Thinking Inside the Box: How Seeing Products on, or Through, the Packaging Influences Consumer Perceptions and Purchase Behaviour

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Abstract

Images of food constitute salient visual stimuli in the mind of the consumer. They are capable of promoting both feelings of hunger and the desire for food. It should not, then, come as any surprise that many product packages present the food contained within as a salient aspect of their visual design. Conventionally, this has been achieved primarily by the use of attractive visual imagery showing the product on the outside of the packaging. Nowadays, however, developments in packaging are increasingly enabling designers to add transparent elements, thus allowing consumers to directly see the product before purchase. Yet relatively little is known about the effectiveness of product imagery as compared with transparent packaging. In this review, we address the various ways in which seeing (images of) food influence the consumer. The implications for packaging designs which include: (a) images of food, and (b) transparent elements, are investigated. Guidelines are also provided for designers and brands on the ways in which to take advantage of these effects of being able to see the food.

Keywords: *Packaging; Packaging design; Transparent packaging; Food aesthetics; Consumption.*

1. Introduction

Packaging is far more than merely a convenient means of getting a product to the store/consumer without damage (see Hine, 1995; Spence, 2016, for reviews). Over the past couple of decades, it has increasingly been realised that product packaging constitutes a powerful marketing tool in its own right (e.g., Rundh, 2005), and as such requires the same attention and techniques used in other areas of marketing to maximise commercial success (see Ahmed, Ahmed, & Salman, 2005). As such, the effects of packaging should be of great importance for designers, marketers, and brand managers alike. It has been estimated that: over three-quarters of food/drink purchase decisions are made at the point of sale (Connolly & Davison, 1996; POPAI, 2014; see also WPP, n.d.); 90% of consumers make a purchase after only examining the front of pack; and 85% of consumers make a purchase without having picked up an alternative product (Urbany, Dickson, & Kalapurakal, 1996). Making purchase decisions is no simple matter either – the average consumer will typically buy only 0.7% of the available products in-store over the course of a year (Catalina, 2014), despite having a range of over 30,000 products from which to choose (e.g., Sainsbury, n.d.). As a result, consumers must find, evaluate, and compare the products that they want from the vast range of products available in-store. There is rarely the opportunity to sample products in-store, and so consumers must make these judgments concerning the likely taste of the food based on the packaging and branding. According to Glanz, Basil, Maibach, Goldberg, and Snyder (1998), consumers primarily buy foods and drinks based on their expected taste and flavour (see also Food Processing, 2013), thus it is important for designers and marketers to: (1) grab the consumer's attention; and (2) create positive associations and expectations in their minds (such as the expectation of a great taste/flavour experience) in order to ensure the long-term commercial success of a product.

Packaging can help achieve these goals both at the point of sale and the point of consumption (see Hawkes, 2010; Hine, 1995; Spence, 2016, for reviews). However, there are many options and parameters of packaging design to consider when it comes to ensuring that the packaging transmits the most effective messaging, captures the attention of the consumer in-store, and achieves its full potential as a tool with which to enhance product experience. A number of studies have been conducted over the last few decades in order to identify how the various elements of product packaging contribute to these effects. Such studies have investigated elements of packaging including the main colour of the packaging (e.g., Danger, 1987; Gimba, 1998; Piqueras-Fiszman & Spence, 2011), packaging shape (Lindstrom, 2005; Meyers, 1991; Velasco, Salgado-Montejo, Marmolejo-Ramos, & Spence, 2014), weight (Kampfer, Leischnig, Ivens, & Spence, submitted; Piqueras-Fiszman & Spence, 2012), shape curvature (Becker, van Rompay, Schifferstein, & Galetzka, 2011; Salgado-Montejo, Leon, Elliot, Salgado, & Spence, 2015), and typeface (Velasco, Woods, Hyndman, & Spence, 2015), to name but a few (see Spence, 2016, for a review). Furthermore, a growing body of research suggests that the sight of food is capable of triggering a diverse range of neurological and physiological responses, which include increased hunger, more favourable taste evaluations, and the priming of reward networks (see Spence, Okajima, Cheok, Petit & Michel, in press, for a review). However, to date, comparatively little research has been conducted to investigate the confluence of these two streams of research. That is, the effect of seeing a product on subsequent product evaluations.

Packaging can enable the consumer to see the product contained within in one of two ways. Either through images of the product printed on the packaging, or through transparency as an element of the packaging. The prevalence of the latter approach would appear to be on the rise, and a trend that is set to continue (Mintel, 2014). Estimates from the US suggest that transparency is present in between 20% to 77% of all packaging, depending on product

category (20% of chips, 20% of cookies, 23% of crackers, 77% of nuts; Deng & Srinivasan, 2013). See Figure 1 for examples of packaging that feature product imagery or transparency.

[Insert Figure 1 here]

This review investigates the evidence concerning how food imagery, either delivered through food images on pack, or else via the use of transparent windows, can influence the consumer. This review also provides guidelines as to how this effect can be levied to the benefit of packaging designers and brand managers.

2. The effects of seeing food

According to the extant literature, images of food tend to constitute salient visual stimuli (see Spence et al., in press, for a review). As such, it would seem natural that this could offer food companies a relatively cheap and easy means of attracting the attention of the customer in-store.

Testing this hypothesis, Nijs, Muris, Euser, and Franken (2010) combined eye-tracking with a visual probe task in order to identify whether images of food (e.g., of chocolate, a donut) would capture attention more effectively than neutral images (e.g., a stapler, or paperclips). These images were matched in terms of their shape, colour, background colour, and position. Attention was robustly captured by food images in all participants[1]. These results were supported by a P300 peak after the presentation of food stimuli. This particular Event-Related Potential (ERP) is thought to be related to the orienting of selective attention (Cuthbert, Schupp, Bradley, Birbaumer, & Lang, 2000). Thus, as these images were task-irrelevant to

1 Note that these results were found regardless of whether the participant was overweight/obese, or normal-weight; and whether they were hungry (following a 17-hr fast), or satiated.

the visual probe task, it would seem that images of food do indeed involuntarily capture people's attention.

di Pellegrino, Magarelli, and Mengarelli (2011) used a similar paradigm (again using a visual probe task) in order to investigate whether such attentional capture caused by images of food was contingent on relative food preferences. The results demonstrated the same pattern of attentional bias towards food cues before eating. However, if the participant was tested on the visual probe task after having eaten a food that had previously been seen in a separate cueing task, then the effect of attentional capture of this same stimulus was markedly reduced. Yet for foods seen previously but not eaten, attentional capture remained at the same level. Such results highlight the fact that attentional capture by food imagery may be modulated by the phenomenon of 'sensory-specific satiety' (see Piqueras-Fiszman & Spence, 2014). This phenomenon suggests that satiety is specific to different sensory food characteristics such that one may still be motivated to eat some food type (e.g., sweet foods) even after being sated on another (e.g., savoury foods). A similar mechanism of heightened cognitive bias towards food cues has also been identified in participants who were hungry (Piech, Pastorino, & Zald, 2010); those who are in a bad mood (Hepworth, Mogg, Brignell, & Bradley, 2010); and those who are overweight (Werthmann et al., 2011).

