



Norwegian
Business School

This file was downloaded from BI Open, the institutional repository at BI Norwegian Business School <https://biopen.bi.no>.

It contains the accepted and peer reviewed manuscript to the article cited below. It may contain minor differences from the journal's pdf version.

Velasco, C., Pathak, A., Woods, A. T., Corredor, A., & Elliot, A. J. (2019). The relation between symmetry in food packaging and approach and avoidance words. *Quarterly Journal of Experimental Psychology*.
<https://doi.org/10.1177/1747021819887172>

Copyright policy of SAGE, the publisher of this journal:

Authors "may post the accepted version of the article on their own personal website, their department's website or the repository of their institution without any restrictions."

<https://us.sagepub.com/en-us/nam/journal-author-archiving-policies-and-re-use>

The relation between symmetry in food packaging and approach and avoidance words

Carlos Velasco^a, Abhishek Pathak^b, Andy T. Woods^c,
Andres Corredor^d, & Andrew J. Elliot^e

^a Corresponding Author: Centre for Multisensory Marketing, Department of Marketing, BI Norwegian Business School, Oslo, Norway, Nydalsveien 37, 0484 Oslo, Norway. E-mail: carlos.velasco@bi.no.

^b School of Business, University of Dundee, Nethergate, Dundee, Scotland, UK, DD1 4HN

^c Department of Psychology, Royal Holloway University of London, Egham, Surrey, UK TW20 0EX .

^d London School of Economics and Political Science, Houghton Street, London, WC2A 2AE, UK.

^e Department of Clinical and Social Sciences in Psychology, University of Rochester, Rochester, NY 14627-0266, USA.

SUBMITTED TO: THE QUARTERLY JOURNAL OF EXPERIMENTAL PSYCHOLOGY

CORRESPONDENCE: Carlos Velasco, Department of Marketing, BI Norwegian Business School, Nydalsveien 37, 0484 Oslo, Norway. E-mail: carlos.velasco@bi.no

ABSTRACT

Research on aesthetic science has demonstrated that people generally prefer symmetrical over asymmetrical compositions. However, it remains unclear whether and how such compositions relate to the concepts of approach and avoidance motivation, especially, in consumer contexts. In addition, it is not known how symmetry may influence such concepts in contexts where objects can differ in terms of their hedonic values (symmetry/product taste congruency). In the present research, we evaluated the relation between visual symmetry of the packaging of products with different hedonic value (sweet, non-sweet, non-food), and approach and avoidance words. In two experiments, we found evidence that people associate symmetrical designs with approach words more often than asymmetrical designs. Importantly, however, we did not find evidence that such an effect is influenced by the hedonic value of the products. Our results have value for scholars and practitioners interested in the effect of aesthetic features of brand elements (such as a product's packaging) on consumer motivation.

Keywords: Symmetry, aesthetics, food packaging, motivation

The relation between symmetry in food packaging and approach and avoidance words

Introduction

It is well known that different sensory features (e.g., colours, shapes, sounds) of brand elements (such as logos, and packages) affect consumer behaviour in specific ways (Velasco & Spence, 2019) and firms capitalize on this to differentiate their products and services from those of their competitors (Kumar, Townsend, & Vorhies, 2014). For example, the visual features (e.g., colour or shape characteristics) of brands can influence consumer preference for a product (Kumar & Garg, 2010; Phillips, McQuarrie, & Griffin, 2014; Salgado-Montejo et al., 2015). Indeed, there is evidence to suggest that people generally prefer certain visual aesthetic features such as roundness over angularity (see Gómez-Puerto, Munar, & Nadal, 2015, for a review) and that using these in the visual design of a brand's element (such as its packaging or logo) can influence consumers' attitudes and preferences (Jiang, Gorn, Galli, & Chattopadhyay, 2015; Westerman et al., 2012) toward products. However, it is not always clear the extent to which such features may actually be differentially related to motivational concepts, something which we address here.

Visual symmetry, preference, and approach and avoidance motivation

Relevant to the present research, empirical work on the preference for different spatial compositions of objects suggests that people tend to prefer symmetrical over asymmetrical configurations (Locher, 1996; Palmer, Gardner, & Wickens, 2008). Symmetry is generally thought of as an essential characteristic of aesthetic objects and is conceptualized as the extent to which a visual element can be divided into two or more related parts via transformations (Lockwood & Macmillan, 1978; Palmer, Schloss, & Sammartino, 2013). For example, reflectional symmetry is a kind of symmetry, which is based on a reflectional transformation, that is, if a line divides a given object in two parts, each part reflects the other. Peoples' preference for symmetry has been demonstrated in multiple contexts such as

those involving art (Locher, Overbeeke, & Stappers, 2005), abstract shapes (Velasco et al., 2016b), and food plating (Velasco, Michel, Woods, & Spence, 2016a). Although it is not fully understood why it is that people prefer symmetry over asymmetry, one possible explanation that has been forwarded is that the ease with which symmetry is processed, given its ubiquitous and regular appearance in nature, might lead to positive feelings (Bertamini, Makin, & Rampone, 2013; Bertamini, Rampone, Makin, & Jessop, 2019).

Importantly, whilst consumers may prefer symmetry, it is still not altogether clear whether such preference also leads them to associate symmetry (vs. asymmetry) with different motivational categories (e.g., approach vs. avoidance, see Velasco et al., 2016b). Moreover, research studying the extent to which preferred vs. less preferred visual features are associated with approach and avoidance concepts is still missing (Chatterjee & Vartanian, 2014). In consumer contexts, for instance, the focus has been primarily on studying the influence of aesthetics on product preference (see Creusen, Veryzer, & Schoormans, 2010; Landwehr, Wentzel, & Herrmann, 2012, for examples). Notably, although valence (positive and negative), an essential emotional evaluative process, is related to different approach and avoidance states (Elliot, Eder, Harmon-Jones, 2013), it is possible that one might like an object and not necessarily have the motivation to approach it – something that Kant called “disinterested interest” (Chatterjee & Vartanian, 2014; see also Penz & Hogg, 2011, for a parallel reflection in consumer contexts). Nevertheless, whilst people may prefer (or not) something and not necessarily approach (avoid) it, symmetry still signals quality and resources (Enquist & Johnstone, 1997) and, as such, can help consumers to navigate the world around them, to develop judgements, and to make choices (Bajaj & Bond, 2018).

