EDITED BY
CARLOS VELASCO
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MULTISENSORY PACKAGING

Designing New Product Experiences

Multisensory Packaging

"As every child knows, the package a present comes in is often as exciting as its content! What every adult may not know is that package design is as much a science now as it is was an art. In this comprehensive, fascinating and astoundingly informative book Velasco & Spence introduce pack designers to a new lexicon in pack design with terms such as sonic design, light-weighting, multisensorial congruency, autotelic touch, sensation transference, moments of truth' and much, much more… The contributors, all experts in their fields, are the true creationists behind "intelligent design". This book will be essential reading for anyone who wants to put something into a box!"

—Francis McGlone, *Liverpool John Moores University, UK*

"In the old days, nobody knew whether the launch of a new brand would be a success or a failure. Recent developments in marketing research decrease the probability of failure. This book provides useful information to marketing research. I would like this book to be read by many marketers, however I would also like to keep it a secret from competitors."

—Yoshinori Ito, *Asahi Breweries, Ltd.*

"In the realm of product development, packaging design can be very much overlooked. People can mistakenly think all you need to make a tasty product is combine some tasty ingredients—but packaging is an ingredient itself! It is much, much more than just a box where products lie in wait, as Velasco and Spence skilfully demonstrate here. Effective design can be deployed not just protect the product; not just to tempt, educate, and encourage the consumer; but also to influence the fundamental experience of the product itself… and without us even noticing. Every page of this book provides fascinating insights into a wide variety of perspectives: I'm confident this book will fast become the 'total package' for anyone who wants to think outside the box and unpack packaging's fullest potential."

—Jane Skelton, *Head of Packaging, Sainsbury's Brand Division, Sainsbury's Supermarkets*

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Contents

v

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List of Figures

List of Tables

1

Multisensory Product Packaging: An Introduction

Carlos Velasco and Charles Spence

Introduction

The history of packaging[1] can be traced back to the first human hunter-gatherers and traders who used early forms of packaging in order to collect, store, transport, and mark their possessions (e.g., Low & Fullerton, 1994; Twede, 2016). However, it can be argued that the full use of

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[1] According to the 2018 Merriam-Webster dictionary, packaging is defined as a 'material used to enclose or contain something'. Importantly, however, in the context of marketing and branding, the meaning(s) of packaging go beyond enclosing and containing to cover some additional functional and aesthetic purposes such as: identifying the brand, providing descriptive information, persuading the consumer, helping product consumption, and facilitating transportation, protection, and storage (see Keller, 2013).

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packaging as a marketing tool, or medium, in categories as diverse as food and beverage (F&B), home and personal care (H&PC), and fast-moving consumer goods (FMCG) only really took off around the start of the twentieth century (see Hine, 1995, for an accessible early history of product packaging; see also Low & Fullerton, 1994). As Hine makes clear, the concern initially was primarily with packaging's effectiveness in terms of portion control and product preservation. However, once such goals had been met, many of those working in the field soon started to realize that their packaging could also be used as a powerful branding and marketing tool (e.g., see Pilditch, 1973; Stern, 1981, see also Fig. 1.1). Indeed, according to Nickels and Jolson (1976), packaging should be considered as constituting the fifth 'P' in the classical marketing mix (in addition, i.e., to product, price, promotion, and place). Such developments took time, of course, and even as recently as the 1980s, one could still find papers being published with titles such as 'Packaging remains an underdeveloped element in pushing consumers' buttons' (Calder, 1983).

The majority of the empirical research on packaging that has been conducted to date has tended to focus on the F&B, H&PC, and FMCG categories. This is presumably because of the especially important role that it plays in delivering the total product experience in these categories

Fig. 1.1 Frequency of publications with 'product packaging' in their title as captured by Google Scholar between 1980 and 2017. Results obtained through 'Publish or Perish 5' software (https://harzing.com/resources/publish-or-perish/; Results obtained on May 10, 2018)

where the consumer normally sees not only (or necessarily even) the product but rather the packaging sitting there on the shelf in the supermarket. Furthermore, many of the products in these categories are often consumed in, or else used from, the packaging (i.e., such as deodorant sprays, toothpastes, perfumes, crisps, and yoghurt). This contrasts with other categories such as consumer electronics or white goods, say, where it makes only the briefest of appearances when the product is transported between the warehouse and customer's home. Just consider, for instance, the last time you bought a laptop knowing in advance what the packaging was going to look/feel like. This, of course, does not mean to say that some of the most innovative brands in this space have not been trying to distinguish themselves by really delivering on packaging that is a pleasure-to-open (e.g., as a case in point, think only of the packaging of Apple computers). That said, the discussion of packaging that one finds in this volume broadens out, on occasion, to discuss insights and approaches that are undoubtedly relevant to some of these other categories (e.g., when considering the growing trend to fragrance the air, or headspace, in the inner packaging of electronics goods, say, see Spence, 2016a).

In the following sections, we present a short overview of the different roles that packaging plays in the fields of marketing and branding. In particular, we highlight the growing interest in multisensory packaging while, at the same time, providing an overview of some of the key material covered in the various chapters that have been gathered together in this volume. As becomes clear, many of the recent developments in packaging design are intimately linked to the explosive growth of interest in sensory, or as we finesse it here, multisensory, marketing.

Packaging: From Brand Element to Multisensory Experience Delivery Device

In recent decades, a growing number of researchers have become interested in assessing the different variables that help product packaging to stand out on the shelf and help convert the consumer to purchase (Masten, 1988; Miller, 1994; Sherwood, 1999). Additionally, there has

also been a growing realization that product packaging constitutes a tremendously powerful element for brands when it comes to creating value, communicating product attributes (and/or setting the best product expectations), and ultimately persuading the consumer to select one product over another (Ampuero & Vila, 2006; Nancarrow, Wright, & Brace, 1998).

Importantly, researchers and practitioners have also started to realize that, in certain cases at least, the packaging actually affects people's experience of the contents as well (see Spence, 2016a; Spence & Piqueras-Fiszman, 2012, for reviews). This growing realization obviously makes packaging an especially powerful tool by which to influence the consumer's multisensory experience (Schifferstein & Spence, 2008). Indeed, there is now a great deal of interest and innovation, not to mention a wider variety of novel packaging formats available than ever before (e.g., Farmer, 2013). This explosion of innovation has also been facilitated by the fact that the design process and rapid prototyping are now much easier/cheaper to execute than ever before. What is more, there are also a range of new methods and techniques out there, all designed to help take some of the uncertainty out of the empirical assessment of the efficacy (whatever the aims/objectives) of new packaging designs (and covered in a number of the chapters in this volume, see also Moskowitz, Reisner, Lawlor, & Deliza, 2009).

A crucial current trend as far as branding, and in this particular case packaging, is concerned regards the consideration of the role of the human senses, and specifically multisensory perception/integration, in designing the 'right' experiences for consumers (Hultén, 2011; Krishna, 2012; Spence, 2016a). This idea is closely tied in with the emergence of the field of 'sensory marketing' (Hultén, 2011; Spence, 2012), that is, marketing that places the human senses at the centre of the consumer experience, or journey. Note, however, that we refer to such an approach to marketing as *multisensory* because it should not only focus on the role of the individual human senses but also their interactions (see Velasco & Spence, this volume, where we outline a new framework for multisensory packaging analysis and design). Multisensory marketing is, of course, by no means restricted to the field of packaging design, but thus far it has certainly been one of the major application areas. The field of

multisensory marketing developed from our growing understanding of the multisensory nature of human perception (e.g., Calvert, Spence, & Stein, 2004; Haverkamp, 2014; Spence, 2018, for reviews), as well as a result of the emergence of new technologies that enable companies to play (relatively cheaply) with much more than merely just the colour scheme (see Petit, Velasco, & Spence, this volume).

Multisensory marketing has now started to influence packaging research and development (see Spence, 2016a, for a review). Indeed, one only needs to consider the key moments of the consumer's experience with a typical product (involving shelf navigation, purchase, use/consumer, and the eventual stage of discarding/recycling, see Mumani & Stone 2018; Salgado-Montejo, Velasco, Ariza, Salgado, & Moreno, 2017) to realize the crucial role of the senses when it comes to a product's packaging. The different sensory properties of product packaging can guide consumers' search behaviours, set their product expectations, facilitate interaction and usability, and even influence product perception itself (see also Louw & Kimber, 2011). Crucially, while the focus has traditionally mostly been on the visual aspects of packaging design (e.g., Plasschaert, 1995; Spence & Velasco, 2018), there is now a growing awareness of the importance of the *multisensory* contributions to product packaging (see Spence, 2016a, for a review). Indeed, a rapidly growing number of forward-thinking companies and brands are spending more of their time than ever before thinking about what their packaging should sound like (Byron, 2012; Wang & Spence, in this volume), what they want it to feel like in the consumer's hand (Gallace & Spence, 2014; Spence in this volume; Spence & Gallace, 2011), and even what it should, or could, smell like too (see Spence & Youssef, 2015; Spence & Piqueras-Fiszman, 2012, for reviews). Some have even been working on the design of edible packaging (modelled on, e.g., grape skin that we normally eat, Hurst, 2018; Quinn, 2012).

This volume brings together contributions from a broad range of leading young scientists working at the border between multisensory packaging research and practice. We have grouped the contributions in three main sections: (1) packaging and the senses; (2) multisensory packaging frameworks and contexts; and (3) the future of multisensory packaging. The first block of chapters deals with how to understand different senses

and sensory information when it comes to the design of product packaging. The next section includes chapters that have the integration of the senses at their core, as well as those touching on health, culture, and branding. The final block involves chapters dealing specifically with consumer neuroscience in the context of product packaging, as well as the role of new technologies in delivering the most innovative of multisensory packaging experiences.

Ever since we first conceived of this volume, our primary goal has been to try and bring together information relevant/interesting to both researchers and practitioners working in multisensory packaging and related fields. In that sense, all of the chapters included in this volume involve elements of both theory and practice.

Packaging and the Senses

In the first section, the chapters focus on vision. 'Colour sells!' as they say. To date, by far the greatest amount of research on packaging design that has been published has revolved around optimizing the visual appearance and shelf-standout (see Spence & Velasco, 2018 for a review). What the consumer sees sets their product expectations. These expectations then anchor the consumer's subsequent product experience (see Piqueras-Fiszman & Spence, 2015, for a review). In this volume, Spence and Velasco present a detailed account of the role that packaging colour plays (or can play if managed well) in optimizing shelf-standout and maximizing processing fluency/congruency. Of course, packaging colour also conveys product and brand meaning to the consumer, and influence their product expectations and experiences. These authors also highlight the sometimes context-dependent meaning of colour and stress its different roles in terms of conveying product-relevant information and differentiating brands. Signature colours, for instance, can become a powerful identifier of a given brand. Just think of, for example, Cadbury's Dairy Milk purple.

In recent years, there has been a growing trend towards the use of transparency in product packaging (see Nassauer, 2014; Simmonds & Spence, 2017). In their chapter in this volume, Simmonds and Spence summarize

the latest evidence concerning the impact of introducing transparency to packaging on consumers' product perception. The authors argue that it normally influences consumers' impression of a product positively. However, that being said, while the trend towards transparency is (perhaps unsurprisingly) on the rise, Simmonds and Spence also make clear that further research is still needed in order to determine which products/categories it may be most appropriate for. Based on the available evidence, the authors summarize a series of findings and recommendations for designers and product developers who may be thinking about, or perhaps already are, working in this space. In many cases, the evaluation of such prototyping work often takes place online. This practice is one that many researchers and firms are now increasingly using in order to evaluate the visual aspects of packaging design (e.g., see Woods, Velasco, Levitan, Wan, & Spence, 2015, for a review of internet-based testing).

Beyond the colour (scheme) and form of the packaging, there is also an emerging interest in, not to mention science around, typeface design (Hyndman, 2015; Velasco, Woods, Hyndman, & Spence, 2015), logo design, and how the various elements should be placed relative to one another on product packaging (see Batra, Seifert, & Brei, 2015).[2] Furthermore, in an exciting recent development, we are now starting to see a shift from merely tweaking existing packaging designs, through to the bottom-up generation of new packaging forms/typeface designs based on insights and carefully controlled experimentation (e.g., Velasco, Salgado-Montejo, Marmolejo-Ramos, & Spence, 2014, for one such early example), often conducted online. In this volume, we have a chapter by Velasco and Spence on typeface in the specific context of product packaging. The authors make clear that whilst this is an often neglected research area in packaging design, the choice of typeface can successfully be used to convey/reinforce a whole range of specific brand associations. In the end, most, if not all, packages involve text and text comes in a typeface. What is more, specific typeface design can also be used to influence the perception of other sensory attributes such as the expected taste/flavour, and in some circumstances, this carries over to affect the perceived aroma of products and/or the flavour of food and beverages too.

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[2] Most research understandably focuses on the front-facing side of product packaging.

In their chapter on auditory packaging research, Wang and Spence draw attention to the fact that many brands are now looking to differentiate themselves through the optimization, or differentiation, of the sound their packaging makes when the consumer interacts with it. Importantly, there is evidence to suggest that despite the fact that consumers rarely think about it, both product and packaging sounds can have profound implications for the sensory and hedonic aspects of product perception (Spence & Wang, 2015). In this chapter, Wang and Spence focus on the role of packaging sounds at the point of sale and during consumption/use. Furthermore, they also discuss opportunities in terms of nudging consumers by means of sonic cues and by combining packaging sounds with other sensory packaging cues.

Visual and haptic cues are ubiquitous in packaging. Consumers typically touch/haptically explore the packaging throughout their interaction with a product (see Spence & Gallace, 2011, for a review). In that sense, then, optimizing the tactile/haptic aspects of packaging is a crucial component of multisensory packaging design. This topic forms the subject of Spence's chapter in this volume. He reviews the evidence showing that many companies are thinking about setting up specific product expectations and experiences by means of the feel of their packaging. Others, meanwhile, are working on the development of a 'signature feel' for their product packaging. Delivering on the latter can help stimulate the consumer's sense of touch in a manner that is hopefully differentiated from that of the competition. Spence goes further in considering the ways in which other multisensory aspects of packaging interact with what consumers' feel (i.e., weight, texture, hardness/compressibility, and temperature of the packaging) and vice versa.

Given the paucity of research conducted to date on the experiential aspects of both taste (as in edible) and smell in packaging in design and branding contexts, such research is covered briefly in chapters in the following section.

Multisensory Packaging Frameworks and Contexts

Considering the complexity of integrating multiple sensory cues in product packaging and the need for some kind of integrative framework, this

section tackles the interrelations between the senses as far as the packaging is concerned. Van Rompay and Fennis present an integrative approach to multisensory packaging design cues, conceptualizing the origins of product perception and sensory evaluation from the perspective of embodied cognition. They argue that cognitive processes are grounded in the bodily states that arise from our interaction with the environment (Krishna & Schwarz, 2014). In their chapter, the authors focus on understanding the role of packaging shape, graphic layout, and composition, as well as the tactile elements of the consumer experience, through bodily experiences and related body-environment interactions. They also discuss how such design factors interact as far as the consumer's product expectations and perception are concerned. Van Rompay and Fennis argue that an embodied approach may account for the different effects of design variables on consumer perceptions and experiences.

In the other chapter in this section, Velasco and Spence present the Multisensory Analysis of Product Packaging (MAPP) framework. First, they provide an overview of different research approaches in multisensory packaging. Next, they focus on the conceptual shift that is required to start considering packaging from a multisensory perspective. This involves the consideration of different kinds of sensory cues and the putative mechanisms guiding their interaction when analysing and designing packaging experiences. Here, sensory cues (involving both low- and high-level attributes), as well as the responses that may arise from them (sensory, semantic, symbolic, and affective), are differentiated. The respective roles of key concepts such as multisensory congruency, sensory dominance, and sensory overload are discussed. The chapter ends with a list of questions that those interested in multisensory packaging may want to ask when considering the design of their product packaging.

The growing interest in the communication of health benefits via multisensory product packaging is addressed in Anna Fenko's chapter. Currently, most health benefits are conveyed via labels and nutritional information (e.g., Lobstein & Davies, 2009). However, such messages may potentially also be communicated through multisensory packaging (with the emphasis on the sensory), and this may, in turn, potentially nudge consumers towards healthier eating behaviours (see also Karnal, Machiels, Orth, & Mai, 2016). In her chapter, Fenko reviews the research on the effects of multisensory packaging cues such as colour, shape, and

sound, as well as informational cues in the context of food experience and product choice. The role of cognitive, symbolic, and cultural aspects of multisensory congruency is highlighted as a means of communicating food healthiness as well as facilitating food choices amongst consumers. Here, one starts to get into questions concerning the ethics of packaging design, should it prove to be as effective in nudging consumer behaviour as some of its proponents would have us believe (see Purnhagen, van Herpen, & van Kleef, 2016; Spence, 2016b).

Given the changing landscape of premium and luxury brands, and the increasing interest of these brands in multisensory design, Velasco and Spence discuss the relevant research concerning multisensory premiumness. They argue that while research on multisensory aspects of premium/luxury packaging has certainly been very limited to date, a number of studies have nevertheless been conducted in which the association between visual information and dimensions of premiumness (e.g., quality, authenticity, willingness to pay a higher price, etc.) have been investigated. Velasco and Spence argue that customization or optimization of brands based on multisensory cues may lead to higher production costs, costs in which a commodity brand might not want, or in fact be willing to, incur. However, they also suggest that such a strategy also presents a great opportunity for the product/brand to differentiate in the premium market (see also Wiedmann, Hennigs, Klarmann, & Behrens, 2013).

In this section on multisensory packaging frameworks and contexts, Machiels and Orth discuss research on multisensory packaging design from a cross-cultural perspective. This topic is vitally important given the different meanings that specific sensory cues can acquire across cultures (e.g., colour) and also given the discussion of the extent to which brands should standardize versus customize (Jameson, 2007). The authors review the relevant literature on the influence of culture on the perception/interpretation of multisensory packaging, which has mostly focused on visual aspects of packaging. Importantly, Machiels and Orth discuss some of the opportunities and limitations associated with tailoring multisensory packaging to specific cultural groups and across different cultural groups. This is particularly relevant given the discussion about the sort of participant groups on which much of the more academic research is based,

whose characteristics might be particular and in some circumstances not representative of different relevant groups of consumers (e.g., see Henrich, Heine, & Norenzayan, 2010).

The Future of Multisensory Packaging

Here, both recent methodological approaches to consumers' responses to packaging as well as some of the novel technologies used in the context of multisensory packaging are summarized and evaluated. Spence, Velasco, and Petit review the consumer neuroscience research that has been published to date relevant to the topic of multisensory packaging. The authors present both some of the latest neuroimaging techniques (e.g., functional magnetic resonance imagining, electroencephalography, etc.), as well as findings that have emerged from studying consumers' responses to packaging with such techniques. Spence et al. argue that whilst promising, such research has mostly focused on determining the different brain areas involved in the processing of visual images of product packaging (e.g., Basso et al., 2014). The suggestion is that one day such research may help businesses to better predict the performance of their product packaging in relation to a brand's strategic aims (see also Kühn, Strelow, & Gallinat, 2016; Spence, 2016b). Crucially, though, before this happens, there are a number of challenges that will need to be addressed as made clear by the discussion in this chapter. For example, neuroimaging research usually involves multiple trials (in order to average over biological noise). Hence, some topics such as surprise in product packaging (which may only occur the first time that a consumer interacts with a novel packaging form) can be difficult to capture with the neuroimaging techniques that are currently available.

In the final chapter of this section, and, in fact, the volume, Petit, Velasco, and Spence review the growing research on sensory enabling technologies as well as how different brands are capitalizing on these in the design of multisensory packaging interactions. Whilst this research is undoubtedly still in its infancy, the authors anticipate that we are going to witness an increase both in the number of studies as well as in the

range of industry initiatives in which sensory enabling technologies will be used to project people into consumption experiences, promote brand engagement, as well as improve product evaluation via, for instance, augmented reality applications.

Undoubtedly, one of the aims of multisensory packaging design is to aid brand building by making product packaging as attractive to as many of the consumers' senses as possible. However, the design of multisensory packaging certainly goes well beyond this too. Sometimes, in fact, research on the topic has been used to guide the design of packaging that is actually maximally unappealing, as in recent research on the most unappealing colour for cigarette packaging (a drab khaki green as it turns out; Day, 1985; Kamenev, 2011; Munafò, Roberts, Bauld, & Leonards, 2011; Noar et al., 2016).

Another interesting example comes from over-the-counter (OTC) and prescription medications. Here, the regulatory framework tends to be rather more challenging than is the case for H&PC or FMCG (e.g., Filik, Purdy, & Gale, 2005; Hethcock, 1978; Roullet & Droulers, 2005). The danger of accidental poisoning is also ever-present (Basso et al., 2014). As such, the emphasis in design is as much on making packaging that is difficult to open (what is often referred to as 'child-proof') rather than on easy open and 'looking good enough to eat.'

There are also a number of challenges that brand managers and designers face, which involve the personalization and regulation of packaging for different populations. Children, for instance, may be especially susceptible to specific marketing cues embodied in packaging design (such as colours, shapes, and characters) that can potentially lead to healthy/unhealthy eating (e.g., Hawkes, 2010; Pires & Agante, 2011; Robinson, Borzekowski, Matheson, & Kraemer, 2007). The elderly, on the other hand, may have specific needs in terms of packaging usability that need to be considered in a world with a rapidly growing ageing society (Lorenzini & Hellström, 2017; Philbert, Notenboom, Bouvy, & van Geffen, 2014).

Multisensory packaging may be used to target specific perceptions and associated behaviours in relation to the reduction of food waste as well as recycling. These are obviously topics that are highly relevant for

sustainability (e.g., Svanes et al., 2010; Wever, Onselen, Silvester, & Boks, 2010). However, complex and controversial questions around exactly what kind of packaging solutions are actually best for the environment remain to be answered. Importantly, multisensory design will help in making new, more sustainable packaging formats both clear (in that they communicate that they are sustainable) and appealing to the consumer (i.e., enhancing natural feel to promote recycling).

Conclusions

The cost of the packaging of many H&PC and FMCG goods can often exceed the price of the product itself, often by several orders of magnitude. It is therefore all the more vital to understand how packaging contributes to, and influences, consumers' product and brand experiences and behaviour. Given that many of the most powerful experiences in our everyday lives are multisensory in nature, here we focus on how the different multisensory aspects of packaging shape such experiences and behaviours. Based on the growing interest in multisensory product packaging, in this edited collection, we have brought together a number of those working in the field to share their unique perspectives in a wide range of concise state-of-the-art reviews.

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Part I

Packaging and the Senses

2

Packaging Colour and Its Multiple Roles

Charles Spence and Carlos Velasco

Introduction

Packaging colour plays a crucial role at *every* stage of the consumer's interaction with many products, ranging from the initial search for a product in the supermarket aisle, or online, through its use (e.g., in-home), and the discarding of any waste after use (Garber & Hyatt, 2003; Krishna, Cian, & Aydınoğlu, 2017; Louw & Kimber, 2011). Packaging plays a key role in categories as diverse as Food & Beverage (F&B), Home and Personal Care (HPC), and Fast-Moving Consumer Goods (FMCG). In fact, colour can be even more critical for products in these categories

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21

given that they are normally displayed in their packaging in a way that is simply not the case for home electronics or white goods.

What the consumer sees plays a key role in driving their attention and setting their product-related expectations (Kauppinen-Räisänen, 2014; Schifferstein, 2006; Singh, 2006; Spence, 2016). Indeed, amongst the various visual cues that are available to both designers and consumers, colour is one of the most important as far as attentional capture is concerned. Colour cues also happen to be amongst the most diagnostic when it comes to shaping the consumer's product- and brand-related expectations as well (Danger, 1987; Lynn, 1981; Marshall, Stuart, & Bell, 2006; Orquin & Loose, 2013; Sacharow, 1970). This is particularly important considering the suggestion that common repeat FMCG purchases are typically made in a matter of seconds by consumers who have likely already been bombarded by a wide range of product alternatives (Nancarrow, Wright, & Brace, 1998; Sacharow, 1970).

