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## Food Imagery and Transparency in Product Packaging

Gregory Simmonds and Charles Spence

### Introduction

Product packaging is a ubiquitous part of Western lifestyles: even if you don't step into a supermarket, you will still likely interact with packaging countless times throughout the course of each and every day. Indeed, you would struggle to eat, drink, or bathe without seeing and touching the packaging that so many commonplace products come in. And, if you were to go grocery shopping (which, according to Nielsen, 2017, the average household does around twice a week), exposure to packaging is unavoidable: for example, walking through all of the aisles of an average North American supermarket results in the shopper being exposed to an average of 38,900 products (according to the Food Marketing Institute, 2018). Similarly, larger supermarkets in the UK offer somewhere between 20,000 and 30,000 different products, with

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G. Simmonds (✉) • C. Spence  
Crossmodal Research Laboratory, Department of Experimental Psychology,  
University of Oxford, Oxford, UK  
e-mail: [gregory.simmonds@psy.ox.ac.uk](mailto:gregory.simmonds@psy.ox.ac.uk)

this number increasing up to as many as 60,000 if you visit the market leader in the UK, Tesco (Wood & Butler, 2015). Given that a typical supermarket customer purchases an average of 240 of these products over the course of the year (Catalina, 2014), the hardest task for the consumer is to find the products that they want to purchase from amongst this very much larger set of alternatives. As a result, the task for marketers and brand managers is to get their products noticed quickly by potential buyers, and tempt them enough to get this product into the shopper's consideration set. Both of these objectives are becoming ever more challenging. Consider, then, that packaging is also the final 'touchpoint' a brand has with a prospective consumer before they decide whether to purchase or not (at least, in conventional bricks-and-mortar stores; see Pilditch, 1973). Packaging design therefore has to convince the consumer, often within a second or less (Clement, 2007), that a product is the best value for money, the tastiest, the most effective, the best quality, and so on, using primarily visual information and cues. All of this, and on only the front-face of the packaging design, given that the majority (c. 88%) of consumers normally don't bother to look at any other face of the packaging prior to purchase (see Benn, Webb, Chang, & Reidy, 2015). With all of this in mind, it suddenly seems that this 'silent salesman' needs to be vocal indeed if it is to attract the attention it needs in order to influence the consumer's purchasing decision.

Despite its importance, the design of effective product packaging has, though, largely been ignored by academics until the last decade or two. As Hine (1995, Foreword, p. x) notes, packaging 'flies beneath nearly everyone's analytical radar', even though it plays such a central role in our lives. Furthermore, these demands leave brand managers and marketers alike hungry for new ways in which to engage, communicate effectively with, and entice prospective consumers using primarily just the (visual) design of the product packaging. This chapter, then, details how images of the product—seen either *on* the packaging (as a printed image), or else *through* the packaging (via some transparent element)—can influence the perceptions and intentions of consumers. Note that there will be a greater focus on food and beverage packaging, given the larger share of attention paid to this subject by empirical investigation.

## The Sight of Food

Given that our survival depends upon the regular consumption of food, it should perhaps come as little surprise to find that our cognitive systems seem biased towards food-related visual cues. Indeed, food-seeking behaviours have been found to be encouraged and influenced by a complex network of both psychological *and* physiological systems, such as circadian rhythms (Masterson, Kirwan, Davidson, & LeCheminant, 2016), attention (di Pellegrino, Magarelli, & Mengarelli, 2011; Nijs, Muris, Euser, & Franken, 2010), reward (Berthoud & Morrison, 2008), and pleasure (Kringelbach, Stein, & van Hartevelt, 2012). However, perhaps most important is the interplay between the visual system and attention (see Laska, Freist, & Krause, 2007): it is this that results in images of food tending to elicit robust involuntary attentional capture (for reviews, see Simmonds & Spence, 2017; Spence, Okajima, Cheok, Petit, & Michel, 2016). Note that while the efficacy of such attentional capture appears to be influenced by individual factors, such as increased feelings of hunger<sup>1</sup> (e.g., di Pellegrino et al., 2011; Nijs, Muris, Euser, & Franken, 2010; Piech, Pastorino, & Zald, 2010), negative mood (e.g., Brignell, Griffiths, Bradley, & Mogg, 2009; Gould, 1997; Hepworth, Mogg, Brignell, & Bradley, 2010), and above-average weight (e.g., Nummenmaa, Hietanen, Calvo, & Hyönä, 2011; Werthmann et al., 2011), it is not exclusive to them. Furthermore, the nutritional value of the food in question also seems capable of influencing this attentional capture, with higher calorie (Garcia-Burgos, Lao, Munsch, & Caldarà, 2017), sugar, fat (Harrar, Toepel, Murray, & Spence, 2011; Sawada, Sato, Toichi, & Fushiki, 2017; Toepel, Knebel, Hudry, le Coutre, & Murray, 2009), and

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<sup>1</sup>Note that 'hunger' relates to feelings of the *need* for food, while 'appetite' relates to feelings of the *desire* for food (that said, the two terms are often used interchangeably). Hunger is largely caused by contraction of stomach muscles that, beyond some point, result in physical sensations of hunger pangs. Appetite, however, is a psychological phenomenon, which can be brought about by physiological indications of hunger (Geiselman & Novin, 1982). Thus, even in the absence of hunger, appealing foods might promote appetite for the food when seen, though satiety should reduce this appetite in a healthy population.

carbohydrate (Yokum, Ng, & Stice, 2011) contents of depicted foods being related to faster attentional capture.<sup>2</sup>

Of course, these psychological and physiological effects do not stop once the consumer's attention has been attracted. Rather, simply seeing food (as long as it is edible; i.e., not spoiled) elicits increased reports of hunger, increased appetite (largely regardless of satiety; Hill, Magson, & Blundell, 1984), increased insulin release compared to baseline (Johnson & Wildman, 1983), and increased salivation (Kljajner, Herman, Polivy, & Chhabra, 1981; see Spence, 2011, for a review). More recent research has scrutinised why this might be, with early results suggesting that seeing food encourages the viewer to imagine eating it (this is what has been referred to as 'consumption simulations'; Keesman, Aarts, Vermeent, Häfner, & Papies, 2016; Papies, Best, Gelibter, & Barsalou, 2017; cf. Tiggemann & Kemp, 2005; or, elsewhere, 'embodied mental simulations', cf. Haasova, Elekes, Missbach, & Florack, 2016), as well as specific approach behaviours towards food (Piqueras-Fiszman, Kraus, & Spence, 2014). In turn, these effects seemingly encourage purchase intentions for the product in question (e.g., Pachauri, 2001; Wilcock, Pun, Khanona, & Aung, 2004) and higher levels of consumption of the product (for reviews, see Lieberman, 2016; McCrickerd & Forde, 2016; Polivy & Herman, 2014). Note that this effect of increased consumption is modulated by food palatability, in that the more attractive or tasty a food/dish/drink is thought to be, the harder this drive to eat is to resist (Passamonti et al., 2009). For those foods that are also perceived as being 'unhealthy' (i.e., high in sugar/fat/carbohydrates), consumers seem to expect a better taste, as well as reporting enjoying the actual consumption more (Raghuathan, Naylor, & Hoyer, 2006). Neurological evidence supports these findings: specifically, functional magnetic resonance imaging (fMRI; a technique

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<sup>2</sup>As a potential fourth nutritional value identified, note also that foods high in alcohol content seem to elicit an attentional bias wherein more attention is paid to alcohol-related, vs. neutral visual stimuli by those who drink (Roy-Charland et al., 2017; for a review, see Field & Cox, 2008). Specifically, an associated effect of increased visual (over auditory) sensory dominance has been identified when alcohol-related stimuli are shown (Monem & Fillmore, 2016). It would certainly be interesting to identify whether such findings can be replicated when using visual stimuli of other foods/drinks, in that less attention might be paid to other sensory modalities. If so, it would be especially interesting to see whether this reduced attention also affects the chemical senses (i.e., smell and taste), since these are obviously fundamental in the appreciation of the food that we consume.

commonly used to investigate brain activity) scans conducted while participants view images of food have identified increased brain activity in those regions thought to govern attentional systems, those that assess how pleasant a food is, and those regulating imagined taste and food cravings (for reviews, see Hollmann, Pleger, Villringer, & Horstmann, 2013; Salem & Dhillon, 2015; van der Laan, de Ridder, Viergever, & Smeets, 2011).