According to Elliot et al. (2013), there is not clear agreement among researchers as to what approach and avoidance is. However, they argue that many researchers link approach (avoidance) motivation with appetition (aversion), reward (punishment), and incentive

(threat). Models of approach-avoidance behaviour indicate the existence of two self-regulatory systems underlying approach and avoidance motivation, respectively, although some researchers have also indicated subsystems within them (Elliot et al., 2013). In general, though, the two primary systems identified have been referred to as the Behavioural Activation System (BAS) and the Behavioural Inhibition System (BIS; see Carver & White, 1994; Gay, 1990).

There is a long tradition of studying the aforesaid systems in consumption contexts, in which consumers are involved in hedonic consumption to satisfy approach (e.g., excitement) or avoidance (e.g., escape everyday anxiety) needs (Arnold & Reynolds, 2012). For example, research has indicated that there are individual differences in how these systems operate, such that people may be more approach or avoidance oriented (Carver & White, 1994), which in turn may influence the way in which they evaluate products and services (Kramer & Yoon, 2007). To the best of our knowledge, there has been little research conducted to date, however, on how the visual properties of brands (e.g., brand logo, packaging), in particular those with aesthetic value, influence consumers' appetitive and aversive associations.

In the present research, we aimed to study how goal-driven consumer behaviour, may be influenced by the visual properties (symmetry) of food and beverage products that varied in their hedonic appeal. In particular, we were interested in investigating whether and how visual symmetry (a feature that evokes distinctive preferences) of food and drink packaging influences participants' associations with approach and avoidance words. This is pertinent because, whilst foods and drinks have an inherent hedonic element, symmetry can signal taste qualia (Turoman, Velasco, Chen, Huang, & Spence, 2018) as well as nutritive value (Rodríguez, Gumbert, De Ibarra, Kunze, & Giurfa, 2004). Here, we focused on a basic form of symmetry, namely reflectional or mirror symmetry (Enquist & Arak, 1994; Wilson & Chatterjee, 2005), which has been shown to influence both affect and taste associations

(Turoman, Velasco, Chen, Huang, & Spence, 2018). The first aim of our research was to bridge the gap between the literature of visual preference and approach and avoidance motivation, and to provide helpful information for practitioners and academics who are looking for ways to nudge consumers toward specific food/drink choices.

Preference for sweetness and feature compatibility

It is worth highlighting that there is evidence to suggest that the preference for symmetry, as well as other aesthetic features, can be influenced by individual differences and context (Leder et al., 2018). The food and drink world might represent a very specific context in that the hedonic appeal of foods may vary dramatically across different products (think of chocolate, a vegetable, and a salty snack). Indeed, it has been suggested that people generally prefer sweet tastes relative to other tastes (Drewnowski, Mennella, Johnson, & Bellisle, 2012; Mennella, 2014). In this sense, it might be the case that, for instance, visual symmetry may influence motivation toward a product with an ambiguous or a non-sweet taste, but perhaps not motivation toward a product with a sweet taste, given its already existing hedonic appeal.

On the other hand, however, there is evidence to suggest a relation between more (or less) preferred product features on the one hand and products' taste (e.g., sweet tastes with more preferred features and bitter tastes with less preferred features) on the other (Velasco et al., 2016c). Such a relation might be due to the differential preference for different tastes. Since people prefer symmetrical designs over asymmetrical, and sweet tastes over other tastes, one may also expect a relation between symmetry in aesthetic design and type of taste (sweet and bitter; see Turoman, Velasco, Chen, Huang, & Spence, 2018). Such a relation may facilitate the fluency with which a product is processed and one may predict, for example, that a sweet tasting product presented in a symmetrical design may enhance liking via processing fluency and, in turn, influence its relation with approach, relative to avoidance, concepts. For this reason, we included differently valenced products (sweet, non-sweet, and

non-food) in order to evaluate people's associations between symmetry and approach (vs avoidance) words for different product types.

With the above in mind, the second aim of our research was to study how symmetry/product taste congruency would influence people's approach and avoidance associations. From the perspective of crossmodal correspondences theory, they congruency between a product's visual characteristics (symmetry) and a product's taste (sweet), based on their valence, may increasing the appeal of the product (e.g., Velasco et al., 2016). As a consequence, this correspondence may lead to stronger associations with approach and avoidance categories. From a different perspective, symmetry, as a powerful visual cue that influences consumer preference, may act solely (independently of product taste) in driving consumer's approach and avoidance associations through the ease with which it is processed and its already strong influence on liking (Bigoin-Gagnan & Lacoste-Badie, 2018).

The present study

To test the aforementioned ideas, we conducted two experiments, one exploratory and one confirmatory, involving forced choice tasks. In Experiment 1, we manipulated both product type (sweet, non-sweet, and non-food) and design symmetry (baseline, symmetrical, asymmetrical left, and asymmetrical right). In Experiment 2, we sought to replicate the results of Experiment 1. Overall, our study links the literature on visual aesthetic properties with that of approach and avoidance motivation in the context of food packaging and, more broadly, consumer behaviour. All manipulations, variables analysed, and data exclusions are reported for both studies.

Experiment 1

In Experiment 1, we evaluated the extent to which participants associate symmetrical and asymmetrical designs with approach and avoidance words. We also evaluated whether such designs are differently associated with approach and avoidance words when compared

with packages without a design element (baseline). Given that there is a natural tendency for people to prefer and to approach sweetness, relative to other tastes (Mennella, 2014), in the present experiment we also manipulated product type, in order to assess the extent to which the relation between visual symmetry and approach and avoidance categories is influenced by the valence of the product.

Methods and materials

Participants. 172 participants were recruited from Prolific Academic (<http://prolific.ac/>) to take part in Experiment 1 in exchange for £2.70. The experiment was designed and performed on Xperiment 3 software (see Woods et al., 2015, www.xperiment.mobi) and lasted for approximately 27 minutes, on average. Data from three participants, who reported that they were not fluent in English, were excluded from the analyses *a priori* (final $n = 169$, age range = 18-66 years, $M = 36.30$ years, $SD = 11.90$, $Females = 80$).