One of the key challenges facing many companies relates to how packaging colour can be used to prime the most appropriate impression at the various moments of their consumers' interaction with a given product. Success may well be achieved at 'the first moment of truth'[1] by modifying the colour of their packaging in order to increase/optimize shelf standout. However, the design solution may then 'fail' at the second 'moment of truth' with consumers reporting that their experience of the product has also changed (and not, it has to be said, necessarily for the better).

The focus of this chapter is on the key role that packaging colour plays in branding (e.g., Deliza & MacFie, 2001). We also look at the role of packaging colour in facilitating product search and shelf standout, in setting product expectations, and, finally, in influencing the consumer's product experience. According to Hine (1995), colour influences consumers in three different ways: the physiological, the associational, and the cultural (cf. Gordon, Finlay, & Watts, 1994; Sacharow, 1970; Wheatley, 1973). Whilst consumers exhibit a small number of seemingly hard-wired physiological responses to specific colours (see Hine, 1995, p. 215; Madden, Hewett, & Roth, 2000, p. 103), in this chapter we

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[1] The 'moments of truth' framework comes out of research commissioned by Procter & Gamble (P&G) (Louw & Kimber, 2011).

focus on the associational level, which refers to those colours (used in product packaging) that have become linked with a specific brand or even a particular product category as a result of consumers having interacted with it in the marketplace previously (Ares & Deliza, 2010; Garber, Hyatt, & Boya, 2008; Kauppinen-Räisänen & Luomala, 2010; Sacharow, 1970). Here, it is important to note that packaging colour(s) can also take on a signature function. That is, over the years, some companies have succeeded in establishing their distinctive colour scheme as a recognizable attribute of their brand identity. Think here only of Tiffany aquamarine or Cadbury's Dairy Milk purple (Garber et al., 2008).[2] According to Labrecque and Milne (2012, p. 712), "Like a carefully chosen brand name, color carries intrinsic meaning that becomes central to the brand's identity, contributes to brand recognition."

The cultural level is also based on learning (e.g., purple being associated with mourning in Japan is presumably a learnt association), but from the embedded regularities and signifiers kept in specific cultures over time, rather than from what one finds in the marketplace (Aslam, 2006; Thomson, 2016; see also Machiels & Orth, this volume). However, while it probably pays for a company to be sensitive to the cultural meaning of colour when entering into a new market,[3] those companies whose signature colour has already been firmly established in one marketplace may have little opportunity to change it, even if they wanted to when entering another.

Importantly, however, when colour is seen in context, specifically when it is embedded in product packaging, its meaning may well change from what is observed when the meaning of colour presented in the abstract is assessed. For instance, bright red in product packaging is used to signify 'full fat' (in the British milk aisle, say; Rox, 2011), 'Ready Salted' in the crisps category, beef in the meat fridge, sweetness in yoghurt drinks (Tijssen, Zandstra, de Graaf, & Jager, 2017), and may

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[2] That said, those who are lucky enough to have a distinctive packaging colour, and who understandably have wanted to protect it in order to stop others from using it, have not always been successful (Nieburg, 2016; see also Walker, 2004).

[3] For instance, it has been suggested that Cadbury's Dairy Milk may have struggled to gain market share over in Japan because the distinctive purple of the brand was associated with death/mourning in the minds of Japanese consumers.

perhaps become the distinctive red of Coca-Cola in the beverage aisle (Garber et al., 2008; see also Henry, 2009; Hine, 1995, pp. 221–222; Stern, 1981). There is seldom a one-to-one correspondence between colours and meanings. Indeed, as Schloss, Lessard, Walmsley, and Foley (2018) noted recently: "This process is complicated, however, because there is seldom a one-to-one correspondence between colors and meanings. One color can be associated with many different concepts (one-to-many mapping) and many colors can be associated with the same concept (many-to-one mapping)."[4]

It is worth stressing that colour involves three distinct components: hue, lightness (sometimes confused with brightness; see Kingdom, 2011, for a review), and saturation. *Hue* refers to the broad colour category (like red, yellow, black,[5] etc.), *lightness* refers the amount of black/white present in a given stimulus, and *saturation* refers to the intensity of the hue. Importantly, these three components of colour can also convey a somewhat distinctive meaning to the consumer (Gimba, 1998; Howes, 2005) as well as influence their behaviour when used in different marketing stimuli (Labrecque & Milne, 2012; Labrecque, Patrick, & Milne, 2013; Tijssen et al., 2017). We have already come across a number of the specific meanings that are associated with particular packaging hues (Gardner, 1981). Notably, packaging hue is rarely seen in isolation (Orth & Malkewitz, 2008), and, what is more, many examples of product packaging actually use multiple hues (e.g., they use colour schemes). The background colour against which a particular example of product packaging is seen and/or the combined influence of the colour and shape (or image mould) of the packaging (Spence, 2016, for a review) can also affect the way in which a given colour is interpreted by the consumer (e.g., Becker, van Rompay, Schifferstein, & Galetzka, 2011; Garber et al., 2008; see also Lick et al., 2017).

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[4] *Colour evokes strong product associations and category imageries. In the USA blue is associated with toys, health foods, dairy foods, desserts and financial services, red is related to toys, pizza and meat entrées, silver is related to dairy foods, green is related to health foods, vegetable entrées, toys and financial services, yellow is related to toys, dairy foods, health foods, and desserts and pink is related to cosmetics and Barbie dolls (Cheskin & Masen Inc., 1976).* (Aslam, 2006, p. 23).

[5] Though, note that, strictly speaking, black and white are actually achromatic colours.

In terms of saturation, packaging that incorporates more saturated colours is generally associated with products that are more intensely flavoured/fragranced/coloured (Becker et al., 2011; Gatti, Spence, & Bordegoni, 2014; Tijssen et al., 2017; see also Hagtvedt & Brasel, 2017; Mai, Symmank, & Seeberg-Elverfeldt, 2016). Empirical evidence supporting the existence of such a saturation-intensity correspondence comes, for example, from the work of Gatti and his colleagues (2014) in Italy. The participants in this study were presented with 12 plastic bottles of handwashing solution and instructed to pick each bottle up, unscrew the lid, and then sniff the contents. The participants then had to rate the perceived intensity of the fragrance and guess how efficiently the product would clean their hands. One of the key results to emerge from this study was that the product's fragrance was rated as smelling more intense when presented in a fully saturated red bottle than when sniffed from either a pink or unsaturated white bottle instead.[6]

The aforementioned results are consistent with the notion that increasing the saturation of the packaging colour leads to expectations that the fragrance of the product itself will be more intense (cf. Hagtvedt, 2014). However, one obvious limitation with Gatti et al.'s (2014) study (at least from a marketing perspective) is that the colour of the packaging was the *only* visual attribute that was available to the participants (i.e., there was no brand name, logo, or product-related imagery on the otherwise blank packaging). Consequently, the packaging colour may have influenced people's expectations more than would be the case were that colour to be embedded in amongst a host of other meaningful graphic design elements. That said, Berentzen and Ommen (2007, as cited in Stoll, Baecke, & Kenning, 2008) have reported that changing the colour of a Nivea can, say, from blue to red led to a significant reduction in product preference. The latter result suggests that colour can still influence the consumer even when brand-relevant information is also available.

In the remainder of this chapter, we review the literature on packaging colour, attention, and processing fluency, factors that are critical when it

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[6] The fragrance sniffed from the red containers was rated as 16% more intense than from the pink and 44% more intense than from the white packaging. The contents of the pink bottles were also rated as smelling significantly more intense than the contents of the white bottles.

comes to facilitating product search and optimizing shelf standout. We then go on to summarize the literature on the various meanings that specific colours have amongst different groups of consumers. Next, we look at how packaging colour is used to set specific sensory and hedonic expectations (regarding the product), as well as to trigger/prime certain higher-level (or conceptual; Thomson, 2016) brand associations. Along the way, we review the emerging evidence demonstrating that packaging colour can actually modify product experience. We end this review chapter by highlighting some of the limitations with current research, and point to a number of intriguing directions for future research.

Using Packaging Colour to Optimize Shelf Standout While Maximizing Processing Fluency

The use of an 'unusual' colour, or colour scheme, in a product and/or its packaging can undoubtedly help a brand to stand out on the shelf (Caivano & López, 2007). 'Unusual' here is defined relative to the colour scheme normally used in the product category. Think only of Gatorade introducing their clear electric blue drink (launched back in 1995; see Wollan, 2016)—not because that colour had any meaningful correspondence with the flavour (raspberry; though note that blue raspberry has been a popular colour-flavour combination for candy floss for many years; Swarns, 2014), but rather because it stood out (through the transparent packaging) on the shelf amongst all of the other fruit-coloured drinks (Garber et al., 2008). Hendrik's Gin, meanwhile, used a squat opaque black bottle for their entry into the gin market—presumably for much the same reason (looking, as it does, rather like an old-fashioned poison bottle—and having nothing to do with the rose and cucumber aroma that is such a distinctive attribute of this particular gin).

Congruency in the Choice of Packaging Colour

Sensory incongruency is a tricky game to play successfully in the marketplace. After all, people normally prefer those product interactions that they find easier to process (i.e., that afford perceptual fluency; e.g., Reber

& Schwarz, 2001; Reber, Schwarz, & Winkielman, 2004; Reber, Winkielman, & Schwartz, 1998). And those stimulus configurations that match the associations that customers have internalized (including any those associations that are based on the so-called crossmodal correspondences)[7] are likely to be processed more fluently and hence to be appreciated more by the consumer (see Spence, 2012). The various sensory cues will likely be perceived as congruent, and hence the multi-sensory experience will be easier to process (processing fluency will, in other words, be increased).

In terms of packaging colour, congruency operates at multiple levels. It may, for example, be defined in relation to a product's flavour, brand attributes (premium, natural, organic, and cheap; see Huang & Lu, 2013), or even in relation to other design elements such as the logo (Bottomley & Doyle, 2006; Gardner, 1981). Imagine, for instance, spotting a bright orange package on the shelf at the supermarket. It might be that the colour has been chosen to signify a cheap product (Wheatley, 1973). However, were it to be that the product was actually a cola-flavoured drink, then the colour would be incongruent (if the customer were to interpret the colour as signifying the flavour of the drink). It is an intriguing question, therefore, as to how the designer can make sure that the consumer correctly understands the meaning of packaging colour (i.e., as intended by the brand; cf. Schloss et al., 2018). The context, in other words, in which colour is seen may be crucial. Here, other elements in the packaging design may help to constrain the possible meaning that is ascribed to colour (see also Garber et al., 2008). By definition, sensory incongruency does not afford processing fluency (defined as the ease with which a stimulus is processed), and may, under certain conditions at least, lead to a negatively valenced 'disconfirmation of expectation' response (see Piqueras-Fiszman & Spence, 2015, for a review).

In terms of shelf standout, packaging colour should really be considered in relation to the scene statistics of the shelf display in which it is likely to appear (Garber et al., 2008; see also Jansson, Marlow, & Bristow,

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[7] Crossmodal correspondences have been defined as the often surprising associations that people sometimes experience between features, attributes, or dimensions, either physically present, or merely imagined, in different sensory modalities (Spence, 2011, 2012).

2004). Relevant here, studies of shelf stand-out typically assess the speed with which customers can find a given product on a more-or-less realistic looking shelf display (Burke, 1996; Burke, Harlam, Kahn, & Lodish, 1992; Zhao, Huang, Spence, & Wan, 2017). So, for example, Garber et al. note how the use of black packaging in the predominantly white flour category might be used to help a new player in the category capture the attention of the customer and so be found more rapidly. This brings to mind Nabisco's strategy some years ago with Alpen breakfast muesli. This distinctively black product packaging was first launched back at the start of the 1970s, with the idea, apparently, being to help the brand to standout in the cereal aisle against the predominantly 'bright early morning sunshine colours' then commonly used in the category (see Wheatley, 1973, p. 26).

However, as Garber et al. (2008) have pointed out, the colour of product packaging really needs to be congruent with the product attributes/values at some level if it is to succeed in the marketplace. In this regard, Garber et al. suggest that Gatorade may have succeeded precisely because the blue colour is associated with a drink that is meant to be refreshing and so perhaps consumed when icy cold. In this case, then, the colour successfully conveys one brand-relevant attribute. Notice here also how the blue colour may have worked since the consumer is unlikely to have had any competing associations with that colour prior to Gatorade's launch into the marketplace (competing associations possibly being the key problem when clear cola drinks have been launched; see also Spence, 2018).

The congruency between product attributes and packaging colour is also relevant in the context of product identification and efficient consumer search. Velasco et al. (2014) have shown how packaging colour/flavour congruency can facilitate the customer's visual search for a particular flavour of crisps. Specifically, people found it significantly easier to locate a predetermined flavour variant when the packaging's colour was consistent with the consumers' prior expectations (i.e., with their colour-flavour correspondences; see also Piqueras-Fiszman & Spence, 2011). In future research, it would therefore be interesting to know whether a customer's goals also influence their search behaviour—for example, when searching for a premium or healthy/natural product, do different colours, such as black or green, stand out (cf. the literature on colour-based

contingent attentional capture; Folk, Remington, & Johnston, 1992; Gofman, Moskowitz, Fyrbjork, Moskowitz, & Mets, 2009)?

Conveying Meaning Through Packaging Colour

While researchers often treat consumers as if they all interpret (packaging) colour in the same way, that is clearly not the case. Rather, there are salient individual differences in the meaning of colour relating to individual, genetic, cultural, and presumably also historic differences. These certainly ought to be taken into account by anyone who wants to communicate effectively by means of packaging colour (Huang & Lu, 2015; Loersch & Bartholow, 2011; Marshall et al., 2006; Mead & Richerson, 2018; Schifferstein, Fenko, Desmet, Labbe, & Martin, 2013). Colour blindness represents a genetically determined difference in the consumer's response to colour (e.g., in product packaging). This is something of a neglected research area, though, given that as many as one in every ten males suffers from some sort of colour vision deficit.[8] Over the years, a number of cross-cultural differences in terms of peoples' associations with specific colours have been highlighted (e.g., see Adams & Osgood, 1973; Gardano, 1986; Jacobs, Keown, Worthley, & Ghymn, 1991; Madden et al., 2000; Wheatley, 1973). As such, it might well be expected that differences in the customers' colour-brand concept associations, in their colour-flavour associations, not to mention in any other associations that might happen to be primed by packaging colour, would be observed.[9]

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[8] The majority of published studies on the topic of packaging colour normally exclude those reporting a deficit in colour vision. It might, however, be argued that a more representative way in which to assess the likely consumer response to a given packaging design is, in fact, to include everyone, given that the colour blind presumably do as much of the shopping as anyone else. What the packaging designer really ought to be interested in is how packaging affects the average consumer (and that includes both those who are colour blind as well as the majority of consumers who are not).

[9] To give one such example of the sorts of cross-cultural differences that have been highlighted previously, just take Wheatley's (1973, p. 25) observation: "In England we expect washing powders to have a blue tinge, but in Switzerland green is the colour that will give whiter than white shirts."

In recent years, a growing number of researchers have started to use various online testing methods/techniques in order to assess the most appropriate colour code/scheme for product packaging within a specific category and within a particular culture, country, or demographic. One of the benefits of this kind of approach is that online testing may take place in several countries/continents simultaneously, thus potentially serving to draw attention to any cross-cultural similarities/differences in the meaning of packaging colour (see Woods, Velasco, Levitan, Wan, & Spence, 2015). For instance, Velasco et al. (2014) assessed the packaging colours that were most appropriate for a given flavour of crisps in mainland China, the UK, and Colombia, using online testing. Blue crisp packets were associated with a 'Natural' flavour by the Colombian participants, with the 'Cheese and Onion' variety by the Brits (though see Piqueras-Fiszman & Spence, 2011), and with the 'Cheese and Bacon' variety of crisps amongst the Chinese consumers who were tested (see also Visser, 2009). Interestingly, however, there was rather more cross-cultural agreement concerning the colours deemed most appropriate for those packets of crisps whose flavour consisted of a single unambiguously coloured ingredient (e.g., such as red packaging for tomato-flavoured crisps and green for the cucumber variety). The Colombian participants' seemingly idiosyncratic choice of green as the most appropriate colour for lemon-flavoured crisps presumably reflects the fact that lemon-related products (and in fact lemons themselves) are associated with the colour green in the Colombian marketplace. (Unsurprisingly, at least for the Western consumer/designer, both the Chinese and the Brits picked yellow instead.)

The Changing Meaning of (Packaging) Colour Through the Years

The associations that come to the mind of the consumer on seeing specific colours in product packaging have likely changed over the years (Sharpe, 1975) and this needs to be borne in mind by the packaging designer. This is especially true in those cases where the packaging designer is wanting to rely on the older research literature. One might, for instance,

want to know when exactly it was that bright orange first became associated with a bargain product/brand. This would seem to be an associational (what Thomson, 2016, labels conceptual) meaning of colour that has strengthened in the marketplace and, more importantly, in the mind of the consumer, over the last half century or so (see Lane, 1991; Sacharow, 1970; and Wheatley, 1973, p. 26, for early mentions). Along similar lines, it is also worth noting that black has not always been associated with premiumness (Bottomley & Doyle, 2006; Wheatley, 1973; see Amsteus, Al-Shaaban, Wallin, & Sjöqvist, 2015, on the varied meanings of this colour).

At the same time, however, the associations that consumers have with some colours (hues) would appear to have stayed fairly consistent for as long as researchers have been probing them experimentally. For instance, the bidirectional crossmodal associations between abstract patches of colour and basic tastes (e.g., bitter, sweet, salty, and sour), such as the association between blue/white and a salty taste haven't obviously changed over the last 35 years or so (see O'Mahony, 1983, for early research in this area and Spence et al., 2015, for a review). Intriguingly, such crossmodal colour-taste correspondences also seem to be consistent across cultures (see Velasco et al., 2016). While many of the previously mentioned studies/reviews were not explicitly related to packaging colour, it would nevertheless seem reasonable to assume that similar trends might be observed there too.

Given the existence of both cross-cultural differences and historical changes in the associations consumers hold with packaging colour, designers need to be careful when trying to interpret the results of the research that has been published to date. Thus, given the growing availability of online testing protocols (see Woods et al., 2015), it may always generally be safer (and, as it happens, surprisingly inexpensive) to test one's assumptions about the meaning of packaging colour for a particular product in a given category, in a specific market, and at a certain point in time for oneself. This may well be preferable to, and/or more reliable than, trying to base any important decisions on the published data that likely relates to a very different category, geographic region, and/or point in time.

Conveying Meaning Through Multiple Colour Cues in Packaging

While much of the literature on the meaning of (packaging) colour that has been published to date has focused on the associations that people have with individual colours, it is important to remember that the majority of packaging is actually comprised of a number of more-or-less distinct colours. Think here only of the Eastman Kodak company, who protected the combination of yellow, black, and red for their brand colour scheme (see Howes, 2005). As such, an important question concerns the meaning/expectations in the mind of the consumer by particular combinations of colour (and, once again, how these may vary cross-culturally).[10] While there has certainly been less work on this topic to date, what research there has been suggests that particular combinations of colour may, in fact, be capable of connoting a particular product attribute more successfully that any single colour can (and/or may be capable of 'speaking' meaningfully to consumers from different cultures).

For instance, based on large-scale online data collection, Woods and his colleagues have demonstrated that pairs of colours, if clearly organized into foreground/background combinations, may sometimes convey a specific attribute (in their case, a basic taste such as sweet sour, bitter, or salty) more effectively than the best of the colours when presented individually (Woods, Marmolejo-Ramos, Velasco, & Spence, 2016). Interestingly, however, when Woods and Spence (2016) arranged pairs of colours side by side (i.e., so that the two colours had equal weighting/importance), their participants found it a little harder to interpret the meaning unambiguously. In fact, in no case did the side-by-side arrangement lead to better performance than the best of the individual colours! Elsewhere, meanwhile, researchers have demonstrated that specific colour triplets can also be used to help consumers effectively discriminate between the scent of different fragrances (e.g., lavender, peppermint, and cucumber; e.g., Jacquot, Velasco, Spence, & Maric, 2016). Intriguingly, this was found to be true even when testing consumers from different

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[10] In Japan, for instance, while the combination of black and white is associated with funerals, the combination of red and white is associated with congratulations (cf. Hine, 1995; Howes, 2005).

countries (e.g., France and the UK) and hence possibly somewhat different cultural backgrounds.

Given Woods and colleagues' recent empirical results, it is intriguing here to note that several decades earlier Favre and November (1979) had already proposed the use of multiple foreground-background colour combinations in order to convey a specific taste (such as acid, sweet, bitter, salted, and liqueur-like sweetish). In fact, the colour schemes that this pair of designers (working at the time for Nestle) put forward turn out not to be too dissimilar from the colours emerging out of the work of Woods and his colleagues. However, as is common in this area, Favre and November failed to provide any explanation for how they actually came to their colour suggestions (i.e., was it merely based on their intuitions or something more rigorous), nor do they provide any empirical evidence to support the eventual rightness of their choices.

What has changed in recent years is the increasing availability of peer-reviewed publically available research methods that can, in theory at least, be used by anyone interested in evaluating the appropriateness of various colour schemes for triggering the right associations/meanings in the minds of a particular target group of consumers. For instance, Lick et al. (2017) have recently assessed the expectations set by packaging label colour in the case of wine amongst Austrian consumers. According to their research findings, red and black are likely to create expectations of a tangy flavour whereas red and orange are more associated with fruity and flowery flavours instead (see also Loersch & Bartholow, 2011).

To date, the majority of the research in this space (i.e., in using combinations of basic colours in order to convey a specific attribute) has tended to focus on those colour schemes that can most effectively communicate a particular sensory attribute such as a taste, flavour, or fragrance. In the future, therefore, it will be interesting to extend the new online testing protocols in order to see whether colour combinations can be used to more effectively communicate other higher level brand attributes such as 'natural,' 'premium' (see Velasco & Spence's, chapter on premiumization, this volume), or 'healthy,' say (see Schiller, 1935, for early work in this space). Eventually, of course, as well as using particular combinations of colour to convey specific meanings, the resulting colour combination needs to be harmonious in and of itself (Ou, 2015), as well as easy to

process by the consumer (Reber & Schwarz, 2001). There may, of course, also be some relevant cross-cultural differences here (Madden et al., 2000).

Finally, here, it is worth noting that the rise of transparent windows in packaging design in recent years in the F&B sector (see Simmonds & Spence, this volume) means that the colour combination/contrast created between the product and pack should also be considered carefully. Indeed, some companies have instituted a signature colour for their brand, one that provides the perfect colour contrast for the product contained within: some famous examples include Heinz's use of a greenish-blue can to set off the reddish orange of their baked beans. Think also of Cadbury's use of purple packaging to enhance the colour of their Dairy Milk chocolate and the signature deep blue of Barilla brand colour which perfectly sets off the golden yellow colour of their pasta (e.g., through the transparent window in the packaging, or traditionally via a colour image of the product on pack). In such cases, when the colours of product and packaging are combined, it is likely to be colour contrast—that is, how the product itself appears against the background of the packaging (i.e., through the transparent window)—that is more important than the meaning of the colour combination itself.

Having reviewed the evidence concerning the meanings/associations of abstract colours and combinations of colours, we move on, in the final section, to assess the expectations set by, and the influence of, colour when embedded in more or less realistic examples of product packaging (one can think of this as the study of colour in context; see Amsteus et al., 2015).