A potential explanation for this attentional capture comes from a recent paradigm shift that has taken place in attentional theory. Traditionally, attentional control was thought of as being governed dichotomously. That is, on the one hand by exogenous selection, which is caused involuntarily by feature properties present in the environment, such as distinctive colours, shapes and movements. On the other, by endogenous, or voluntary selection, guided by an observer's goals (see Theeuwes, 2010, for a review). However, a revised framework has introduced a third factor: namely, selection- and reward-history (see Awh, Belopolsky, &

Theeuwes, 2012). Previously-rewarded or selected targets can elicit attentional capture, even after long periods of extinction, or when not goal-relevant (e.g., Anderson, Laurent, & Yantis, 2011; Anderson & Yantis, 2013; Camara, Manohar, & Husain, 2013; Chelazzi, Perlato, Santandrea, & Della Libera, 2013). Food seems to be an inherently rewarding stimulus, especially when they taste pleasant. This association between food and reward can be explained through positive reinforcement, such as from eating/smelling/etc. pleasant foods; as well as through negative reinforcement, from the avoidance of feelings of hunger (see Berridge, 1996; Rogers & Hardman, 2015). Indeed, a cognitive bias towards food cues has been identified (Brignell, Griffiths, Bradley, & Mogg, 2009), as well as preferential visual processing for images of foods that have a higher-fat and higher-carbohydrate content (Harrar, Toepel, Murray, & Spence, 2011). As such, it is perhaps not so surprising that food stimuli should be so effective in terms of commanding our attention.

Viewing food seems to have effects other than simply just attentional capture. Wansink, Painter, and Lee (2006) found that presenting sweets in clear as compared to opaque jars resulted in significantly higher consumption. When a jar was close and transparent, participants ate an average of 7.7 sweets per day, as compared to 4.6 when it was opaque. And when it was placed 2 meters away, the same effect was also found: an average daily consumption of 5.6 when visible, and 3.1 when opaque. This effect was so strong that the participants themselves noted that the sweets were both significantly harder to resist and more attention-capturing when in a transparent jar. As reported in Wansink (2004), a similar effect was found when participants were provided with sandwich quarters: if they were in a transparent wrap, participants consumed more, as compared to a non-transparent wrap condition. Furthermore, Bodenlos and Wormuth (2013) identified that food does not have to be accessible to cause this effect. Participants consumed more calories after watching a food-based programme, as compared to a nature program, thus supporting recent claims that the

rich and rapidly growing world of ‘gastroporn’ may be driving us to increased levels of food consumption (see Spence et al., in press, for a review). Passamonti et al. (2009) found that such sensitivity to food was also especially potent when viewing appetising as compared to bland food images, and concluded that “*external food cues, such as the sight of appetizing food can evoke a desire to eat, even in the absence of hunger*” (Passamonti et al., 2009, p. 43).

A number of neurological substrates have also been identified. In a comprehensive meta-analysis by van der Laan, de Ridder, Viergever, and Smeets (2011), fMRI data from participants viewing food vs. non-food images found multiple foci of activation in, for example: the lateral orbitofrontal cortex, an area associated with judging the expected pleasantness of food; the lateral occipital complex, associated with heightened attention and visual processing of emotional stimuli (such as food); the middle insular cortex, an area thought to be involved in food cravings or imagining the taste of foods; and the amygdala, which is well documented in its involvement with reward processing (see Figure 2). Research by Volkow et al. (2002) found heightened dopamine levels in the dorsal striatum, and suggested that this region is likely involved in generating food motivation when viewing food images. These neurological activations provide further evidence that viewing images of food can lead to preferential attentional processing, as well as presumably influencing evaluations of the product and its packaging. Thus, using food imagery as a graphical component on packaging could be a powerful tool in the designer’s arsenal.

[Insert Figure 2 here]

Aside from increased consumption, other effects of seeing foods have also been identified, such as increased craving for food, increased hunger, and changes in salivation (see Spence, 2011; Wansink, 2004, for reviews). Indeed, Rogers and Hill (1989) identified that

overconsumption due to the presentation of appetising food was preceded by increased ratings of hunger and salivation. Increased hunger and food cravings have, in turn, have been found to promote purchase intentions (Pachauri, 2001; Wilcock, Pun, Khanona, & Aung, 2004), thus suggesting there could be a clear pathway from seeing images of a food product to being more likely to purchase it. As such, using food visuals would seem like a potentially powerful means of attracting the consumer's attention and influencing their subsequent purchase behaviour.

Understanding this effect with respect to packaging design is crucial, such that designers and marketers can provide consumers with what they want, thus satisfying consumers as well as potentially increasing sales volume, as well as for public health policy-makers to make decisions regarding the circumstances under which seeing foods on packaging would be appropriate (see Hawkes, 2010, for a commentary on the rationale for regulating packaging designs for products aimed at children). Consumers are increasingly demanding to see what they are buying either on, or preferably through, the packaging, with 54% of consumers agreeing it's important to be able to see a product through the packaging itself (Mintel, 2014). This appears set to be a trend that will continue to grow in the years to come (see also Mintel News, 2014).

3. Food imagery on product packaging

Although the field of research concerning the use of food imagery on product packaging is still relatively modest in size, there are nevertheless already some important lessons to be learned. First, that on-pack product images can provide an effective means of communicating with the consumer. For example, in Schifferstein, Fenko, Desmet, Labbe and Martin's (2013) study, food imagery on-pack was seen to help inform consumers concerning key product

information. Members of a representative consumer panel were recruited to investigate the sensory experiences of a product at various stages, ranging from evaluation through to consumption. Packages used during experimentation either had large visuals of the product on the packaging, or else had no graphic at all. The results revealed that a majority of the consumers (85.1%) relied on looking at the packaging in order to determine what to expect from the product at the point of purchase, and almost a third (28.7%) would use the image to infer what the product would taste like.