Thus, one might reasonably expect these powerful effects of seeing (attractive or tasty) foods to be a godsend for the packaging designer. Surely, letting the consumer see enticing product images on (or the product itself through) the packaging should have a net positive effect on product perception and sales performance? And, assuming that this is the case, why would any designer or brand manager choose *not* to do so, given such a putative advantage? The following sections aim to summarily investigate the empirical response to these questions.

## The Impact of Food Imagery on Product Packaging

Despite the potentially powerful effect of using product imagery on packaging, and, anecdotally, its common prevalence in the marketplace, a remarkably small number of empirical studies to date have investigated how the imagery used in packaging designs influences the consumer. Regardless, a number of effects on consumers' evaluations of products have been identified in the existing research, and certain valuable learnings can still be drawn, which are discussed shortly. However, one must first be quite clear about what 'imagery' relates to in this context. When talking about 'product imagery', we refer to a printed visual representation of the product (likely shown cooked or prepared as intended for consumption) inside the packaging. With 'food imagery', however, we refer to representations of product ingredients as well as the product itself: thus, pictures of vegetables on a soup packet or tomatoes on a bottle of ketchup would be included. Note that this can be further divided into 'edible' and 'inedible' food imagery: as an example of the latter, the image of roasted coffee beans on a packet of ground coffee are likely evocative of the flavour, despite the fact that they (and

indeed, the product) must be manipulated in some way before they are ready to be consumed (in the case of coffee, brewed). Finally, and most broadly, ‘food-relevant imagery’, which is imagery of something inedible but which relates to, or is evocative of, the product: for example, using an image of cows to draw on their intrinsic link to milk or herbs on bottles of gin or seasoned sausages. Note also that, for some categories, none of these seem to apply (or at least, to be commonplace): for example, cola-flavoured products seldom use imagery of any of the most distinctive ingredients or flavours (typically being cinnamon, lemon, and vanilla) or the product on pack. Thus, throughout the rest of this chapter, when we talk about ‘imagery’ we refer only to product imagery or, occasionally, edible food imagery, since our interest is in reviewing the role of seeing (edible) foods on product packaging.

Turning our focus back to the effects of seeing food on-pack (or, specifically in this case, product imagery): the attentional capture effects of food imagery, as discussed previously, have also been identified for packaging designs using food imagery (e.g., Underwood, Klein, & Burke, 2001; Venter, van der Merwe, de Beer, Kempen, & Bosman, 2011). Furthermore, estimates suggest that the vast majority (as many as 80–90%) of consumers look at product imagery on-pack while browsing the supermarket shelves to help them find what they want (see Varela, Antúñez, Cadena, Giménez, & Ares, 2014), hinting at how important imagery can be for consumers and their shopping behaviours. A small segment of the population (estimated at around 20%) seems especially dependent on product imagery when evaluating overall product liking, being strongly skewed towards those products that show product imagery (Deliza, Macfie, & Hedderley, 2003). Product imagery has also been found capable of increasing the amount of attention that is paid to the brand logo (Underwood et al., 2001), as well as encouraging the consumer to infer information/attributes about both the brand and product from the imagery used (Rebollar et al., 2017; Schifferstein, Fenko, Desmet, Labbe, & Martin, 2013; Underwood & Klein, 2002; Underwood & Ozanne, 1998), and facilitating comparisons between products within the consideration set by comparing images (Venter et al., 2011). Therefore, it would seem clear that the choice of whether to use imagery (or not) in packaging design is a non-trivial decision: imagery can capture attention, provide information about the product and brand, and increase overall product liking.

In addition to (or, feasibly, as a result of) this increased attention paid to the product, the simple use of product imagery has also been found to encourage purchase intentions (Gofman, Moskowitz, Fyrbjork, Moskowitz, & Mets, 2009; Piqueras-Fizman, Velasco, Salgado-Montejo, & Spence, 2013). This is thought to be likely dependent on both the product and the image shown, with more attractive product images providing a greater increase in purchase intent<sup>3</sup> (Mizutani et al., 2010). This seems to match the conventional wisdom of designers, as summarised by Hine (1995), where effective packaging design is that which is both innovative and appealing, such as ‘a photograph of ice cream that emphasizes its texture and is so vivid shoppers almost want to lick the carton’ (p. 196). However, it is important that any product imagery used provides (or is perceived to provide, at least) an honest portrayal of how the product inside will look when the consumer gets ready to eat it. Underwood and Ozanne (1998) highlight that imagery that is thought to be intentionally misleading (e.g., digitally manipulated to look larger, fresher, tastier, healthier, and/or of better quality than it would, in reality, be) can reduce purchase intent dramatically, potentially resulting in a net deleterious effect (see Pearson-Jones, 2018; Webster, 2018, for a few examples).<sup>4</sup>

Furthermore, the use of product imagery has also been found to be an effective tool by which to manipulate sensory expectations and evaluations. By using one of only two different images (in this case, either a photograph or a drawn illustration of passion fruit, for a passion fruit juice drink; see Deliza et al., 2003), it is possible to elicit significantly

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<sup>3</sup>Note here that while it may seem reasonable to expect that ‘attractive’ foods are also ‘unhealthy’ (which capture our attention to a greater extent, as mentioned in the previous section), one can imagine healthy foods that can still be presented attractively and unhealthy foods in an unattractive manner. Additional research may help to clarify the exact distinction between these two concepts, as they are often conflated. There may also be relevant cross-cultural differences here.

<sup>4</sup>Note that, as yet, it has not been explored how different types of image manipulation affect the judgements of consumer. For example, a designer could include tempting, if unrealistic, serving suggestions; or show an inadvisably large portion size (e.g., Khehra, Fairchild, & Morgan, 2018); or use perspective and clever framing to distort perceptions of product size; or exaggerate the relative proportion or prevalence of certain ingredients (e.g., the filling in sandwiches); and so on. Some may be more or less acceptable to the consumer, and affect product judgements accordingly. However, without further research, no guidance can be offered. Furthermore, note that sometimes the ‘deceit’ might only be perceived at the point of unboxing the product, perhaps leading to a disconfirmation of expectations (e.g., see Schifferstein, Kole, & Mojet, 1999), and affecting later purchase. This might also be a worthy line of enquiry.

different expected sensory profiles for exactly the same product, based on sensory expectations including how sweet, pure, refreshing, fresh, and natural the product is expected to be. Deliza et al. (2003) also proposed that the two significantly different sensory profiles were likely responsible for a significantly different overall liking for the product, highlighting just how powerful the use of product imagery can be. Indeed, similar effects have been identified when using imagery of the product itself, as opposed to its core ingredient: Rebollar et al. (2017) used crisp (potato chip) packaging with either an image of a chip ('product imagery') or raw potato on (merely 'food imagery'). The packaging with the image of the actual product resulted in expectations that the crisps were saltier and crispier (as compared to the package with the image of a potato), and were rated as more likely to be purchased.<sup>5</sup> Note that similar influences have been identified with respect to factors such as colour and shape (which are discussed in greater depth in a number of the other chapters in this volume; cf. Velasco et al., 2016). It is also possible (although currently untested) that the shape or colour of imagery, as well as the content and location of the image, play persuasive roles in the formation of sensory expectations as well (e.g., Velasco, Adams, Petit, & Spence, in press; see Piqueras-Fiszman & Spence, 2015, for a review of the literature on sensory expectations). Thus, although the current literature cannot yet predict whether some particular image (or design) will provide or modify some particular expected sensory profile, ambitious product developers could potentially use packaging design, when paired with adequate research (e.g., see Hamlin, 2016), in order to augment the resulting product experience without necessarily having to change the recipe at all.

Note, as well, that the visual context in which the image is presented has been found to moderate the benefits of its use in some circumstances. For example, if the background becomes more visually salient

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<sup>5</sup>Note that there will likely be cases where this is not the case. For example, Machiels and Karnal (2016) identify a subset of consumers who find product packaging designs with imagery of *ingredients* on the package, rather than imagery of the *actual product*, to be more natural, and have a 'purer' taste. As a result, these consumers are also more willing to purchase the product with the ingredient imagery. This subset describes consumers that are health-conscious and are more prone than average to search for symbolic meaning; thus, the image of the ingredient acts as a visual metaphor for purity, whereas the product is seen as artificial.