Apparatus and materials. The base stimuli set consisted of 30 black and white images, with similar levels of luminance ($M = 230.82$, $SD = 16.25$ pixel luminance), 10 of typically sweet food and drink products (apple juice, cake, candy, chocolate, cookies, cupcakes, honey, jam, soda, and sugar), 10 of typically non-sweet food and drink products (beer, chips, coffee, corn, ketchup, meat, milk, olives, peanut, and salad), and 10 of non-food products (CD case, detergent, glass, headphones, lightbulb, moisturizing cream, pen, paint spray, t-shirt, and USB charger). Four versions of each stimulus were created (for a total of 120 images): One without a design element (baseline), one with a centred design element (symmetrical), one with the design element off centre to the left (asymmetrical left), and one with the design element off centre to the right (asymmetrical right, see Figure 1, for examples and see <https://osf.io/7t45w/>, to access the full stimuli set and data from Experiments 1 and 2). The design elements were centred with respect to the furthest edge of each side (right/left)

of every package. For the asymmetrical stimuli the element was shifted 20% toward the left/right furthest edge of the package, with respect to the centre. When the element of a package was surrounded by a circle or rectangle (see Figure 1A and 1B), the element was moved 20% toward the edge of the circle/rectangle, with respect to the centre.



Figure 1. Examples of (A) sweet products, (B) non-sweet products, and (C) non-food products. From left to right are the baseline, symmetrical, asymmetrical left, and asymmetrical right designs used in Experiment 1.

Five pairs of approach/avoidance words used in previous research (Fetterman, Ode, and Robinson, 2013; Velasco et al., 2016b) were used in this experiment: Approach–avoid, advance–retreat, seek–escape, pursue–evade, and proceed–withdraw.

Design and procedure. The experiment used a 3 x 4 within-participants experimental design with the factors of product type (sweet, non-sweet, and non-food) and symmetry (baseline, symmetrical, asymmetrical left, and asymmetrical right). After participants agreed to take part in the study (by signing a standard consent form), they were asked some demographic questions (sex, English proficiency, age, and country of origin). Then, they

moved on to five practice trials (selected at random from the experimental trials) in which they were instructed to press 'z' (left) and 'm' (right) to indicate which attribute (from the corresponding pair of approach-avoidance words that appeared on the left and right side of the product) they associated with the product that appeared on the screen. Each trial started with a fixation cross (500-1250 ms, randomly determined), followed by the product with a word on each side of the product corresponding to an approach and avoidance word pair (see Figure 2, for a schematic representation of a trial). Participants were instructed to respond promptly and were told that each trial should take a few seconds to complete.

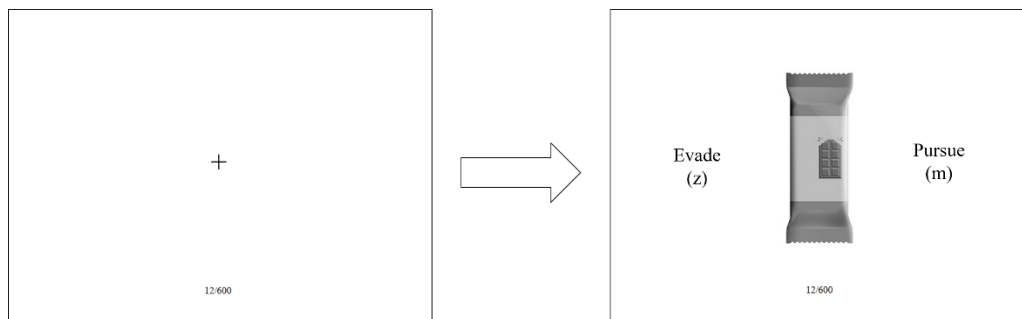


Figure 2. Schematic representation of a trial in Experiment 1.

After completing the five practice trials, participants started the actual experiment. The 30 base stimuli, in their four versions, were presented five times, one for each approach and avoidance word pair, for a total of 600 trials. The trials were presented in random order across three blocks (there was a short break every 200 trials). Again, participants were instructed to press “z” or “m” to indicate whether they associated the product with the word presented on the left or right side of the product, which would correspond to a given approach and avoidance word pair. The position of these words was randomized for each stimulus across participants (but held constant for each participant – that is, a given participant would always have, for example, ‘evade’ on one side and ‘pursue’ on the other) to avoid any position effects (see Figure 2).

Analyses. The word choice data (approach vs. avoidance words) were aggregated as a function of product type and symmetry, and analysed by means of a 3 x 4 analysis of variance-type statistic (ATS)¹ in the R Statistical Software package {nparLD} (Noguchi et al. 2012). Although many researchers are unaware of the advantages of robust alternatives relative to traditional parametric tests (e.g., traditional ANOVA), robust statistics ease many of the problems associated with traditional parametric tests such as assumption violations and outliers (Erceg-Hurn & Mirosevich, 2008; Wilcox, 2017). Significant main effects and interactions were further analysed with Bonferroni-Holm corrected Wilcoxon Signed Rank tests. Cliff's Delta (CD), as implemented in the {effsize} package in R (see <https://cran.r-project.org/web/packages/effsize/effsize.pdf>), was used as a measure of effect size; the value ranges from -1 to 1, where 0 means total overlap and 1 and -1 mean no overlap between the distributions (Cliff, 1996).

Results and discussion

The analysis revealed a significant main effect of symmetry, $F_{ATS}(1.82, \infty) = 53.01, p < .001$, but did not reveal an effect of product type, $F_{ATS}(1.93, \infty) = 2.03, p = .133$. The interaction between product type and symmetry was also significant, $F_{ATS}(3.17, \infty) = 5.10, p = .001$ (see Figure 3, for a visual representation of the results).

¹ Note that, whilst the numerator degrees of freedom are available in the ANOVA-type statistic, the denominator's are supposed to be infinity because "...a finite denominator degrees of freedom tends to provide very conservative results with an increase in the number of levels in the within-subjects factor, leading to a low power" (see supporting appendices in Marmolejo-Ramos et al., 2013, p. 3-4; see also Bathke et al., 2009; Noguchi et al., 2012).