Underwood and Klein (2002) found that packages incorporating an image of the product transmitted information about the brand – not just the product – and were capable of giving rise to, or manipulating, brand beliefs. In this study, consumers who placed the most importance on these brand beliefs formed more favourable evaluations overall if the packaging incorporated an image of the product. As such, the evidence that has been published to date suggests on-pack product imagery is an important way for consumers to gain an understanding of a product from its packaging, and a potential way in which to give clarity to product and brand positioning.

Venter and colleagues (2011) suggest that this product information obtained from imagery also enables more direct comparison of products, as well as attracts the consumer's attention. In an exploratory study, consumers' perceptions of food packaging were investigated through 25 semi-structured interviews. Ambiguous packaging was on-hand to prompt discussion. Content analysis was conducted on coded responses. The results revealed that consumers were attracted to images of the product on pack. This was found to act as a key source of information for many consumers, allowing them to identify product features through a trustworthy source and compare different products in the category. Some participants identified that the same effect could also be achieved, if not augmented, by the use of

transparent packaging, but that this would only be relevant for visually-appealing products. Moreover, this insight is consistent with findings from the Mintel (2014) Food Packaging Trends report, where it was found that consumers – especially older consumers – find transparent packaging helpful in terms of gauging the freshness of products, enabling health-conscious and quality-seeking shoppers to find exactly what they want (see also Mintel News, 2014).

Food imagery may also be capable of enhancing later perceptions of the food, as well as increasing the propensity for the consumer to purchase the product. In order to test this notion, Mizutani and colleagues (2010) manipulated product imagery on packaging in order to try and understand whether a product image could influence flavour evaluation in the case of orange juice. Images were attached to cups, used as a proxy for packaging, with the image attached varying along two dimensions: congruency (whether all of the images in the set were of oranges, or random neutral stimuli), and valence (whether all images were pleasant or unpleasant, e.g., fresh or rotten). Those juices which were presented with pleasant images were judged as tasting fresher and more palatable, and those presented with congruent images were judged as having better aromas. Such results suggest that product images on-pack provide a simple but effective means to favourably influence later product evaluations.

In addition to this enhancement of product evaluations, product imagery has also been shown to increase purchase intentions. For example, Gofman, Moskowitz, Fyrbjork, Moskowitz, and Mets (2009) found that the presence of a product-related graphic (in this case, an image of either grapes or a wine bottle) on the front-facing facet of boxed wine helped to increase purchase intentions significantly, as compared to when no product graphic was displayed. Furthermore, the colour of the product image seemed to influence the magnitude to which purchase intentions were increased. A purple wine bottle graphic convinced a greater number

of respondents to state that they ‘would buy’ the boxed wine, as compared to a green bottle graphic which was otherwise identical. Similarly, Piqueras-Fiszman, Velasco, Salgado-Montejo, and Spence (2013) identified that replacing textual information regarding the ingredients with visual information on the front of packaging was also capable of influencing purchase intentions. Their results revealed that the flavour-relevant imagery accounted for 59% of the relative importance of willingness-to-try ratings, as opposed to the textual information. This translated into an average 1.32-point increase on a 9-point purchase intent scale when the image was present, hinting at just how impactful graphics on front-facing facets of packaging can be on the intentions of the consumer.

However, while there may be compelling reasons to advocate the use of product imagery on packaging, care must be taken not to negatively impact the packaging aesthetics. Prior research suggests that aesthetically pleasing packaging designs can increase desire to own the product (Norman, 2004), encourage willingness to pay a higher price (Bloch, Brunel, & Arnold, 2003), and increase preference over well-known brands (Reimann, Zaichkowsky, Neuhaus, Bender, & Weber, 2010). Perhaps this should come as little surprise, as the halo-effect has long been known to cause otherwise-unjustified positive inferences about people or things that are deemed attractive (e.g., Bloch, 1995; Pritchard & Morgan, 1996; Reichert & McRee Walker, 2005). Furthermore, changing packaging designs for well-established brands has the potential to remove elements of the design that consumers rely on to identify the product. As Lee, Gao, and Brown (2010) reported, Tropicana (a global juice brand) saw a drop of 20% in the sales of their orange juice in the US after redesigning the juice carton. An image of an orange was replaced with an image of a glass of orange juice, in an effort to show consumers the appetising ‘inside’ of the orange (i.e., the juice), not the relatively less appetising ‘outside’ of the orange (i.e., the peel). This simple change reportedly resulted in consumers not being able to find the product, as the previous design had become integral to

the identification of the brand, and represented an estimated $27.3 million loss in revenue due to reduced sales. As such, thorough market research is strongly recommended for any potential redesign of packaging, in order to identify what the impact will be on consumer evaluations and purchase behaviour, and thus to ensure market success and mitigate loss.

A further constraint on the use of product imagery would be to make sure that such imagery is not perceived as dishonest. Underwood and Ozanne (1998) highlighted how effective packaging must ultimately communicate effectively to consumers. In six interviews in which participants were guided through a store, opinions were recorded concerning the packaging of around 50 products that the participant selected themselves. One key theme that emerged was that participants often felt tricked or duped by packaging, such as by images that were perceived as being intentionally misleading (e.g., images that had been overly digitally enhanced, or had ‘healthy’ visual cues when this could not be justified by looking at the product’s nutritional content). The researchers theorised that it is in the interest of the brand manager to follow four norms for the development of packaging design: the norms of truthfulness, sincerity, comprehensibility, and legitimacy. Respondents actively avoided those products that defied these norms, resulting in their feeling deceived. Thus, while product imagery does seem to convey many potentially positive benefits, care must be taken to avoid over-emphasising the product visuals, and so, being potentially dishonest. Conversely, using transparent windows as part of product packaging has been suggested to help dispel any such perceptions of deception, instead helping to make the brand seem ‘honest’ (Burrows, 2013).

4. Transparent packaging

Rather than showing an image of the product, it is becoming increasingly viable to show the consumer exactly what's inside the packaging by using transparent elements in packaging. The field of research investigating how transparent packaging influences consumer evaluations and behaviour is, though, still in its infancy. However, it is important to understand the impact of such packaging on consumers in order to determine whether it is an effective or worthwhile design decision, especially given its increasing prevalence, as mentioned previously.