The Role of Packaging Colour(s) on Product Expectations and Product Experience

Over the years, there have been a number of anecdotal suggestions from marketers/commentators suggesting that changing the colour of the packaging (e.g., the colour of the cans of popular soft drinks) influenced consumers' reports about the taste/flavour of the contents (Cheskin, 1957; Esterl, 2011). Why, though, should a noticeable change in the

colour of the packaging lead so many consumers to experience the taste of the presumably familiar-tasting product differently? One thing to note here is that when people drink straight from the can, the only visual cue that they may have available to them is, in fact, the colour of the packaging; that is, they may well not see the colour of the drink itself. Hence, it might be expected that packaging colour would have a more pronounced influence on taste/flavour perception under such conditions than when the consumer can see the colour of the product as well. Interestingly, however, even under such conditions, the colour of the packaging can nevertheless still influence what consumers say about the product. So, for instance, Barnett and Spence (2016) demonstrated that people's ratings of the citrus/fruity notes in a craft beer were influenced by the colour of the label. In particular, those who assessed the beer which was served in a clear glass, but poured from a brown bottle with a greenish-yellow label, rated it as tasting significantly more citrusy/fruity (by around 10%) that than those who sampled the same beer from a glass where the beer had been poured from an unlabelled brown bottle or else from a bottle with a brown-coloured label instead.

Similar effects of packaging colour on product expectations have been reported in a number of other product categories and markets as well (Ares & Deliza, 2010; Mead & Richerson, 2018; Piqueras-Fiszman & Spence, 2011). Meanwhile, Piqueras-Fiszman and Spence had their participants try to identify the flavour of crisps (potato chips) when sampled direct from four packets of 'salt and vinegar' and 'cheese and onion' crisps (commercial product packaging was used). Unbeknownst to the participants, however, the contents of a couple of the packets had been switched surreptitiously. A number of the participants found it surprisingly difficult to correctly identify the flavour of the crisps when presented in the incongruently coloured packaging. By contrast, they experienced no such problems when sampling the crisps from their correctly coloured packaging instead.[11]

Huang and Lu (2015) conducted a laboratory-based study in which their participants evaluated the apparent healthiness and sweetness of

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[11] Beyond explicitly assessing the specific associations that consumers may have with particular packaging colours, Piqueras-Fiszman and Spence also used a simplified version of the Implicit Association Test (IAT) in order to pick up on the more implicit associations that consumers hold with product packaging colour.

four different foods: breakfast cereal, ice-cream, iced tea, and yoghurt presented in blue, green, or red packaging, with each participant rating a total of 12 of different exemplars of product packaging. The participants expected products in red packaging to taste sweeter (and to be less healthy) than the same products when presented in packaging coloured in blue or green. However, that said, one limitation to bear in mind here is that Huang and Lu only assessed taste expectations. Remember that differences in expected product attributes do not always carry over to influence the consumer's actual experience on tasting the product (see Zellner et al., 2018, for one recent null result in this space).

Furthermore, it should also be noted how the single colour manipulations used in Huang and Lu's (2015) somewhat artificial-looking packaging prototypes are rather more 'obvious' than would be the case for the more realistic, ecologically valid, examples of product packaging that one finds in the store. As such, the variations of packaging colour used that were used in this study might be expected to have a more pronounced effect on product expectations than would be the case were more realistic examples of packaging to have been evaluated under more naturalistic conditions.

Tijssen et al. (2017) systematically and orthogonally varied the hue, saturation, and lightness of the colour of realistic exemplars of product packaging. The results of this research showed that participants expected a healthy low-sugar yoghurt drink in red packaging to be significantly sweeter, creamier, and more intensely flavoured than the same product when presented in blue packaging. Meanwhile, for a less healthy low-fat processed sausage product, the red packaging led to expectations of a fattier and more flavourful sausage than did the blue packaging. Decreasing colour lightness was shown to increase expected sweetness. In this case, varying the lightness of the packaging had opposite effects on expected flavour intensity for the two products studied.[12]

Tijssen and her colleagues (2017) went on to demonstrate in their laboratory research that the taste expectations elicited by variations in packaging

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[12] Like Piqueras-Fiszman and Spence (2011) before them, Tijssen and her colleagues (2017) also used the IAT to assess the strength of the association between packaging colour and specific brand associations (e.g., healthfulness).

colour influenced the actual taste of the products. Specifically, the low-sugar yoghurt served in red packaging with low brightness and high saturation was rated as tasting sweeter, creamier, and as having a more intense flavour. That said, the colour-based effects on taste ratings were somewhat less pronounced than those documented solely on the basis of the visual expectations set by the packaging colour (cf. Becker et al., 2011). As such, Tijssen et al. (2017) have used some of the most meaningful and realistic product exemplars that have been tested to date in their assessment of the meaning of packaging colour. However, as mentioned earlier, there is still the worry here that if all that varies between one product and the next is the colour of the packaging, then the participants might well have their attention drawn to this attribute of the packaging design in a way that is simply not representative of our everyday shopping encounters, say (one can think of this in terms of task demands). For instance, consider only how the participants in Tijssen et al.'s study were presented with 12 versions of the same product packaging varying only in terms of its colour (specifically its, hue, saturation, and lightness). Perhaps, then, they may have been primed to think about the relative meaning of subtle differences in shading more than were they to have been exposed to any one of these packages in a crowded supermarket aisle, say. One solution to address this potential issue in future research involves combining large-scale within-participants testing of the colour variants (as is Tijssen and her colleagues' studies) with some between-participants testing. If conducted appropriately, the latter approach should mean that the participants will not have any awareness that it is specifically the meaning of the colour of the packaging that is under investigation. Should similar results be obtained using both methods, one can be reasonably sure that colour really does have the meaning/impact suggested by Tijssen et al.'s findings.

Conclusions

The aim of this chapter has been to highlight the crucial role played by colour in the design of multisensory product packaging. Initially, it plays a dominant role when it comes to capturing the shopper's attention in the aisle, or, as is increasingly the case, online. Distinctive colours, and colour

schemes, can also act as valuable brand assets (Kanner, 1989). In many categories, though, packaging colour is more commonly used to convey category-specific information. Packaging colour, in other words, plays a number of important yet different roles in guiding the consumer experience/journey.

The evidence that has been published to date supports the view that packaging colour can also influence the consumers' experience of the product itself (e.g., its perceived taste, flavour, and/or fragrance; though, see Zellner et al., 2018). What is clear is that packaging colour automatically sets expectations in the mind of the consumer concerning the likely sensory properties of the contents (Huang & Lu, 2015; see Piqueras-Fiszman & Spence, 2015, for a review). These expectations then anchor, and potentially also influence, the following product experience depending on, amongst other things, whether the actual sensory experience of the product is from the expectations that were set by the packaging colour scheme (see Ares & Deliza, 2010; Deliza & MacFie, 2001; Piqueras-Fiszman & Spence, 2015).

Packaging colour can also be used to convey higher-order information, signalling, for example, that a product is premium (black) or cheap (orange). In a few cases, colour is associated with a specific brand and hence connotes whatever the brand stands for in the mind of the consumer (Thomson, 2016). Thus, given the multiple meanings of colour, it becomes an intriguing question as to whether certain interpretations/associations dominate over others, or whether instead it all depends on the context in which that colour is seen (and perhaps on the objectives/mindset of the consumer).[13]

Ultimately, though, the key point to remember is that packaging colour plays a dominant role at *all* stages of the consumer's interaction with a food product. The challenge, therefore, for the packaging designer is to try and determine which colour scheme will be the best throughout the different stages of the consumer's product experience/interaction. They may also need to figure out which stage of the interaction is most important.

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[13] For instance, one can ask the question of what packaging colour scheme would be best for a company purveying *premium* orange juice to use as the background colour for their product packaging.

One might also want to rank the relative importance of packaging colour at these various stages of the consumer journey in some meaningful way. The good news is that the latest cognitive/consumer neuroscience-inspired online testing techniques are now increasingly enabling F&B and FMCG companies, not to mention the design agencies who so often work for them, to evaluate the efficacy (e.g., the shelf standout) and meaning of various different colour schemes more effectively and in a variety of cultures (see Woods et al., 2015). Another area that it will be interesting to watch in coming years is how big data analyses are going to revolutionize the way in which new packaging designs are assessed in the future (e.g., Kaedi & Alinia, 2017). These large-scale approaches are all the more important given that finding colour schemes that work cross-culturally are particularly challenging for global branding (given the well-documented cultural differences in the meaning of colour).

Directions for Future Research

One of the questions to which researchers have yet to provide a satisfactory answer concerns whether packaging colour affects the perception of F&B products more when the product itself is consumed directly from the packaging than when it is removed from the packaging prior to consumption. (The question of whether or not the consumer can see the product in/through the packaging may, of course, also be relevant here.) This is an important topic given the suggestion that roughly one-third of all food and drink is consumed directly from the packaging. In the future, it will be interesting to see whether neuroimaging may increasingly come to help explain how it is that packaging colour comes to affect people's product-related expectations in quite the way that it does.

Looking to the future, we may well see more research looking at the combined influence/interaction between the colour of the product and that of the packaging (e.g., see Sugrue & Dando, 2018). Here, one might also wonder to what extent the meaning and influence of colour in product packaging is similar to/different from what has been demonstrated/found in terms of variations in the colour of products themselves (see Spence, 2015, for the meaning of colour in food and drink products, and Hagtvedt, 2014, for the meaning of colour value for product attributes).

We would argue that one should always consider the question of how realistic those studies in which packages that are only seen on a prototype package displayed on a monitor really are. It may be that the results of such research (where the manipulation of packaging colour is separated from the actual product being evaluated) underestimate the full extent of packaging colour's influence on the customer's product perception. At the other extreme, though, it is also important to remember that the product expectations induced by packaging colour do not always affect the customer's product experience. In fact, oftentimes, the influence of packaging colour on product *experience* is less pronounced than the effects shown for product *expectations* (Becker et al., 2011; Tijssen et al., 2017). Furthermore, on occasion, changing the packaging (or wrapper) colour has been shown to exert no impact whatsoever on people's product experience (cf. Zellner et al., 2018).

One of the most important challenges for those wanting to understand the influence of packaging colour is what happens when this cue is set amongst a multitude of other packaging cues (such as typeface, branding, written descriptions, etc.; see Bottomley, 2006; Lunardo & Livat, 2016; Ngo, Piqueras-Fiszman, & Spence, 2012). All of these various cues may well be competing for the customer's limited attention. As such, one key methodological question here then becomes whether those experimental settings in which packaging colour is the *only* thing that changes (e.g., from one trial to the next) may unintentionally serve to draw attention to the colour of the packaging in a way that is simply not representative of our everyday shopping encounters.[14] Another issue that we believe would benefit from further research will be to assess how long-lasting the impact of any particular change in packaging colour is for product expectations, as well as for the customer's perception/experience of a given product. After all, to date, the majority of the research that has been conducted has only involved short-term exposure to the effects of innovative packaging

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[14] Construal level may also be an important factor to consider as well. So, for example, Lee, Deng, Unnava, and Fujita (2014) noted that black and white promote a high-level construal (i.e., focus on the abstract and essential features of a stimulus), while colour triggers a low-level construal (i.e., focus on the concrete and superficial features of a stimulus). Thus, a black-and-white/colour visual on packaging would influence the perceived importance of the product features, regulatory focus, and/or consumers' goal/motivations.

colouring. Consequently, as yet, relatively little solid research has actually been conducted in the marketplace (or perhaps, better said, at least not much that is in the public domain on this topic).

Despite the various caveats that have been summarized here, it is our belief that research into the optimization of colour in product packaging in order to try and convey the 'right' expectations, and/or to optimize the customer's product experience, is now in a much better place than it has been previously (Schuldt, 2013). In part, these developments can be attributed to the rise of consumer neuroscience-inspired online (and occasionally in-lab) testing. Such techniques (including online search and the assessment of consumer's product expectations and associations, e.g., by using cognitive neuroscience-inspired paradigms such as the Implicit Association Test (IAT)) can potentially be used to provide answers rapidly and cheaply and potentially be conducted in multiple markets simultaneously.

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3

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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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[1] (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, & Caldara, 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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[1] 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.[2]

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 (Klajner, 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 & Kemps, 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 (Raghunathan, Naylor, & Hoyer, 2006). Neurological evidence supports these findings: specifically, functional magnetic resonance imaging (fMRI; a technique

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[2] 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 & Dhillo, 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, Antúnez, 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-Fiszman, 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[3] (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).[4]

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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[3] 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.

[4] 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.[5] 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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[5] 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-Fiszman, & Spence, 2014; Spence, 2018; Spence, Piqueras-Fiszman, 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).[6] 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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[6] 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
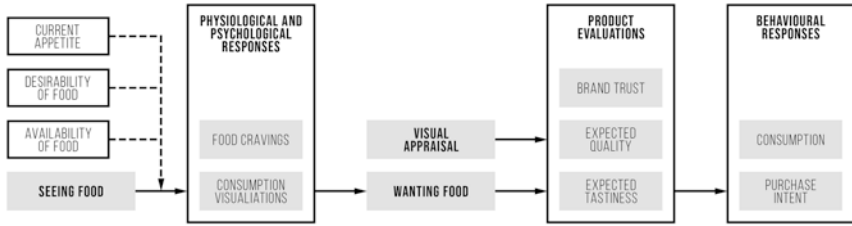
Fig. 3.1 Modelling the psychological mechanisms that manipulate product-related evaluations and behaviours that occur after the consumer sees food

(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[7] (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),

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[7] 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.[8] Indeed, all designs with transparent elements were expected,

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[8] 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 & Trinquecoste, 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 Trinquecoste (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.[9]

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[9] 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 Hagtvedt (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?

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4

The Role of Typeface in Packaging Design

Carlos Velasco and Charles Spence

Introduction

The choice of typeface[1] and font for product packaging is undoubtedly an important, if frequently underrated, topic in applied consumer research. Indeed, given its importance and ubiquity (both on product packaging and elsewhere), it is surprising that there has not been more research on

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[1] At the outset, it is important to clarify the difference between typeface and font (Brownlee, 2014). Nowadays these terms are, in many cases, used interchangeably. To illustrate the difference, whilst Tw Cen MT 14pt in italics would be a different font from Tw Cen MT 10pt without italics, Tw Cen MT is a different typeface than Times New Roman. According to Brownlee, in the old days of analogue printing, the metal blocks that followed the same design principles (e.g., Tw Cen MT) were considered the typeface while fonts, on the other hand, indicated the specific sub-blocks of a given typeface (i.e., bold, italics, underline, upper and lower case, different sizes).

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the design of typeface over the years (McCarthy & Mothersbaugh, 2002; Velasco, Hyndman, & Spence, 2018). Moreover, the available research has not necessarily considered typeface specifically in the context of packaging design (Karnal, Machiels, Orth, & Mai, 2016). This is an important omission because space comes at a premium on product packaging, especially given all of the information that legally needs to be presented there (i.e., the name of the product and the list and quantity of ingredients for food products, say). Given that one does not want the packaging to look too cluttered this, then, effectively constrains the size of the typeface that can be used. As we see later, this also raises questions as to the kinds of typeface that should be used to present specific information. Considering the impact that the choice of typeface can have in facilitating (or not) reading/comprehension (e.g., according to Mackey & Metz, 2009), manufacturers may sometimes also make the mandatory information on packaging harder to read than perhaps it needs to be.

Note that any text appearing on product packaging will either incorporate an off-the-shelf typeface or else a custom-designed one in order to communicate key information about the product or brand (Hutton, 1987). However, beyond any factual information that is conveyed by the text found on product packaging, the very visual characteristics of the typeface itself (what early researchers referred to as the 'feeling value' or 'atmosphere' of lines/typeface; e.g., Berliner, 1920; Poffenberger & Barrows, 1924) can also connote, communicate, and/or reinforce a specific meaning to whoever happens to see/read it (Bringhurst, 2004; Garfield, 2011; Henderson, Giese, & Cote, 2004; Hyndman, 2015).[2] Blanchard (1980, 1998), amongst many others, distinguish here between any meaning that is 'denoted' by the typeface (literally what is meant by the words) and the 'connoted' meaning. The latter refers to the more implicit meaning carried by the choice of typeface/font. Just take the early examples of brand typeface shown in Fig. 4.1 and consider the associations that they bring to mind. Poffenberger and Franken (1923, p. 312), at least, were convinced that: 'In the case of "Disston" and

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[2] One can think of this as an aspect of semiotics (cf. Nöth, 2001). Interestingly, neuropsychological research by Barton et al. (2010) suggests that the processing of the meaning and style/script of the text may actually rely on activity in different cerebral hemispheres.

Fig. 4.1 A selection of early commodity typefaces from Poffenberger and Franken (1923). Reprinted from Poffenberger, A. T., & Franken, R. B., 'A study of the appropriateness of type faces', *Journal of Applied Psychology, 7*(4), 312–329, 1923, APA publisher

"Speed-grits" the type very clearly carries something of the atmosphere of the commodity' (the commodities in this case were saws and hand sanders, respectively).

In the best-case scenario, a brand may even become intimately linked to a specific recognizable typeface. In fact, sometimes a particular typeface becomes synonymous with a brand, as has arguably happened with the *Spencerian Script* that has been used for the Coca-Cola logo on bottles and cans over the last century. It can be argued that, in such cases, the properties of the typeface are likely to be congruent with the properties of the product in terms of their shape-symbolic meaning (or associations; see Velasco, Hyndman, et al., 2018). That is, the low-level physical features of typefaces (e.g., the curvature, see Fig. 4.2, for a series of typeface characteristics) can set specific expectations in the mind of the viewer. According to Velasco, Woods, Hyndman, and Spence (2015), the roundness of the typeface on a soft drink can or bottle, such as in *Spencerian Script*, can be taken (rightly or wrongly) to signal the presence of a sweet-tasting drink. It has been argued that such expectancy effects operate at a level that, in many cases, may be functionally subliminal (see Spence, 2012, for a review; see also Durgee & O'Connor, 1996). What is also relevant to note here is that the widespread trend of copycat marketing/design (e.g., see Kulesza, Szypowska, & Dolinski, 2014; Spence, 2012; Van Horen &
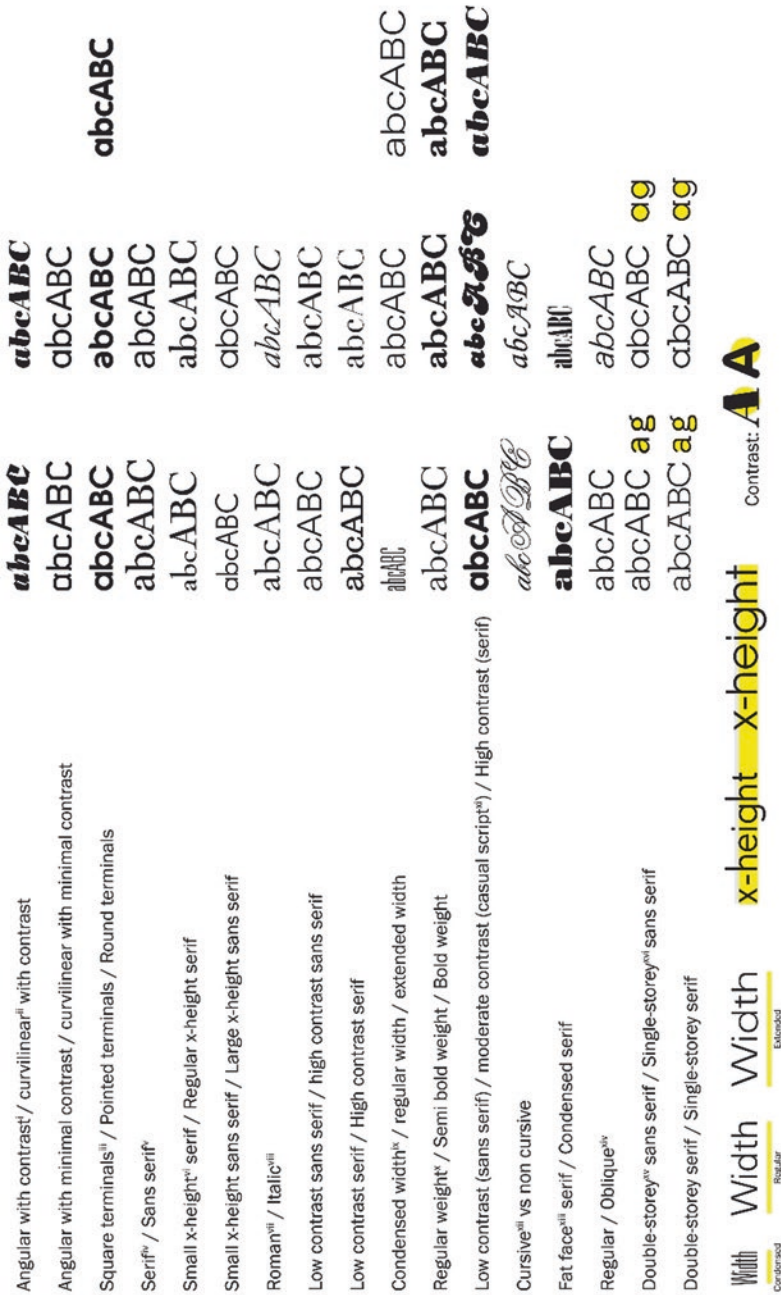
Fig. 4.2 Some typeface features that designers work with (see also Kahn & Lenk, 1998; Sanocki & Dyson, 2012). The shading at the bottom highlights different widths of typeface, differing x-heights, and the contrast between thick and thin strokes. Reprinted with permission from *International Journal of Gastronomy and Food Science, 11*, Velasco, C., Hyndman, S., and Spence, C., The role of typeface curvilinearity on taste expectations and perception, 63–74, Copyright (2018), with permission from Elsevier

Pieters, 2012a, 2012b) is likely to ensure that a successful brand leader's approach to the choice, or design, of typeface may well be mimicked, more or less closely, by its competitors. However, what becomes iconic is not necessarily the roundness, symmetry, or bold font of the brand name or logo but rather the combination of features that come together as more of a gestalt impression (Wagemans, 2015) or unique identity.

This chapter covers typeface research as it relates to packaging design. In particular, the focus is on the ease with which different typefaces are processed (this is what is known as processing fluency; Reber, Winkielman, & Schwartz, 1998) as well as their ability to prime certain specific associations. We discuss the role of typeface in the design of product packaging—where typeface is but one aspect of the total product offering. We also review some of the techniques that have been used over the years in order to assess the specific meaning of typeface. We argue that the choice of typeface constitutes a crucial aspect of packaging design, one that plays a key role in conveying information about a brand and, as such, should not be ignored.

The Processing Fluency of Different Typeface

A critical aspect of typeface design that relates to the ease with which written information can be processed, but also to the meaning and/or particular inferences that consumers develop, is how easy or difficult it is to read.[3] In this case, processing fluency depends not only on the particular typeface used but also on the viewer's familiarity with it and on what is written (e.g., how long the words are and how easy they are to pronounce, e.g., Song & Schwarz, 2009).

Enhancing the ease of processing (or processing fluency) normally exerts a positive effect on consumers' evaluations of objects[4] (Dreisbach & Fischer, 2011; Gump, 2001; Huang, Li, Wu, & Lin, 2018; Reber

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[3] One way in which to make text more difficult to read is simply to vary the typeface/font on a letter-by-letter basis (Sanocki, 1987). This, though, is not recommended unless one happens to be composing a ransom note.

