation increased perceived flavour intensity and sweetness and creaminess in the dairy drink";* Tijssen *et al*., 2017, p. 55).

Based on the literature review, some conclusions can be drawn, also generating the hypotheses that were tested in our experiments:

a) Consumers generally prefer rounded-shaped packaging (Velasco *et al.*, 2016; Westerman *et al.*, 2013). Therefore, (H1) packaging shape will influence product preference, with rounded shapes being preferred over angular shapes.
b) Rounded-shaped packaging are usually associated with sweet-tasting flavours, while angular-shaped packaging is more commonly associated with sour-tasting flavours (Velasco *et al.*, 2014). These conclusions suggest that (H2) packaging shape will influence the expected taste of the product, because the rounded (as compared to the angular) packaging will be more related to sweet than sour, salty, or bitter tastes.
c) Warm-coloured packaging is preferred over packaging designed with other colour schemes (Rebollar *et al.*, 2012). Therefore, (H3) packaging colour will influence preference (willingness to buy the product, how much the packaging attracts the consumer's attention, and the pleasantness of the design), with red-to-yellow packaging being preferred over the blue-to-green and greyscale packaging. Additionally, packaging colour will present an influence on taste associations, because hues tend to be attached with specific tastes, with red-to-yellow evoking more associations to the

sweet taste than the packaging in other colours palates (H4) (see also Saluja & Stevenson, in press).

d) Angular-shaped packaging is associated with healthy products (Fenko, Lotterman, and Galetzka, 2016). Sweet food is usually seen as less healthy than food with other tastes, such as salty and bitter. These assumptions suggest that packaging shape will influence perceived healthfulness, with rounded packages being perceived as containing a product that is less healthy than the angular packaging (H5).
e) Warm colours are associated to sweet flavour (Rebollar *et al.*, 2012). Because sweet food is usually perceived as less healthy, red-to-yellow packaging to be more related to sweet tastes, while blue-to-green packaging would be more strongly associated with healthier foods (H6).

Experiment 1

Methods

Experiment 1 was designed to test H1 to H4. Packaging shape (angular vs. rounded) and the visual appearance of the packaging (greyscale, red-to-yellow, and blue-to-green) were crossed in a 2x3 within-groups experimental design. Given that the greyscale images were rated differently from the coloured packaging, we can be reasonably certain that our participants interpreted the former as greyscale packaging (i.e., and did not think of it as a black-and-white picture of an otherwise colourful product). The dependent measures were preference for the product/packaging (willingness to purchase the product; how much the packaging attracted the consumer's attention, according to their own evaluations; and the pleasantness of the packaging design) and taste association (sweet, sour, bitter, or salty), to identify if one of the four would be associated to a specific packaging. As far as possible, the product packaging was designed so as not to be strongly associated with any particular product category (see **Figure 1**). The idea here being that this would allow us to assess any associations between packages and tastes, independent of the specific product that might be contained within.

A total of 50 participants (37 females), with a mean age of 27 years (SD=5.0 years), were approached via e-mail through the researchers' networks in Brazil. Those with a design background were excluded (cf. Becker *et al.*, 2011). The participants accessed the questionnaire via a link that redirected them to a Survey Monkey website where they could answer the questions anonymously and rate the statements to measure the dependent variables. Consent was acquired tacitly, that is, by answering the questionnaire, the participant allowed the use of the information by the researchers, in accordance with the Brazilian ethical resolutions for such studies (see Novoa, 2014).

After introductory questions (gender, age, and academic background), the participants were presented with one product packaging image at a time, and statements about the products/packaging were rated directly after viewing each one. Note that the participants did not have access to all of the images at the same time, nor could they go back to the previous image after having rated the statements. The six images were presented in a random order.

Preference was evaluated by means of three statements, adapted from Westerman *et al.* (2013): 'I would purchase this product'; 'This design is attention grabbing'; and 'This design is pleasing'. Agreement with each statement was measured on a Likert scale from 1 (completely agree) to 5 (completely disagree). Taste associations were also measured (adapted from Rebollar *et al.*, 2012). The participants evaluated the degree to which they associated each

package with a specific taste quality (sweet, salty, bitter, and sour), using a Likert scale of 0 (not at all) to 10 (completely).