Previous findings regarding the features of packaging design which have the capacity to influence consumer evaluations and purchase decisions allow predictions to be made about those features of transparent elements which may elicit similar effects. For example, a general preference amongst consumers for rounded shapes (as compared to angular shapes) has been noted (see Bar & Neta, 2006), which leads to higher purchase intentions for packages that display rounded shapes (see Gómez-Puerto, Munar, & Nadal, 2016, for a review). In addition, rounded shapes on packaging have also been found across several studies to promote evaluations of sweetness for the product inside, with angular shapes promoting evaluations of bitterness and sourness (for reviews of these taste-shape correspondences, see Spence, 2011; Spence & Deroy, 2013; Spence, 2012; Velasco, Woods, Deroy, & Spence, 2015; and Velasco, Woods, Petit, Cheok, & Spence, 2016). Certain benefits are afforded if the taste expectations promoted by the angularity of shapes in the packaging design matches that of other expectations, or the consumer's later experience of the product. Specifically, such a correspondence has been found to result in consumers experiencing less confusion regarding the product (Piqueras-Fiszman & Spence, 2011), associating the product with more positive emotions (Salgado-Montejo, Velasco, Olier, Alvarado, & Spence, 2014), being able to locate it faster (Velasco et al., 2015; see also Sunaga, Park, & Spence, 2016), and rating the taste of the product as more liked and more

intense (Barnett & Spence, in press; Okamoto et al., 2009; for a review, see Piqueras-Fiszman & Spence, 2015). As such, one might expect that the angularity of the shape of a transparent window to have an impact on consumer evaluations and purchase decisions in a similar fashion. Note that it is not the intention of this review to list the effect of every design element on the consumer. However, other dimensions of transparent windows (or transparent packaging more generally) that might feasibly be thought to influence the consumer, based on prior findings, might include: the position of the transparent window (e.g., Deng & Kahn, 2009; Westerman et al., 2013), the orientation of the transparent window (e.g., Shen, Wan, Mu & Spence, 2015; Velasco, Woods & Spence, 2015), the colour of the transparent window (e.g., Piqueras- Fiszman & Spence, 2011; Spence, Levitan, Shankar, & Zampini, 2010), the colour contrast between packaging and the product (discussed later), the size of the transparent window (e.g., van Rompay, Hekkert, & Muller, 2005), and the aesthetic/visual balance with other design elements (e.g., Bloch, Brunel, & Arnold, 2003; Norman, 2004; Reimann, Zaichkowsky, Neuhaus, Bender, & Weber, 2010).

The remainder of this section will focus on reviewing those studies that have assessed these elements with respect to transparent packaging. Investigating how transparent window tint and shape may impact consumer evaluations, Engels (2015) revealed that the coloured tint of the window itself (when presented as a part of cardboard packaging) is not of great importance to product perceptions. However, coloured windows were found to lead to more positive ratings for perceptions of taste and post-taste purchase intent if the window colour contrasts well with the colour of the product. Interviews with experts (presented alongside the same research) revealed that the latter agreed that tinted windows would be obstructive to the goal of letting the consumer see what's inside, and so would avoid using them, perhaps except for more creative/limited edition designs. Furthermore, the results suggested angular (vs. rounded) windows can result in more positive ratings of pack attractiveness, the

perceived and actual taste perceptions of the product (both pre- and post-taste), as well as, importantly, purchase intent. However, it should be noted that the greater benefits conferred by angular windows here contrasts with prior research, suggesting a general preference for rounded shapes (Bar & Neta, 2006; Westerman et al., 2012). While untested, it can be speculated that angular windows may only confer such benefits for penne-shaped pasta, due to some attribute such as its shape, size, or taste. Indeed, previous findings regarding shape-taste correspondences (as already discussed at the start of this section) might well predict that the most effective window shape may vary by product category. As such, the careful choice of window shape could be used to tap into such shape-taste correspondences, and potentially influence consumer product evaluations. This is definitely an area that is deserving of future investigation.

Transparent packaging has also been identified as having an impact on the amount of food consumed from the package. Deng and Srinivasan (2013) reported that participants consume significantly more by weight (as much as 69% more) from transparent packaging as compared to opaque, plain packaging, but only in the case of visually-attractive foods (e.g., Froot Loops, which are a variety of bright, attractive colours; vs. Cheerios, which are a homogenous beige). However, this also seems to be specific to smaller food items: the consumption of individual M&Ms compared to larger M&M cookies elicited very different results in transparent packaging. That is, the participants consumed 58% more M&Ms when they were presented in transparent as compared to opaque packaging, but ate 28% less M&M cookie(s) under the same conditions. A further caveat is that consumption seems to become reduced for healthier foods when presented in transparent packaging: that is, participants ate 78% fewer carrot sticks when presented in transparent as compared to opaque packaging.

Deng and Srinivasan (2013) also posit a theoretical model to explain why transparent packaging increases consumption under certain circumstances. They suggest that being able to see the food increases its salience (the salience effect), but at the cost of being able to see how much has already been consumed (the monitoring effect). Whichever effect is greater dictates the likelihood of consumption (and thus purchase intent), where the salience effect will increase consumption, and the monitoring effect will decrease it. Empirical testing confirmed this hypothesis, and thus suggests smaller food items should be presented in transparent packaging, and larger or healthier foods in opaque packaging, in order to drive desire to consume, and thus purchase intentions, up.

Billeter, Zhu, and Inman (2012) assessed the effect of transparency in packaging with respect to consumer purchase decisions. This was achieved by comparing product evaluations for both opaque and transparent packaging designs. The results revealed that transparent packaging led to: inferences that the product was more trustworthy (even after controlling for freshness and quality judgements); greater consumer preference; and greater purchase intent. Further, a visually unattractive (‘puke’ green) product gave rise to reduced trust in the product if presented in transparent packaging. Note, however, that several of these findings were based on inedible products, such as liquid detergent, so cannot be directly extrapolated to edible goods. Nevertheless, such results do suggest tentatively that transparent packaging is only truly effective when the food presentation is visually appealing.

Furthermore, Chandran, Batra, and Lawrence (2009) also compared transparent and opaque packages, with the aim of investigating how perceptions of quality and product trust impacted purchase intentions for both familiar and unfamiliar brands. In an exploratory study, for an unfamiliar brand of mouthwash, participants evaluated the product being of significantly better quality if it was in transparent packaging, and would pay significantly more for it.