[4] Though note that a 'positive effect' is not always the healthiest. For example, Gomez, Werle, and Corneille (2017) reported a study in which they found that nutrition information that is easier to

et al., 1998; Song & Schwarz, 2008; Winkielman et al., 2003). For instance, the evidence suggests that it leads to positive affective reactions (see LaBroo, Dhar, & Schwarz, 2008; Reber, Schwarz, & Winkielman, 2004; Winkielman & Cacioppo, 2001, for some examples). Here, though, it is worth noting that there are situations in which a company or brand may actually wish to make it harder for their consumers to process the text (e.g., Mead & Hardesty, 2018; cf. Pocheptsova, Labroo, & Dhar, 2010). This is because that difficulty may, in turn, convey associations that are appropriate for the product experience in question. Specifically, a typeface that is harder to read is sometimes deliberately used in order to help convey the notion that the product itself is more complex/special (e.g., see also Alter, 2013, on the benefits of disfluency, such as the prompting of careful and deep information processing) or perhaps more innovative (Cho & Schwarz, 2006). For example, Song and Schwarz (2008, 2010) have demonstrated that text that is harder to read is associated with a better quality/more expensive wine. On the other hand, Huang and Kwong (2016) provide evidence for the idea that lower typeface legibility leads to increased perceived variety in a menu or catalogue (which is something that might appeal to variety-seeking consumers), relative to typeface that is more legible. That said, designers and marketers also need to bear in mind that a customer's mood/emotion may, though, be lowered by exposure to typeface that they have difficulty reading (Gump, 2001).[5] This strategy might also prove difficult if marketing to those consumers with special needs (e.g., the elderly, those with low vision; Feely, Rubin, Ekstrom, & Perera, 2005).

The consistency between the implicit (or 'connoted') meaning of a given typeface (e.g., light vs. heavy) and the word that is 'dressed' in such a typeface (e.g., ant vs. elephant) can influence the fluency with which the word is processed too (see Walker, 2008, for a review; see also Walker, 2016). This, of course, also raises the question of the extent to which typeface/product name, typeface/product type, and typeface/product

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process (vs. more difficult to process) leads to higher purchase intentions not only for healthy but also for unhealthy foods.

[5] Warde (1930) captured this almost a century ago when he said that 'The type which, through any arbitrarily warping of design or excess of "colour", gets in the way of the mental picture to be conveyed, is a bad type'.

category consistency may influence processing fluency. As we see below, the research that has been published to date provides evidence for the idea that brand/typeface consistency can indeed influence product perception and choice (e.g., Doyle & Bottomley, 2004, 2006).

In summary, therefore, depending on the aims of the packaging designer, and the moment of consumer-product interaction that is being targeted, fluency or disfluency may be the more appropriate objective. For example, it has been suggested recently that persuasive health messages would do well to aim for fluent design properties. In particular, Okuhara, Ishikawa, Okada, Kato, and Kiuchi (2017) reviewed 40 research articles on different kinds of processing fluency (related to typefaces but also to other design elements such as the kind of language used, the amount of information provided, etc.). In terms of typefaces and fonts, they indicated that most studies point to the idea that an easy to process font enhances comprehension and positive affect (see also Guenther, 2012; Mosteller, Donthu, & Eroglu, 2014).

On the Multiple Meanings of Typeface

In one of the earliest studies of its kind, Poffenberger and Barrows (1924) assessed the 'feeling value' of lines in a group of 500 participants (see Warde, 1956, for an early essay on typefaces). The lines in this particular study were presented on cards and the participants had to select the line that best fitted a given feeling (e.g., merry, sad, furious). The results revealed that different feelings were judged as being most appropriate for different kinds of curved lines. So, for example, 'Sad' was associated with a slow descending curve, 'Quiet' was associated with a slow horizontal curve, 'Lazy' with a slow descending curve, and 'Merry' with a medium rising curve. Around the same time, a number of other researchers published studies that came to very similar conclusions (e.g., see Lundholm, 1921; see also Bar & Neta, 2006, for more recent research on curvature preference). Whilst this research, at least as far as it was originally conceived, was not necessarily specific to typefaces, we would argue that it already suggests that lines, independent of whether they compose letters in specific typefaces or not, convey affective meaning.

In fact, it has long been asserted that typefaces are associated with feelings (or atmospheres, Kastl & Child, 1968; Morrison, 1986). For instance, according to early research by Poffenberger and Franken (1923, p. 312), 'The belief is fairly general that heavy faced type carry with them the atmosphere or feeling of solidity and strength, and that the thin faced type suggest fineness and delicacy'. Meanwhile, according to the opening lines of an early paper by Davis and Smith (1933, p. 712), 'In working with type faces in practical advertising one will frequently come upon assertions such as: bold type expresses cheapness, italic types express femininity, or that Bodoni type expresses modernness, and the like, evidently without any proof except the impression made upon the asserter by the characteristic of the type'. With this in mind, what should the packaging designer wishing to select a specific typeface to connote a certain value or meaning be looking for exactly?

There is a long, if surprisingly sparse, literature on the psychological associations with different typefaces (e.g., see Berliner, 1920; Davis & Smith, 1933; Poffenberger & Franken, 1923; Schiller, 1935; Tannenbaum, Jacobson, & Norris, 1964).[6] In what is perhaps the earliest study to have been conducted in this area, Berliner (1920) had his participants rank a selection of 18 handwritten typefaces in terms of their appropriateness for a selection of four different products (fish, pork and beans, pancake flour, and orange marmalade).[7] The results revealed a correlation between the respondents' responses, thus arguing that particular typefaces are indeed associated with specific 'atmospheres'. Meanwhile, Poffenberger and Franken (1923) used what they described as 29 rather common advertising 'faces' and measured their appropriateness for both abstract qualities and actual commodities (e.g., cheapness, automobiles, dignity, building material, economy, luxury, jewellery, strength, and perfume). The results revealed some degree of consistency in the rankings obtained across participants. That is, the patterns of responses obtained were distinctly non-random. See also Davis and Smith (1933), for another

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[6] Note that much of the early literature on the design of typeface was focused primarily on issues of legibility (e.g., Burt, Cooper, & Martin, 1955), rather than on the assessment of connotative meaning.

[7] The participants in Berliner's (1920) study were instructed to arrange the 18 typefaces in order, in terms of their suitability for expressing the 'atmosphere' of the product.

example assessing the appropriateness of typefaces for different kinds of advertising/products.

Initial research also suggested that there are typefaces that, as any other objects, connote specific, perhaps more implicit, meanings. Tannenbaum et al. (1964) investigated the connotations of specific typefaces. In their study, 3 groups of 25 participants, each varying in terms of their level of knowledge of typefaces (pro, semi-pro, and amateur) evaluated 16 displays of 4 typefaces (serif—Bodoni, Garamond—and sans-serif—Spartan, Kabel—, all presented in upper vs. lower case and in regular vs. italics forms) on a series of semantic differential scales (scales anchored with polar adjectives, e.g., good-bad, beautiful-ugly, strong-weak, angular-rounded, etc.). Of the 25 such scales, the authors were able to identify 5 common underlying dimensions of connotative meaning, namely evaluation (e.g., pleasant-unpleasant), potency (e.g., strong-weak), activity (e.g., fast-slow), complexity (e.g., simple-complex), and a physical dimension (e.g., round-angular), on which to map the different families of typeface. That said, though, evaluation, potency, and activity accounted for most of the variation in the data (consistent with previous research on dimensions of meaning, see Osgood, Suci, & Tannenbaum, 1957; see also Rowe, 1982).

Tannenbaum et al. (1964) analysed the role of participant group (pro, semi-pro, amateur), typeface family (Bodoni, Garamond, Spartan, Kabel), case (upper, lower), and inclination (regular, italics) on the dimensions of evaluation, potency, and activity. Multiple findings emerged, including the observation that as far as the evaluation dimension was concerned, the pros judged the typefaces more positively than did the amateurs and semi-pros. Moreover, Garamond typeface was evaluated more positively than the others. Spartan and Bodoni appeared to be the most potent of the typefaces tested. Similarly, upper case and regular typeface led to more potent judgements than lower case and italics, respectively. Finally, in terms of the activity dimension, Kabel was the least active, whilst italics led to higher activity than regular. All-in-all, this research tried to capture the underlying meaning of different fonts. Such results therefore provide a systematic approach for a brand/packaging designer wanting to promote a desirable image through their choice of typeface.

Given the long history of research on the topic of typeface associations, one might also wonder whether typeface associations stay the same over the decades or whether instead their meaning changes as the years go by. It can certainly be argued that several of the typefaces shown in Fig. 4.1 look decidedly dated to twenty-first-century eyes, thus hinting, or so we would like to argue here, at the changing associations, of specific typefaces.

More recently, a growing number of researchers have been studying typeface in the context of both psychology and marketing (e.g., Childers & Jass, 2002; Schroll, et al., 2018; Tantillo, Lorenzo-Aiss, & Mathisen, 1995; Van Rompay & Pruyn, 2011; Velasco, Hyndman, et al., 2018). For example, Henderson et al. (2004) conducted a study designed to identify key typeface design dimensions as well as key impressions derived from specific typefaces. Whilst they considered the dimensions of meaning discussed in earlier research (e.g., potency, evaluation, and activity), they decided to approach the topic somewhat differently. First, they identified and gathered design characteristics and corresponding representative typefaces (e.g., balanced/unbalanced, curved/angular, serif/sans-serif). Second, they had graphic designers and advertisers rate the representative typefaces in terms of the different design characteristics. Third, they identified relevant impressions for firms (e.g., innovative, honest, attractive), and finally, they had consumers evaluate the typefaces on the different scales representing the impressions.

By means of factor analyses, Henderson and her colleagues (2004) indicated that typeface design attributes could be grouped into six factors: Elaborate, harmony, natural, flourish, weight, and compressed. Moreover, they suggested that the different impressions could be simplified down to four factors, namely pleasing/displeasing, engaging/boring, reassuring/unsettling, and prominent/subtle. Finally, they also assessed how the different design dimensions would influence the impression dimensions. For example, natural had the largest impact on pleasing/displeasing, natural and elaborate on engaging/boring, harmony and elaborated on reassuring/unsettling, and natural on prominent/subtle.

Building on the aforementioned attributes, Grohmann, Giese, and Parkman (2013) subsequently went on to study the extent to which they influence people's evaluations of brand personality (including excitement, sincerity, sophistication, competence, and ruggedness dimensions).

The results of the latter study revealed, for instance, that when a brand uses fonts that are rated high in terms of harmony, natural, and flourish, they also appear to be more exciting, sincere, sophisticated, rugged, and competent, whilst those brands that are rated higher in weight appear more rugged and competent (see also see also Brumberger, 2004). Meanwhile, Grohmann (2016) assessed the possibility of communicating gender by means of typeface design across four experiments where the results indicated that script typefaces (e.g., Rage Italic, Scheherazade) led to higher perceived brand femininity relative to display typefaces (Impact, Stencil Set) which enhanced the perception of a brand as being masculine.[8] There are also examples in the marketplace of products targeting different genders deliberately by means of the use of different typefaces. For example, think of the typefaces used by brands such as for Gillette razors for men versus women (see their Venus brand).

Importantly, though, this research has not only focused on connotations but also suggested that typefaces can influence a range of consumer processes. So, for example, Doyle and Bottomley (2004) studied the role of typeface/brand congruency on brand choice. In their study, they provided evidence to suggest that brands presented in an appropriate typeface, that is, one that feels more appropriate for a given brand (e.g., ice cream in Snowdrift typeface) versus less appropriate (e.g., ice cream in Arial), are chosen more frequently. In that sense, not only are there typefaces and fonts that may convey the meaning of a given product better but they can also influence the way in which consumers make decisions. Notably, Doyle and Bottomley (2009, 2010) assessed typeface appropriateness based on the dimensions of connotative meaning. But, most relevant here, Doyle and Bottomley (2009) suggest that people's perception of the meaning (e.g., evaluation, activity, potency) of an object's name (e.g., surnames, products, services) can be influenced by the associations evoked by the typeface that goes along with it. Research by Doyle and Bottomley (2011) has also studied the separable effects of typeface and the symbolism associated with the phonetic properties of the letters of brand names. Their results suggested that, potentially, the visual—that is, the way brand

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[8] It is perhaps a remaining question though, whether the associations between typeface and gender are internalized by consumers as a function of some regularities in the market place.

names look, or typeface—may potentially be more significant in conveying a given message or meaning relative to the sound symbolic nature of the brand's name.

Other research, meanwhile, has highlighted how specific 'exotypes' (i.e., typefaces that are influenced by foreign calligraphy) are sometimes used by food and beverage brands in order to communicate the notion that the product itself has exotic origins (see Celhay, Boysselle, & Cohen, 2015). In particular, Celhay et al. tested the connotations triggered by six different exotypes (a Latin typeface that resembles a non-Latin one) with more than 1700 participants. Their results revealed that exotypes in product packaging can provide an effective means of communicating specific product origin or culture (e.g., Arabic conveyed by means of 'Arab Dances' typeface).

A Case of Research on Typefaces: The Taste of Typeface

Previous research on the connotative meaning, or associations, of typeface typically had participants simply rate a range of typefaces in terms of various semantic differential scales. One can think of the box-scale as used in our own research on typeface (Velasco, Woods, Hyndman, et al., 2015; Velasco, Woods, Wan, et al., 2018) as a modern version of this approach. We have been using the latter approach increasingly frequently in order to assess the strength of any association between typeface (or other design features) and concepts/descriptors (see Fig. 4.3). This approach to measuring the associations of typefaces, as well as their connotative meaning, has a key advantage over other rating procedures. That is, there is no need for individual scales for each stimulus but instead all stimuli appear on the same trial relative to one dimension, thus facilitating the speed with which the participant can respond. This, in turn, allows the researcher to test a much larger number of typefaces in a much shorter space of time, thus potentially providing quick inputs for the design process of multisensory packaging.
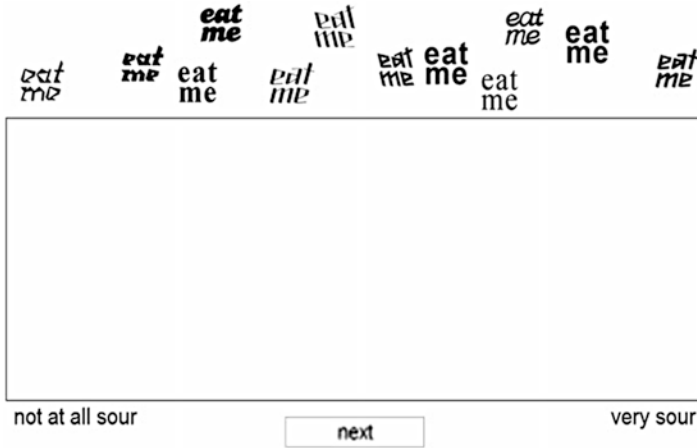
Fig. 4.3 The box-scale used in Velasco et al.'s (2015, CC BY) study to assess any crossmodal associations between typeface design and basic taste properties (e.g., sweet, sour, salty, and bitter). Participants drag the items shown at the top of the screen into the relevant position in the box. This approach, which can easily be conducted online, has the advantage that multiple typeface design solutions can be assessed rapidly in accordance with the strength of their association with the particular brand/product attributes that happen to be of interest to the designer/researcher

For example, in our own research, we have investigated the crossmodal associations (i.e., associations between features across the senses) that people hold between typeface features and specific product tastes (see Velasco et al., 2015). This is built on a large body of prior research showing the crossmodal correspondences that exist between gustatory taste attributes (e.g., bitter, sweet, sour, and salty) and shape properties such as roundness and angularity (Velasco, Woods, Petit, Cheok, & Spence, 2016). In particular, a number of studies have demonstrated that people typically associate rounder shapes, and hence one might imagine rounder typeface, with those products having a sweeter taste, while associating shapes that are more angular with bitter, salty, sour tastes instead. Asymmetry also appears to be a salient shape attribute. Turoman, Velasco, Chen, Huang, and Spence (2018), for instance, conducted a study showing that people typically associate asymmetrical (as compared to symmetrical) shapes with sourness, that is, with products having a sour or

acidic taste. Importantly, beyond merely associating tastes with typeface, our latest research has also shown that the taste expectations that are set by 'tasty' typeface can, under certain conditions at least, influence the rated taste of a food—in our case, the rated sweetness/sourness of a lemon/lime-flavoured jelly bean (see Velasco, Hyndman, et al., 2018).

Support for the notion that rounder typeface is associated with sweetness comes from a study involving typeface in packaging reported by Velasco, Salgado-Montejo, Marmolejo-Ramos, and Spence (2014). When a range of angular and rounded typefaces were created (see Fig. 4.3), and participants associated them with a specific taste, it was the rounder typefaces that primed a sweeter-tasting product (see also Velasco et al., 2015).[9] Hence, one natural follow-up question concerns whether similar shape-taste associations in typeface would also be documented in other languages, or in places, such as China, where a very different script is used (cf. Pan & Schmitt, 1996). However, the results of our latest research suggest that indeed they are (see Velasco et al., 2018b). In the latter study, rounded or angular Western scripts were shown to English-speaking participants in the UK and to Spanish speakers in Colombia. Intriguingly, no matter where the consumers came from, and no matter the language tested, rounded typefaces were associated with sweetness, and sweet-tasting products, as expected.

Do such results imply, then, that the typeface shape-taste correspondence is universal? Here it is worth noting that the majority of the contemporary research that has been designed to assess the connotative meaning of typeface has tended to focus on testing WEIRDos (i.e., Western, Educated, Industrialized, Rich, and Democratic, students, primarily North American undergraduates studying psychology; Henrich, Heine, & Norenzayan, 2010). Indeed, in one study conducted in a remote population—the Himba tribe of Kaokoland in Northern Namibia (a group without any written language or supermarkets—though, it should be said, reasonably often the subject of psychologists' research), the bitterness in a dark chocolate was associated more strongly with a rounder shape while the sweeter taste of milk chocolate was associated

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[9] Notice here how essentially the same results were observed no matter whether the text was presented in isolation or when it was presented on the front of a drinking vessel.

with a more angular shape instead (see Bremner et al., 2013). That is, the angularity-taste mapping was *reversed* from that repeatedly seen in Western participants when it comes to sweetness detection (see also Liang et al., 2016).[10]

In summary, since the early days of typeface research, it has been suggested that typefaces convey meaning over and above the semantic meaning of the words they 'dress'. That is, their connotative value/meaning is often just as important as what the text actually denotes. Moreover, the evidence suggests that, whilst typefaces do not act independently of the other design elements, or of the context (e.g., product type or category) in which they appear, they can nevertheless influence consumer perceptions and decisions.

Conclusions

While typeface design does not really get a mention in Hine's (1995) book *The Total Package*, nor in many other more academic volumes on packaging (e.g., Stern, 1981), it is undoubtedly an important component of multisensory packaging design. The main reason for this is that text is a ubiquitous feature of product packaging and where there is text there is typeface. And while it is certainly true that the kind of typeface that a brand uses might provide nothing more than another cue in a packaging design (e.g., sometimes typefaces have characteristic colours, which can influence feelings; e.g., Lee & Pai, 2012) that already contains multiple distinct attributes, it can nevertheless still be used strategically (Yiannas, 2015). Indeed, the characteristics of the typeface are undoubtedly relevant not only when it comes to communicating/understanding written information (Juni & Gross, 2008; Song & Schwarz, 2010), but also as far as setting (or modifying) specific product and brand *expectations* and associations are concerned (Childers & Jass, 2002; Grohmann et al., 2013). And, perhaps more surprising still, in some cases, the choice of

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[10] That said, in future research, it will be important to replicate and extend this result in the same/ other remote groups in order to assess the robustness and extent of this apparent cross-cultural difference.

typeface has even been shown to influence the consumer's product *experience* too (see Velasco, Hyndman, et al., 2018).

At a more philosophical/fundamental level, one might want to know whether the human response to specific attributes of typeface/font is innate, or learnt through experience (see Colarelli & Dettmann, 2003; Henderson et al., 2004). While there is unlikely to be a simple answer to this question, it is worth noting that if one starts from the early literature on the affective/feeling value of lines (Lundholm, 1921; Poffenberger & Barrows, 1924) it is perhaps more natural to side with the idea that, at least some responses (e.g., affect) may be common across people (though see Bremner et al., 2013). Note here that the common responses are not necessarily to typefaces themselves but to characteristics of lines and shapes more generally. However, given the just-mentioned case of iconic typeface and the ubiquity of copycat marketing strategies, it is easy to see how there are likely to be regularities out there in the marketplace that people might be able to pick up on through experience (Van Horen & Pieters, 2012a, 2012b).

Another topic that will be of interest for future research concerns the interaction between typeface and other aspects of label design. Think, for example, of everything from the logo (e.g., Salgado-Montejo, Velasco, Olier, Alvarado, & Spence, 2014) through to any frame that may surround the brand logo (Fajardo, Zhang, & Tsiros, 2016). Could one convey taste, or complexity, through shading the (e.g., filled) typeface colour? Given that colours also convey affective feeling/emotion (see Palmer, Schloss, & Sammartino, 2013), one could potentially combine colour with typeface to influence legibility (Ko, 2017) and furthermore deliver a congruent connotative meaning (see Schiller, 1935, for early research on the combined impact of colour and typeface in advertising; see also Jain & Pasricha, 2017; Karnal et al., 2016). As a final note, we would like to highlight the fact that there are multiple typefaces available now and many more being created all the time (Garfield, 2011). Given the apparent increasing interest in the role of typefaces in packaging, and more broadly marketing, it seems as in the years ahead there will be a growing acknowledgement of their importance when it comes to communicating and priming specific impressions.

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5

Sonic Packaging: How Packaging Sounds Influence Multisensory Product Evaluation

Qian Janice Wang and Charles Spence

Introduction

The majority of the literature on product-related sensory expectations has focused solely on those that are set by eye, that is, by what the consumer sees. Although we rarely think about it, the sounds that we hear before or during product usage can also influence our expectations about the functional and sensorial attributes of a product, as well as our hedonic evaluations.[1] In this chapter, we consider just what information is potentially conveyed to the consumer by the sounds that packaging makes when a product is picked up, examined, consumed, and/or used. First, we review the research highlighting the importance of sound at different stages of consumer-packaging interaction. Next, we give

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[1] Note that the focus of this chapter is on food and beverage (F&B) and home and personal care (HPC) products.

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some real-world packaging examples and review the research available concerning the influence of packaging sounds at the point of purchase and at the point of consumption/usage. We look at sensory marketing examples, where a signature sound has been incorporated into the design of product packaging and where the modification of packaging sounds has helped to emphasise certain specific product or brand attributes. Given that consumer perception is inherently multisensory (Spence, 2011), we review the evidence showing how altering the sound made by the packaging can emphasise other sensory aspects, especially the tactile/haptic. Finally, we examine some of the most intriguing future trends in the design of packaging sounds.

In this chapter, we focus primarily on the auditory aspects of packaging, a fast-growing area of research and application in recent years (e.g., Spence, 2016; Spence & Piqueras-Fiszman, 2012). While the visual aspects of packaging have dominated the research so far, the sound made by packaging when a product is picked up from the shelf, or when it is opened or used, also constitutes potentially important, if often overlooked, elements of the consumer's overall multisensory product experience (see Byron, 2012; Spence, 2016; Spence & Piqueras-Fiszman, 2012; Spence & Wang, 2015). To clarify, the focus of this chapter is only on the sound made by the packaging or via interactions between the product and the packaging (e.g., just imagine the glugging sounds when wine is poured from the bottle).