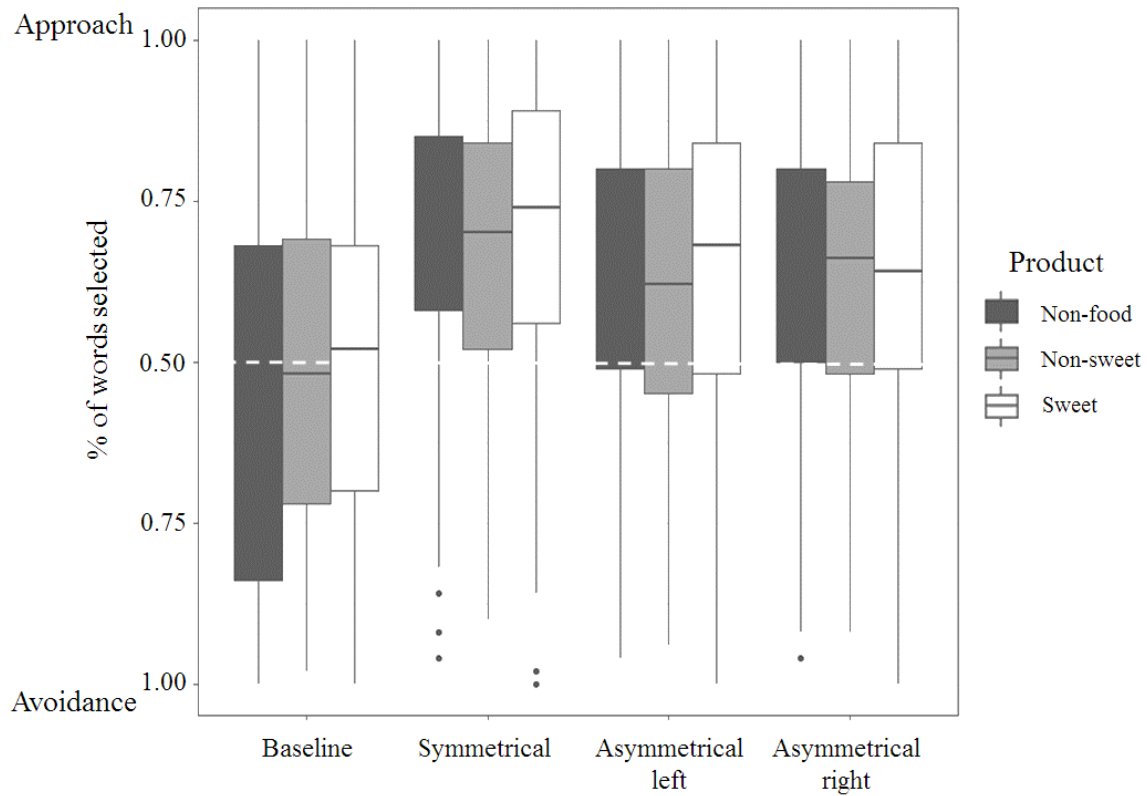


Figure 3. Boxplot corresponding to the percentage of approach/avoidance words selected as a function of product type and design symmetry in Experiment 1. Boxplots visualize the distribution of the data based on the minimum value, first quartile, median, third quartile, and maximum value (Weissgerber, Milic, Winham, & Garovic, 2015). The points that are shown individually are those that fall in the lower or upper percentiles.

Participants associated the symmetrical ($p < .001$, $CD = .488$, 95% CI [.374, .587]), asymmetrical left ($p < .001$, $CD = .356$, 95% CI [.236, .466]), and asymmetrical right ($p < .001$, $CD = .368$, 95% CI [.248, .477]) product designs with approach words more often than the baseline product designs. Moreover, participants associated the symmetrical designs with approach words more often than the asymmetrical left ($p < .001$, $CD = .168$, 95% CI [.045, .286]) and asymmetrical right ($p = .001$, $CD = .162$, 95% CI [.039, .280]) designs. The difference between the asymmetrical left and asymmetrical right designs was not significant ($p = .437$, $CD = .011$, 95% CI [-.112, .134]).

Based on our hypothesis, the interaction term was further assessed by looking at whether the baseline, symmetrical, and asymmetrical designs differed in their association with approach/avoidance words as a function of product type. The analyses are presented for each product type. For the 1) non-food products, participants selected fewer approach words for the baseline designs than the symmetrical ($p < .001$, $CD = .495$, 95% CI [.381, .594]), asymmetrical left ($p < .001$, $CD = .374$, 95% CI [.254, .482]), and asymmetrical right ($p < .001$, $CD = .390$, 95% CI [.270, .498]) designs. In addition, they selected more approach words for the symmetrical designs than the asymmetrical left ($p < .001$, $CD = .178$, 95% CI [.055, .295]) and asymmetrical right ($p < .001$, $CD = .160$, 95% CI [.037, .279]) designs. No difference was found between the asymmetrical right and asymmetrical left designs ($p = .365$, $CD = .022$, 95% CI [-.101, .144]). Similarly, for the 2) non-sweet products, participants selected fewer approach words for the baseline designs than the symmetrical ($p < .001$, $CD = .396$, 95% CI [.279, .502]), asymmetrical left ($p < .001$, $CD = .270$, 95% CI [.148, .384]), and asymmetrical right ($p < .001$, $CD = .290$, 95% CI [.168, .403]) designs. In addition, participants selected more approach words for the symmetrical designs than the asymmetrical left designs ($p < .001$, $CD = .140$, 95% CI [.017, .259]), though not the asymmetrical right designs ($p = .275$, $CD = .126$, 95% CI [.003, .246]). No difference was found between the asymmetrical right and asymmetrical left designs ($p = .275$, $CD = .019$, 95% CI [-.104, .142]). Lastly, for the 3) sweet products, participants selected fewer approach words for the baseline designs than the symmetrical ($p < .001$, $CD = .435$, 95% CI [.320, .538]), asymmetrical left ($p < .001$, $CD = .307$, 95% CI [.186, .419]), and asymmetrical right ($p < .001$, $CD = .301$, 95% CI [.180, .413]) designs. In addition, they selected more approach words for the symmetrical designs than the asymmetrical left ($p = .002$, $CD = .137$, 95% CI [.014, .257]) and asymmetrical right ($p < .001$, $CD = .150$, 95% CI [.027, .269]) designs. No

difference was found between the asymmetrical right and asymmetrical left ($p = .156$, $CD = .010$, 95% CI [-.113, .133]) designs.