However, for a familiar brand (i.e., Listerine[2]), the product was thought to be of significantly worse quality when in a transparent bottle, but with no significant difference for purchase intentions compared to the opaque pack. Qualitative analysis of open-ended questions suggested this effect was due to consumer scepticism over the contents of an unknown brand, which transparent packaging helped to alleviate. However, for known brands, there was no distrust of the product contents regardless of the packaging. Two further studies determined product trust was indeed a mediating variable in the process of making inferences of product quality from packaging. Specifically, when packaging was consistent with recorded consumer expectations for the packaging (i.e., that toilet bleach should be presented in opaque packaging), product trust was high, leading to perceptions that the product was of higher quality. However, when such expectations were violated (i.e., that cough syrup should be presented in transparent packaging), trust was lower, as were perceptions of quality. While it should again be noted that none of these products are to be ingested, nor designed to optimise product taste, some important learnings can still be gained. First, that transparent packaging is capable of manipulating perceptions of product quality and product trust through being able to directly see the product (in agreement with the results from Billeter, Zhu, & Inman, 2012; see also Sogn-Grundvag & Ostli, 2009), which influences purchase intentions. Second, that the degree of product trust mediates perceptions of product quality, such that when product trust is high, perceptions of quality will likely also be high. Finally, that transparent packaging might be most effective when consumers are unfamiliar with the brand. That is, consumers could use the opportunity to see the product to judge its quality, and then use this judgement to inform their purchase decision.

[2] Interestingly, the vast majority of Listerine's products have been sold in transparent packaging since the inception of the brand. Currently, only the premium 'whitening mouthwash' range is sold in opaque packaging, which might provide one explanation as to why opaque packaging for Listerine may be seen as related to higher quality products.

The link between the use of transparent packaging and perceived healthfulness of a product has also been investigated, but with somewhat contradictory results. In an exploratory study outlined in Sioutis (2011), participants were recruited online and had to rank different packaging designs for either a cereal or an orange juice product in order of perceived healthfulness. The designs varied across four variables, each having two levels. These were: colour (green vs. red), shape (square vs. rounded packaging), graphic (product image vs. image of a landscape), and visibility (transparent window vs. no window). Conjoint analysis[3] was used to interpret the results, finding that transparent packaging was judged to be more healthful compared to non-transparent designs. Furthermore, visibility was found to be the most important factor for perceptions of healthfulness within the cereal designs (contributing 39.8% of the total importance for all attributes), and the second most important for the orange juice designs (23.2% of total importance). Yet while these initial findings suggest transparency could be a promising way to highlight the healthfulness of a product, subsequent research has found orthogonal results. Riley, da Silva and Behr (2015) also investigated whether the use of transparent packaging (amongst other design elements) could affect perceived healthfulness of a product. Similarly to Sioutis (2011), a conjoint analysis was used, investigating the level of information (showing a product description vs. not showing a description), imagery (a flavour-relevant drawing or image vs. a transparent window), the presence of an organic logo (present vs. not), and packaging colour (green vs. orange). Three different product categories (coffee, carrot soup and carrot baby food) were judged on packaging design preference in terms of healthfulness. The results suggested transparent windows were slightly less preferred to show healthfulness for all product categories tested, with an image instead being the preference. In addition, these 'visual' aspects were found to be of relative importance, second only to the level of information

[3] Conjoint analysis is a widely-used technique in market research, and uses preference scores for different possible designs of a product. The results ultimately provide an estimation of how much value consumers implicitly ascribe to each attribute manipulated.

present on the packaging. That is, having detailed product information on-pack was found to account for a most of the relative importance for preference judgements (40.1% for baby food, 48.8% for soup, and 40.1% for coffee), with imagery/transparency following as the second most important attribute (20.4% for baby food, 19.1% for soup, and 22.0% for coffee). Thus, while transparency may be preferred when it comes to showing healthfulness in some categories, it appears imagery would certainly be more beneficial in others. Perhaps one explanation for these results is that those products that were perceived as less healthful within transparent packaging had less aesthetically pleasing products to showcase. For example, the carrot soup product used was a dark brown colour, which may have not matched expectations of bright and vibrant colours for a fresh and healthy product. In addition, the coffee beans shown through a window looked much lighter than one might expect coffee beans to, which again may have reduced the impression of wholesome and healthy produce. Indeed, making judgements for the healthfulness of coffee beans may have not been an intuitive task for participants, since coffee itself typically contains very few calories assuming nothing is added to the drink afterwards and that no other ingredient has been added to the beans during production (as would seem uncommon). Since participants performed a forced choice task (and one where the resulting scores did not signify any specific quantity between ranks, only the ranks themselves), these results might feasibly have been inflated if the designs were actually judged to have performed very similarly, but participants were unable to reflect this in their responses. It is clear that further investigation is required before the impact of transparent packaging on judgements of product healthfulness is fully understood.

It is also important to note that the use of transparency in packaging has been found to have negative impact on product perceptions under certain circumstances. For instance, Vilnai-Yavetz and Koren (2013) report an experimental study that investigated the mechanisms responsible for a ready meal brand seeing a 30% decline in sales after incorporating

transparent elements in their packaging design for a boiled vegetable product. After surveying consumers in a supermarket, the results were consistent with the sales data, in that participants were significantly less likely to purchase the new transparent packaging design compared to the original opaque packaging. Furthermore, the transparent variant received significantly worse scores for perceived aesthetics and product quality, but was rated as having significantly higher perceived instrumentality (i.e., how functional or 'easy to use' it was). A mediation analysis showed both perceived aesthetics and perceived product quality mediated the relationship between packaging type and purchase intentions, with perceived product quality having a very strong impact on purchase intentions ($\beta = 0.62$), and perceived aesthetics having slightly less influence ($\beta = 0.25$). Note that this effect of transparent packaging resulting in lower purchase intentions may be attributable to how the transparency was incorporated, where the whole of the plastic lid of the product was made transparent, allowing full view of the boiled vegetable ready meal inside. Thus, consumers perceiving the product to be visually unappealing (which the significantly worse perceived aesthetics scores might suggest) might be a likely explanation for the reduced purchase intentions, and gives further evidence to previous research that suggests transparent packaging only has beneficial effects for visually attractive products. In addition, a similar case study has also been reported by the Wall Street Journal (see Nassauer, 2014), where a brand of lunch meats replaced a red lid with a fully transparent alternative. Sales volume dropped for the product with the new packaging design, reportedly due to consumers not being able to find the product at the fixture without the characteristic red lid. When the packaging was reverted to the original design, sales began to rise to previous levels. This example hints at just how impactful simple changes to packaging design can be, and that transparency has the potential to harm purchase intentions in some situations.