(e.g., more detailed, more colourful, etc.), then visual attention may be drawn *away* from the image of the food (Zhang & Seo, 2015), essentially distracting the consumer. Although not, as far as we are aware, empirically tested to date, one might reasonably expect the inverse to also hold true (i.e., using a less detailed background design to help guide attention to any prominent product imagery). If this were to be achieved, one might also expect this to result in an increased overall product preference, as per the previously discussed effects of seeing foods—perhaps this would be a fruitful avenue for future research (cf. Simmonds, Woods, & Spence, *in press*). Indeed, note that surrounding colours, shapes, and textures are all thought potentially important factors, as supported by the growing body of research into the effect of plateware and cutlery on people's perception of the food served (see Deroy, Michel, Piqueras-Fizman, & Spence, 2014; Spence, 2018; Spence, Piqueras-Fizman, Michel, & Deroy, 2014).

Such results encourage us to assume that product imagery could be a real boon (both from the point of view of the consumer, by enhancing the product experience, as well as for commercial interests, by encouraging sales). Yet, as perhaps will now be evident from that which has gone before in this chapter, one of the key findings from reviewing this literature is that there is a real opportunity to expand our knowledge in this area. Little is currently known about the relative effects elicited by the different ways in which imagery can be displayed. For example, how would manipulating different styles of photography, the 'temperature' of any images, the nutritional value of products shown, the use of any serving suggestions, and/or the size of the area that the photography occupies on the packaging influence the effects already identified? Indeed, how does this affect consumption at home? Are the effects of seeing food(s) replicated robustly and to the same extent on packaging designs as in real life, and does this change as a function of the environment in which the packaging is seen? And finally, does using product imagery in packaging design impact perceptions of the brand more broadly? None of these questions have, as yet, been answered, and it is critical to do so before more concrete direction could be given to interested parties such as brand managers and designers, not to mention public health officials.

## The Impact of Transparent Packaging

As we have discussed already, seeing product imagery can have a net positive effect on consumer evaluations and purchase intentions. However, printing an image is not the only way in which to display the product on-pack: what about the growing trend of wanting to see products *through* transparent packaging (as discussed in Deng & Srinivasan, 2013)? The following section of this chapter investigates how the effects elicited by product imagery can be replicated using transparency, and indeed, how any effects elicited by imagery and transparency can differ.

Two pieces of evidence already discussed lead to the hypothesis that transparent windows should have a positive effect on consumers' product evaluations that is greater than that of a printed image of food products. The first being that the sight of food encourages the mind to imagine eating it (i.e., the 'consumption simulations' addressed earlier; Keesman, Aarts, Vermeent, Häfner, & Papies, 2016; Papies, Best, Gelibter, & Barsalou, 2017). It does not seem unreasonable to cautiously assume that transparent packaging should elicit this effect more robustly, since the consumer could, in most cases, *actually* reach out and eat the product that they see in front of them since it is available (assuming that the food thus shown doesn't need to be cooked prior to consumption, like raw pasta; conversely, printed images are not well known for their edibility).<sup>6</sup> Second, since printed images may be seen as untrustworthy or duplicitous (Underwood & Ozanne, 1998; Venter et al., 2011), any benefit that such imagery may have conferred may in some cases be markedly reduced (or else undone entirely); conversely, transparent windows should have far fewer (if any) issues of consumers feeling uncertain of, or 'duped' as to, what is contained within the packaging.

Broadly speaking, the existing evidence supports the notion that transparent packaging should provide the same, if not greater, benefits compared to product imagery. The presence of transparent packaging seems capable of increasing purchase intent and perceived product quality (Billeter, Zhu, & Inman, 2012; Chandran, Batra, & Lawrence, 2009; Engels, 2015; Simmonds, Woods, & Spence, 2018). Furthermore, these

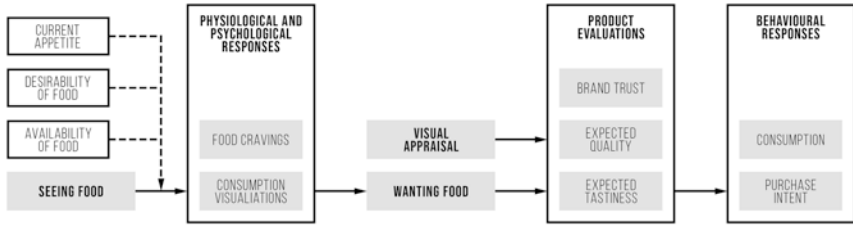
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<sup>6</sup>It may, of course, be that the brain does not meaningfully discriminate between real food and images of food. Research on this topic would certainly be of value.

findings have consistently been found to be reliant on the product being attractive (or, perhaps, energy dense, as discussed in a previous section), wherein more visually attractive food products see greater benefits in terms of consumer perception. Indeed, Vilnai-Yavetz and Koren (2013) detail a case study in which the opposite was true: the introduction of transparent packaging had a negative effect due to the product itself not being attractive. With respect to the other, complementary mechanisms at play here, many studies have identified that any increase in purchase intentions is likely mediated by an increase in expected product quality (Chandran et al., 2009; Simmonds et al., 2018; Vilnai-Yavetz & Koren, 2013) or perceived product trust (Billeter et al., 2012) from being able to see the product. Expected product tastiness and perceived packaging attractiveness have also been identified as having mediating roles in this relationship, although with varying effect sizes for different product categories (see Simmonds et al., 2018, for further discussion).

Aside from resulting in greater consumer purchase propensity, transparent packaging has been implicated in a number of other effects. For example, Deng and Srinivasan (2013) identified that participants who watched a (distractor) film ate up to 88% more of a snack item in transparent packaging than in opaque packaging. This was, again, found to be mediated by product attractiveness: roughly 60% more (by weight) of attractive foods was eaten if it was in a transparent package as opposed to opaque packaging, yet roughly 30% *less* for unattractive foods in the same circumstances. Thus, the evidence suggests that transparent packaging seems capable of influencing consumer behaviour both in-store *and* at home. Additionally, while more 'honest' imagery can help build trust in the product (as discussed previously), transparent packaging is thought to help maximise this, resulting in overall high product trust (see Burrows, 2013; Venter et al., 2011).

Combining all of the various findings discussed throughout this chapter, a model to explain the effects on the consumer of seeing food can be advanced (see Fig. 3.1). In this, the very act of seeing food leads to a number of physiological and psychological responses, without any conscious control. These responses include food cravings, the triggering of feelings of hunger, and visualising consuming the product (i.e., embodied mental simulation). Several factors moderate the magnitude of these responses: if the food is seen to be desirable (i.e., attractive), or available



**Fig. 3.1** Modelling the psychological mechanisms that manipulate product-related evaluations and behaviours that occur after the consumer sees food

(i.e., could readily be eaten), then these responses will be greater. However, if the consumer is currently sated (i.e., not hungry due to having eaten recently), then these responses will likely be minimised. These responses trigger a wanting for food, which, in turn, enhances certain evaluations of the product in question. For example, the product will likely be expected to be tastier, of better quality, and produced by a more trustworthy brand, if the food is wanted more. The ability to accurately appraise the product is also likely to impact upon these evaluations<sup>7</sup> (especially on brand trust). These product evaluations would then result in a greater likelihood of purchase and consumption for the product. Thus, transparent elements have the upper hand over imagery in two cases: the product is more available (since the food itself is seen by the consumer), positively moderating the effect of seeing food if it is ‘attractive’; and the product can be more accurately and honestly appraised (whereas imagery would possibly be seen as untrustworthy or manipulated in some way), increasing the positivity of people’s product evaluations. Note that this model does not consider several other important factors in consumption/purchase behaviours, such as price, value for money, previous experience, and individual factors such as weight, mood, and so on: these have been purposefully omitted for brevity.