On the Relative Importance of Sound at Different Stages of User-Package Interaction

Packaging design is inherently multisensory, but which is the most important sense when it comes to product perception? Here, it is crucial to consider the relative importance of different sensory modalities in the various stages of product experience. While vision typically dominates in the purchasing scenario (i.e., at the point of purchase; POP), it has been suggested that the other senses become somewhat more important at the later stages of product usage (Fenko, Schifferstein, & Hekkert, 2010; Schifferstein, Fenko, Desmet, Labbe, & Martin, 2013). For instance,

based on a survey of 243 Dutch participants reported by Fenko et al., the importance of audition increases from the point of purchase to one week, then one month after purchase. Of course, not all packaging sounds remain as relevant beyond the first (and perhaps only) usage (e.g., think here only of the opening a beer can or a pack of crisps), but some packaging sounds are heard repeatedly during product usage (e.g., opening and closing of pills bottle or a tube of mascara, see section "Packaging Sounds in Frequent-Usage Scenarios"). Schifferstein et al. (2013) demonstrated that even for food products that are typically consumed immediately after opening, there is nevertheless still a difference in just which sense is considered the most important over time. For instance, between the stages of purchase and consumption, the importance of visual cues fades notably after purchase.

As we demonstrate later, sounds can sometimes play an important, if often underappreciated, role in helping the consumer to make their purchase decision, as well as to influence their product perception at the later stages of opening/consumption.

Effect of Packaging Sounds at the Point of Purchase

Packaging Sound as a Diagnostic Tool

It is important to note that packaging sounds can aid consumers in their purchase decisions. There are a number of examples of how the sounds made by product packaging are used as a diagnostic cue by the wily shopper. After all, who knows when people first started tapping watermelons—whose rind can be considered a natural form of packaging (see Sacharow, 1982, on this theme)—in order to tell whether they are ripe or not (the hollower the sound the better, apparently; see Stuckey, 2012). More than half a century ago, now, Amerine, Pangborn, and Roessler (1965, p. 228) reported how shoppers would sometimes shake canned fruit in the store—presumably in order to estimate the fruit to syrup ratio. Similarly, consumers have been known to shake the box of breakfast cereals in order to assess its fullness too.

These days, a wide assortment of packaging choices means that there will often be salient differences in the same product when sold with different packaging. For instance, compare the sloshing sound made by shaking a full gable top Tetra Pak with the sound made by the same liquid in an unopened Brik packaging format instead. This difference in user-packaging interaction sound can influence the consumer's decision as to whether to switch to a new kind of bleach[2]—a product whose perceived efficacy is, in part, determined by the thickness of the liquid (or at least that is what the consumer has internalised having watched too many ads). So how good are consumers at guessing the product features by just listening to sounds made by packaging or by user-packaging interactions? It turns out, for example, that sighted individuals, when blindfolded, are quite good at filling a receptacle up to the brim just by listening to the sound which the liquid makes in the receptacle (Cabe & Pittenger, 2000). Listeners can, one presumes, pick up information concerning the fundamental resonant frequency that increases as a vessel fills. Given such results, it would not be so surprising to find that consumers were able to tell the fullness of a container of liquid simply by shaking it. It has even been suggested that the thickness (or viscosity) differences between similar liquids may also be audible. At the extreme, of course, this must be true—think only of the sound of pouring water versus honey (see also Gaver, 1993, pp. 15–17). However, at the Crossmodal Research Laboratory here in Oxford, we have been able to show that, even for more similar liquids (such as a light-bodied white wine versus a full-bodied red wine), people can discern differences in pouring sounds based, putatively, on differences in viscosity (see Spence & Wang, 2015, for a review). In particular, the sounds of a low-alcohol wine (Tesco Vinho Verde 2013, 9% alcohol) and a high-alcohol wine (Ridgy-Didge Shiraz 2012, 14.5% alcohol) being poured into both white and red wine glasses were recorded. In an online test (N = 43), where the participants had to answer four questions (testing the sounds of pouring into both red and white wine glasses, with both orders of sound presentation), performance

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[2] In fact, wily marketers have seized upon the shoppers' not-so-surreptitious reliance on sound to guide their purchasing choice for some products. Once we heard about invisible baffles being introduced inside a bleach container to change the sounds that are heard when the product was shaken in store (making the product sound more viscous).

was significantly better than chance, thus, indicating a sensitivity to such viscosity differences (at least under forced-choice conditions).[3]

Packaging sounds might also be used to diagnose product freshness. For instance, Brown (1958) conducted a study where the participants were asked to determine the freshness of bread loaves by just feeling them. Eighteen loaves of bread were wrapped in three types of wrappers: cellophane, cellophane with a wax paper insert band, and wax paper. The cellophane-wrapped bread was judged to be fresher than the wax-paper-wrapped loaves, and this result was observed both for university students and for housewives (who might have been expected to have more experience in selecting and judging bread freshness). One can wonder whether this result might not have had as much to do with the distinctive sound that the different materials made as with their feeling. Most pertinently, the cellophane-wrapped bread, which was rated as the freshest, also happened to make a louder noise compared to the wax-paper-packaged loaves!

Packaging Sounds

Many products have packaging that make noise when picked up by the consumer (e.g., when rattled gently or when opened). For example, we can see the evidence of sonic packaging design in the latest trend of laundry pellets (e.g., Downy Fresh Protect Laundry Beads), where consumers are in fact encouraged to shake the containers. Perhaps hearing the rattling sound can help convince potential consumers that the sound is somehow correlated with a more effective product, or perhaps it just adds a playful auditory element to the shopping experience. In any case, it is worth noting here that consumers are four times more likely to make a purchase once they have picked up the product (Gallace & Spence, 2014), which makes noisy packaging that encourages "rattling" a sensible idea.

It is worth noting that caution should be applied when packaging sounds are involved. One now infamous debacle involving the sound of the packaging occurred a few years ago involving Sun Chips (e.g.,

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[3] The participants answered 15% more questions correctly (99/172) than expected by chance (86/172), $X^2(1,172) = 3.930$, $p = 0.047$.

Horovitz, 2010; Vranica, 2010a, 2010b). While it is certainly true that hearing loud, crunchy sounds can make potato crisps taste crispier (Vickers, 1991), whether it be the sound of mastication itself (Zampini & Spence, 2004) or even the rustling of a crisp bag (Spence, Shankar, & Blumenthal, 2011); experience has shown the dangers of going too far in this regard. Frito-Lay, the parent company of Sun Chips, introduced a new biodegradable form of packaging for their product in 2010 in the North American market. However, it was so noisy, coming in at over 100 decibels when shaken, that customers complained about not being able to hear a conversation over the sound of the bag (Beckerman & Gray, 2014). Sales dropped month after month, and the company was soon forced to withdraw it from the shelves—after the stopgap measure of sending out free earplugs didn't work.

Packaging Sounds During Product Usage/ Consumption

When it comes to communicating the security of a seal, the effectiveness of a spray bottle, or even encouraging a celebratory mood, packaging sounds can influence consumer expectations about how well the product is made and how well it works.

Sound of Opening

Although packaging undoubtedly makes some sound whenever we pick it up, the most noticeable sound of our interaction normally comes when the consumers open the packaging, be it a pressurised can of soda or a bag of crisps. One of the most famous examples of a distinctive package opening sound is that of "Snapple pop". According to Snapple (owned by Dr Pepper Snapple Group Inc.), the pop that the consumer hears on unscrewing the cap from an unopened bottle provides a cue to its freshness and security. "The company calls it the 'Snapple Pop'. They believe that it builds anticipation and offers a sense of security, because the consumer knows the drink hasn't been opened before or tampered with" (Byron, 2012). In fact,

"Snapple was so confident about the pop's safety message that in 2009 it eliminated the plastic wrapping that encircled the lid. It saved on packaging costs and eliminated an estimated 180 million linear feet of plastic waste, the company says. 'We were a lot more comfortable making that decision because we knew there was this iconic pop', says Andrew Springate, Senior Vice President (Marketing)" (Byron, 2012).

When it comes to canned carbonated beverages, the sound of popping open a pressurised can is the key to communicating a product's freshness and carbonation. We have come across a few individuals who are convinced that they can tell the difference between cans of Coke and Pepsi being opened, based on nothing more than their supposedly distinctive opening sounds. Without some research down in the laboratory, however, it is hard to know whether this is anything more than wishful thinking (or a crossmodal effect of colour on loudness; see later), given the fact that there are a number of physical factors that might interact with the package opening sound. The gauge of the metal used in the can, for instance, or the size of the opening, might both play a role (see Spence & Zampini, 2006, for a review). Here, one might wonder whether a steel Sapporo can, for example, sounds different from other aluminium beer cans (Spence & Piqueras-Fiszman, 2012). In addition, a louder can-opening sound might imply that the can is more pressurised or that it is warmer.[4]

Komatsuzaki, Han, and Uchida (2016) have researched how to design a pressurised can with a pleasant opening sound. The authors relate the physical aspects of the can—such as the thickness of the panel, the residual thickness of the scores, the contact between the tab and the panel—with the physical attributes of the opening sound. These researchers have also correlated these sounds with people's feelings and attitudes. For instance, based on their innovative research, the authors suggested that cans with a longer tearing sound might leave an "easy to open, comfortable impression" on consumers.

Elsewhere, British designer Patrick Jordan (2000, p. 108) highlighted the beer company that tried to evoke the sound of quality by varying the

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[4] Recalling the Ideal Gas Law ($PV = nRT$), pressure is proportional to temperature in the closed system of a soda can. This means that the same product at a higher temperature will have higher pressure, with the volume of the container and amount of liquid being constant.

hiss that was heard when their cans were opened. However, beyond these relatively isolated exceptions, it is surprising how most canned and bottled drinks do sound pretty much indistinguishable from one another on opening. This is especially remarkable considering how much marketing budget companies spend on optimising their visual design, without really capitalising on the opportunities now being afforded by sonic branding. Of course, studies like those reported by Komatsuzaki et al. (2016) demonstrate that detailed, user-oriented sonic design (psychoacoustics) is on the horizon. Another product category where package opening sound can be well integrated with the perception of the product is in the case of baby food; baby food manufacturers should think about integrating sounds like "Snapple pop" that will reassure the caregivers about the freshness and genuineness of the product.

Wine Closures

The wine industry is also interested in the sounds of opening and closure. In 2014, Australian firm Zork created a polyethylene reseal-able wine closure that pops when opened, therefore, combining the functional advantage of eliminating the risk of cork taint with the celebratory feel of opening a bottle of wine (Bouckley, 2014). As it turns out, the designers at Zork got it right in aiming to replicate the popping sound of a cork. Why so? Well, we recently investigated just exactly how the difference in wine bottle closures can influence people's celebratory mood and their wine drinking experience (Spence & Wang, 2017). We focused on the sound of opening a bottle sealed with cork versus one sealed with a screw cap.

A total of 140 UK participants rated samples of two Argentine Malbec wines under two conditions; first, they listened to the sound of a cork being pulled or the sound of a screw cap being twisted open before tasting a wine. Next, they opened a cork-stoppered and a screw cap bottle themselves before pouring and tasting each wine. The wines were rated on scales of intensity, quality, celebratory appropriateness, and the celebratory mood felt by the participants after tasting the wine. The wines from the cork-sealed bottles were perceived to be higher in quality, more appropriate for a celebration, and left the taster in a more celebratory mood (see Fig. 5.1). Moreover, this result was the same regardless of

whether the participants only heard the sounds of opening or whether they, in fact, opened the bottle themselves (thus experiencing auditory plus haptic cues). The latter result implies that it is the knowledge about closure type, rather than how the knowledge was acquired, that led to the different ratings that were observed. The suggestion therefore is that distinctive packaging sounds can set sensory as well as hedonic expectations in the mind of the consumer (Piqueras-Fiszman & Spence, 2015).

The Importance of Loudness

Recalling the Sun Chip debacle described in section "Packaging Sounds", it is perhaps no coincidence that the noisy packaging was paired with a food that is in itself fairly noisy. In fact, from the very beginning when potato chips were first packaged for portion-controlled enjoyment by the consumer, the marketers immediately realised that it would be a
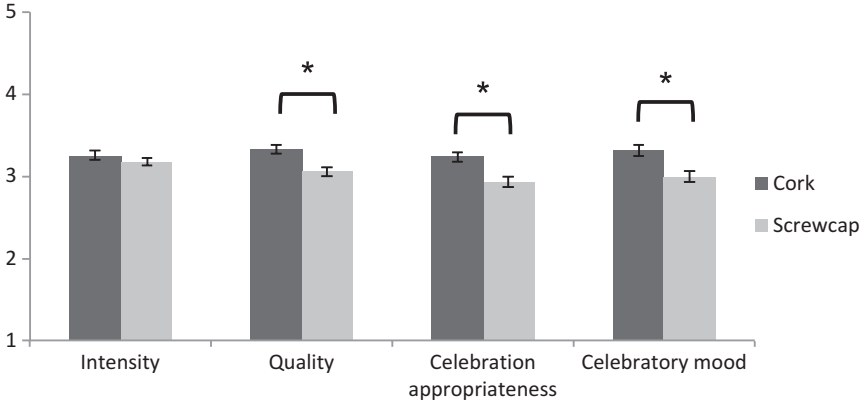
Fig. 5.1 Mean values of wine intensity, wine quality, celebration appropriateness, and celebratory mood for wines with cork versus screw cap enclosures (Spence & Wang, 2017). Error bars indicate standard error of means, and asterisks (*) indicate significant differences at $p = 0.05$. The y-axis reflects mean ratings on 5-point scales (1 = least intense/lowest quality/least celebration appropriate/lowest celebratory mood, 5 = most intense/highest quality/most celebration appropriate/highest celebratory mood). [Figure reprinted from Spence & Wang, 2017]

good idea to put such a noisy product in packaging that was itself noisy (cf. Smith, 2011). A few years ago, a study conducted at the Crossmodal Research Laboratory in Oxford had participants bite into 40 Original Pringles potato crisps while listening to either white noise or the sound of opening/manipulation of one of three different crisp packages—Kettle, Walkers, or Pringles (Spence et al., 2011). The authors demonstrated that the participants' perception of the crisps was influenced by the particular soundtrack that they happened to hear—the crisps were rated as about 10% crunchier if they heard the rattling bag of Kettle's or Walker's crisps compared to the popping sound of a tube of Pringles!

This illustrates the importance of sound level in sonic packaging: Get it right, and it can "functionally" enhance the consumer's perception in a positive way; but get the level wrong (like in the case of Sun Chips), and you potentially have a PR disaster on your hands!

Sometimes, however, the issue isn't loudness but a matter of discretion and privacy. For instance, Tampax Radiant was launched by Proctor & Gamble Co. to have a plastic wrapper that wouldn't make loud crinkling sounds when opened (Byron, 2012). The reason for this design change was to give women more privacy (e.g., in public bathrooms). Cultural differences (see Machiels and Orth's chapter "Multisensory Packaging Design across Cultures", in this book) can also dictate what sound levels are appropriate. However, it is important to keep in mind that making packaging sounds too quiet might make the product seem ineffective, such as the case for can-opening sounds (Komatsuzaki et al., 2016) or for aerosol sprays (Spence & Zampini, 2007). After all, as Richard Lyon of RH Lyon Corp attests, "people equate noise with power" (Wolkomir, 1996).

Packaging Sounds in Frequent-Usage Scenarios

For some products, packaging is used multiple times beyond the initial opening—think, for instance, of the case of opening/closing the pill bottle or the tube of mascara.[5] Ted Owen, Vice President of Global Package

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[5] Frequent use packaging usually involves what Krishna, Cian, and Aydinoglu (2017) term "intermediate packaging". In their lexicon, "outer packaging" involves the outermost layer of packaging, such as the paper box, a pill bottle, or mascara tube might be sold in, whereas "intermediate pack-

Design at Clinique, certainly believes that the soft, crisp click of the company's High Impact Extreme Volume Mascara not only reassures users that the package is securely closed but, more importantly, "conveys the elegance" of the mascara formula (Byron, 2012). Originally, the steep curve in the nib of the mascara tube emitted a high-pitched click, which had sounded cheap to the designers. Some 40 prototypes were designed in order to arrive at the perfect closure sound.

Were the designers at Clinique just being idiosyncratic, or can distinct product sounds really convey a sense of "elegance" (Özcan & van Egmond, 2012)? Lageat, Czellar, and Laurent (2003) tackled the intriguing—and no doubt lucrative—question of what sonic characteristics might be associated with luxury. Their investigation focused on the clicking sound of high-end cigarette lighters. Interestingly, the 200 consumers who took part in this study could be segmented into two distinct groups—one group that valued understated sounds that are matte, even, and low-pitched and another group that preferred a more conspicuous clicking sound that was clear and resonant. So, much like beauty, it would appear that luxury is indeed in the ear of the beholder (see Velasco & Spence, this volume).

In terms of enhancing perceived product efficiency, Spence and Zampini (2007) investigated whether people's perception of an aerosol spray could also be modified by changing the spraying sounds associated with its operation. Participants in one experiment had to rate the pleasantness and forcefulness of a number of aerosol sprays that were held by an experimenter outside of the testing booth. The participants could see the aerosol being sprayed into the air over a microphone through a window in the side of the booth, while the sound made by spraying the aerosols picked up by the microphone was manipulated and played back to the participants via headphones. The aerosol sprays were rated as being more pleasant when either the overall sound level was reduced or when just the high-frequency sounds in the 2–20 kHz range were attenuated. By contrast, ratings of the perceived forcefulness of the aerosol sprays

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aging" would refer to the pill bottle and "inner packaging" to the design of the pill itself. Therefore, package interaction at the point of purchase involves the outer packaging, whereas package interaction at the point of consumption involves the intermediate and inner packaging.

were reduced when either the overall sound level or just the high-frequency sounds were attenuated (see Fig. 5.2).

Finally, the careful manufacturer would do well to stress test their products to ensure that the packaging sounds good even after repeated use. Any squeaking or clattering of the spray bottle nozzle, for instance,
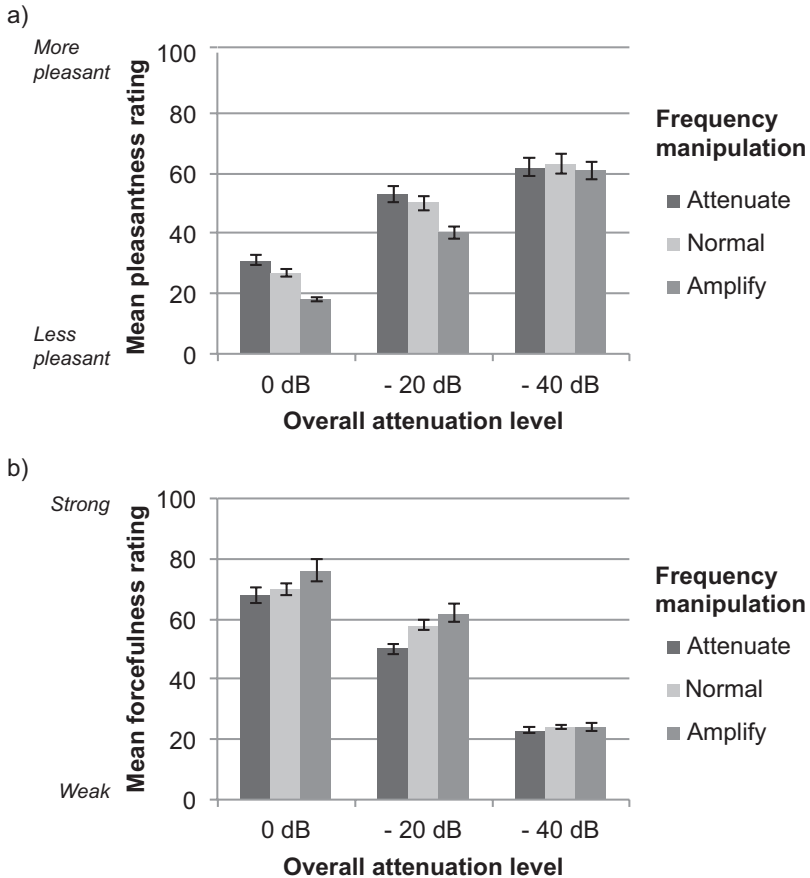
Fig. 5.2 Mean responses for (a) the pleasantness (unpleasant-pleasant) and (b) the forcefulness (weak-strong) response scales for the three frequency manipulations (high frequencies attenuated, veridical auditory feedback, and high frequencies amplified) against the three overall attenuation levels (0 dB, −20 dB, and −40 dB), using data from Spence and Zampini (2007), Experiment 1. Error bars indicate standard error of means

can indicate a mechanism that hasn't been put together well (Byron, 2012). For instance, the company Method Products ensures their spray bottles can withstand 10,000 sprays without making such disconcerting noises.

The Sound of Product-Packaging Interaction

Besides the sound of the packaging as it is being handled or opened, there is also a subtle area of product-packaging interaction sounds. Take a bottle of wine, for instance. Not only do we hear the sound of the popping of the cork, we also hear the periodic sound as air makes its way into the bottle to equalise the air pressure as we pour out a glass. Smith (2007, p. 53) has made the intriguing suggestion that expensive wines generate a distinctive gentle glugging sound when poured from the bottle (see also Antin, 2014). Certainly, one could imagine how the temporal dynamics of the sound of wine being poured from a broad-shouldered Bordeaux bottle, say, would differ from the sound of a similar wine poured from a sloping-shouldered Burgundy bottle, or even a taller, narrower, Riesling bottle instead. To the best of our knowledge, though, there has been no empirical study on this topic to date. And while many people might think they can't infer much from such subtle sonic properties, research has shown that people can discern a surprising amount of non-auditory information from sound alone, such as viscosity, carbonation, and temperature (Velasco, Jones, King, & Spence, 2013a, 2013b; Spence & Wang, 2015).

The same considerations for a wine bottle may also apply to bottled beer as well. According to Friedrich Blutner, an eminent psychoacoustician (cited in Stummerer & Hablesreiter, 2010, p. 105), "The sounds that beer makes can be influenced by the composition of the drink on the one hand and by the shape of the bottle on the other hand. Clever breweries design the bottleneck—consciously or intuitively—so that a striking gurgling sound between 5 and 6 hertz is produced when the beer is poured…The rhythm of 5 to 6 hertz makes us happy and a beer which gurgles from the bottle in this rhythm simply sounds happy". The elongated narrow neck of the Beck's beer bottle was apparently chosen for just this reason.

Sound in Combination with Other Sensory Elements

An exciting future research direction, and an open opportunity for packaging designers, is the combination of sounds with other sensory elements. Because the brain is a fundamentally multisensory organ, changing any specific sensory attribute of a product (for instance, the sound that it makes) is likely to impact on the customer's overall product experience. Indeed, a growing body of empirical research now attests to the fact that manipulating the sounds that people hear when they touch and interact with many everyday products and/or surfaces can have a pronounced effect on the way in which they not only perceive, but also react, to them.

The parchment skin illusion provides a particularly dramatic example of auditory modulation of tactile perception (Jousmäki & Hari, 1998). Participants were asked to rub their palms together, and the sound was recorded and played back to them via headphones. When the high-frequency (greater than 2 kHz) components of the hand-rubbing sound were enhanced (or the sound level was increased in general), participants reported feeling enhanced smoothness and dryness of their skin, compared to when the sound was unfiltered or dampened. One limitation with this experiment, though, was that only 11 out of the 17 participants who were initially tested experienced the illusion and were allowed to complete the main study. Guest, Catmur, Lloyd, and Spence (2002) subsequently went on to demonstrate the robustness of the parchment skin illusion at the Royal Society Summer Science Exhibition, where the majority of the over 2000 attendants reported experiencing the illusion. A further experiment conducted at the Crossmodal Research Laboratory showed that amplifying the high-frequency auditory feedback sounds altered people's perception of the texture of abrasive sandpaper. This is relevant for packaging designers, as these studies provide convincing empirical evidence that auditory cues can modulate tactile perception of different surfaces.