So what can we conclude about the inclusion of transparency as an aspect of packaging design? First, that it's capable of driving increased consumption of the product, supporting the evidence of the effects of food image presentation discussed earlier. Second, that it can lead to an increase in purchase intent, in the perception of brand transparency, and it can modify expected and actual taste evaluations. These effects are thought to be moderated by the desirability, or visual attractiveness, of the product itself (as suggested by results of Deng & Srinivasan, 2013; and Vilnai-Yavetz & Koren, 2013). Third, that transparent packaging is likely to be especially impactful for brands consumers are unfamiliar with, as it gives them the ability to assess the quality of the product within more easily. Fourth, that transparent packaging can also lead to more negative product evaluations (such as perceived healthfulness, aesthetics, and quality) and purchase intentions depending on the brand, the product category, and how visually appealing the product is. As such, transparency in packaging seems a promising tool to be able to increase product evaluations and purchase intentions under certain circumstances, but new packaging designs should still be subjected to extensive consumer testing before being implemented to ensure the results are indeed beneficial.

Some of these benefits of transparency in product packaging might also be explained by higher-level, or more abstract, accounts. For example, adding transparency may have symbolic value, aside from the visual effects of being able to see a product, which leads to inferences and evaluations regarding the product. In language, the notion of 'transparency' is synonymous with 'openness', 'trustworthiness', and 'comprehensibility'. Furthermore, transparency may promote representations of 'being able to see (understand)' something. The field of cognitive semiotics might argue that, by an observer recognising an element of packaging as transparent, corresponding semantic or metaphorical representations (such as those listed above) might also become activated, and transfer the same meaning of these

representations to the product itself (see Brandt & Brandt, 2005; Burrows, 2013; Zlatev, 2012). Alternatively, through a brand actively choosing to show consumers what is within the package, they potentially give the impression that they have ‘nothing to hide’, thus leading to a similar effect of increased perceived trustworthiness. Indeed, the previously discussed findings from Billeter, Zhu, and Inman (2012) are consistent with such theories, given that participants inferred that the products (and their respective brands) shown in transparent packaging were more trustworthy. Having said this, showing the consumer the product upfront may reduce any anticipation or ‘intrigue’ consumers might otherwise feel when opaque packaging is used. For instance, Patrick, Atefi and Hagtvedt (in press) recently reported that opaque packaging may allow the product to be ‘unveiled’, the act of which was found to increase perceived product value. In the same article, they also reported that transparent packaging removed this effect, and resulted in a significantly lower perceived value. While such results and hypotheses may shed some insight into the mechanics between transparent packaging and consumer evaluations, a wider range of higher-level accounts have not yet been empirically tested in the research that has been published to date. This, then, certainly seems like a niche that future research should fill to broaden our understanding of the impacts of packaging design on the consumer.

Further investigation is certainly needed in order to fully validate these findings, and doing so is essential to our understanding of whether transparent windows are more efficacious as compared to their more traditional graphical counterparts. In addition, much of the research in the field thus far has used very plain packaging (either plain cardboard boxes or brown paper bags), or otherwise relatively basic mock-ups of product packaging designs. Thus, the application of these findings to current packaging design for actual products may not be expected to yield similar results, and highlights a need for experiments using more ecologically-valid stimuli. So, while it would certainly seem that transparent packaging

confers a wide array of potential benefits, more research is needed before we can fully understand the phenomenon and thus make more informed recommendations.

5. Further implications of transparent packaging

In addition to the empirical evidence highlighting the benefits of transparent packaging, there remains some more pragmatic considerations and implications of the use of transparency or windows as part of the design of packaging.

One such consideration might be that the product, or the arrangement of the product as seen through a transparent window, may not be as visually appealing as intended once it reaches the store shelf. As an example of this, covering a window in cardboard packaging with a thin or non-rigid plastic window may be likely to reduce the overall structural integrity of the packaging, thus potentially leading to an increase in the number of products damaged in-transit, or more complicated shipping requirements. Naturally, using a thicker, more robust plastic pane would help to resolve this issue, but at an expected additional cost. Further, products may become dislodged or disordered inside their packaging during haulage, potentially making them less visually attractive. If the consumer can see this, they might be less likely to purchase a visually unappealing product (as discussed previously), or one that is damaged. Even in the case of products such as cereals or crisps, any settling of the food(s) within the package may serve to make the product look denser or less appealing than intended, especially if some of the product disintegrates during transit. To combat this, the products would need to be tightly packed in order to ensure little gets dislodged in the event that the package does get shaken or disturbed. As far as the settling of the product is concerned, windows would be best placed away from the very lowest portion of the packaging, where the accumulation of dust, broken bits, or settling may be visible for some

products. Conversely, placing a window in the upper portion of a pack may not show any of the product at all if it has settled below this level. As Stuart Leslie, founder of '4sight', a New York design firm, said recently in a Wall Street Journal article (Nassauer, 2014): *"You don't want to hit people over the head with, 'Look, there are 2 inches of space on the top of this container'"*. As such, the position of the window is critical and needs to be carefully considered, as several experts also suggested during the interviews in Engels (2015). Lastly, if the product has a mix of different elements, such as cereals with currants or nuts, the consumer may expect to be able to clearly see these through any transparency in the packaging – if not, they may feel deceived, and their perception of the product may suffer. Indeed, reformulations to recipes with visibility in mind may be necessary to ensure that the product looks appealing, will remain intact, and clearly showcases all of the ingredients that the product claims elsewhere to contain (see Oster, 2014).

Another important consideration for the inclusion of transparent elements into packaging would likely be cost. From a rudimentary search online of ready-to-use packaging with and without windows, packaging with windows seems to be consistently slightly more expensive (some 10-30% for pre-assembled paper bags, from the author's own research) than their windowless counterparts. Equally, adding a hermetic seal to ensure food safety can further increase the cost, although some categories, such as chilled pizzas or cereals, can avoid this by packaging the product in a plastic wrap to achieve a seal, and not covering any window with plastic to mitigate costs. This being said, with recent advances in the field of die-cutting and the services now proffered by packaging solutions companies, transparency as part of packaging now offers equivalent levels of food safety. Furthermore, transparent elements can reportedly be built in for marginal extra cost if producing packaging is produced on a large scale. According to one source, the cost of adding transparency can mostly be offset from any cost of embossing or foil decoration that would be used to attract attention in place of the

transparency (Greasley, 2012). Note also that some categories may not be suited to the incorporation of transparent packaging for reasons of spoilage. Examples of such product categories include those which would oxidise in contact with sunlight, such as cream-based liqueurs, or those where raw ingredients might discolour, such as for potato tubers (see Martin & Sheppard, 1983). However, perhaps transparent packaging will, in the future, be able to give us advanced warning of spoiled food. For example, researchers at the Fraunhofer EMFT have developed a transparent film that changes colour if the meat inside has gone off (Fraunhofer Mikroelektronik, 2011).