In order to assess the effect of the symmetrical relative to the asymmetrical and baseline designs (Velasco et al., 2016b), we aggregated the data of the asymmetrical left and right designs and performed a 3 (baseline, symmetrical, asymmetrical) \times 3 (sweet, non-sweet, non-food) ATS. A significant main effect of symmetry, $F_{ATS}(1.61, \infty) = 65.98$, $p < .001$, and a significant interaction between product type and symmetry, $F_{ATS}(2.47, \infty) = 6.21$, $p < .001$, were observed. The effect of product type was not significant, $F_{ATS}(1.92, \infty) = 2.09$, $p = .125$. Participants associated the symmetrical designs with approach words more often than the baseline ($p < .001$, $CD = .488$, 95% CI [.374, .587]) and asymmetrical ($p < .001$, $CD = .173$, 95% CI [.050, .290]) designs, and the asymmetrical designs were associated with approach words more strongly than the baseline designs ($p < .001$, $CD = .361$, 95% CI [.241, .471]).

As for the interaction term, given our hypothesis, we evaluated the differences between symmetry levels as a function of product type. For the 1) non-food products, participants responded with approach words more often to the symmetrical designs than the baseline ($p < .001$, $CD = .495$, 95% CI [.381, .594]) and asymmetrical ($p < .001$, $CD = .180$, 95% CI [.057, .297]) designs, and to the asymmetrical designs more often than the baseline designs ($p < .001$, $CD = .380$, 95% CI [.260, .489]). For the 2) non-sweet products, participants responded with approach words more often to the symmetrical designs than the baseline ($p < .001$, $CD = .396$, 95% CI [.279, .502]) and asymmetrical ($p = .027$, $CD = .137$, 95% CI [.014, .257]) designs, and to the asymmetrical designs more often than the baseline designs ($p < .001$, $CD = .282$, 95% CI [.160, .396]). For the 3) sweet products, participants responded with approach words more often to the symmetrical designs than the baseline ($p < .001$, $CD = .435$, 95% CI [.320, .538]) and asymmetrical ($p < .001$, $CD = .151$, 95% CI [.028, .270]) designs, and to the asymmetrical designs more often than the baseline designs ($p <$

.001, $CD = .303$, 95% CI [.182, .415]). Here, it is important to look at the effect sizes. In all product conditions, the results are symmetry > asymmetry > baseline in approach associations, where the effect size is always larger when comparing symmetry vs. baseline and asymmetry vs. baseline, though with some product-specific differences. This suggests that having a design element, symmetrical or asymmetrical yields a stronger approach response than not having it (baseline), something which might be even more important in the case of non-food products and sweet products, relative to non-sweet products.

To summarize, in Experiment 1 we found evidence for the idea that participants 1) associate symmetrical packaging designs with approach words more often than baseline or asymmetrical designs, and 2), asymmetrical designs with approach words more often than baseline designs. These results appear to be consistent across both food (sweet and non-sweet) and non-food products. In Experiment 2, we dropped the baseline condition and aimed to replicate and confirm the results of Experiment 1. We excluded the baseline design in Experiment 2 because the results of Experiment 1 demonstrated that both of the other designs (symmetrical and asymmetrical) differed significantly from it in terms of the approach/avoidance word associations. Moreover, given that most packages and labels generally include design elements in the real marketing environment, our main interest focused on how the relative difference between symmetrical and asymmetrical designs is associated with approach and avoidance.

Experiment 2

Methods and materials

100 English-speaking participants ($M = 35.97$ years, $SD = 13.34$, *Females* = 61) between the ages 18 and 68 years were recruited from Prolific Academic to take part in the experiment in exchange for £2.0. The experiment lasted for approximately 23 minutes, on average.

The apparatus and materials, procedure, and analyses were the same as those used in Experiment 1. This experiment followed a 3 x 3 within-participants experimental design with the factors product type (sweet, non-sweet, and non-food) and symmetry (symmetrical, asymmetrical right, and asymmetrical left). The same analyses performed in Experiment 1 were used in Experiment 2.

Results and discussion

A significant main effect of symmetry, $F_{ATS}(1.27, \infty) = 11.82, p < .001$, was observed. Neither product type, $F_{ATS}(1.81, \infty) = 1.01, p = .357$, nor the interaction between product type and symmetry, $F_{ATS}(3.80, \infty) = .27, p = .888$, were statistically significant (see Figure 4, for a visual representation of the results).