In terms of real-world packaging applications, Labbe, Pineau, and Martin (2013) have demonstrated that the perception of food's naturalness goes well beyond the visual aspects of the packaging material. In fact,

packaging that reflects food naturalness is also influenced by the tactile and auditory properties of the packaging. These authors found that people expected natural food packaging to be rough (in terms of both its visual and tactile texture), supple, and quiet. These studies offer evidence that, going forward, it would be worthwhile for marketers to make sure that all the sensory cues provided by the product packaging are congruent with each other. Congruent sensory cues result in enhanced processing fluency (Schwarz, 2004)—in other words, how easily consumers can process new information presented by the product packaging/label—which has been demonstrated to enhance product preference (Labroo, Dhar, & Schwarz, 2008; Winkielman, Schwarz, Fazendeiro, & Reber, 2003). So, a noisy, crackly example of product packaging might go well with bright colours and an angular font (Menzel, Fastl, Graf, & Hellbrück, 2008; Spence, 2012; Velasco, Salgado-Montejo, Marmolejo-Ramos, & Spence, 2014), whereas a product with soft, muted sounds might go best with similarly congruent soft colours and rounded font.

Future Trends

Healthy/Ecological Products

As people strive towards a healthier lifestyle, the question becomes one of how marketers can use the packaging to make its products seem healthier or more beneficial, either for the body or for the environment (see Fenko, this volume). As mentioned earlier, the work by Labbe and his colleagues (2013) has revealed that the combination of visual, auditory, and tactile cues (rough, supple, and quiet) emphasised the naturalness of food products. The producers of healthy foods with lower calories/fat/sugar/salt content might therefore want to consider how to communicate these values via packaging sounds.

Take the example of low-calorie sparkling beverages, which sometimes come in the 250 ml sleek can format (https://www.packagingnews. co.uk/design/new-packs/new-sleek-can-for-schweppes-sparkling-juice-drink-08-03-2017). Physically, there is less resonance in the cavity of a sleek can than in the standard 330 ml can, which means, for one thing,

that the sound of opening a sleek can is quieter and higher pitched compared to the sound of opening a standard can. This is yet to be empirically tested, but it would not surprise us if people were to automatically associate higher pitch and quieter sounds with a lower-calorie or reduced sugar product. After all, higher pitch is associated with smaller size (Evans & Treisman, 2010; Gallace & Spence, 2006), and the principle of magnitude matching predicts that low auditory volume would correspond to lower taste/flavour intensity (Bartoshuk, Duffy, Fast, & Snyder, 2004). Similarly, cartons of lower fat cream would make a higher-pitched sloshing sound compared to those of full-fat cream, as the full-fat cream would be more viscous and therefore make a lower-pitched sound (and similarly for less and more sugary drinks). After all, as we saw earlier, people can tell the viscosity of liquid just by hearing its pouring sound (see section "Packaging Sound as a Diagnostic Tool")! Makers of low-fat/low-sugar products might therefore want to consider designing the packaging in such a way as to produce higher-pitched, quieter sounds to match the healthier design of the product.

One can even consider a way of making recyclable packaging remind its users to recycle. Note that when Sun Chips debuted its biodegradable packaging, it perhaps drew *too much* attention to the packaging by its deafening sound (Beckerman & Gray, 2014; Vranica, 2010a, 2010b). One potential idea is to make use of the natural packaging research; if the packaging feels "natural" (Labbe et al., 2013), it might remind the user of the importance of the ecosystem and perhaps encourage them to recycle.

Augmented Sounds Linked to Product Packaging

With the advent of smartphones and quick response (QR) codes, sonic packaging is no longer restricted to just sounds made by the packaging (remember the tinny sounds of birthday greeting cards that played a song when you opened the card?). More and more, we are seeing manufacturers include sounds—not to mention visual entertainment—in technologically enhanced product packaging and associated sensory applications (see Petit et al., this volume, for more discussion of this topic). Häagen-Dazs

recently featured a "Concerto Timer" augmented reality app (http://www.altoriot.com/the-app-that-turns-your-haagen-dazs-container-into-a-classical-concert-out-of-star-wars/). When users looked at a pint of ice cream through the app, a holographic violinist or cellist would appear above the container and play a two-minute piece of music (http://www.adweek.com/digital/haagan-dazs-offers-augmented-reality-concerto-timer-app-for-ice-cream-lovers/). The idea being that the two minutes spent listening to the music would be sufficient to let the ice cream soften to the perfect point before being consumed.

Similarly, Krug Champagne has eagerly embraced musical associations in its marketing campaigns, incorporating soundtracks into their Krug App.[6] By scanning the unique ID on the back of each bottle of Krug, the owner of the bottle can read about the hundreds of wines that went into the careful blend of the Champagne (unless, of course, one was extra lucky enough to possess one of the few vintage single-vineyard bottles), as well as listen to the "Music Pairing". These are pieces of music that were (idiosyncratically) chosen by specific musicians as going particularly well with the Champagne.

Conclusions

As this chapter has by now hopefully made clear, there are a number of open questions regarding future research on the power of sonic packaging. While it is clear that sound can communicate both physical and emotional information, what remains to be established is the extent to which distinctive sounds influence people's judgements of a product—especially when a difference in sound level (see section "The Importance of Loudness") can mean the difference between success and disaster! What is clear from all the instances of signature product-packaging sounds is that brands are increasingly focused on using sound as a way of distinguishing themselves from the competition and to communicate functional expectations about the products themselves (Underwood & Klein, 2002; Underwood & Ozanne, 1998; Vartan & Rosenfeld, 1987).

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[6] https://itunes.apple.com/gb/app/krug/id836677059.

In the future, it is easy to imagine how a growing number of brands will start to consider delivering a more distinctive packaging sound in order to convey specific ideas/brand attributes. A growing body of research indicates just how important packaging sound is, in shaping the consumer expectation about the functional, sensory, and hedonic attributes of the product contained within. Furthermore, as proved by the research reviewed in this chapter, packaging sounds can be studied systematically, by methodically manipulating the auditory feedback heard by the user (Spence, 2014; Spence & Zampini, 2007; Zampini & Spence, 2004). In such a virtual prototyping environment, precise auditory drivers of consumer perception and behaviour can be fine-tuned without the hassle and expense of producing different prototypes and running consumer panels. This would then reduce the cost and time required in coming up with effective packaging sound designs.

Furthermore, there is the intriguing question of individual differences in sound perception, an area of interest to product designers looking to increasingly customise products for different market segments (just see, for instance, Dorito's controversial planned release of smaller, quieter packages of crisps for women, Odling, 2018). It should also be kept in mind that different population groups may use a different mix of extrinsic (brand/packaging information) or intrinsic (liking and familiarity for the product) cues to aid their purchase decisions (Mueller & Szolnoki, 2010), so it would be worthwhile to research the relative impact of packaging for the target market before launching a new product. Another aspect of individual differences to consider here are cultural differences; for instance, given that different cultures have different levels of noise tolerance/appreciation (Wolkomir, 1996), might this pattern extend to the sounds of product packaging as well?

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6

Tactile/Haptic Aspects of Multisensory Packaging Design

Charles Spence

Introduction

The growing interest in the tactile/haptic aspects of packaging comes, in large part, from the burgeoning interest in sensory marketing more generally (e.g., see Cooper, 2013; Hilton, 2015; Johnson, 2007; Krishna, 2012; Spinney, 2013; Vickers & Spence, 2007). Brand managers and packaging designers are increasingly trying to develop more distinctive sensory 'touch points' with their consumers. And while practitioners and researchers have long thought carefully about the visual aspects of design, it is only recently that much consideration has really been given to the question of what one's packaging should feel like in the consumer's hands

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(Howes, 2005; cf. Stevens, 2008).[1] In this chapter, I review the latest research in this area (see Spence, 2016; Spence & Gallace, 2011; Spence & Piqueras-Fiszman, 2012, for earlier reviews). I summarize the findings concerning how the tactile/haptic[2] attributes of the packaging can set expectations that, in turn, may influence product perception and consumer behaviour (see Anon, 1999; Krishna, Cian, & Aydinoğlu, 2017; Underwood, 1993). I also highlight how the various multisensory attributes of the packaging interact amongst themselves.

As far as product packaging is concerned, there are a number of tactile/haptic attributes to be considered, including the weight, surface texture/feel, hardness (e.g., firmness/compressibility), and temperature (see Gallace & Spence, 2014, for a review). Where a specific example of product packaging falls along any one of these dimensions can play an important role in terms of determining how the consumer experiences/thinks about the product contained within. Sometimes, though, it is as much the *difference* between the expected and the actual tactile/haptic attribute that is key to setting the consumer's expectations (e.g., heavier than expected is normally good, lighter than expected, rarely so). Generally speaking, the tactile/haptic attributes of the packaging should correspond crossmodally (at a sensory and/or semantic level) to the specific brand/product attributes that the brand/designer would like to optimize/draw attention to. That said, there is something of a tension here between packaging that correctly signals the likely attributes of the contents (and so corresponds in some sense) and product packaging that sets expectations that are higher/better than the product delivers, in the hope of positively anchoring the consumer's product experience (see the following section for more on the notion of anchoring). The latter approach might

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[1] Matthew Unger, purchasing group manager at Procter & Gamble (P&G), suggests that a good design, in terms of material, craftsmanship, and visual quality, is important in a successful package. Critically, however, he goes on to say that the way a package feels to the consumer, how 'it speaks' through touch as well as vision, is the 'moment of truth, the moment of choice' (http://www.brandpackaging.com/Archives_Davinci?article=622). Along similar lines, Nipun Marwah, marketing manager for MeadWestvaco's Packaging Resources Group, suggests that 'when you create a tactile feel, the consumer is more likely to pick it [the product] up. And once it is in the consumer's hand, the sale is that much closer' (see also Underhill, 1999).

[2] Active touch is often referred to as haptics in this area of research (Childers & Peck, 2010; Peck & Childers, 2008).

be the one to adopt if one wanted to reduce the sugar/salt/fat in a food product, say, without the consumer noticing the change in formulation.

Inspired by classic examples, such as the Coca-Cola contour bottle (Prince, 1994), a growing number of brands/packaging designers have, in recent years, been working to develop a distinctive signature feel that can help differentiate their brand from the competition (see Gallace & Spence, 2014; Lindstrom, 2005; Raine, 2007; Spence & Gallace, 2011). At the same time, however, there is also growing interest in developing functional tactile/haptic packaging that can deliver a benefit in terms of enhancing the consumer's multisensory product experience. Using cross-modal incongruency strategically to capture the attention of the consumer is another relevant strategy here (to which I return later). There are, of course, also important questions here about the graspability and/or ease of use/manipulation of the packaging and how this can be optimized.

Sensation Transference

A key notion to bear in mind when thinking about the tactile attributes of product packaging is what Louis Cheskin called 'sensation transference' (a term the eminent marketer coined back in the 1930s; see Cheskin, 1957, 1981).[3] The basic idea here is that people, and that includes the consumer, typically cannot separate what they think about the product from what they feel about the packaging. Or, as Stern (1981, p. 3) put it: 'Consumers generally do not distinguish clearly between a product and its package, and many products are packages (and many packages are products)'. Crucially, a large body of research now shows that what the consumer thinks (or feels), consciously or otherwise, about the packaging is often transferred to their rating (and presumably to their experience) of the product itself.[4] Hence, if the tactile (or for that matter any other) attributes of the packaging prime notions of premiumness, or quality, say, in

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[3] Note that Spence and Gallace (2011) talk of 'affective ventriloquism', when referring specifically to the more hedonic form of sensation transference.

[4] Hollywood-based designer Saul Bass put it even more succinctly when he stated that 'Packaging is the product' (Day, 1985).

the mind of the consumer then the latter will likely also rate the product itself as being more premium and/or of higher quality too.[5]

Such sensation transfer effects may be enhanced given the temporal precedence of exposure to the packaging over the product itself, meaning here simply that the consumer is nearly always exposed to the packaging before they get to experience/use the product (see Spence & Piqueras-Fiszman, 2012, for a review). As such, the packaging is likely to set product expectations that then anchor the experience on subsequently evaluating the product itself. Crucially, people rarely seem to update their initial estimates sufficiently in light of subsequent information (this is known as the 'anchoring effect'; e.g., see Stewart, 2009). What is more, the influence of the tactile/haptic effects of the packaging also occurs when the product itself is removed prior to evaluation (e.g., Barnett, Velasco, & Spence, 2016). That said, whether such effects are greater when the product is used/consumed directly from the packaging (than when separated from it) is a question that has not been adequately researched to date (though, see Ferreira, Submitted, for preliminary evidence on this score).

However, beyond any such 'sensation transference'/'affective ventriloquism' effects, it is also worth noting that, in certain cases, product packaging may serve the function of signalling (i.e., semiotically) something of the meaning of a product (e.g., that the contents should be considered as a gift, say). Think here only of the dinner party wine conundrum, where gifting a bottle of wine in a presentation box can easily take on this role, or the 'excessive' wrapping of Easter Eggs (Barthel, 1989; Crowe, 2018; Krippendorff & Butter, 1981; Rigby, 2010/2011; Usborne, 2012).[6] There is also an emerging literature indicating how the shape (or shape properties—e.g., more rounded vs. more angular) of the packaging can

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[5] Both 'sensation transference' and 'affective ventriloquism' are typically framed in terms of assimilation. That said, it is important to note that contrast effects between the product and packaging (or between different components of the product packaging) have also been documented (e.g., Zampini, Mawhinney, & Spence, 2006).

[6] The Dundee chocolate orange box of the last century served much the same purpose (see Sacharow, 1982, p. 52). In this case, individual chocolate segments were wrapped in foil, grouped in spheres of 20, foil-wrapped again, and then sold in a heavy box with an abaca rope containing several oranges. The box was overwrapped with transparent polypropylene. Relevant here, Krishna et al. (2017) distinguish between outer, intermediate, and inner packaging.

itself also be used to set (almost subliminally) expectations in the mind of the consumer (e.g., Becker, Van Rompay, Schifferstein, & Galetzka, 2011; Cheskin, 1957, 1981; Overbeeke & Peters, 1991; Spence, 2012; Van Rompay, Kramer, & Saakes, 2018; Velasco, Woods, Petit, Cheok, & Spence, 2016).

Tactile Experience of Packaging: 'The Moments of Truth' Framework

At the outset, it is important to distinguish between the various different moments of truth in the consumer's interaction with a food and beverage (F&B) or home and personal care (HPC) product. Touch/haptics may play a more or less significant role at each stage: From initial interaction with the product on the shelf, through modifying product usage/experience, and the eventual disposal/recycling of the packaging. While touch/haptics is most important during product usage, even at 'the first moment of truth', the tactile attributes of packaging design may play a subtle, but potentially important role (see Louw & Kimber, 2011). Specifically, they may encourage the consumer to pick a product up off the shelf in order to evaluate it further (Peck, 2010; Solomon, 2002; Stephens, 2008). Here, in terms of relevant examples, one might think of everything from the Heineken can coated with thermochromic paint (giving it a nice tactile feel), through to the textured burlap packaging of Marfa brand soaps (Sundar & Noseworthy, 2016a). Similarly, those bottles and cans that have a raised crest or logo on the front facing may also encourage the consumer to feel them (see also Hartmann & Haupt, 2016, p. 185; Klatsky & Peck, 2012). This is likely to be a desirable strategy given the evidence suggesting that consumers are more likely to purchase a product once they have picked it up from off the shelf (Spence & Gallace, 2011; Underhill, 1999).[7] What is perhaps also worth noting here is that holding a product (or even imagining holding it) leads to an increase in perceived ownership as well as an

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[7] Of course, such unusual packaging features normally have a cost implication. Unfortunately, all too often, these 'expensive' design features end up being removed from the packaging in order to save money (by the bean-counting accountants). In my opinion, at least, this is often a mistake. Relevant sales data would, of course, help here.

increase in the amount that consumers are willing to pay (Peck & Shu, 2009). Consumers also tend to make more unplanned purchases of those products that they touch (Anon, 2010; Peck & Childers, 2006). In terms of the role of touch at the end of the product lifecycle, one company recently developed an innovative form of product packaging that becomes noticeably rougher to the touch when the product inside has gone off (Bennett, 2018). In this case, at least, the texture of the packaging plays a *diagnostic* role (cf. Kampfer, Leischnig, Ivens, & Spence, 2017) in the consumer's evaluation of the product itself. There may also be a link here to those companies that try to give their products a 'vintage' or 'relic' look—possibly connecting to the themes of product attachment and ownership.

Direct contact (no matter whether it be with the product or its packaging) is an important component of the consumer's product experience (e.g., Grohmann, Spangenberg, & Sprott, 2007; McCabe & Nowlis, 2003; Mooy & Robben, 2002), though just how important tactile contact is depends on the product category (think here only about buying, e.g., a sweater vs. a CD; Peck & Childers, 2003a, 2008). The power of tactile marketing at the first moment of truth was amply highlighted by an anecdote reported by Ellison and White (2000). These journalists described how when a branch of Asda (a British supermarket) removed the wrapping from several brands of toilet tissue in store, so that the shoppers could feel and compare the textures, sales of the in-store brand soared, resulting in a 50% increase in shelf space for the product line. While product touch is typically used to assess the diagnostic features of a product, the tactile attributes of the packaging are typically non-diagnostic, and hence their influence is likely to be more incidental in nature.

Tactile Contamination

Tactile marketing can be a challenging strategy to pull off effectively given the existence of 'tactile contamination' (Argo, Dahl, & Morales, 2006). The problem here is that consumers typically do not like to pick up a product that they know, or suspect, may have been touched/

inspected by another customer beforehand.[8] Indeed, such concerns are not without merit given the rise of the touch table, the increasingly popular tendency to place the items in store at a level that makes it easy for the consumer to touch them (Robinson, 1998, pp. 203–204; Underhill, 1999). To provide some context, according to one store audit, towels are typically touched by six people before actually being purchased in store (Underhill, 1999, p. 162).[9] Robinson (1998, p. 179), meanwhile, notes that consumers actually end up buying less than a quarter of the products that they touch in store. And, the more intimate the product, think make-up or food, the greater the danger of such contamination effects interfering with the consumer's product response (see Vanech, 2005).

What, then, is a manufacturer to do if they have a product that they know the customer likes to touch but would like to minimize the risk of tactile contamination? One toothbrush manufacturer attempted to deal with this problem by introducing a separate touch strip on the outside of their packaging. The idea was to reproduce the feel of the back of the toothbrush safely wrapped up inside (see Spence & Gallace, 2011; Spence & Piqueras-Fiszman, 2012), thus engaging the consumer's sense of touch, while at the same time ensuring that the product itself remains uncontaminated by the hands of other consumers (see Fig. 6.1). More often than not, though, these days packaging is primarily used to protect, portion-control, and/or preserve the product that happens to be contained within. So, one can ask, what specific tactile attributes of product packaging are people actually aware of? And, perhaps more importantly, how does the manipulation of any one of these attributes change the consumer's product experience? In the following section, I summarize the evidence relevant to each of the major tactile attributes of product packaging that have been assessed scientifically, namely weight, texture, hardness (firmness/compressibility), and temperature. Thereafter, I take a look at how such tactile influences are modulated by other sensory cues (such as vision, olfaction, or audition).

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[8] As evidenced by consumers picking up a newspaper/magazine from anywhere but the top of the pile.

[9] That said, it should be noted that touch tables normally display products devoid of their packaging.

Fig. 6.1 The toothbrush packaging that allows the consumer to feel the difference while avoiding tactile contamination

Tactile Attributes of Packaging Design

Weight

One aspect of the feel of the packaging that is absolutely crucial to modulating the consumer's product experience is its weight (see Piqueras-Fiszman & Spence, 2012b; Spence & Piqueras-Fiszman, 2011). In fact, over the last few years, we have conducted a number of studies demonstrating that people's perception of the sensory and hedonic properties of a range of F&B products can be altered quite significantly simply by changing the weight of the packaging. Generally speaking, those products that are presented in heavier packaging are rated as having a more intense smell (Gatti, Spence, & Bordegoni, 2014), as likely to be more satiating (Piqueras-Fiszman & Spence, 2012b; Spence & Piqueras-Fiszman, 2011; see also Jostmann et al., 2009; Lin, 2013; Maggioni, Risso, Olivero, & Gallace, 2015; Piqueras-Fiszman, Harrar, Alcaide, & Spence, 2011), and to be of better quality/liked more as well (Kampfer et al., 2017). Heavier packaging, in other words, is generally a good thing as far as the consumer's product experience is concerned (though see also Chandler, Reinhard, & Schwarz, 2012).

The increased liking for those products that come in heavier packaging presumably helps explain why it is that so many consumers report that Coca-Cola tastes better from a glass bottle than from a noticeably lighter metal can. Note here that many consumers also report that they like beer more when it comes from a bottle than from a can. In fact, we recently demonstrated that consumers rate beer as tasting significantly better when they know that it has come from a glass beer bottle rather than from a can (see Barnett et al., 2016). This despite the fact that our participants were unable to differentiate between the beers (which came from the same batch) under blind tasting conditions. Intriguingly, in this case, although the participants had been encouraged to pick the bottle or can up prior to evaluating the beer, they sampled the drink itself from the same kind of plastic cup in all conditions (see also Kobayashi & Benassi, 2015).

Meanwhile, in another study, Kampfer et al. (2017) added a weight to the base of a box of chocolates (27% of total weight) or a drink can (21% of total weight). The participants in two studies picked the product up in its packaging; they opened the latter, tasted the contents, and finally rated them. The results revealed that even though the participants only sampled a single product (and hence had no point of comparison concerning what the product packaging *should* weigh) those who picked up the heavier packaging nevertheless gave the product a significantly higher rating in terms of its desirability and their Willingness-to-Pay (WTP) than those who picked up the packaging to which no additional weight had been added. Increased packaging weight also led to increased ratings of flavour intensity as well. One is reminded here, on the one hand, of the everyday expression 'a weighty matter' and, on the other hand, one has to question the product specificity of such heavy packaging benefits. Would heavier packaging also be a good idea for products that are 'light' and/or low calorie, one might well ask? Only future research will tell.

Elsewhere, Piqueras-Fiszman and Spence (2012a) weighed 275 of the wine bottles in an Oxford wine store, documenting a significant correlation between the weight of the bottles and the prices of the wine that were for sale. In particular, for every extra pound (sterling) that people paid for a bottle of wine they got, on average, an additional 8 grammes of glass (see Fig. 6.2). Such results therefore confirm anecdotal reports that
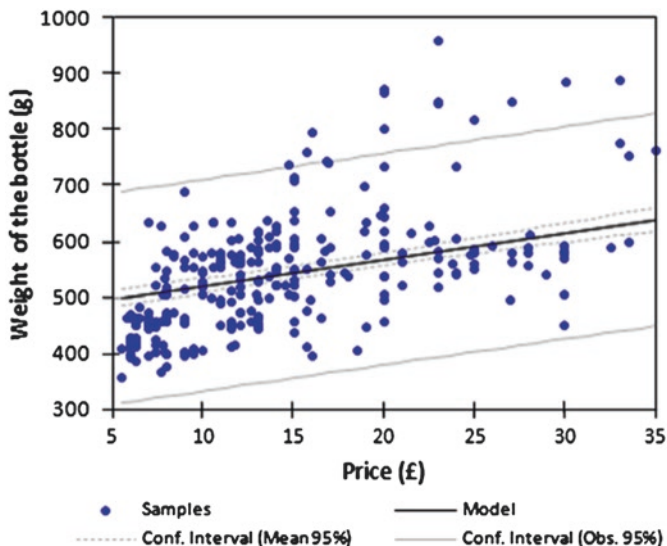
Fig. 6.2 Weights of all the wine bottles (samples) in an Oxford wine shop as a function of price as assessed by Piqueras-Fiszman and Spence (2012a). The graph highlights the correlation between increasing weight and price in the marketplace

some wine producers deliberately go for heavy bottles in order to signal the quality of their wines.[10] Note, here, that wine constitutes an excellent category to assess weight-price correlations given the standardization of the 750 ml wine bottle. One other area where the correlation between packaging weight and price is apparently even stronger is the case of lipstick (this being another product whose volume is essentially fixed; see Spence & Piqueras-Fiszman, 2011).