Results

A factor analysis was used to evaluate if the three items to measure preference (willingness to purchase the product, how much attention the packaging draws from the consumer, and the pleasantness of the packaging design) could be reduced to a smaller number of key factors. The results revealed a single factor, explaining 81.1% of the total variance. All of the items had a factorial charge from 0.88 to 0.91 in this single factor, and communalities were between 0.78 and 0.83. Cronbach's Alpha for the three preference items was 0.88. Therefore, the three items can be seen as single measure, and hence from now on the results are presented as a sole dependent variable defined as "preference". Preference was treated as a new variable, resulting from the mean of the three items.

Table 1 shows means and standard deviations of preference, divided by packaging characteristic (shape and colour).

Packaging colour influenced people's responses to preference [$F(2,39)=38.75$, $p<0.001$]. The red-to-yellow and blue-to-green packaging were rated more highly in terms of purchase intention than the greyscale packaging exemplars ($p<0.001$ in both cases; Table 2 presents means and standard deviations of taste associations to the packaging).

The analysis revealed a significant main effect of packaging colour on the association with sweet taste ($F(2,48)=11.25$, $p<0.001$), with the red-to-yellow and blue-to-green packaging being rated higher in terms of expected sweetness than the greyscale packaging. However, there was no difference between the first two colourful packaging exemplars. There was also an effect of shape on the strength of the sweet taste association [$F(1,49)=5.0$, $p<0.05$], with the angular packaging surprisingly being assigned a higher score in terms of expected sweetness than the more rounded packaging.

Packaging colour influenced the association with the sour taste [$F(2,48)=8.39$, $p=0.001$], with the blue-to-green packaging scoring higher in terms of expected sourness than the greyscale and red-to-yellow packaging. The latter two packaging exemplars did not differ significantly from one another. Packaging colour impacted the strength of the associations with the salty taste [$F(2,48)=3.42$, $p<0.05$], with the red-to-yellow packaging scoring higher in terms of expected saltiness than the blue-to-green packaging. There was no significant difference between the greyscale packaging and either of the coloured exemplars of product packaging.

Discussion

In summary, it was hypothesized that packaging shape would influence consumer's preference (H1). Westerman *et al*. (2013) used packaging that had a clearly identified product category. Differently, in this specific experiment, the results indicated that the packaging shape failed to affect consumer preference when the packaging lacked a clearly identified product category.

As predicted by H3, packaging colour influenced people's expected product preference. The colourful (i.e., red-to-yellow and blue-to-green) packaging was rated more highly than the greyscale packaging, across all three statements. Because no differences between the two-colour palates were detected, the second part of H3, concerning how red-to-yellow would be preferred over the other two packaging colour schemes, was not supported.

The results of Experiment 1 also provide support for H2, in which we believed that packaging shape would influence expected taste. The results of the experiment indicated that it only influenced participants' associations with a sweet-tasting product. We also hypothesized that the rounded packaging would be more related to the sweet taste. However, the results revealed that with the specific packaging exemplars tested here, angular packaging was rated as sweeter than the rounded packaging. In relation to H4, packaging colour influenced all taste associations. Excepting the bitter taste, there were strong associations between tastes and packaging colour schemes. Specifically, both the red-to-yellow and blue-to-green packaging were more strongly associated with sweetness than was the greyscale packaging. Meanwhile, the blue-to-green packaging was most strongly associated with the sour taste, while the red-to-yellow packaging was more strongly associated with a salty tasting product.

We developed our second experiment with these results in mind, wanting to further test our hypotheses. We manipulated the images from the first experiment by adding information concerning the product category (buttery vs. cereal cookies) to the outside of the packaging. Furthermore, because the greyscale presented lower ratings than the two colourful packaging exemplars and because such packaging schemes (at least as pure B&W designs) are not currently widely used in the marketplace in Brazil where the study was conducted, we didn't include it in our second experiment. The participants answered the same three statements from the first experiment about preference as well as six new items on expected healthiness of the products.