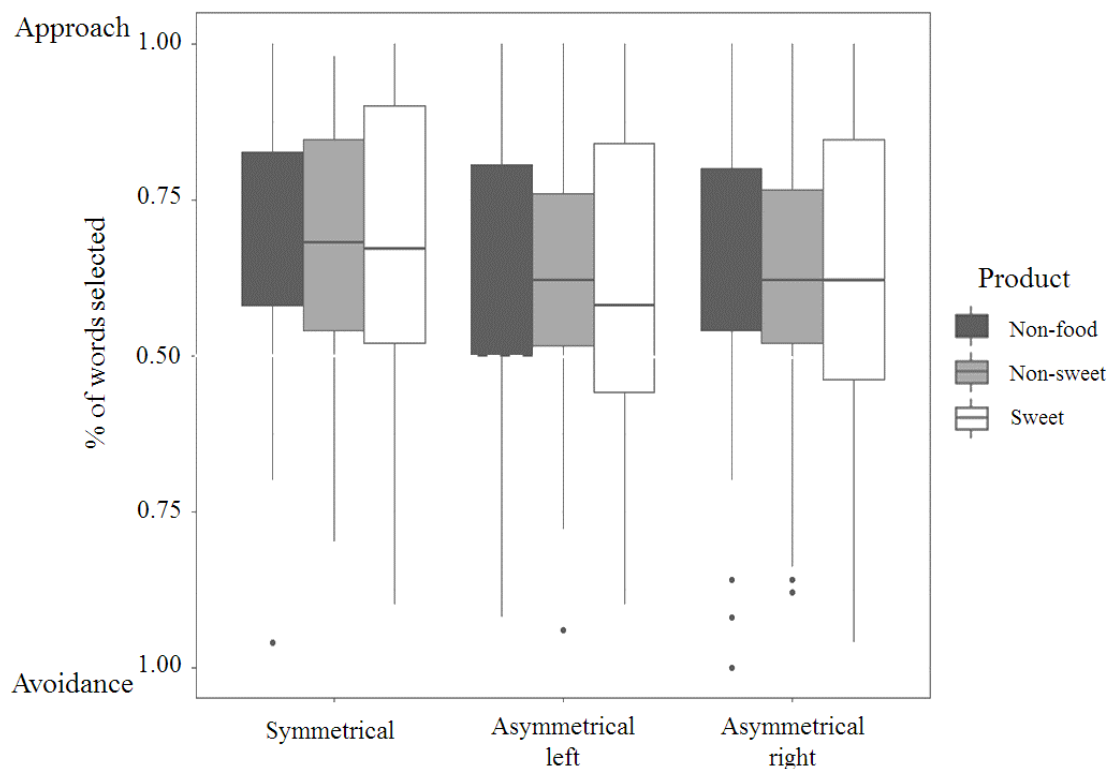


Figure 4. Boxplot corresponding to the percentage of approach/avoidance words selected as a function of product type and design symmetry in Experiment 2.

Participants associated the symmetrical designs with approach words more often than asymmetrical left ($p = .004, CD = .186, 95\% CI [.025, .337]$) and asymmetrical right ($p =$

.045, $CD = .153$, 95% CI [-.008, .306]) designs. No difference between the asymmetrical left and asymmetrical right designs was observed ($p = .215$, $CD = .034$, 95% CI [-.127, .192]).

As in Experiment 1, we also aggregated the data of the asymmetrical left and asymmetrical right designs and performed a 2 (symmetrical, asymmetrical) \times 3 (sweet, non-sweet, non-food) ATS. A main effect of symmetry was observed, $F_{ATS}(1.00, \infty) = 13.86$, $p < .001$. No effects of product type, $F_{ATS}(1.81, \infty) = .88$, $p = .407$, nor the interaction between product type and symmetry, $F_{ATS}(1.92, \infty) = .46$, $p = .622$, were observed. Participants associated the symmetrical designs with approach words more often than the asymmetrical designs ($CD = .180$, 95% CI [.019, .332]).

In summary, Experiment 2 aimed to replicate and confirm the findings of Experiment 1. As hypothesized, the symmetrical designs were more often associated with approach words than the asymmetrical designs and this effect seems to hold across product types. Note that, in contrast with the results of Experiment 1, in this experiment we did not find an interaction between symmetry and product type. This is associated with the absence of the baseline condition, which yielded different effects relative to symmetry and asymmetry in each product type condition in Experiment 1.

General discussion

The present research was designed to assess the relation between visual symmetry in food and drink packaging, and approach and avoidance words. In Experiment 1, several products of three categories, namely sweet, non-sweet, and non-food products, were presented to participants, without a design element, and with a symmetrical, asymmetrical left, or asymmetrical right design element. Results revealed that participants associated the symmetrical products more often with approach words than products without a design element or products with an asymmetrical design element. Experiment 2 replicated the findings of Experiment 1. Interestingly, we did not find strong evidence in our data for the

existence of an effect of product type (sweet, non-sweet, non-food), nor of the interaction between design symmetry and product type.

Why are symmetrical packages more strongly associated with approach words than asymmetrical packages? A number of studies have provided robust evidence for the idea that humans evaluate symmetry as more attractive than asymmetry (Palmer et al., 2013). Research has suggested that symmetry may feel attractive in that it signals higher quality relative to asymmetry (Enquist & Arak, 1994) and in food contexts even nutritional value (Rodríguez, Gumbert, De Ibarra, Kunze, & Giurfa, 2004). Note that quality here is understood in the context of evolutionary biology where symmetry might signal higher phenotypic and genotypic make-up than asymmetry (Little, 2014). In this sense, one may expect that people have a tendency to approach products that signal high quality (e.g., symmetrical) and perhaps avoid (or at least not approach) those that signal low quality or are of ambiguous quality. Indeed, given that consumers judge a product through its packaging, visual aesthetic features of the packaging likely guide both consumers' evaluations and behaviour toward that product (Ampuero & Vila, 2006; Wang, 2013).

Notably, we included products with a different hedonic value. Overall, sweet foods tend to be more positively valenced than non-sweet foods and non-food products (which are neutral; Mennella, 2014). In that sense, and perhaps inconsistent with the results reported by Velasco et al. (2016b, Experiment 4) where object (not feature) valence seemed to override the effects of symmetry, the present research suggests that, independent of the kind of product, symmetry in design will increase the likelihood of a product being associated with approach-related concepts. The difference between the results reported here and those reported by Velasco et al. (2016b) might be a function of the way in which the design symmetry was manipulated. In the latter research, the manipulation was somewhat subtler relative to the present research. All-in-all, the results presented here suggest that aesthetic

manipulation of a product's packaging can influence consumers' associations with motivational categories, over and above the correspondence that these features have with the taste (hedonic appeal) of the product.

It is worth noting that the control (baseline) packages in Experiment 1 were less frequently associated with approach words than were the other packages. This is, perhaps, reminiscent of the literature on how plain packaging might be a means to remove differentiators that might influence consumer perception and behaviour (Gallopel-Morvan, Gabriel, Le Gall-Ely, Rieunier, & Urien, 2013). Whilst this has mostly been studied in the context of products such as tobacco (Freeman, Chapman, & Rimmer, 2008), it is important to consider the relevance of plain packaging in the context of food and drink products as well, given the significant challenges that sugar consumption currently poses to public health (Bollard, Maubach, Walker, & Mhurchu, 2016; Lustig, Schmidt, & Brindis, 2012). Indeed, above-and-beyond plain packaging, we suggest that both firms and scholars interested in public health should consider the aesthetic properties of food packaging, given the impact they can have on both preferences and motivational states. Several practical recommendations may derive from this research. For example, one may avoid using design elements in order to discourage a product's association with approach concepts or perhaps use symmetry in order to encourage/discourage a specific motivation toward a given product. One may even think of using different levels of visual symmetry in order to signal how good or bad a product may be, say, in terms of its effects on consumers' health.