Perhaps of particular interest to public health practitioners, note that transparent packaging seems to be able to moderate people’s perceptions (or expectations) of product healthfulness (see also Fenko, this volume),

<sup>7</sup> Presumably, if the product needs cooking prior to consumption, then this appraisal is of greater importance (e.g., of meat, to make sure it is fresh and of the correct size and cut), since an inedible product would be unlikely to entice anyone’s appetite.

although the mechanisms by which this effect is elicited are not yet well understood. Sioutis (2011) identified that the presence of transparent windows on packaging designs was highly influential in terms of increasing the expected healthfulness of a product. Conversely, however, Riley, Martins da Silva, and Behr (2015) reported that product imagery, rather than transparent packaging, promoted greater expectations of product healthfulness. Their research also highlighted that the choice of transparency versus imagery seems to be, instead, a relatively unimportant factor when forming health expectations based on packaging design (with the amount of textual product information presented on pack contributing the most to these expectations). A potentially likely explanation for these conflicting results may be identified by considering the attractiveness of the product in the stimuli used: Sioutis (2011) used orange juice and breakfast cereal as stimuli, with these being photographs of real packaging mock-ups, all using relatively large windows. Meanwhile, Riley et al. (2015) instead used carrot puree, carrot soup, and coffee beans, with these being digital mock-ups, and with small and novel window shapes (e.g., a carrot-shaped window for the carrot products). Perhaps the stimuli used by the former were more attractive to participants, positively mediating this effect seen on expected healthfulness. Alternatively, however, perhaps the smaller, novelty windows on the rendered stimuli used by the latter were hard to identify as a transparent element.

Note that more recent preliminary research by Kroese (2017) suggests that transparent (predominantly paper) packages increased expected healthfulness, expected freshness, and product liking over and above that of opaque (predominantly plastic) packages. Furthermore, the authors' own (as yet unpublished) exploratory research has found that a greater amount of transparency in packaging designs by surface area is, likewise, positively related to greater expectations of product healthfulness and freshness.<sup>8</sup> Indeed, all designs with transparent elements were expected,

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<sup>8</sup> The exact mechanisms that cause this effect are still being investigated, but two theories seem most plausible: first, that seeing (more of) the product encourages inferences of product naturalness, which, in turn, encourages perceptions of healthiness and freshness. Note, however, that this may be a result of the product chosen for stimuli: a ready-to-eat and vegetable-rich noodle salad. Second, that effects are caused by a generalised halo effect from consumers being generally responding favourably to those products that are visible. Further investigation should be able to clarify.

on average, to contain healthier products than those designs with only product imagery, which, in turn, were seen as healthier than designs that showcased neither transparency nor imagery. This work was conducted using mock-up brands for three major product categories (ready meal, wholemeal bread, and minced beef), thus hinting at the potentially broad generalisability of such results across many product categories. Yet regardless, further research into the role that transparent packaging plays on the formation of expectations of healthfulness would be vital in clarifying these previous findings.

Finally, it seems important to highlight that the prevalence of transparency on product packaging is thought to be growing (see Mintel, 2014, 2016; Mintel News, 2014). While little evidence exists to detail the proportion of packages in the marketplace featuring transparent elements, a few estimates have been put forward: Deng and Srinivasan (2013) estimated that 40.3% of packaging has at least some aspect of transparency in the North American market. Similarly, Festila (2016) identified 41.1% of a sample of new products launched on the Danish market that had transparent packaging (with no significant difference in prevalence between health- and non-health-focused product propositions). However, both of these estimates only considered a relatively small number of product categories (only nine unique product categories between them) and only around 1100 products were included across both studies, so may not be a particularly representative estimate. As such, the authors aimed to seek their own estimate for the prevalence of transparent packaging, using the UK's two largest supermarkets (45% of grocery market share at the time of research; April 2016). The number of products with any element of transparency, and the total number of products, was recorded respectively, and for each product category available. Three counts were conducted: one in-store at a large supermarket (Sainsbury's) and two using online storefronts (Tesco and Sainsbury's). Only foods and drinks were evaluated, excluding loose fruits and vegetables, fresh bakery items, deli-counter products, baby food, pet food, and beers, wines, and spirits.

The overall prevalence of transparency in the UK was calculated at approximately 45% of all food/drink packages, in line with the previous US and Danish estimates. Across all product categories, the order of

prevalence of transparent packaging (from highest to lowest) was bakery (c. 80%), fresh foods (c. 65%), drinks (c. 60%), food cupboard (c. 35%), then frozen (c. 15%). Furthermore, counter to what one might expect, transparency was uncommon in snacking and ‘impulse purchase’ products. For example, for chocolate products, prevalence was less than 1%; for biscuits and cereal bars, the prevalence was around only 5%; for crisps, snacks, and nuts, around 10%; and for sweets, around 30%. And conversely, many of the categories with a very high prevalence of transparency were not your typical tempting snack foods at all: for example, prepared chilled fruit, vegetables, and salads had just over 99% prevalence of transparency; and chilled meat, fish, and poultry had over 95% prevalence. In light of all of the results previously discussed in this section, and especially with regards to the results of Deng and Srinivasan (2013), it would seem reasonable to expect that being able to see the product in especially tempting product categories would be beneficial for general appeal and prospective sales. Furthermore, perhaps concealing fruit and vegetables might increase purchase and consumption, at least according to this theory: if so, this should be pursued as a worthy alternative to achieving a common goal for public health officials. While there may be technological challenges in creating transparent packaging in every product category (e.g., where foods are prone to bleaching or spoiling faster with prolonged exposure to sunlight, foods/fats smearing on transparent windows, a technological inability to produce transparent packaging that can maintain a hermetic seal, a desire to optimise packaging for recyclability, etc.), overcoming or resolving these issues certainly seems likely to simultaneously disrupt the market and appeal to the human tendency for focusing attention on (desirable) foods.

## The Problem with Minimalism

By synthesising the results outlined so far, it seems evident that packaging design effectiveness should be optimised by simply showing consumers the product within. Indeed, if the product in question is deemed attractive enough, a transparent window (or fully transparent package) would be the best way to showcase it, and one could expect the greatest benefit in percep-

tions of product quality, tastiness, and associated purchase intent. On the other hand, a less attractive product would likely fare best in packaging that had a printed, but perceivably trustworthy, image of the product on the package instead. Packages with very minimalistic and visually ‘simple’ designs that feature few design elements would thus seem an unwise choice, missing out on all of the benefits above, assuming no product or food imagery was visible (as evidenced in Simmonds et al., 2018; see also Werle, Balbo, Caldara, & Corneille, 2016). Yet anyone with experience working in the Fast Moving Consumer Goods sector will know only too well that this is not always the case. Indeed, some products seem to flourish in minimalistic packaging designs that have barely any more embellishment on them than that required by law. Think, for example, of major UK ranges like Hotel Chocolat, Innocent smoothies, Kettle Chips, and Heck sausages. Indeed, as further examples, many high-end wine labels appear to be successful in the marketplace with largely stripped-back designs. Do these designs not go against all of the evidence detailed here?

One explanation for the phenomenon of effective minimalistic packaging designs might be offered by considering that product categories tend to have a set of informal ‘category-based visual codes’, design ‘heuristics’ which have evolved over generations of successful packaging redesigns (Celhay & Trinquécoste, 2015). These lead to a set of heterogeneous packaging designs for each product category (not to mention the relative success of copycat branding and packaging design, where lesser or newer brands use well-entrenched visual and semiotic cues that exist on market-leading or more dominant brands; e.g., see Kuijken, Gemser, & Wijnberg, 2017; Thao, 2015). However, breaking these cues can signpost a brand as being more innovative, as well as allowing brands to create an aesthetic design not bound by category cues. For example, Celhay, Masson, Garcia, Folcher, and Cohen (2017) identified that atypical, minimalistic wine labels performed on a par with more typical designs if they were novel enough (i.e., to stand out) and were abiding by an unwritten ‘ideal incongruence’ with the established category norms.