Experiment 2

Methods

We again tested H1 (packaging shape will influence product preference, because rounded shapes will be preferred over angular ones). We also tested H5 (packaging shape will influence perceived healthfulness, with rounded packages being perceived as containing a less healthy product than the angular packaging) and H6 (red-to-yellow packaging will be more related to sweet tastes, while blue-to-green packaging would be more strongly associated with healthier foods).

Packaging shape (angular vs. rounded), packaging colour (red-to-yellow vs. blue-to-green), and product category (cereal vs. buttery cookies) were crossed in a 2x2x2 intra-groups experiment design. Expected healthiness and preference were the dependent measures. In contrast to Experiment 1, a specific product category was used in the packaging shown to the participants in Experiment 2. Although our initial idea in Experiment 1 had been to try to avoid evoking consumer associations with specific product categories, it is complicated to ensure that this is, in fact, always the case, because packaging shapes and colours may be often related to specific products by consumers (based on their prior experience from the marketplace; see Velasco *et al.,* 2016, for a review). Therefore, we decided to use similar images from the previous experiment, but now indicated the specific product category on the packaging itself.

To choose the type of font and placing of the information, a mood-board was created based on several existing cookie packages that one can find in the international marketplace. We searched for images via Google, using the words "package" and "cracker", as well as their variations in Portuguese - "*pacote*" and "*bolacha*" - and in German - "*cracker*" and "*verpackung*". Based on this search, a free italic font was used, because this was the type used in 42% of the packaging found in our online search. The gently inclined arrangement of the fonts was also observed in the mood-board. Because the experiments were conducted in Brazil,

the text used in the packaging is written in Portuguese. The final eight packages that were used in the experiment are shown in Figure 2.

The sample consisted of 102 new individuals (58 females) with a mean age of 40 years (SD=15). Sampling and procedures for data collection were the same as in Experiment 1. An additional question was used to identify and exclude those who had taken part in Experiment 1.

After viewing each image, the participants reported their agreement with the same three items concerning product/packaging preference as used in Experiment 1. Six additional new items were also added to this experiment in order to evaluate the expected healthiness of the contents of the packaging. The latter items were adapted from Fenko, Lotterman, and Galetzka's (2016) study: *"I expect this product to be healthy; I would consider this product as good for me; The product looks healthy; This product looks low on calories; I have an impression that this product is healthy; This cookie seems to be healthier than other similar cookies"*. Following the same pattern as for the other statements, the agreement with each statement was measured on a Likert scale from 1 (completely agree) to 5 (completely disagree).

Results

As in Experiment 1, a factor analysis was used to reduce the three items used to measure preference and check whether they would also associate with a single factor. The analysis resulted in one factor, which explains 76.9% of the total variance. All items have charged from 0.84 to 0.90 in this single factor, and communalities are between 0.71 and 0.80. Cronbach's Alpha for the three preference items is 0.85, indicating that "preference" can be analysed as single variable. Preference was treated as a new variable, resulting from the mean of the three items (willingness to purchase the product, how attention-capturing the packaging was, and the pleasantness of the packaging design). Table 3 shows the mean preference statement responses given by the participants.

Packaging shape impacted preference ($F(1,101)=9.864$, $p<0.01$). The rounded packaging was preferred over the angular one ($p<0.01$). Product category also impacted preference ($F(1,101)=12.178$, $p<0.01$). The buttery cookie was preferred over the cereal one ($p<0.001$).

Table 4 presents the complete results concerning the statements given by the participants concerning their expected healthiness of each product/packaging. A factor analysis reduced the six items to one factor that could be used to assess how healthy a product appears to be. This sole factor explains 79.5% of the variance. All items have factorial charge from 0.81 to 0.93 in this factor, and communalities are between 0.65 and 0.86. Cronbach's Alpha for the three preference items is 0.95.