Further implications for the use of transparency in packaging design include the additional design opportunities that using windows, specifically, could bring. For example, there are opportunities to design windows to take advantage of the benefits of relevant shape symbolism (e.g., Ngo et al., 2013; Spence, 2012; Spence & Ngo, 2012; Spence, Ngo, Percival, & Smith, 2013). As suggested by the research reported by Fairhurst, Pritchard, Ospina, and Deroy (2015), sweeter-tasting products will be better suited to have packaging designs featuring rounded windows, and sour- or bitter-tasting products with a more angular one (as discussed already). As a further example, a leaf-shaped window may well instil in the mind of the consumer the notion that the product is natural or fresh. As an extension of this, using any transparency at all has the capacity to signal a premium offering, innovativeness and modernity in a product and brand (especially if transparent packaging is not a ‘category-norm’; see Burrows, 2013); as well as the notions of freshness (see also Nikolaidou, 2011), honesty, and quality assurance already discussed in Billeter, Zhu, and Inman (2012). Additionally, the benefits of transparency could also be augmented by using product visuals alongside, although careful steps would need to be taken to avoid a design that appears too visually-cluttered. There are, however, also risks of using such packaging when trying to convey the legacy of a brand, thus consumer testing of new packaging design concepts would

still be advisable. For instance, one manufacturer was reticent to use too much transparency, to avoid undermining the heritage which the packaging originally conveyed, and for which the product was known (Murray, 2016). Conversely, a ‘best of both worlds’ approach might also be effective in some situations: for example, in by using a very narrow transparent area, or a semi-transparent element, to elicit perceptions of mystery or intrigue by ‘not giving it all away’ at the point of sale. See Figure 3 for some recent examples of creative designs that have used transparency.

[Insert Figure 3 here]

One further aspect that is also worth noting is that the impact of a transparent window is likely to be moderated by the main colour of the packaging around it. The field of visual attention has long held colour to be a key component of attentional capture, being especially capable of attracting our attention if the contrast between foreground-background is greater (e.g., Treisman & Souther, 1985; Folk, Remington, & Wright, 1994; Theeuwes, 1994; see Wolfe & Horowitz, 2004, for a review). Indeed, high contrast between packaging colours has been found to attract the attention of consumers to a product (Bix, Seo, & Sundar, 2013; though see also Sunaga, Park, & Spence, 2016) as well as to important elements in advertising (Schindler, 1986) In addition, the perceived attractiveness of vegetables has recently been found to differ depending on the background colour the vegetable is presented on, with quite different background colours proving optimal for the vegetables tested (see Schifferstein, Howell, & Pont, 2016) . Given that visual attention is attracted to regions of high contrast, perhaps this could play a pertinent role with respect to transparent windows. For example, orange-coloured baked beans, visible through an otherwise-teal container (as is the case with Heinz products) would likely make the product stand out more and attract attention. Examples of other brands that could use transparency to leverage high contrast

between packaging- and product-colour might include Cadbury's (purple packaging, with brown-coloured chocolate) and Barilla (dark blue packaging, with light-yellow pasta). However, where the product and the packaging have low contrast, such as pasta in beige packaging, say, the effect may be lessened. If transparency is used, a strong contrast between product and brand colours would likely be beneficial. However, while likely an important consideration, this has yet to be addressed by research so no clear guidance can be offered at this point (though see Lyman, 1989).

There can also be functional benefits to transparent elements of packaging: using a narrow strip of transparency can help the consumer to monitor how much of the product has already been consumed. Furthermore, transparent elements allow an easier means of assessing whether or not the food has spoiled, thus potentially reducing the amount of food wasted by disposing of it simply when the printed expiry date is met, not when it is actually inedible. Such benefits may not be so impactful at the point of sale, but could certainly bring added value to the consumer at home.

One must also be aware of a recent demand from consumers to be able to recycle product packaging, which may deter them from purchasing some plastic packages (e.g., Mainieri, Barnett, Valdero, Unipan, & Oskamp, 1997; Rokka & Uusitalo, 2008). Note that transparent windows and plastic packaging can now be readily obtained from recycled plastics (such as rPET), which could help mitigate such problems of recycling (see Mintel, 2016, for a review). Additionally, providing clear and comprehensive recycling instructions may help alleviate any concerns consumers have regarding recycling and packaging waste (Langley, Turner, & Yoxall, 2011).

6. Guidelines

Based on the empirical evidence reviewed here, we would offer the following guidelines:

- Use product imagery as an effective means of capturing the customer's attention, enhancing their perception of the product, and increasing purchase intent.
- Product imagery, if used, should avoid being disingenuous or overly digitally-enhanced, as consumers will be unlikely to purchase again if the design ultimately gives rise to a negative disconfirmation of expectation(s).
- Use transparent packaging, only if the product is not visually unappealing, in order to promote consumption, perceived quality and brand trust and higher purchase intentions, especially as the consumer demand for transparent packaging is currently on the rise.
- Thorough market research should be used in order to test any new packaging designs, in order to fully understand the likely impact on consumer evaluations and purchase behaviour.

Previous findings can also be taken to suggest that: (1) angular windows would likely be preferred by consumers compared to rounded windows; (2) coloured tints for transparency are unlikely to have a negative impact on consumer evaluations or behavioural intentions; (3) transparent packaging is likely most effective for brands which a consumer is unfamiliar with, in order to allow them to gauge the quality of the product prior to an initial purchase; and (4) that perceived product healthfulness can be strongly influenced by the presence of transparent packaging, but whether this is beneficial or detrimental to the product likely depends on the product category in question and how appealing the product itself looks. However, these findings have yet to be tested robustly through the use of several experiments and product categories, and caution would be advised in treating these as guidelines.

7. Conclusions

In summary, the research clearly suggests that enabling the consumer to see the product, either through, or on, the packaging has a marked effect on consumer behaviour. As such, the correct use of product imagery and/or transparency as part of packaging design plays a critical role in influencing the success of products in the marketplace. However, the existing literature regarding transparent packaging currently remains scant, with many areas in need of further investigation. Some of the questions that have yet to be answered properly include the following: How does the size and position of transparent windows on product packaging mediate any effect on consumer perceptions and purchase behaviour? Does the use of transparency raise the accepted price (or willingness-to-purchase) of the product? (And does that benefit outweigh the additional cost?) Would any benefit be conferred by using both transparent packaging alongside product visuals? Does the colour contrast between the contents of the packaging (as seen through a window) and the rest of the packaging influence/modulate these effects? These are just some of the research questions that will need to be answered carefully in order to benefit designers, marketers, and those with an interest in public health alike.