Furthermore, as hypothesised by Celhay and Trinquécoste (2015), a specific segment of consumers seem more strongly influenced by atypicality, being more likely to buy products that are sold in atypical designs. This population is thought to have a higher-than-normal sensitivity to



aesthetics (see Myszkowski, Storme, Zenasni, & Lubart, 2014), deriving value from the atypicality of the designs themselves. Perceived risk was found to influence these consumers, in that they were more likely to purchase an atypical design if there was little perceived risk to them (e.g., for a product lower in price or quantity, or which isn't a key ingredient for their needs, etc.), but far less likely to purchase if the risk was higher. Indeed, some evidence suggests that brands should continually redevelop their designs in order to maintain a modicum of design atypicality (i.e., 'newness', see Talke, Müller, & Wieringa, 2017), although the boundary conditions for this effect are not yet well understood. Indeed, the distinction between atypical and minimalistic designs (and, indeed, minimalistic and luxury or premium brands, as per Velasco and Spence, this volume) is not clear in the broader literature, so more concrete recommendations cannot yet be made.

Interestingly, perceived effort in creating such packaging designs may also play a role, having been found to positively impact perceived product quality (Söderlund et al., 2017). While it is not currently clear that minimalistic designs would exhibit this by appearing 'crafted', this seems a further potential explanation. Indeed, this might help explain why so many premium products are sold in packages that are devoid of embellishment (see Velasco & Spence, this volume). Additionally, it also seems feasible that increasingly minimalistic designs can effectively communicate key product benefits (since there is little other visual information to distract from this communication). However, category-based visual codes may likely take on semiotic content (e.g., in the way that, in the UK at least, purple is synonymous with milk chocolate, that red is synonymous with dark chocolate, thanks to the dominant market positions and pack designs of Cadbury's and Bourneville chocolates, say). Thus, perhaps the most effective designs are those that can reliably communicate to consumers what the product is with as few visual cues as possible, while also being able to entice them to make the purchase. As discussed previously, product imagery or transparency likely play important roles in effectively informing the consumer.<sup>9</sup>

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<sup>9</sup>Note that, for especially premium, non-food products, sometimes keeping the product hidden might be preferable, adding to the 'allure' of the product and allowing for an 'unveiling' experience: see Patrick, Atefi, and Hagtvéd (2017).

Seeing that no research seems to adequately explain the causality behind the phenomenon of appeal for minimalistic package designs, further interrogation of possible mechanisms may develop into an interesting field of study in the future. Indeed, it might also be interesting to see whether brand trust acts as an important factor with regards to atypical designs, as it seems to be in the use of printed product imagery.

## Implications and Opportunities for Product Packaging

When considering the future opportunities for using imagery and transparency to design new product experiences, one must focus on innovation in both design and research. Specifically, there is scope for much more research to be undertaken to understand the exact effects (and their limits) on consumers for imagery on packaging, and this has been highlighted throughout this chapter. This could potentially be a very productive future area of research, since the designer has full control over how the product will be presented, thus also giving them the control over any resulting effects or biases.

Additional development of new opportunities to show consumers the product while it sits in its packaging would certainly also help designers and brand managers alike to take control of the product experience. Any packaging (or other solution, such as augmented reality) that can help products be seen through their packaging, but without any undesirable side-effects (such as a reduction in shelf life for products that bleach or spoil in contact with sunlight), would help provide designers with additional opportunities. For example, some packaging formats preclude the possibility of transparency, like aluminium cans, or foil-wrapped products (cf. Brand Packaging, 2017). Indeed, transparent packaging might be especially useful in ‘impulse’ purchase product categories that currently have low transparency prevalence, given that designs could simultaneously disrupt the market and showcase appealing snack foods to hungry consumers. Perhaps packaging-free shopping environments (where products are available from deli-style counters or dispensers, and as are currently being trialled; e.g., Beament, 2018) should also be

considered by retailers eager to experiment with new ways to increase sales. While the suggestion alone seems heretical given the subject of the entire book, a move to a packaging-free aisle might ensure consumers could see products that might otherwise be hidden behind the packaging, while simultaneously reducing packaging waste, so should not be discounted too quickly. Indeed, since glass is readily recyclable and relatively cheap to produce, this may be of greater appeal to more eco-conscious consumers. And additionally, perhaps (in some cases) designers should also become involved in the product development process at an earlier stage. For example, if it is known that a product will be seen through the packaging, and given that attractive and visible products seem to be much better at driving consumers to make a purchase than any other design, designers may have a vested interest in making sure that the product itself is also attractive and looks attractive alongside the rest of the packaging design. This may be as simple as helping guide the colour(s) of the finished product (e.g., finding the 'tastiest' product colour to the mind of the consumer, in relation to the rest of the packaging), or indeed, as involved as guiding the packaging process so certain pre-planned patterns can be visible in the packaged product (providing some synergy with the rest of the design; imagine, if you could print or etch onto the product, your design could still be hard at work even when the packaging was in the bin!). If designers can gain control over some of this process too, they could truly design the packaging, and thus product experience, to sell itself.

As a final and closing thought, one should consider and remain mindful that packaging design can be most influential at two stages: first, in-store (i.e., at the point of sale), and second, at home or on the go (i.e., the point of consumption). Thus, the capacity for packaging designs to influence both purchase and consumption seems evident. Almost all of the academic research involving product imagery focuses on the former. Those concerned with public health (especially in light of the growing obesity epidemic of recent decades) may well benefit from scrutinising how packaging design may be hindering, and could instead potentially be encouraging, healthful dietary behaviours. Existing calls for this scrutiny, and perhaps regulation, appear to have gone unanswered (see Hawkes, 2010; Purnhagen, van Herpen, & van Kleef, 2016). The precedent for using design as an intervention seems to have been set by the use of plain

product packaging for cigarettes in countries such as the UK and Australia, where packaging design is used directly to help encourage public health. Does it seem so farfetched that similar principles could be applied here, by concealing highly calorific food and drink within opaque packaging?

## References

- Beament, E. (2018, February 28). *Netherlands opens world's first plastic-free supermarket aisle as UK urged to follow example*. Retrieved from <http://www.independent.co.uk/news/world/europe/plastic-planet-packaging-free-supermarket-ekoplaza-amsterdam-netherlands-recycling-pollution-a8232101.html>
- Benn, Y., Webb, T. L., Chang, B. P. I., & Reidy, J. (2015). What information do consumers consider, and how do they look for it, when shopping for groceries online? *Appetite*, *89*, 265–273. <https://doi.org/10.1016/j.appet.2015.01.025>
- Berthoud, H.-R., & Morrison, C. (2008). The brain, appetite, and obesity. *Annual Review of Psychology*, *59*, 55–92. <https://doi.org/10.1146/annurev.psych.59.103006.093551>
- Billeter, D., Zhu, M., & Inman, J. J. (2012). Transparent packaging and consumer purchase decisions. In J. Sevilla (Ed.), *When it's what's outside that matters: Recent findings on product and packaging design*. Paper presented at Association for Consumer Research 2012 Conference, Vancouver, Canada (pp. 308–312).
- Brand Packaging. (2017, November 7). *Del Monte using clear cans to showcase product*. Retrieved from <https://www.brandpackaging.com/articles/86058-del-monte-using-clear-cans-to-showcase-product>
- Brignell, C., Griffiths, T., Bradley, B. P., & Mogg, K. (2009). Attentional and approach biases for pictorial food cues. Influence of external eating. *Appetite*, *52*(2), 299–306. <https://doi.org/10.1016/j.appet.2008.10.007>
- Burrows, J. (2013). *Visually communicating 'honesty': A semiotic analysis of Dorset Cereals' packaging* (BSc dissertation). University of Leeds, UK. Retrieved from <http://media.leeds.ac.uk/files/2013/07/Jessica-Burrows-BACS-2013.pdf>
- Catalina. (2014). *Engaging the selective shopper*. Retrieved from <https://www.catalina.com/insights/research-studies/engaging-the-selective-shopper-one-pager/>
- Celhay, F., Masson, J., Garcia, K., Folcher, P., & Cohen, J. (2017). Package graphic design and innovation: A comparative study of Bordeaux and Barossa