The evaluation of how healthy a product packaging appeared was influenced by packaging colour [$F(1,101)=10.74$, $p<.001$] and shape [$F(1,101)=6.776$, $p<.05$], and product category [$F(1,101)=86.218$, $p<.001$]. No interaction effects were detected. Packaging designed in red-to-yellow colour scheme ($p<.001$), in rounded shape ($p<.05$), and containing buttery cookies ($p<.001$) were rated higher in expected healthiness of each product/packaging.

Discussion

In summary, the shape of the product packaging exerted a significant influence over participants' preferences. The rounded packaging was rated higher than the angular packaging. The buttery cookies also scored higher than the cereal cookies. These results allow us to accept H1, because shape influenced product preference, when a product category was identified.

Packaging colour and shape influenced our Brazilian participants' associations with product healthfulness. When thinking about our H5, these results do not corroborate hypothesis that products in angular-shaped packaging are perceived as healthier than the ones in rounded-shaped packaging. We also hypothesized that blue-to-green packaging would be related to healthier foods (H6), but our results go against this view, because angular packaging containing buttery cookies had a higher mean rating than the other packaging.

Conclusions

It was assumed that round packaging would be preferred to angular packaging by consumers (H1). Based on experiments with identified product categories (e.g., Westerman *et al*., 2013; Simmonds and Spence, 2016), a consumer preference for rounded shapes has previously been reported. This suggests that having a defined product category may have influenced the results, because it would ground the studied packaging, corroborating with the idea proposed by Silayoi and Spence (2007): people usually are fonder of the shapes that are already known by them, because they have been more exposed to it. Additionally, the results reported by Rebollar *et al* (2017) also demonstrated that similarity between images used in an experiment and the existing ones in the market may bring to participants' minds experiences and sensations felt when consuming those brands. Rebollar *et al*. (2012) indicated that there is a more significant relationship between packaging colour and preference (willingness to buy) for a product than between shape and preference. Our results do not support this assumption, because both packaging shape and colour influenced preference.

It was also hypothesized that the shape of the packaging would influence taste associations, because rounded packaging would be more related to the sweet taste than the angular packaging (H2). The results of our first experiment revealed that there was an impact of packaging shape on taste associations, because products in angular packaging evoked higher associations with the sweet taste than products in rounded packaging. On the other hand, Velasco *et al*. (2016) found that when the consumer's knowledge is insufficient to make adequate evaluations of a product, different abstract elements can help lessen the ambiguity regarding what taste to expect that the product might have. The participants might have been able to relate tastes to packaging shape differently than they might have done had they identified a specific product category. From this result we can raise the hypothesis that people are more likely to link angular-shaped packaging to sweet taste, when there is no determined product category.

In our second experiment, angular packaging once again evoked higher associations with sweet tastes than did the rounded packaging. Angular packaging containing buttery cookies presented highest means than round packaging shapes with the same type of cookies. If we take into consideration that buttery cookies in the market are usually sweeter, we can infer that the findings from this experiment support those of the first.

We hypothesized that there would be an influence of packaging colour on preference, with red-to-yellow packaging being preferred (H3). The findings of our first experiment suggest that individuals preferred non-grey packaging, considering the three statements, while packaging designed in red-to-yellow and blue-to-green were equally preferred. In our second experiment, the results revealed that packaging colour did not have an effect on preference.

This goes against our hypothesis that product category may direct packaging colour preference (Rebollar *et al*., 2012).

We also indicated that packaging designed in red-to-yellow would evoke more associations to sweet taste than packaging in other colours pallets (H4). This hypothesis was confirmed in Experiment 1, in line with the study conducted by Rebollar *et al* (2012). Therefore, consumers may associate an expected taste to a product due to packaging colour, when they cannot access it through experimentation (Mai *et al.*, 2016).