Over in Italy, Gatti et al. (2014) conducted a study in which 20 participants picked up each of 12 opaque plastic bottles of a handwash solution. They had to unscrew the lid of each bottle and then sniff and rate their impression of the contents. Four of the bottles were white, four were pink, and four were fully saturated red. Half of the bottles had three

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[10] Goldstein and Herschkowitsch (2010, p. 80) wrote that 'These Bogle bottles are hefty, and their weight is a nice feature—one that often tricks people into thinking the wine is more expensive than it really is' (see also Faraday Packaging Partnership & Glass Technology Services, 2006).

drops of fragrance added, while the remainder had seven drops of fragrance added. A small lead weight (c. 100g) was added to half of the bottles (note that the base weight of the packaging was 350g). The results of Gatti et al.'s laboratory-based research revealed that the participants rated the intensity of the fragrance as significantly higher (by approximately 15%) in the heavier than in the lighter packaging (cf. Hagtvedt, 2014). Furthermore, the participants also thought that the product in the heavier bottle would be more effective at cleaning their hands. No interaction between the addition of weight to the packaging and the amount of fragrance that had been added to the product was observed in the data analysis. In the light of such results, the perfume industry's tendency to use heavy glass bottles to package their perfumes suddenly starts to make a lot more sense (Frost, 2006).

Across a relatively diverse range of product categories, then, including everything from wine bottles to lipstick, there would appear to be a strong correlation between the weight of the packaging and how much the consumer can expect to pay for the product (cf. Lindstrom, 2005).[11] That said, there are challenges for the packaging designer, especially given that, as noted earlier, many companies are increasingly being forced to (or in some cases are themselves choosing to) lightweight their packaging, given growing consumer concern about packaging waste (e.g., Anon, 2006; Finch & Smithers, 2006; though see also Aldridge & Miller, 2012). Nevertheless, when one sees the beneficial effects of increased packaging weight on the consumer's multisensory product experience (as assessed, so far, it should be said, mainly in laboratory studies), then the trade-off becomes all the more salient. Consumers, after all, rarely associate positive feelings with those products whose packaging is lighter than expected (see Spence & Piqueras-Fiszman, 2011, 2012). In this regard, it is worth noting that the weight relative to the consumer's expectations (e.g., heavier than expected) can be as important as the actual weight of the packaging itself (or, as is normally the case, the weight of the product plus packaging). So, for example, simply increasing the weight of the stopper

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[11] One of the only examples of consumers reporting that the packaging was too heavy comes from Nickels and Jolson (1976) who documented that the consumers they spoke to did not like the excessive weight of a particular vinegar bottle.

that has to be removed from a premium bottle of spirits or perfume, say, can potentially be used to effectively convey the notion of a quality product even though the weight of the total package offering may not be that high (if, say, it has been light-weighted).[12]

Texture

Next, I want to address the question of what impact the texture of the packaging has on people's product perception. Zampini et al. (2006) were one of the first to address this issue empirically. In their laboratory research, they assessed whether the texture of the packaging would influence the perception of product texture and, in particular, whether an assimilation or contrast effect would be observed (see Piqueras-Fiszman & Spence, 2015, for a review). The participants in their study had to rub the textured cap of a stick deodorant (which they could not see) on to the surface of their contralateral arm and rate its texture. The cap of the deodorant had one of eight different roughnesses, while the handle of the product packaging was either rough or smooth. A small but significant *contrast* effect was reported for the rougher caps in the series. In particular, they were rated as feeling rougher on the arm when people held the smooth handle than when they held the rough packaging texture instead. That said, the effects, while statistically significant, weren't especially impressive. One might wonder here whether contrast effects might be more prevalent in this category—where the packaging held in the hand is used to rub the product on another part of the skin.[13]

Meanwhile, Piqueras-Fiszman and Spence (2012c) assessed whether the texture of the packaging would influence people's perception of pieces of digestive biscuit or yoghurt that were served in plastic yoghurt pots that either had their normal smooth sides or else had been treated

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[12] The author has a collection of spirits bottle stoppers and perfume lids that are disappointingly light to illustrate the wasted opportunity/poor design decisions that are sometimes taken in this regard.

[13] Here, it is important to note that the distribution of receptor types varies across the skin surface (Klatsky, 2010; McGlone & Spence, 2010; Weinstein, 1968) and differs between the skin on the hand holding the deodorant stick and the skin surface where it is normally rubbed (be it the underarm region, or the forearm, as tested here).

to give them a much rougher feel. In this case, a sheet of rough sandpaper was affixed to the outside of the packaging to create a rough feel. The participants rated the texture of the food and their liking for it. Intriguingly, rating of the texture of the digestive biscuit (if not of the yoghurt) was significantly affected by the feel of the packaging (rough vs. smooth). Specifically, an assimilation effect was observed—that is, holding rougher packaging resulted in people rating the biscuit as tasting rougher.[14] More recently, Biggs, Juravle, and Spence (2016) conducted a conceptually similar study in which their participants tasted ginger biscuits from plates that were either smooth or else had been given a rough sandpaper finish. In this case, the results of two experiments demonstrated that the gingerness of the biscuits could be accentuated by the rough (as compared to smooth) feeling of the plate in the hands.

Elsewhere, Van Rompay, Finger, Saakes, and Fenko (2017) conducted a study in which their participants had to evaluate a drink served in a receptacle that had a rounded or more angular 3D-printed outer surface. Once again, the results revealed that the texture felt in the hand influenced people's evaluation of the taste qualities of the drink. And, even more recently, Van Rompay et al. (2018) have demonstrated that a sharp 3D-printed outer cup surface brought out the intensity of the taste of ice-cream when compared to the ratings given when people held a smooth surface instead. While the latter two studies concern the outer surface of drinking/eating receptacles rather than product packaging *per se*, the implications for the latter should be clear.

Thus far in this section, the research on surface texture has merely assessed the sensory properties of the packaging, for example, how rough or smooth it feels. No semantic or affective meaning, note, has been attached to the felt surface in these studies. That is, participants judged a surface finish as more or less rough without associating what

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[14] While it would be easy to imagine that no one would actually coat their product packaging with sandpaper (as done by Biggs, Juravle, & Spence, 2016; Piqueras-Fiszman & Spence, 2012c; see also Zampini et al., 2006), a few years ago one company (Der Schnaps) did indeed indicate the strength of the alcohol by the roughness of the sandpaper on which the label was printed (see Hartmann & Haupt, 2016, p. 189; Spence & Piqueras-Fiszman, 2012; meanwhile Skyy vodka ran a limited-edition holiday bottle with velvet flocking; Mohan, 2013)!

they were feeling with any specific meaning such as a 'natural' or 'skin-like' finish, or with a specific brand (e.g., this feels like the texture of a Jif Lemon). Some researchers, though, have been trying to convey a specific affective response by manipulating the feel of the product packaging (see Chen, Barnes, Childs, Henson, & Shao, 2009; Schifferstein, Fenko, Desmet, Labbe, & Martin, 2013). Relevant here, a few years ago, Velvet toilet tissue introduced packaging that had a surface feel that was semantically congruent with the brand. In this case, the plastic outer wrapping for the multi-roll packs had been treated so as to give a velvety feel that matched the brand name. Other relevant examples include Godiva's silky chocolate and Hovis crustless loaf with soft-touch lacquer (from Amcor Flexibles; Anon, 1999; Raine, 2007; see also Kaleido, 2004).[15]

In recent years, there has also been growing interest in the simulation, or creation, of product packaging that feels 'natural' in the hands of the consumer (e.g., Labbe, Pineau, & Martin, 2013; Nikolaidou, 2011; Overvliet & Soto-Faraco, 2011; Whitaker, Simoes-Franklin, & Newell, 2008). Early examples of the use of distinctive and somewhat naturalistic packaging from the marketplace include the iconic Jif Lemon bottle (see https://en.wikipedia.org/wiki/Jif_(lemon_juice)). While this early exemplar of semantically meaningful textured product packaging might feel 'cheap' these days, it is worth noting that much more hyper-realistic surface textures can now be rendered: See, for example, the amazing 'Juice Skin' packaging created by Japanese designer Naoto Fukasawa (Hara, 2004, pp. 50–57). In this case, the designer has been able to perfectly simulate the rough skin of a kiwi fruit (using electrostatic flock printing), the waxy sheen of a banana skin, and the seeded textural finish of the surface of a strawberry. Such packaging solutions do not, it should be said, come cheap. Notice here also how, in both cases, the realistic surface texture is combined with the appropriate colour scheme for the fruits concerned. The packaging is, in other words, multisensorially congruent (about which, more in the following section).

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[15] Note that lacquers have, for some years now, been printed onto standard packs in order to give them a textured (i.e., rough or smooth) feel (Raine, 2007).

Firmness/Compressibility

The firmness/compressibility of product packaging (what some might choose to call the hardness) is another tactile/haptic attribute that can be, and often is, manipulated, be it intentionally or otherwise. For instance, Krishna and Morrin (2008) conducted one of the only empirical studies to have investigated the impact of this aspect of tactile design on consumers' rating of the contents (in this case, a plastic bottle of water). Their results revealed that if the feel of the container in which a drink was presented was judged to be 'flimsy', then this negatively influenced how consumers rated the quality of the contents, at least if they scored high in 'Need for Touch' (about which, more in the following section; see also Tu, Yang, & Ma, 2015). While it is undoubtedly tempting, from an academic point of view, to try and separate the influence of texture and hardness (i.e., firmness/compressibility) as distinct attributes as far as product packaging is concerned, it is important to note that many realistic packaging finishes/materials can, perhaps, only really be understood by considering the influence of variations in several of these dimensions simultaneously.[16]

Here, just take, for instance, the responses of the members of a focus group who tried Clairol's Daily Defence shampoo, soft-touch plastics packaging, describing the experience as 'almost sexy' (e.g., Anon, 1999).[17] In this case, the tactile/haptic experience of the consumer can perhaps best be understood in terms of some combination of firmness/compressibility and texture. Relevant here, the plastic containers of a number of household beauty products nowadays incorporate 'soft touch' resins, providing a particularly soft and pleasurable feeling when held in the hand. The limited-edition packaging for one Coty fragrance went one stage further: In this case, the perfume flask was enclosed in a flexible skin made from the same kind of plastic that is used to cover prosthetic limbs (see Lupton, 2002, p. 135)! The packaging of 'Alli', the fat-blocking pill

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[16] The unpleasant sound associated with squeezing a plastic bottle might also convey notions of cheapness/low quality.

[17] So enamoured were the members of this particular focus group that they were apparently reluctant to let go of the packages after having been introduced to them (see Anon, 1999). This, though, may say as much about the challenges of doing focus group research as anything else!

released in the United States a little over a decade ago, consisted of a pill-box that could be opened with one hand. Made of soft rubber and careful texturing, it was rated as being especially pleasing to the touch (see Johnson, 2007). The underlying idea, apparently, in this case was that customers who held the rounded container in their own hands would be reminded of the feeling of holding a friend's hand.

Temperature

To date, there has been little research concerning the impact of the perceived temperature of product packaging on people's product experience. Nevertheless, it is easy to imagine how a packaging designer might want to manipulate the felt temperature of the packaging in order to induce either an assimilation or contrast response in terms of the consumer's experience of the contents (cf. Piqueras-Fiszman & Spence, 2015; Zampini et al., 2006). Would an ice cool drink feel cooler were the temperature of the packaging to be manipulated (either making it feel warmer or cooler, to induce assimilation or contrast, respectively)? This is just one of the outstanding questions where more research is undoubtedly still needed. Here, there is also scope to work/research on what are known as 'touch blends' (Bentley, 1900; Gallace & Spence, 2014). Think here only of something like the sensation of wetness. There are no receptors in the skin coding for this particular tactile attribute. Instead, it is what is called a 'touch blend', resulting from the integration of the firing of pressure and temperature (cold) receptors. One might wonder just how many other touch blends might be of interest to the packaging designer.

Packaging Shape

Iconic Packaging Shape

In his book, *Brand Sense*, Martin Lindstrom (2005) gives the example of reaching into the bottom of the ice-box and feeling the distinctive shape of the Coca-Cola contour bottle. By means of this example, Lindstrom

would have his readers believe that packaging shape should be considered within the remit of tactile branding. It is, though, important to recognize here that while such a situation undoubtedly does illustrate tactile/haptic brand recognition, more often than not, we *see* the shape of the packaging on the shelf first. Hence, the shape of the packaging should probably, really, primarily, be considered as an element of *visual* branding.[18] Nevertheless, that said, it is certainly true to say that the macrogeometic shape of product packaging can also be felt and may influence product experience (i.e., the crossmodal influence of packaging shape presumably occurs no matter whether the shape of the packaging is seen and/or felt in the hand; it is just that we are likely to engage visually first with the shape of the packaging).

In terms of the influence of packaging shape, it should be noted that certain arbitrary packaging forms come to take on a specific meaning (or association) after being repeatedly linked to a particular product, brand, or category. This is what Meyers (1981) calls an 'image mould'. For instance, one need think here only of the Wishbone salad dressing bottle that set the norm for the category when it was first introduced (Hine, 1995). Similarly, the Kikkoman dispenser bottle (Blythe, 2001, p. 116; Day, 1985), the Perrier water bottle, and the Brahma beer bottle (Hine, 1995; Johnson, 2007) all serve much the same function (see also Bertrand, 2002; Miller, 1994). In terms of unbranded examples of image moulds, one need only consider how premium ice-cream is nearly always sold in a cylindrical shape whereas rectangular packaging is nearly always used for more mass-market (commoditized) ice-cream instead. In fact, this 'image mould' has held sway over the category ever since ice-cream was first packaged for home use more than half a century ago (see Cheskin, 1957). Relevant here, one useful strategy for the packaging designer wanting to change (and hopefully to improve) people's perception of a particular product or brand is simply to change the image mould. Specifically, adopting the image mould of a different category, think here only of those premium olive oils packaged in what look like

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[18] And, of course, when the signature shape of the bottle is represented as a silhouette on the side of a can of Coca-Cola, say, it is most certainly an example of purely <u>visual</u> branding (Durgee, 2003).

perfume bottles, has proved a very successful strategy for a number of companies over the years (see Spence, 2016).

Haptic Affordances

One important question with regard to the shape of product packaging is how easy is it to pick-up, not to mention, how easy is it to open/use? The number of broken teeth that have been reported to result from consumers trying to open product packaging annually is certainly not something to be laughed at (e.g., Whyte, 2013). This is, of course, especially important for the growing number of elderly consumers out there (e.g., see Anon, 2008). Changing the shape of the packaging can also be used to modify strategically the way in which the consumer picks up/interacts with a product (e.g., Desanghere & Marotta, 2011; Gibson, 1977; Juravle, Velasco, Salgado-Montejo, & Spence, 2015).[19] Indeed, realizing the power of scent to the success of many of their products, Procter & Gamble (P&G) have in recent years been working on modifying the shape of certain of their brand packaging in order to make it easier for the customer to assess the fragrance of a product in store direct from the packaging.[20]

Once upon a time, packaging that was more difficult to open may have been taken by the consumer to signify higher quality (see McDaniel & Baker, 1977). Nowadays, though, that is rarely the case. And this goes all the way from the packaging of fast-moving consumer goods (FMCG) up to high-value consumer electronics (think here only of the Apple MacBook product packaging). Indeed, increasingly, innovative companies are working on optimizing the out-of-box experience (OOBE) (Margolis, 2012), and this is about a seamless opening experience, not a difficult one. In the HPC and F&B categories, one of the benefits of modifying the product packaging to enhance the ease of use is, of course, the potential for increased product usage. Just take, the EZ Squirt plastic

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[19] Of course, handedness is also an important factor to take into account here.

[20] One might think here also of *Downy Unstopables In-Wash Scent Booster Lush* product line that so effectively brings haptics, sound, and scent together in a highly innovative product/packaging design.

ketchup bottle as an illustrative example: This innovative packaging design, and the associated increased ease of use by the consumer, apparently increased consumption by 12% (see Gladwell, 2009).

Interim Summary

The evidence reviewed in this section clearly demonstrates that simply by varying the tactile attributes of product packaging, it is possible to influence people's perception of the product contained within. However, it is important to remember here that the feel of product packaging doesn't only depend on what is happening at the skin surface. What the consumer sees, hears, and smells have *all* been shown to influence tactile/haptic perception as well. For instance, certain colours (hues) can make objects feel heavier (e.g., Alexander & Shansky, 1976), though perhaps the underlying factor is really how bright/dark the colour appears (see Hagtvedt, 2014; see also Walker, Francis, & Walker, 2010). Meanwhile, certain fragrances have been shown to influence the felt texture of various different surfaces/materials (see Churchill, Meyners, Griffiths, & Bailey, 2009; Demattè, Sanabria, Sugarman, & Spence, 2006; Laird, 1932). Crossmodal correspondence between colour and temperature might be relevant too (e.g., Ho, Van Doorn, Kawabe, Watanabe, & Spence, 2014), given that, for example, people tend to believe that red stimuli are hotter than blue stimuli and that blue stimuli are generally rated as cooler than red. Hence, the packaging designer who wants their product packaging to feel especially cool (i.e., a can of beer) would be well advised to colour it blue rather than red to help convey/reinforce the appropriate thermal experience in the mind of the consumer (see also Fenko, Schifferstein, & Hekkert, 2010; Wastiels, Schifferstein, Heylighen, & Wouters, 2012). And, as we see in the next section, they might also be well advised to use a cool smell too.

There have even been suggestions that the ambient fragrance may subtly influence people's grasping behaviour (Castiello, Zucco, Parma, Ansuini, & Tirindelli, 2006). Specifically, Castiello and his colleagues reported that smelling a large fruit (e.g., an orange) tended to slow people's grasping responses to small fruits (e.g., a strawberry) and *vice versa*

on smelling a small fruit. In other words, laboratory research has also highlighted the multisensory influences on tactile/haptic perception. In the future, one could, perhaps, imagine how such insights might lead to some intriguing developments in scented packaging. And although there is no space to go into these in detail here, the packaging designer would be well advised to bear them in mind when thinking about innovating in the area of tactile/haptic packaging design.

Combining Cues in Multisensory Product Packaging

The majority of the laboratory-based studies mentioned in the previous section tended to use very simple examples of packaging, including felt textures (or grasped objects) without much relevant *visual* interest and often unrealistic textures (e.g., sandpaper). One particularly important practical question, therefore, concerns whether the tactile aspects of packaging design are still anything like as important when experienced in the context of realistic visual packaging design features. This concern is particularly relevant given that we humans appear to be visually domi- nant creatures (see Schifferstein, 2006; Spence, Parise, & Chen, 2011; Wastiels, Schifferstein, Wouters, & Heylighen, 2013). Over the last decade, several studies have started to address this question empirically. However, additionally, there is an equally important question here con- cerning whether the packaging designer should necessarily always be aim- ing for multisensory congruency, or whether instead there are also situations in which tactile-visual, or tactile-olfactory, incongruency offers a viable strategy. I summarize the limited evidence on these two questions in the following section.

Marlow and Jansson-Boyd (2011) assessed people's (N = 84 under- graduates) perception of two FMCG (namely soap and biscuits) pre- sented in packaging that had been given one of three different surface textures (normal cardboard, thick-ribbed cotton fabric, and flimsy smooth plastic). Participants either looked (but could not touch), touched (but were prevented from viewing), or else visually inspected the packaging

while feeling it. The results showed that the texture of the back of the packaging did indeed influence people's ratings of the attractiveness of the product, but that they were more influenced by visual assessment based on the front of the pack.

Elsewhere, Labbe et al. (2013) had their participants (N = 120) rate the naturalness of a dehydrated soup product after looking at the packaging, after touching it, or after listening to the sound it made when touched. The participants were also exposed to all three packaging cues at the same time. The results revealed that tactile cues (especially roughness) appeared to be more important than visual or auditory cues in conveying the sense of naturalness (relative contribution of 55%, 24%, and 21%, respectively, to participants' ratings of naturalness). That said, there was no evidence for a multisensory enhancement in perceived naturalness from combining the separate sensory cues.

Congruency Versus Incongruency in Tactile/Haptic Packaging Design

Crossmodal congruency is normally the most appropriate strategy for the packaging designer. As yet, there have only been a few studies comparing the consequences of congruent versus incongruent multisensory design that are relevant to packaging. For instance, Krishna, Elder, and Caldara (2010) conducted a couple of laboratory-based studies in which they investigated the consequences of matching scent with tactile properties at a more semantic level. In one study, these researchers demonstrated enhanced haptic perception and product evaluation when olfactory and tactile cues were matched in terms of a feminine/masculine scent being paired with feminine (smooth)/masculine (rough) texture.[21] In particular, 73 undergraduates rated how good a texture felt in the hand and also estimated its quality. Pairing the female fragrance with the soft texture led to the latter being rated more highly (i.e., as feeling better to the hand) than when the feminine scent was paired with the rougher

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[21] Here, one might also think of the Dove brand deodorant that has a soft touch satiny finish together with a 'softer-sounding' spray than a young man's brand such as Lynx/Axe, say (see Kaleido, 2004; Spence & Zampini, 2006, 2007).

texture (and *vice versa* for the masculine scent). A similarly beneficial effect of olfactory-tactile crossmodal semantic congruency was also documented in a second experiment in which 116 undergraduates rated a therapeutic gel pack. In this case, a warm/cool fragrance was paired with a warm/cool feel. The use of semantically congruent temperature associations led people to rate that they thought the product would work more quickly and be more effective in terms of its ability to relieve pain. Semantic crossmodal congruency was, in other words, beneficial as far as setting positive product-related expectations in the mind of the consumer was concerned.

That said, other researchers have reported how, on occasion, incongruency can also have a place in packaging design (Ludden, Schifferstein, & Hekkert, 2009; see also Schifferstein & Spence, 2008). Relevant here, research from Sundar and Noseworthy (2016a, 2016b) suggests that different strategies may be more appropriate for different brands/brand personalities. In particular, they suggest that visual-tactile incongruency in packaging design tends to work better for those brands that are rated as exciting (see also Littel & Orth, 2013). In particular, Sundar and Noseworthy conducted a series of field and laboratory studies in which people were presented with products packaged in such a way that they either look and felt textured (crossmodally congruent), or they looked textured but felt like something else (crossmodally incongruent). In this case, sincere brands (like Hallmark, Ford, Coca-Cola) were preferred when there was congruency (i.e., they looked as they felt), while those brands that were judged more exciting (BMW, Pepsi, Mountain Dew) were preferred when there was incongruency between the seen and felt texture of the packaging instead. Here one might also want to discriminate between hedonic and utilitarian brands (cf. Dhar & Wertenbroch, 2000).

On the plus side, incongruent multisensory packaging might well be expected to attract the attention of the consumer. At the same time, however, it is also worth remembering that sensory incongruency does not promote processing fluency (e.g., Ferreira, Submitted; Littel & Orth, 2013; Winkielman, Ziembowicz, & Nowak, 2015). As such, while there may be a few occasions where tactile crossmodal incongruency could be an effective strategy for multisensory packaging design, such an approach should probably be used with caution.