- wine visual codes. *Recherche et Applications en Marketing (English Edition)*, 32(2), 46–70. <https://doi.org/10.1177/2051570716685524>
- Celhay, F., & Trinqucoste, J. F. (2015). Package graphic design: Investigating the variables that moderate consumer response to atypical designs. *Journal of Product Innovation Management*, 32(6), 1014–1032. <https://doi.org/10.1111/jpim.12212>
- Chandran, S., Batra, R. K., & Lawrence, B. (2009). Is seeing believing? Consumer responses to opacity of product packaging. *Advances in Consumer Research*, 36, 970 (A. L. McGill & S. Shavitt, Eds., Duluth, MN: Association for Consumer Research). Retrieved from <http://www.acrwebsite.org/volumes/14463/volumes/v36/NA-36>
- Clement, J. (2007). Visual influence on in-store buying decisions: An eye-track experiment on the visual influence of packaging design. *Journal of Marketing Management*, 23(9–10), 917–928. <https://doi.org/10.1362/026725707X250395>
- Deliza, R., Macfie, H., & Hedderley, D. (2003). Use of computer-generated images and conjoint analysis to investigate sensory expectations. *Journal of Sensory Studies*, 18(6), 465–486. <https://doi.org/10.1111/j.1745-459X.2003.tb00401.x>
- Deng, X., & Srinivasan, R. (2013). When do transparent packages increase (or decrease) food consumption? *Journal of Marketing*, 77(4), 104–117. <https://doi.org/10.1509/jm.11.0610>
- Deroy, O., Michel, C., Piqueras-Fiszman, B., & Spence, C. (2014). The plating manifesto (I): From decoration to creation. *Flavour*, 3, 6. <https://doi.org/10.1186/2044-7248-3-6>
- di Pellegrino, G., Magarelli, S., & Mengarelli, F. (2011). Food pleasantness affects visual selective attention. *The Quarterly Journal of Experimental Psychology*, 64(3), 560–571. <https://doi.org/10.1080/17470218.2010.504031>
- Engels, M. W. (2015). Looking through the colour and the shape of food packaging: The use of crossmodal correspondences in the design of food packaging windows. Retrieved from <https://uhdspace.uhasselt.be/dspace/handle/1942/19221>
- Festila, A. (2016). *Health metaphors of package design* (PhD thesis). University of Aarhus, Denmark. Retrieved from [http://badm.au.dk/fileadmin/Business\\_Administration/PhD/Alexandra\\_Festila\\_PhD.pdf](http://badm.au.dk/fileadmin/Business_Administration/PhD/Alexandra_Festila_PhD.pdf)
- Field, M., & Cox, W. M. (2008). Attentional bias in addictive behaviors: A review of its development, causes, and consequences. *Drug and Alcohol Dependence*, 97(1–2), 1–20. <https://doi.org/10.1016/j.drugalcdep.2008.03.030>

- Food Marketing Institute. (2018). Supermarket facts. Retrieved from <https://www.fmi.org/our-research/supermarket-facts>
- Garcia-Burgos, D., Lao, J., Munsch, S., & Caldarà, R. (2017). Visual attention to food cues is differentially modulated by gustatory-hedonic and post-ingestive attributes. *Food Research International*, 97, 199–208. <https://doi.org/10.1016/j.foodres.2017.04.011>
- Geiselman, P. J., & Novin, D. (1982). The role of carbohydrates in appetite, hunger and obesity. *Appetite*, 3(3), 203–223.
- Gofman, A., Moskowit, H. R., Fyrbjork, J., Moskowit, D., & Mets, T. (2009). Extending rule developing experimentation to perception of food packages with eye tracking. *The Open Food Science Journal*, 3, 66–78. <https://doi.org/10.2174/1874256400903010066>
- Gould, S. J. (1997). An interpretive study of purposeful, mood self-regulating consumption: The consumption and mood framework. *Psychology and Marketing*, 14(4), 395–426. [https://doi.org/10.1002/\(SICI\)1520-6793\(199707\)14:4<395::AID-MAR6>3.0.CO;2-4](https://doi.org/10.1002/(SICI)1520-6793(199707)14:4<395::AID-MAR6>3.0.CO;2-4)
- Haasova, S., Elekes, B., Missbach, B., & Florack, A. (2016). Effects of imagined consumption and simulated eating movements on food intake: Thoughts about food are not always of advantage. *Frontiers in Psychology*, 7. <https://doi.org/10.3389/fpsyg.2016.01691>
- Hamlin, R. P. (2016). The consumer testing of food package graphic design. *British Food Journal*, 118(2), 379–395. <https://doi.org/10.1108/BFJ-03-2015-0105>
- Harrar, V., Toepel, U., Murray, M. M., & Spence, C. (2011). Food's visually perceived fat content affects discrimination speed in an orthogonal spatial task. *Experimental Brain Research*, 214(3), 351–356. <https://doi.org/10.1007/s00221-011-2833-6>
- Hawkes, C. (2010). Food packaging: The medium is the message. *Public Health Nutrition*, 13(2), 297–299. <https://doi.org/10.1017/S1368980009993168>
- Hepworth, R., Mogg, K., Brignell, C., & Bradley, B. P. (2010). Negative mood increases selective attention to food cues and subjective appetite. *Appetite*, 54(1), 134–142. <https://doi.org/10.1016/j.appet.2009.09.019>
- Hill, A. J., Magson, L. D., & Blundell, J. E. (1984). Hunger and palatability: Tracking ratings of subjective experience before, during and after the consumption of preferred and less preferred food. *Appetite*, 5(4), 361–371.
- Hine, T. (1995). *The total package: The evolution and secret meanings of boxes, bottles, cans, and tubes*. New York, NY: Little, Brown.
- Hollmann, M., Pleger, B., Villringer, A., & Horstmann, A. (2013). Brain imaging in the context of food perception and eating. *Current Opinion in Lipidology*, 24(1), 18. <https://doi.org/10.1097/MOL.0b013e32835b61a4>

- Johnson, W. G., & Wildman, H. E. (1983). Influence of external and covert food stimuli on insulin secretion in obese and normal persons. *Behavioral Neuroscience*, *97*(6), 1025–1028.
- Keesman, M., Aarts, H., Vermeent, S., Häfner, M., & Papies, E. K. (2016). Consumption simulations induce salivation to food cues. *PLoS ONE*, *11*(11), e0165449. <https://doi.org/10.1371/journal.pone.0165449>
- Khehra, R., Fairchild, R. M., & Morgan, M. Z. (2018). UK children's breakfast cereals—An oral health perspective. *British Dental Journal*, *225*(2), 164–169. <https://doi.org/10.1038/sj.bdj.2018.531>
- Klajner, F., Herman, C. P., Polivy, J., & Chhabra, R. (1981). Human obesity, dieting, and anticipatory salivation to food. *Physiology & Behavior*, *27*(2), 195–198. [https://doi.org/10.1016/0031-9384\(81\)90256-0](https://doi.org/10.1016/0031-9384(81)90256-0)
- Kringelbach, M. L., Stein, A., & van Hartevelt, T. J. (2012). The functional human neuroanatomy of food pleasure cycles. *Physiology & Behavior*, *106*(3), 307–316. <https://doi.org/10.1016/j.physbeh.2012.03.023>
- Kroese, M. (2017, January). *Packaged versus unpackaged food: The perceived healthfulness and other consumer responses* (Master's thesis). University of Twente, The Netherlands. Retrieved from [http://essay.utwente.nl/71732/1/Kroese\\_MA\\_FacultyBMS.pdf](http://essay.utwente.nl/71732/1/Kroese_MA_FacultyBMS.pdf)
- Kuijken, B., Gemser, G., & Wijnberg, N. M. (2017). Categorization and willingness to pay for new products: The role of category cues as value anchors. *Journal of Product Innovation Management*, *34*(6), 757–771. <https://doi.org/10.1111/jpim.12414>
- Laska, M., Freist, P., & Krause, S. (2007). Which senses play a role in nonhuman primate food selection? A comparison between squirrel monkeys and spider monkeys. *American Journal of Primatology*, *69*(3), 282–294. <https://doi.org/10.1002/ajp.20345>
- Lieberman, L. S. (2016). Objective and subjective aspects of the drive to eat in obesogenic environments. In L. L. Sievert & D. E. Brown (Eds.), *Biological measures of human experience across the lifespan* (pp. 195–230). Cham, Switzerland: Springer. [https://doi.org/10.1007/978-3-319-44103-0\\_10](https://doi.org/10.1007/978-3-319-44103-0_10)
- Machiels, C. J. A., & Karnal, N. (2016). See how tasty it is? Effects of symbolic cues on product evaluation and taste. *Food Quality and Preference*, *52*, 195–202. <https://doi.org/10.1016/j.foodqual.2016.04.014>
- Masterson, T. D., Kirwan, C. B., Davidson, L. E., & LeCheminant, J. D. (2016). Neural reactivity to visual food stimuli is reduced in some areas of the brain during evening hours compared to morning hours: An fMRI study in women. *Brain Imaging and Behavior*, *10*(1), 68–78. <https://doi.org/10.1007/s11682-015-9366-8>