It was hypothesized that rounded packaging would be perceived as having less healthy products than angular packaging (H5), because we expected that it would have been more related to the sweet taste in the first experiment. In the second experiment, angular packaging was expected to contain a healthier product than the rounded packaging, corroborating with findings by Fenko *et al.* (2016). In the first experiment, the angular-shaped packaging was related to the sweet taste. In the second experiment, in which the product types were identified, packaging shape influenced evaluations of how healthy a product category appears to be, identifying angular packaging as being healthier than the rounded packaging.

We also indicated that packaging colour would have an effect on the evaluation of how healthy the cookies appeared to be, because these products in blue-to-green packaging would be perceived to be healthier than those in red-to-yellow packaging (H6) (Fenko *et al.*, 2016; Tijssen *et al.*, 2017). Differently from the expected result, packaging designed in red-to-yellow colour scheme showed higher averages of expected healthiness, despite the product category.

Interaction effects were not evaluated in the studies that gave rise to our hypothesis. In our experiments, no interaction effects were identified, which is an advance to the current literature. It is also relevant to highlight as a contribution to the existing knowledge that the identification of product category in the packaging significantly changed results. Colour impacted preference when product category was not identified in the packaging (experiment one), and shape had an effect on preference when the product category was indicated in the packaging (second experiment). Therefore, more naturalistic packaging should be used in experiments on the topic.

There are some limitations with the present study that should be mentioned. First, the stimuli used in the experiments may not have been realistic enough, because they lacked nutritional information, brand, and product images that one normally finds on product packaging (see Simmonds *et al.*, 2018). More naturalistic stimuli should be used in future research to verify the external validity of our results. Second, participants' interests regarding dieting, calorie intake, and previous experiences with food and packaging were not assessed, which may have influenced their evaluation of expected healthiness, taste expectations, and preferences. The investigation of these aspects may help identifying reasons behind incoherencies, such as the perception of buttery cookies as healthier than cereal ones. Therefore, our study did not explore why certain responses were given by participants, topic that can be explored in future research.

Third, the fact that all the respondents in the study are Brazilian may have had some influence on the results. These sample characteristics may indicate opportunities to run cross-cultural studies on the topic in the future, because as seen in Bremner *et al*. (2013), cultural-environmental factors have, on occasion, also been shown to shape people’s repertoire of crossmodal correspondences. Fourth, both experiments used a within-participants design, with the participants comparing the food packaging directly. Although our aim was to recreate a naturalistic setting (e.g., supermarket), where respondents can evaluate different products, the results may obviously be influenced by the induced comparison. Therefore, future studies may additionally consider using a between-participants experimental design.

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Table 1. Means and standard deviations of preference in Experiment 1.

Shape	Colour	Preference
Rounded	Red-to-yellow	3.86±0.79
	Blue-to-green	4.07±0.82
	Greyscale	2.76±1.32
Angular	Red-to-yellow	4.10±0.75
	Blue-to-green	4.07±0.92
	Greyscale	2.72±1.35

Table 2. Means and standard deviations of taste associations in Experiment 1.

Shape	Colour	Sour	Salty	Bitter	Sweet
Rounded	Red-to-yellow	2.82±3.06[ab]	3.90±3.72[b]	2.36±3.09	4.70±3.70[bc]
	Blue-to-green	4.40±3,12[b]	2.84±2,93[a]	2.44±3,16	3.76±3,26[bc]
	Greyscale	2.42±3.04[a]	3.44±3.56[ab]	2.94±3.27	1.80±3.02[a]
Angular	Red-to-yellow	3.34±3.31[ab]	4.74±3.78[b]	2.40±3.02	4.96±3.52[c]
	Blue-to-green	4.54±3.41[b]	3.08±3.25[a]	2.80±3.14	4.10±3.50[bc]
	Greyscale	2.34±2.90[a]	3.04±3.21[a]	3.46±3.46	3.08±3.38[ab]

[a,b,c] Same letters don't differ by Bonferroni's test at the 5% significance level