There are a few limitations of the present research that future work should consider. First, attractiveness biases are generally multi-determined in that they not only involve visual features but also individual, social, and situational variables (Barclay, 2017). A product's packaging is multidimensional and with this in mind, the strong relation found between symmetry and appetitive categories in our work might be attributed to participants being

exposed to a single consistent symmetry/asymmetry change throughout the experiment onto which they based their approach and avoidance word choices. Another limitation might be associated with the kinds of stimuli selected for each of the product categories chosen. Given the special value of sweet foods for humans (Mennella, 2014), one might have expected that sweet products would have evoked a stronger association to their corresponding packages and approach words, compared to the packages of other product types. Given that liking and wanting mechanisms are dissociable (Chatterjee & Vartanian, 2014), it might be the case that preference for sweetness does not always translate into approach associations.

To conclude, our results provide evidence for the idea that, all things being equal, packaging symmetry leads consumers towards specific motivational associations. We suggest that visual aesthetic properties of packaging can be used to guide consumers toward specific motivational associations. This is relevant for firms that are aiming to enhance their market performance and is also potentially interesting for those who want to discourage the consumption of certain products (e.g., those with high levels of sugar) in interest of public health.

Acknowledgements

Carlos Velasco would like to thank the Research Funding from the Department of Marketing, BI Norwegian Business School.

References

- Ampuero, O., & Vila, N. (2006). Consumer perceptions of product packaging. *Journal of Consumer Marketing*, 23(2), 100-112.
- Arnold, M. J., & Reynolds, K. E. (2012). Approach and avoidance motivation: investigating hedonic consumption in a retail setting. *Journal of Retailing*, 88(3), 399-411.
- Bajaj, A., & Bond, S. D. (2018). Beyond Beauty: Design Symmetry and Brand Personality. *Journal of Consumer Psychology*, 28(1), 77-98.
- Barclay, P. (2017). Attractiveness biases are the tip of the iceberg in biological markets. *Behavioral and Brain Sciences*, 40: e21.
- Bathke, A.C., Schabenberger, O., Tobias, R.D., & Madden, L.V. (2009). Greenhouse-Geisser adjustment and the ANOVA-type statistic: Cousins or twins? *The American Statistician*, 63, 239-246.
- Bertamini, M., Makin, A., & Rampone, G. (2013). Implicit association of symmetry with positive valence, high arousal and simplicity. *i-Perception*, 4(5), 317-327.
- Bertamini, M., Rampone, G., Makin, A. D., & Jessop, A. (2019). Symmetry preference in shapes, faces, flowers and landscapes. *PeerJ*, 7:e7078.
- Bigoin-Gagnan, A., & Lacoste-Badie, S. (2018). Symmetry influences packaging aesthetic evaluation and purchase intention. *International Journal of Retail & Distribution Management*, 46(11/12), 1026-1040.
- Bollard, T., Maubach, N., Walker, N., & Mhurchu, C. N. (2016). Effects of plain packaging, warning labels, and taxes on young people's predicted sugar-sweetened beverage preferences: an experimental study. *International Journal of Behavioral Nutrition and Physical Activity*, 13(1), 95.

- Carver, C. S., & White, T. L. (1994). Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: The BIS/BAS scales. *Journal of Personality and Social Psychology*, *67*, 319-333.
- Chatterjee, A., & Vartanian, O. (2014). Neuroaesthetics. *Trends in Cognitive Sciences*, *18*(7), 370-375.
- Cliff, N. (1996). Answering ordinal questions with ordinal data using ordinal statistics. *Multivariate Behavioral Research*, *31*(3), 331-350.
- Creusen, M. E., Veryzer, R. W., & Schoormans, J. P. (2010). Product value importance and consumer preference for visual complexity and symmetry. *European Journal of Marketing*, *44*(9/10), 1437-1452.
- Drewnowski, A., Mennella, J. A., Johnson, S. L., & Bellisle, F. (2012). Sweetness and food preference. *The Journal of Nutrition*, *142*(6), 1142S-1148S.
- Elliot, A. J., Eder, A. B., & Harmon-Jones, E. (2013). Approach–avoidance motivation and emotion: Convergence and divergence. *Emotion Review*, *5*(3), 308-311.
- Enquist, M., & Arak, A. (1994). Symmetry, beauty and evolution. *Nature*, *372*(6502), 169-172.
- Enquist, M., & Johnstone, R. A. (1997). Generalization and the evolution of symmetry preferences. *Proceedings of the Royal Society of London B: Biological Sciences*, *264*(1386), 1345-1348.
- Erceg-Hurn, D. M., & Mirosevich, V. M. (2008). Modern robust statistical methods: An easy way to maximize the accuracy and power of your research. *American Psychologist*, *63*, 591-601.
- Fetterman, A. K., Ode, S., & Robinson, M. D. (2013). For which side the bell tolls: The laterality of approach-avoidance associative networks. *Motivation and Emotion*, *37*(1), 33-38.
- Freeman, B., Chapman, S., & Rimmer, M. (2008). The case for the plain packaging of tobacco products. *Addiction*, *103*(4), 580-590.