- McCrickerd, K., & Forde, C. G. (2016). Sensory influences on food intake control: Moving beyond palatability. *Obesity Reviews*, *17*(1), 18–29. <https://doi.org/10.1111/obr.12340>
- Mintel News. (2014, August 26). Thought bubble: Clear packaging sees the light [Blog post]. Retrieved from <http://www.mintel.com/blog/food-market-news/thoughtbubble-clear-packaging-sees-the-light>
- Mintel. (2014). Global packaging trends—US—July 2014. Retrieved from <http://store.mintel.com/food-packaging-trends-us-july-2014>
- Mintel. (2016). Global packaging trends 2016. Retrieved from <http://www.easypack.net/static/pdf/Mintel-Report-Global-packaging-trends-2016.pdf>
- Mizutani, N., Okamoto, M., Yamaguchi, Y., Kusakabe, Y., Dan, I., & Yamanaka, T. (2010). Package images modulate flavor perception for orange juice. *Food Quality and Preference*, *21*(7), 867–872. <https://doi.org/10.1016/j.foodqual.2010.05.010>
- Monem, R. G., & Fillmore, M. T. (2016). Alcohol-related visual cues impede the ability to process auditory information: Seeing but not hearing. *Psychology of Addictive Behaviors*, *30*(1), 12–17. <https://doi.org/10.1037/adb0000140>
- Myszkowski, N., Storme, M., Zenasni, F., & Lubart, T. (2014). Is visual aesthetic sensitivity independent from intelligence, personality and creativity? *Personality and Individual Differences*, *59*, 16–20. <https://doi.org/10.1016/j.paid.2013.10.021>
- Nielsen. (2017). Deep discount grocery stores are gaining share with store brands. Retrieved from <http://www.nielsen.com/us/en/insights/news/2017/deep-discount-grocery-stores-are-gaining-share-with-private-label.print.html>
- Nijs, I. M. T., Muris, P., Euser, A. S., & Franken, I. H. A. (2010). Differences in attention to food and food intake between overweight/obese and normal-weight females under conditions of hunger and satiety. *Appetite*, *54*(2), 243–254. <https://doi.org/10.1016/j.appet.2009.11.004>
- Nummenmaa, L., Hietanen, J. K., Calvo, M. G., & Hyönä, J. (2011). Food catches the eye but not for everyone: A BMI-contingent attentional bias in rapid detection of nutrients. *PLoS ONE*, *6*(5), e19215. <https://doi.org/10.1371/journal.pone.0019215>
- Pachauri, M. (2001). Consumer behaviour: A literature review. *The Marketing Review*, *2*(3), 319–355. <https://doi.org/10.1362/1469347012569896>
- Papies, E. K., Best, M., Gelibter, E., & Barsalou, L. W. (2017). The role of simulations in consumer experiences and behavior: Insights from the grounded cognition theory of desire. *Journal of the Association for Consumer Research*, *2*(4), 402–418. <https://doi.org/10.1086/693110>



- Passamonti, L., Rowe, J. B., Schwarzbauer, C., Ewbank, M. P., von dem Hagen, E., & Calder, A. J. (2009). Personality predicts the brain's response to viewing appetizing foods: The neural basis of a risk factor for overeating. *Journal of Neuroscience*, 29(1), 43–51. <https://doi.org/10.1523/JNEUROSCI.4966-08.2009>
- Patrick, V. M., Atefi, Y., & Hagtvedt, H. (2017). The allure of the hidden: How product unveiling confers value. *International Journal of Research in Marketing*, 34(2), 430–441. <https://doi.org/10.1016/j.ijresmar.2016.08.009>
- Pearson-Jones, B. (2018, March 12). Tory party deputy chairman blasts Tesco's 'cynical' packaging after it used labeling trick to make pack of beef look TWICE the size... and shoppers say there's something fishy about the cod too. *The Daily Mail*. Retrieved from <http://www.dailymail.co.uk/news/article-5492377/MP-blasts-Tescos-cynical-packaging.html>
- Piech, R. M., Pastorino, M. T., & Zald, D. H. (2010). All I saw was the cake: Hunger effects on attentional capture by visual food cues. *Appetite*, 54(3), 579–582. <https://doi.org/10.1016/j.appet.2009.11.003>
- Pilditch, J. (1973). *The silent salesman: How to develop packaging that sells*. London, UK: Business Books.
- Piqueras-Fiszman, B., Kraus, A., & Spence, C. (2014). “Yummy” versus “yucky”! Explicit and implicit approach-avoidance motivations toward appealing and disgusting foods in normal eaters. *Appetite*, 78, 193–202. <https://doi.org/10.1016/j.appet.2014.03.029>
- Piqueras-Fiszman, B., & Spence, C. (2015). Sensory expectations based on product-extrinsic food cues: An interdisciplinary review of the empirical evidence and theoretical accounts. *Food Quality & Preference*, 40, 165–179.
- Piqueras-Fiszman, B., Velasco, C., Salgado-Montejo, A., & Spence, C. (2013). Using combined eye tracking and word association in order to assess novel packaging solutions: A case study involving jam jars. *Food Quality and Preference*, 28(1), 328–338. <https://doi.org/10.1016/j.foodqual.2012.10.006>
- Polivy, J., & Herman, C. P. (2014). Eating in response to external cues. In T. Gill (Ed.), *Managing and preventing obesity: Behavioural factors and dietary interventions* (pp. 181–192). Amsterdam: Elsevier.
- Purnhagen, K., van Herpen, E., & van Kleef, E. (2016). The potential use of visual packaging elements as nudges. In K. Mathis & A. Tor (Eds.), *Nudging: Possibilities, limitations and applications in European law and economics* (pp. 197–216). Cham, Switzerland: Springer.
- Raghunathan, R., Naylor, R. W., & Hoyer, W. D. (2006). The unhealthy = tasty intuition and its effects on taste inferences, enjoyment, and choice of food products. *Journal of Marketing*, 70(4), 170–184.

- Rebollar, R., Gil, I., Lidón, I., Martín, J., Fernández, M. J., & Rivera, S. (2017). How material, visual and verbal cues on packaging influence consumer expectations and willingness to buy: The case of crisps (potato chips) in Spain. *Food Research International*, 99, 239–246. <https://doi.org/10.1016/j.foodres.2017.05.024>
- Riley, D., Martins da Silva, P., & Behr, S. (2015). *The impact of packaging design on health product perceptions* (pp. 81–89). Presented at the Marketing and Business Development (MBD) International Conference 2015, Bucharest, Romania. Retrieved from <http://www.mbd.ase.ro/?p=103>
- Roy-Charland, A., Plamondon, A., Homeniuk, A. S., Flesch, C. A., Klein, R. M., & Stewart, S. H. (2017). Attentional bias toward alcohol-related stimuli in heavy drinkers: Evidence from dynamic eye movement recording. *The American Journal of Drug and Alcohol Abuse*, 43(3), 332–340. <https://doi.org/10.1080/00952990.2016.1209511>
- Salem, V., & Dhillo, W. S. (2015). Imaging in endocrinology: The use of functional MRI to study the endocrinology of appetite. *European Journal of Endocrinology*, 173(2), R59–R68. <https://doi.org/10.1530/EJE-14-0716>
- Sawada, R., Sato, W., Toichi, M., & Fushiki, T. (2017). Fat content modulates rapid detection of food: A visual search study using fast food and Japanese diet. *Frontiers in Psychology*, 8, 1033. <https://doi.org/10.3389/fpsyg.2017.01033>
- Schiffstein, H. N. J., Fenko, A., Desmet, P. M. A., Labbe, D., & Martin, N. (2013). Influence of package design on the dynamics of multisensory and emotional food experience. *Food Quality and Preference*, 27(1), 18–25. <https://doi.org/10.1016/j.foodqual.2012.06.003>
- Schiffstein, H. N. J., Kole, A. P. W., & Mojet, J. (1999). Asymmetry in the disconfirmation of expectations for natural yogurt. *Appetite*, 32(3), 307–329. <https://doi.org/10.1006/appe.1998.0208>
- Simmonds, G., & Spence, C. (2017). Thinking inside the box: How seeing products on, or through, the packaging influences consumer perceptions and purchase behaviour. *Food Quality and Preference*, 62, 340–351. <https://doi.org/10.1016/j.foodqual.2016.11.010>
- Simmonds, G., Woods, A. T., & Spence, C. (2018). ‘Show me the goods’: Assessing the effectiveness of transparent packaging vs. product imagery on product evaluation. *Food Quality and Preference*, 63, 18–27. <https://doi.org/10.1016/j.foodqual.2017.07.015>
- Simmonds, G., Woods, A. T., & Spence, C. (in press). Investigating the role of colour contrast between product and packaging on the consumer’s evaluations of food products. *Packaging Technology and Science*.