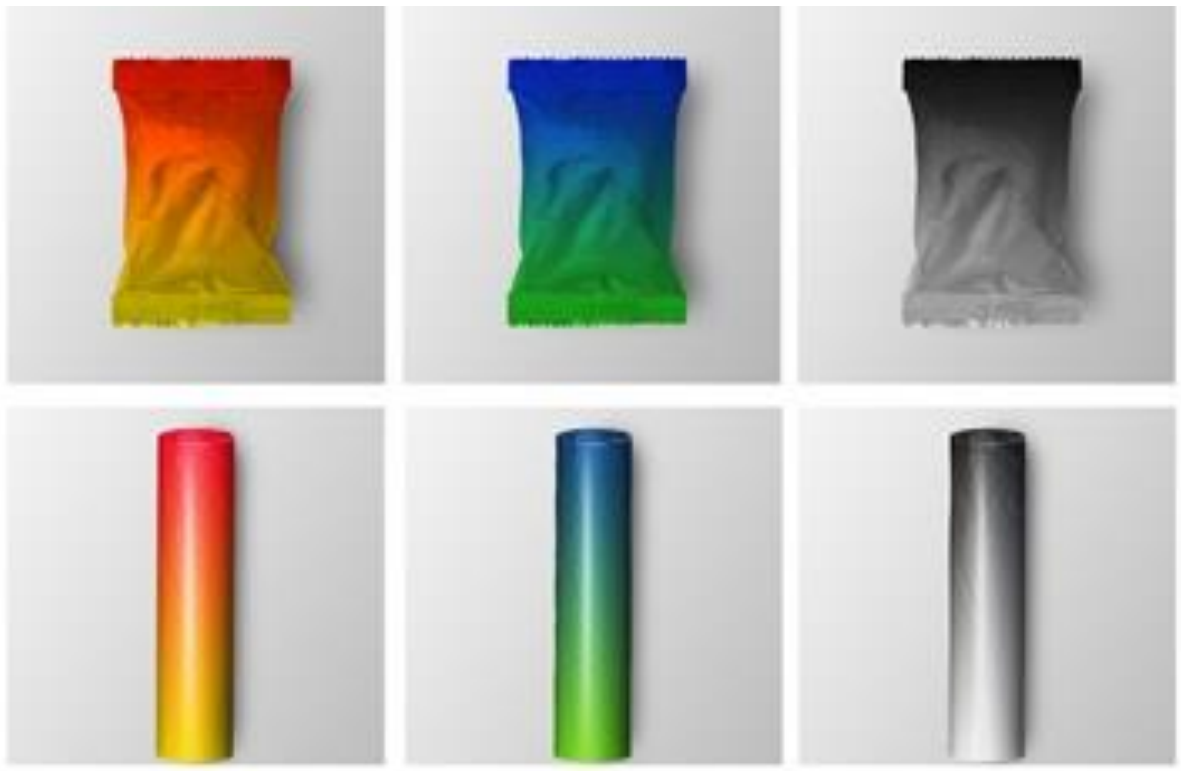
Table 3. Means and standard deviations of preference in Experiment 2.

Colour	Shape	Product category	Preference
Red-to-yellow	Angular	Buttery	3.12±1.20
		Cereal	3.04±1.20
	Rounded	Buttery	3.42±1.10
		Cereal	3.19±1.12
Blue-to-green	Angular	Buttery	3.31±1.15
		Cereal	3.20±1.18
	Rounded	Buttery	3.58±1.17
		Cereal	3.35±1.16

Table 4. Means and standard deviations of expected healthiness in Experiment 2.

Colour	Shape	Product category	Preference
Red-to-yellow	Angular	Buttery	4.14±0.78
		Cereal	3.37±1.08
	Rounded	Buttery	4.12±0.82
		Cereal	3.56±1.09
Blue-to-green	Angular	Buttery	3.76±0.98
		Cereal	3.10±1.15
	Rounded	Buttery	3.94±1.01
		Cereal	3.29±1.12

Figure 1. The six examples of product packaging shown to the participants in Experiment 1.



[Source: Created by the authors.]

Figure 2. Packaging images used in Experiment 2.



[Source: Created by the authors.]