- Gallopel-Morvan, K., Gabriel, P., Le Gall-Ely, M., Rieunier, S., & Urien, B. (2013). Plain packaging and public health: The case of tobacco. *Journal of Business Research*, 66(1), 133-136.
- Gray, J. A. (1990). Brain systems that mediate both emotion and cognition. *Cognition & Emotion*, 4(3), 269-288.
- Gómez-Puerto, G., Munar, E., & Nadal, M. (2015). Preference for curvature: A historical and conceptual framework. *Frontiers in Human Neuroscience*, 9:712.
- Jiang, Y., Gorn, G. J., Galli, M., & Chattopadhyay, A. (2015). Does your company have the right logo? How and why circular-and angular-logo shapes influence brand attribute judgments. *Journal of Consumer Research*, 42(5), 709-726.
- Kramer, T., & Yoon, S. O. (2007). Approach-avoidance motivation and the use of affect as information. *Journal of Consumer Psychology*, 17(2), 128-138.
- Kumar, M., & Garg, N. (2010). Aesthetic principles and cognitive emotion appraisals: How much of the beauty lies in the eye of the beholder?. *Journal of Consumer Psychology*, 20(4), 485-494.
- Kumar, M., Townsend, J. D., & Vorhies, D. W. (2015). Enhancing consumers' affection for a brand using product design. *Journal of Product Innovation Management*, 32(5), 716-730.
- Landwehr, J. R., Wentzel, D., & Herrmann, A. (2012). The tipping point of design: How product design and brands interact to affect consumers' preferences. *Psychology & Marketing*, 29(6), 422-433.
- Leder, H., Tinio, P. P., Briber, D., Kröner, T., Jacobsen, T., & Rosenberg, R. (2018). Symmetry Is Not a Universal Law of Beauty. *Empirical Studies of the Arts*. doi: 10.1177/0276237418777941.
- Little, A. C. (2014). Domain specificity in human symmetry preferences: Symmetry is most pleasant when looking at human faces. *Symmetry*, 6(2), 222-233.

- Locher, P. (1996). The contribution of eye-movement research to an understanding of the nature of pictorial balance perception: A review of the literature. *Empirical Studies of the Arts, 14*, 143-163.
- Locher, P., Overbeeke, K., & Stappers, P. J. (2005). Spatial balance of color triads in the abstract art of Piet Mondrian. *Perception, 34*(2), 169-189.
- Lockwood, E. H., & Macmillan, R. H. (1978). *Geometric symmetry*. Cambridge, UK: Cambridge University Press.
- Lustig, R. H., Schmidt, L. A., & Brindis, C. D. (2012). Public health: the toxic truth about sugar. *Nature, 482*(7383), 27-29.
- Marmolejo-Ramos, F., Elosúa, M. R., Yamada, Y., Hamm, N. F., & Noguchi, K. (2013). Appraisal of space words and allocation of emotion words in bodily space. *PLoS One, 8*(12): e81688.
- Mennella, J. A. (2014). Ontogeny of taste preferences: Basic biology and implications for health. *The American Journal of Clinical Nutrition, 99*, 704S-711S.
- Noguchi, K., Gel, Y. R., Brunner, E., & Konietzschke, F. (2012). nparLD: An R software package for the nonparametric analysis of longitudinal data in factorial experiments. *Journal of Statistical Software, 50*, 1-23
- Palmer, S. E., Gardner, J. S., & Wickens, T. D. (2008). Aesthetic issues in spatial composition: Effects of position and direction on framing single objects. *Spatial vision, 21*(3), 421-449.
- Palmer, S. E., Schloss, K. B., & Sammartino, J. (2013). Visual aesthetics and human preference. *Annual Review of Psychology, 64*, 77-107.
- Penz, E., & Hogg, M. K. (2011). The role of mixed emotions in consumer behaviour: Investigating ambivalence in consumers' experiences of approach-avoidance conflicts in online and offline settings. *European Journal of Marketing, 45*(1/2), 104-132.

- Phillips, B. J., McQuarrie, E. F., & Griffin, W. G. (2014). How visual brand identity shapes consumer response. *Psychology & Marketing, 31*(3), 225-236.
- Rodríguez, I., Gumbert, A., de Ibarra, N. H., Kunze, J., & Giurfa, M. (2004). Symmetry is in the eye of the 'beeholder': innate preference for bilateral symmetry in flower-naïve bumblebees. *Naturwissenschaften, 91*(8), 374-377.
- Salgado-Montejo, A., Tapia Leon, I., Elliot, A. J., Salgado, C. J., & Spence, C. (2015). Smiles over frowns: When curved lines influence product preference. *Psychology & Marketing, 32*(7), 771-781.
- Turoman, N., Velasco, C., Chen, Y. C., Huang, P. C., & Spence, C. (2018). Symmetry and its role in the crossmodal correspondence between shape and taste. *Attention, Perception, & Psychophysics, 80*(3), 738-751.
- Velasco, C., Michel, C., Woods, A. T., & Spence, C. (2016a). On the importance of balance to aesthetic plating. *International Journal of Gastronomy and Food Science, 5-6*(October–December 2016), 10-16.
- Velasco, C., Salgado-Montejo, A., Elliot, A. J., Woods, A. T., Alvarado, J., & Spence, C. (2016b). The shapes associated with approach/avoidance words. *Motivation and Emotion, 40*(5), 689-702.
- Velasco, C., Woods, A. T., Petit, O., Cheok, A. D., & Spence, C. (2016c). Crossmodal correspondences between taste and shape, and their implications for product packaging: A review. *Food Quality and Preference, 52*, 17-26.
- Velasco, C. & Spence, C (Eds). (2019). *Multisensory packaging: Designing new product experiences*. Cham: Palgrave MacMillan.

- Velasco, C., Woods, A. T., Petit, O., Cheok, A. D., & Spence, C. (2016c). Crossmodal correspondences between taste and shape, and their implications for product packaging: A review. *Food Quality and Preference*, *52*, 17-26.
- Wang, E. S. T. (2013). The influence of visual packaging design on perceived food product quality, value, and brand preference. *International Journal of Retail & Distribution Management*, *41*(10), 805-816.
- Weissgerber, T. L., Milic, N. M., Winham, S. J., & Garovic, V. D. (2015). Beyond bar and line graphs: time for a new data presentation paradigm. *PLOS Biology*, *13*(4), e1002128.
- Westerman, S. J., Gardner, P. H., Sutherland, E. J., White, T., Jordan, K., Watts, D., & Wells, S. (2012). Product design: Preference for rounded versus angular design elements. *Psychology & Marketing*, *29*(8), 595-605.
- Wilcox, R. R. (2017). *Introduction to robust estimation and hypothesis testing (4th Ed.)*. London, UK: Elsevier.
- Wilson, A., & Chatterjee, A. (2005). The assessment of preference for balance: Introducing a new test. *Empirical Studies of the Arts*, *23*(2), 165-180.