- Sioutis, T. (2011, July). *Effects of package design on consumer expectations of food product healthiness* (Master's thesis). University of Aarhus, Denmark. Retrieved from [http://pure.au.dk/portal-asb-student/files/39310329/effects\\_of\\_package\\_design\\_on\\_consumer\\_expectations\\_of\\_food\\_product\\_healthiness.pdf](http://pure.au.dk/portal-asb-student/files/39310329/effects_of_package_design_on_consumer_expectations_of_food_product_healthiness.pdf)
- Söderlund, M., Colliander, J., Karsberg, J., Liljedal, K. T., Modig, E., Rosengren, S., ... Åkestam, N. (2017). The allure of the bottle as a package: An assessment of perceived effort in a packaging context. *Journal of Product & Brand Management*, 26(1), 91–100. <https://doi.org/10.1108/JPBM-12-2015-1065>
- Spence, C. (2011). Mouth-watering: The influence of environmental and cognitive factors on salivation and gustatory/flavor perception. *Journal of Texture Studies*, 42(2), 157–171. <https://doi.org/10.1111/j.1745-4603.2011.00299.x>
- Spence, C. (2018). Background colour & its impact on food perception & behaviour. *Food Quality & Preference*, 68, 156–166.
- Spence, C., Okajima, K., Cheok, A. D., Petit, O., & Michel, C. (2016). Eating with our eyes: From visual hunger to digital satiation. *Brain and Cognition*, 110, 53–63. <https://doi.org/10.1016/j.bandc.2015.08.006>
- Spence, C., Piqueras-Fiszman, B., Michel, C., & Deroy, O. (2014). Plating manifesto (II): The art and science of plating. *Flavour*, 3, 4. <https://doi.org/10.1186/2044-7248-3-4>
- Talke, K., Müller, S., & Wieringa, J. E. (2017). A matter of perspective: Design newness and its performance effects. *International Journal of Research in Marketing*, 34(2), 399–413. <https://doi.org/10.1016/j.ijresmar.2017.01.001>
- Thao, H. T. P. (2015, August 10). *Can referring to exemplars trigger support for smaller brands' evaluation? The effects of category inference on brand evaluation and brand choice for brands from emerging economies* (thesis). Retrieved from <http://ir.lib.ncku.edu.tw/handle/987654321/156910>
- Tiggemann, M., & Kempf, E. (2005). The phenomenology of food cravings: The role of mental imagery. *Appetite*, 45(3), 305–313. <https://doi.org/10.1016/j.appet.2005.06.004>
- Toepel, U., Knebel, J.-F., Hudry, J., le Coutre, J., & Murray, M. M. (2009). The brain tracks the energetic value in food images. *NeuroImage*, 44(3), 967–974. <https://doi.org/10.1016/j.neuroimage.2008.10.005>
- Underwood, R. L., & Klein, N. M. (2002). Packaging as brand communication: Effects of product pictures on consumer responses to the package and brand. *Journal of Marketing Theory and Practice*, 10(4), 58–68. <https://doi.org/10.1080/10696679.2002.11501926>

- Underwood, R. L., Klein, N. M., & Burke, R. R. (2001). Packaging communication: Attentional effects of product imagery. *Journal of Product & Brand Management*, 10(7), 403–422. <https://doi.org/10.1108/10610420110410531>
- Underwood, R. L., & Ozanne, J. L. (1998). Is your package an effective communicator? A normative framework for increasing the communicative competence of packaging. *Journal of Marketing Communications*, 4(4), 207–220. <https://doi.org/10.1080/135272698345762>
- van der Laan, L. N., de Ridder, D. T. D., Viergever, M. A., & Smeets, P. A. M. (2011). The first taste is always with the eyes: A meta-analysis on the neural correlates of processing visual food cues. *NeuroImage*, 55(1), 296–303. <https://doi.org/10.1016/j.neuroimage.2010.11.055>
- Varela, P., Antúnez, L., Cadena, R. S., Giménez, A., & Ares, G. (2014). Attentional capture and importance of package attributes for consumers' perceived similarities and differences among products: A case study with breakfast cereal packages. *Food Research International*, 64, 701–710. <https://doi.org/10.1016/j.foodres.2014.08.015>
- Velasco, C., Adams, C., Petit, O., & Spence, C. (in press). “Sweet’n Low”? On the localization of tastes and tasty products in 2D space. *Food Quality and Preference*. <https://doi.org/10.1016/j.foodqual.2018.08.018>
- Velasco, C., Michel, C., Youssef, J., Gamez, X., Cheok, A. D., & Spence, C. (2016). Colour–taste correspondences: Designing food experiences to meet expectations or to surprise. *International Journal of Food Design*, 1(2), 83–102. [https://doi.org/10.1386/ijfd.1.2.83\\_1](https://doi.org/10.1386/ijfd.1.2.83_1)
- Venter, K., van der Merwe, D., de Beer, H., Kempen, E., & Bosman, M. (2011). Consumers' perceptions of food packaging: An exploratory investigation in Potchefstroom, South Africa. *International Journal of Consumer Studies*, 35(3), 273–281. <https://doi.org/10.1111/j.1470-6431.2010.00936.x>
- Vilnai-Yavetz, I., & Koren, R. (2013). Cutting through the clutter: Purchase intentions as a function of packaging instrumentality, aesthetics, and symbolism. *The International Review of Retail, Distribution and Consumer Research*, 23(4), 394–417. <https://doi.org/10.1080/09593969.2013.792743>
- Webster, B. (2018, March 10). Idyllic meat wrappers hide harsh reality of mass modern farming. *The Times*. Retrieved from <https://www.thetimes.co.uk/article/idyllic-meat-wrappers-hide-harsh-reality-of-modern-mass-farming-8mkfdmtzt>

- Werle, C. O. C., Balbo, L., Caldara, C., & Corneille, O. (2016). Is plain food packaging plain wrong? Plain packaging increases unhealthy snack intake among males. *Food Quality and Preference*, *49*, 168–175. <https://doi.org/10.1016/j.foodqual.2015.12.007>
- Werthmann, J., Roefs, A., Nederkoorn, C., Mogg, K., Bradley, B. P., & Jansen, A. (2011). Can(not) take my eyes off it: Attention bias for food in overweight participants. *Health Psychology*, *30*(5), 561–569. <https://doi.org/10.1037/a0024291>
- Wilcock, A., Pun, M., Khanona, J., & Aung, M. (2004). Consumer attitudes, knowledge and behaviour: A review of food safety issues. *Trends in Food Science & Technology*, *15*(2), 56–66. <https://doi.org/10.1016/j.tifs.2003.08.004>
- Wood, Z., & Butler, S. (2015, January 30). Tesco cuts range by 30% to simplify shopping. *The Guardian*. Retrieved from <https://www.theguardian.com/business/2015/jan/30/tesco-cuts-range-products>
- Yokum, S., Ng, J., & Stice, E. (2011). Attentional bias to food images associated with elevated weight and future weight gain: An fMRI study. *Obesity*, *19*(9), 1775–1783. <https://doi.org/10.1038/oby.2011.168>
- Zhang, B., & Seo, H.-S. (2015). Visual attention toward food-item images can vary as a function of background saliency and culture: An eye-tracking study. *Food Quality and Preference*, *41*, 172–179. <https://doi.org/10.1016/j.foodqual.2014.12.004>