Fortunately, the means of answering such questions are becoming increasingly accessible. As Woods, Velasco, Levitan, Wan and Spence (2015) highlighted recently, the use of online research testing methods is becoming an increasingly valid and viable methodology for perceptual research, and even preferable compared to laboratory research in many respects. In addition, understandings of multisensory perception (especially between vision and taste) are growing fast, and will help identify further avenues for understanding consumer psychology (see Velasco, Woods, & Spence, 2015; Velasco et al., 2014; for a couple recent examples). Indeed, as more and more brands incorporate multisensory aspects into their packaging design (Johnson, 2007; Spence, 2016; Spence & Wang, 2015), the capacity and

demand for such research will likely increase dramatically, and this demand needs to be both acknowledged and met by the academic literature.

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Author’s contributions

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Figure Legends

Figure 1 (a): Examples of front-facing product imagery as part of packaging design in four Fast Moving Consumer Goods (FMCG) food categories; **(b):** Examples of transparency as part of packaging design in four FMCG food categories.

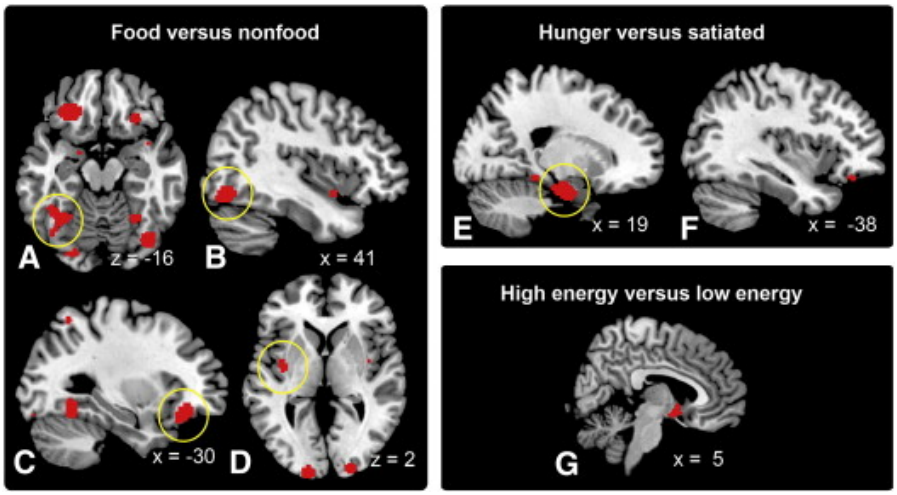
Figure 2: Activation Likelihood Estimation meta-analysis results, showing brain regions with significant maxima ($p < .05$, FDR-corrected for multiple comparisons, cluster size > 100 mm^3). Circled regions show a presence of these foci in at least a third of all studies analysed. Red regions highlight the difference in activation between different image presentation conditions. Combined, these slices show the regions most activated when presented with images of foods. Slices A-D highlight the difference in activation between food vs. non-food image presentations. Specifically, the labels show: (A) a cluster from the left posterior fusiform gyrus to the middle occipital gyrus; (B) the right posterior fusiform gyrus; (C) the inferior frontal gyrus of the left lateral orbitofrontal cortex; and (D) the left middle insula. Slices E-F highlight the difference between hungry vs. satiated state. (E) shows a cluster from the right parahippocampal gyrus to the right amygdala; and (F) shows a cluster in the inferior frontal gyrus of the left lateral orbitofrontal cortex. Finally, (G) shows a cluster between the hypothalamus and the caudate, from image presentations of high energy vs. low energy foods. Reprinted with thanks from van der Laan, de Ridder, Viergever, and Smeets (2011), Figure 2.

Figure 3: Examples of innovative transparent packaging design across several FMCG food categories.

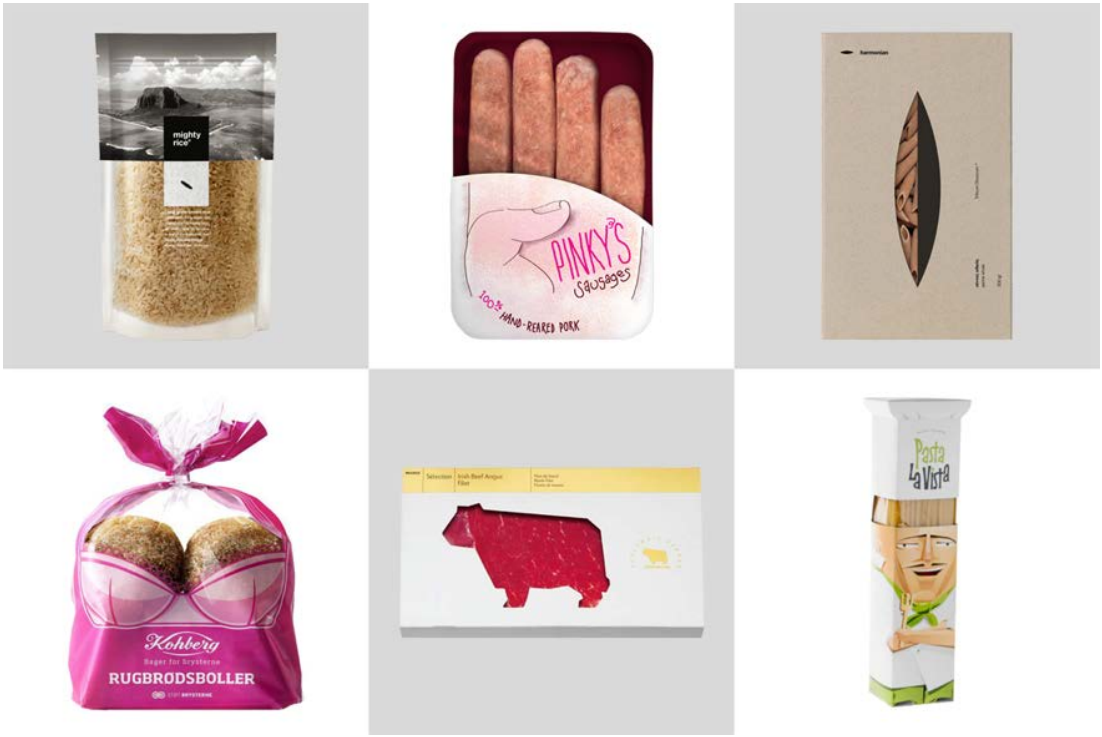
Figure 1(a).

Figure 1(b).

Figure 2.


Food versus nonfood
A
z = -16
B
x = 41
C
x = -30
D
z = 2
Hunger versus satiated
E
x = 19
F
x = -38
High energy versus low energy
G
x = 5

1124 Figure 3.



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