Individual Differences in the Need for Touch

Everything that has been reported thus far has tended to assume that all consumers are more or less the same as far as their need/desire for product/packaging touch is concerned. However, research conducted over the last 15 years or so clearly demonstrates that this is not the case. In fact, it turns out that consumers can be reliably segmented in terms of their need for touch (typically, by means of their questionnaire responses)[22] and that this segmentation influences various aspects of their consumer behaviour/perception (e.g., Atakan, 2014; Peck & Childers, 2003a, 2003b; Peck & Wiggins, 2006; Peck & Wiggins Johnson, 2011).[23] Peck and Childers (2003a, p. 431) demonstrated that people differ in terms of their 'need for touch'. This they define as 'a preference for the extraction and utilization of information obtained through the haptic system'. A few years later, Peck and Childers (2008, p. 207) stated that 'The instrumental dimension of NFT refers to those aspects of touch that reflect outcome directed touch with a salient purchase goal… Autotelic touch involves a consumer seeking fun, sensory stimulation, and enjoyment with no purchase goal necessarily salient'. In the years since the Need for Touch (NFT) framework was put forward, a number of studies have documented that it is a useful framework. Krishna and Morrin (2008), for instance, found that that the firmness of the drinking receptacle influenced the responses of those who were low in their autotelic NFT but had no influence in those who were high in autotelic NFT. It would be interesting to investigate here whether visual-tactile incongruency (as discussed in the preceding section) interacts with the autotelic NFT.

Conclusions

As the research reviewed in this chapter has hopefully made clear, the tactile/haptic attributes of product packaging represent a crucially important, if often underrated, aspect of multisensory packaging design.

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[22] The sorts of questions used by Peck and Childers to pick out the high autotelic NFT include Touching products can be fun; I find myself touching all kinds of products in stores.
[23] Citrin, Stem, Spangenberg, and Clark (2003) also highlighted individual differences in touch when considering the challenges for touch of internet marketing.

Crucially, a growing body of rigorous empirical research now shows that even seemingly non-diagnostic tactile/haptic attributes of the packaging can, and often do, influence consumer perception. To date, the weight, texture, and firmness/compressibility of product packaging have all been demonstrated to influence people's expectations and thereafter their experience of the product contained within. The perceived temperature of the packaging is also likely to play some role too, though there has been little research specifically on this question to date. Giving product packaging an interesting feel, or finish, constitutes an effective marketing tool, if it encourages the consumer to pick the product up off the shelf, and by so doing, increases the likelihood that they will end up placing the product in their basket (see Gallace & Spence, 2014; Lewis & Street, 2003; Spence & Gallace, 2011). That said, the pace of research has been slower here than, say for, visual design. This is, in part simply because of the difficulty in creating the relevant stimuli, not to mention the fact that conducting online research on tactile/haptic design is obviously much more difficult, if not impossible. That said, while innovation in the space of tactile/haptic design was traditionally prohibitively expensive (at least to do it well) for all but the most high-end brands, there is now much more opportunity for packaging designers across the spectrum to innovate in terms of the feel of the packaging, and what is more, a growing body of empirical research to help understand what the outcome of any particular manipulation might be.

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Part II

Multisensory Packaging Frameworks and Contexts

Full-Bodied Taste: On the Embodied Origins of Product Perception and Sensory Evaluation

Thomas J. L. van Rompay and Bob M. Fennis

Introduction

Situated at the interface of advertising and the visual arts, packaging design has for many years attracted the interest of researchers, designers, and artists alike. Consider, for instance, industrial designer Raymond Loewy, whose graphic designs for, amongst others, Lucky Strike and LU (a French producer of biscuits and cookies) have become iconic. Or consider American artist Andy Warhol and his famous blown-up (Campbell's) soup cans, which in 2012 inspired a special edition 'soup' series by that same brand. Little did Loewy and Warhol realize that their designs for food manufacturers have

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done more than just trigger amusement and delight and that their designs may well have influenced consumers' actual consumption experiences. Indeed, recent research, discussed in this chapter, convincingly shows that packaging design (for all kinds of foods and beverages) shapes consumers' (sensory) experiences during food and beverage consumption (e.g., Krishna, 2012; Spence & Gallace, 2011).

By virtue of this direct relationship between packaging and contents, and by being physically present at an ever-widening array of consumer choice contexts (ranging from supermarkets and gas stations to schools, libraries, and sports facilities), packaging design is obviously of great importance to both marketers and brand managers. For instance, in 2015, Heineken reenergized one of its Mexican beer brands with new colours and a distinctive matt finish, suggestive of a more masculine personality. In contrast to traditional tools of persuasion (e.g., slogans or product claims) through which meanings are communicated explicitly by advertisers, such design cues may induce more implicit consumer-generated attributions of brand meaning (Deng & Kahn, 2009; Krishna, 2012; Peracchio & Meyers-Levy, 2005).

Finally, from a societal perspective, packaging design may stimulate healthy food consumption. For instance, the look and feel properties of product packaging have been shown to influence sweetness evaluations in taste sample tests (e.g., Van Rompay, Finger, Saakes, & Fenko, 2017). Such findings attest to the feasibility of managing sugar content (and other less than healthy ingredients) without necessarily 'spoiling' the experience (at least in the short term). In other words, packaging design may be an important tool for overcoming health-compromising heuristics consumers may entertain such as 'healthy is not tasty' (Raghunathan, Naylor, & Hoyer, 2006). As of yet, however, no evidence-based designs and systematic evaluations thereof (testifying to the feasibility of such an approach) have seen the light of day. Arguably, the main reason for this is that (notwithstanding the promise of new technologies allowing for the creation of ever more advanced and sensory-rich packaging designs), our understanding of why and how specific packaging properties steer consumer decision-making and influence sensory experiences is still in its infancy.

Aims and Approach

Taking note of the great potential of packaging design for managing sensory experiences and consumer decision-making on the one hand, and the simultaneous lack of understanding of how and why specific design elements may exert such an effect on the other, the aim of this chapter is to show how an approach inspired by the embodied cognition framework may provide (part of) an answer to these questions. This framework was originally developed in the field of cognitive linguistics (Lakoff & Johnson, 1980, 1999) and subsequently fine-tuned and tested in the domains of cognitive and social psychology. We argue that in order to understand why specific look and feel properties of packaging design call forth specific evaluations and (sensory) experiences, we have to go back to primary, bodily experiences and related body-environment interactions. For instance, the widespread usage of rough-feeling, matt surface finishes in packaging design and its association with toughness or masculinity can be understood when realizing that in our everyday interactions with objects, rough surfaces feel 'hard' and 'inflexible' on our skin, whereas smooth surfaces rather feel 'soft' and 'supple'. This very brief introspection reveals why we may be inclined to typify a person we have trouble coming to terms with as *rough* or *rugged*. More importantly for the present undertaking, it allows us to understand why we may readily associate a black, matt packaging design with a masculine or rugged brand personality. In other words, the embodied cognition framework postulates that bodily states or experiences (e.g., a sharp or intense sensation on our skin) occurring in our daily interactions with the environment (e.g., when interacting with objects) are at the basis of symbolic or abstract meaning attributions to objects (e.g., perceiving an object as *masculine* or *rugged*; Barsalou, 2008; Van Rompay & Ludden, 2015). Although there are different views on embodied cognition (Wilson, 2002), they all share the notion that cognitive representations are fundamentally grounded in their physical context (cf. Niedenthal, Barsalou, Winkielman, Krauth-Gruber, & Ric, 2005).

Another central tenet in our line of reasoning revolves around how these 'embodied' expectations (triggered by multisensory aspects of

packaging design) subsequently 'transfer' to sensory experiences issuing forth from the consumption of the contents. Such transfer effects from packaging to taste have been repeatedly demonstrated for different types of products and design factors. For instance, Piqueras-Fiszman and Spence (2012) demonstrated a relationship between packaging texture and taste perception by showing that biscuits in a rough package were rated as being crisper than identical biscuits sampled from a smooth package instead. Likewise, Van Rompay et al. (2017) recently demonstrated that a bitter coffee was perceived as more bitter in a sample cup with an angular, rather than a rounded, tactile pattern on the outer surface. Thus, interaction with the container (i.e., cup or package) can generate expectations, and these expectations then modulate subsequent consumption experiences.

As illustrated by these examples, this sequence usually involves an automatic process in which consumers draw on initial impressions (derived from packaging design) which then generate expectations that colour their subsequent evaluations (e.g., product feel or taste; Huber & McCann, 1982; Pinson, 1986). However, sometimes we may discount a first impression and its source (i.e., the package), and more deliberately evaluate a product and its contents. For instance, the 'green' image suggested by the package of an (unhealthy) snack encountered in a supermarket may instil doubt or scepticism, leading to a more thorough evaluation of the snack's taste in which we try to 'discount' the package as a reliable source of information. Hence, we also discuss those studies suggesting that, depending on design of packaging and environment, different types of information processing may be activated. On a more general level, the workings of packaging design may also vary as a function of personality, values, or concerns (e.g., think here only of organic shoppers and their concerns for eco-friendly food consumption).

In the remainder of this chapter, we discuss these notions and questions in relation to three different dimensions of packaging design: overall packaging shape, graphic layout and composition, and tactile packaging properties. Although packaging experience may also comprise smell and sound, vision and touch may well be most amenable to the embodied account discussed here (as also suggested by the relatively large number of studies addressing these sense modalities in particular). In

each case, we discuss the embodied basis of the findings and notions discussed, followed by evidence from experimental research from the food and beverage context, or from research in related disciplines (e.g., design research or social psychology). We close the review with, as of yet, unexplored directions for future research and product development in the context of healthy lifestyle management. Before zooming in on packaging design, we first situate the embodied cognition perspective within the broader context of consumer decision-making and automatic processes.

A Situated, Embodied Perspective on Consumer Judgment and Decision-Making

Most of the studies discussed in this chapter share at least two key features: (1) seemingly trivial or subtle packaging cues can have a strong impact on (sensory) product evaluation and (2) consumers are generally unaware of such effects. When asked, in fact, they often deny (or are surprised) that subtle packaging cues influenced their evaluations. These overall findings fully align with the emerging picture of human judgment and decision-making which radically contrasts with the classical economic notion of consumers optimizing utility functions and thus forming stable and well-defined preferences (Persky, 1995). Instead, this picture emphasizes the seemingly irrational, haphazard, and volatile nature of much of consumer behaviour.

Stretching out way beyond the confines of multisensory packaging design, consumer psychology is replete with such 'surprising' findings. For instance, consumers have been shown to prefer brand names starting with their own name letter (Brendl, Chattopadhyay, Pelham, & Carvallo, 2005), buy more French wine when French, instead of German, music is played in the supermarket (North, Hargreaves, & McKendrick, 1999), become more creative after being exposed to the Apple, rather than the IBM logo (Fitzsimons, Chartrand, & Fitzsimons, 2008), and drink more Lipton ice tea after having been exposed subliminally to the Lipton Ice brand (Karremans, Stroebe, & Claus, 2006). These examples are at odds with the notion of consumers as rational, thoughtful decision-makers and instead stress the overwhelming influence of incidental contextual

factors on consumer behaviour. Moreover, they point to involuntary, automatic processes that account for this influence and that unfold outside consumer awareness.

This emerging picture is sometimes portrayed as so unstable, haphazard, and idiosyncratic that some scholars have been tempted to label these unconscious effects as 'noise' that merely distracts from the value of conscious decision-making in understanding consumer behaviour (e.g., Simonson, 2005). We disagree with this qualification. Instead, we view such effects as music (rather than noise), although understanding its orchestration and arrangements sometimes requires venturing into some previously unexplored places. One of these (relatively) unexplored places, we argue in this chapter, is the domain of the human body and its interrelatedness with the environment.

Grounded Cognition in Consumer Behaviour

An emerging and promising perspective from which to try and understand the impact of design features on consumer perception, judgment, and choice (which also takes centre stage in the present contribution) is that of socially situated or *grounded* cognition, of which the embodied perspective is part and parcel (Smith & Semin, 2004). In short, this perspective holds that the consumer cognition that drives such judgment and choice is malleable, distributed, embodied, and highly sensitive to the demands of the situation. Hence, all cognition is situated or grounded in reality, encompassing both the physical and social environment, as well as the bodily states in which it emerges. The embodied perspective is but one (albeit fascinating) possibility via which consumer cognition is shaped 'on the fly' by its integration with environmental stimuli.

Note that this perspective assumes that such grounded cognition is highly adaptive as it enables the consumer to quickly and efficiently cope with sometimes rapidly changing social situations (Smith & Semin, 2004). Indeed, only when grounded in social reality and the self, can people respond effectively to threats and opportunities as and when they occur and interrupt ongoing behaviour when needed. In addition, this context dependency does not mean that consumers are a slave of the situation, but it *does* mean that consumer goals, preferences,

and predispositions are not immutably given but may interact with situational demands and features to jointly shape perception, judgment, and behaviour. Many of the studies discussed in this chapter illustrate how embodied cognition 'allows' people to anticipate on near-future sensations and experiences (based on design cues comprised by product packaging). It is this adaptability and interdependence between consumer experience and the environment (cf. Smith & Semin, 2004) that nicely aligns with basic tenets in behavioural biology and evolutionary functionalism, which highlight how humans can flexibly adapt, anticipate, and deal with the challenges of rapidly changing environments. The consumer psychological consequence of adopting this paradigm, though, is that we need to focus on the consumer-environment interface as the object of study in order to further our understanding of consumer judgment and decision-making. In this contribution, we zoom in on packaging features and how they interact with consumer-specific processes and properties (such as consumer personality and values) in shaping (sensory) product evaluation and experience.

Overall Packaging Shape and Embodied Meaning Portrayal

Starting out at the level of the overall product or packaging design, the first (and most direct) type of embodiment reflects consumers' inclination to easily detect human features or traits in products, a tendency generally referred to as personification or anthropomorphism (Aggarwal & McGill, 2007; Guthrie, 1993). The classic Coca-Cola bottle resembling the female body outline is a well-known example from the domain of packaging. Similarly, all of us will be familiar with the anthropomorphic features of automobile design, particularly the front appearance which typically reminds consumers of human face-like features (represented in headlights and grille), either conveying, depending on the brand and its positioning, an impression of affiliation and benevolence or, conversely, aggression, competition, and dominance (Aggarwal & McGill, 2007). More recently, Karim, Luetzenkirchen, Khedr, and Khalil (2017) provided empirical evidence for the notion that using watches in advertisements with a time

setting resembling a smiling face (i.e., 10:10) can positively influence consumer responses.

When turning to the food and beverage context, a brief trip to a supermarket suffices to encounter numerous other examples, ranging from soap and shampoo dispensers to mayonnaise and ketchup bottles resembling human (or animal) bodies or parts thereof. And indeed, Salgado-Montejo, León, Elliot, Salgado, and Spence (2015) showed that participants rate such products (tea, shampoo, and juice in their study) more positively and choose these more frequently when they display a smile-like concave line rather than a frown-like convex line.

Apart from generating a smile on one's face or making a product stand out on the shelf, such endeavours may also appeal to consumer concerns for healthy food consumption and dieting. In particular, Ooijen, Fransen, Verlegh, and Smit (2017) recently showed that packaging shape can serve as a cue that communicates the healthiness of food products. Inspired by embodiment accounts, they demonstrated that slim packaging designs (resembling slim human bodies), as opposed to wide packaging designs, trigger perceptions of product healthiness and are more readily perceived as 'light' or 'low-calorie' variants. Importantly, however, effects of packaging shape on choice likelihood and attitude only transpired for those consumers entertaining health-relevant shopping goals (i.e., a concern for healthy food consumption and/or a fit, slim body); packaging shape did not affect responses for consumers driven by hedonic shopping goals (i.e., consumers looking for a moment of sweet indulgence or delight). In other words, people may be more or less attuned to specific design factors depending on the extent to which the meanings they connote match related and, at the time, active concerns or goals.

At a more abstract level (i.e., where there is no explicit resemblance between product and human body), overall product or packaging shape may also trigger specific meaning attributions. Most notably in the writings of gestalt psychologist Rudolf Arnheim (1969, 1974), relationships between overall shape features (such as orientation, balance, and closure) and specific meaning attributions are proposed. For instance, in relation to the perception of works of art, Arnheim (1974) argues that properly balanced compositions are perceived as *at rest* or *still*, whereas unbalanced compositions are perceived as *restless*. Indeed, similar couplings between

balance and meanings such as *still*, *stable,* and *trustworthy* have been demonstrated in experimental studies with respect to overall product shape (Van Rompay, Hekkert, Saakes, & Russo, 2005). Such couplings are (at least in part) embodied as they find their origins in our own perceptions of bodily balance and related feelings of stability or the lack thereof.

As another example of how overall packaging shape can generate attributions of meaning, consider product orientation (i.e., horizontal versus vertical orientation) and its relatedness to power-related constructs such as *dominance*, *luxury*, and *exclusivity* (e.g., Van Rompay, De Vries, Bontekoe, & Tanja-Dijkstra, 2012). To understand why this dimension is persuasive in product perception, think only of linguistic phrases such as 'she is looking down on others' (*dominance*), 'we made it to the top/it's lonely at the top' (*success/exclusivity*), or a high-end/upscale fashion store (luxury). Such expressions are rooted in our own physical interactions in and with the environment where we, for instance, experience a higher sense of control or power over others when positioned high above them. At the same time, 'rising' or 'going up' entails overcoming gravitational forces and thus requires strength and perseverance. For that reason, we intuitively understand why it is 'lonely at the top' or why 'reaching the top' (or 'climbing the social ladder') equals being successful and perseverant.

Not only is this relationship language-independent (Lakoff & Johnson, 1999), it has also been shown to apply to product and packaging design (Machiels & Orth, 2017; Van Rompay et al., 2005; Van Rompay & Pruyn, 2011). For instance, Van Rompay and Pruyn (2011) demonstrated that a fictitious bottled water brand is more readily perceived as *luxurious*, and elicits higher price expectations, when it comes in a tall, elongated bottle shape rather than in a more compact bottle shape. Machiels and Orth (2017) illustrated how perceptions of verticality may also be induced through the environmental context. Specifically, their findings show that consumers' power and quality perceptions are enhanced when a package is placed on a shelf that is vertically rather than horizontally orientated. It would certainly be interesting to study the extent to which such verticality cues also drive taste perceptions. Are consumers, for instance, more inclined to describe the taste of coffee as *refined*, *exclusive*, or *sophisticated* when associated with a package portraying verticality cues? Or conversely, do they rate the same coffee as tasting

more flat, nondescript, and common, when packaging is more horizontally oriented? As to these possibilities, upscale coffee brand Nespresso appears to allude to the former, rather than the latter option (further strengthened by their 'high design by *Nespresso*' slogan) as apparent from their vertically oriented (advertising, packaging, and store) designs.

Finally, consider another (related) structural variable, orthogonal versus oblique orientation. Specifically, Joye, Fennis, Kreuer, and Redies (2018) showed that the relative orthogonal (vs. oblique) compositional orientation of CD album cover art affects the audience's perceptions of the music on those CDs. This research builds on the established perceptual phenomenon that organisms (ranging from goldfish to humans) show a preference and processing advantage when dealing with orthogonal, as opposed to obliquely oriented visual stimuli, a phenomenon known as the 'oblique effect' (Appelle, 1972). The authors demonstrated that this effect is not tied to perceptual facilitation and increased perceptual performance per se but spills over to affect cross-modal aesthetic preferences. In a series of experimental and cross-sectional studies using secondary data, the authors showed that consumers listened longer to tracks on a (fictitious) new music CD, and liked these tracks more, when exposed to an album cover that was orthogonally, rather than obliquely, oriented. Moreover, systematically comparing more than 350 international music CDs revealed that albums with more orthogonally oriented CD covers (as identified with a new efficient scanning and assessment tool) ended up higher in the music charts (i.e., those of the US, UK, and Germany, and controlling for a number of evident confounding variables). Furthermore, they were rated higher by musical experts (i.e., those from Rolling Stone magazine) than their more obliquely oriented counterparts.

Translated to the current context, would an orthogonal orientation also enhance taste liking and quality perceptions?

Packaging Shape and Taste

The studies discussed so far did not assess the extent to which (embodied) meanings communicated by design also impact actual sensorial product experiences. Inspired by work on cross-modal correspondence (whereby

impressions generated by one sense, such as meanings connoted by a product's visual appearance, transfer to, for instance, the taste of a product; Schifferstein & Spence, 2008; Spence, 2012), Becker, Van Rompay, Schifferstein, and Galetzka (2011) tested whether meanings connoted by shape angularity transfer to taste intensity evaluations. Specifically, they departed from the notion that angular form features are readily associated with potency-related meanings such as *tough*, *powerful*, and *intense* (Bar & Neta, 2006; Zhang, Feick, & Price, 2006). The relationship between angularity and potency is embodied insofar as angular (as opposed to rounded) shapes generating a more intense, sharp impression on our skin while interacting with them. Such interactions may vary from handling or holding a stone or small object in our hands to a child at play smashing her head against a sharp-edged coffee table. On a visual level, angular shapes have been likewise associated with power-related constructs such as confrontation and conflict (Zhang et al., 2006).

To test whether meanings connoted by packaging design transfer to taste, Becker et al. (2011) presented an identical yoghurt associated with either a rounded or angular package (displayed on a laptop screen) to shoppers at a supermarket (see Fig. 7.1). The findings revealed that yoghurt associated with the angular package was indeed rated as stronger in taste compared to (the identical) yoghurt associated with the rounded package, although these effects were particularly strong for shoppers with a high sensitivity to design (as reflected in high scores on items such as 'Sometimes the way a product looks seems to reach out and grab me'; Bloch, Brunel, & Arnold, 2003). Hence, because we experience angular objects in our everyday interactions as more forceful, we also tend to rate food or beverage contents associated with angular packaging designs in line with this construct (see Velasco, Woods, Petit, Cheok, & Spence, 2016 for a review on the relationship between shape and taste).

These combined findings testify to the means for embodied meaning portrayal via overall (packaging) design and for influencing taste and aesthetic evaluations. At the same time, however, consumers may be more or less attuned to such relatively subtle design manipulations either because the values these meanings connect to are more or less salient (Ooijen et al., 2017) or because consumers may be more or less attuned to design manipulations in general (Becker et al., 2011).

Fig. 7.1   Angular (left panel) and rounded (right panel) packaging shape. Source: Becker et al. (2011)

Graphic Layout and Composition

A package's physical 3D appearance makes for a close kinship between packaging design and product design. However, when we focus on the visual, graphic part of a package (where brand- and product-related visuals and textual elements such as brand and product information meet), packaging design leans heavily towards the visual arts and advertising design. When looking back at the packaging variants presented in Fig. 7.1, it is easy to see that design choices in this context include, amongst others, decisions on placement of visuals, orientation, and direction of shapes and lines, colour selection, and decisions on visual complexity.

   In recent years, a considerable body of research has shown that such decisions are far from trivial and may in fact have a far-reaching impact on brand and product evaluations. As discussed, the notion that the suggestion of movement (vs. stability or balance) is an important predictor of visual experience is widespread among artists and researchers interested in the visual arts (Arnheim, 1969; Kandinsky, 1926). But whereas

when applied to overall package shape (as discussed in the previous section), means for exploration are limited due to functional constraints (i.e., a packaging has to take in a stable, solid position during transport, on the shelf, and later on in consumers' homes), when studied in relation to graphic design of packaging labels, such constraints disappear and means for exploration are thus endless.

For instance, recent studies in consumer psychology have stressed the importance of implied movement by graphic design (e.g., through arrows, lines leading the eye from start to end, or frozen depictions of objects in motion) to branding and advertising practices (Cian, Krishna, & Elder, 2014; Roggeveen, Grewal, Townsend, & Krishnan, 2015). Cian et al. demonstrated that such movement-suggesting visuals indeed evoke eye movements which, in turn, enhanced consumer engagement (i.e., involvement) with the brand and inspired positive attitudes. In other words, engaging consumers on a physiological, bodily level may likewise foster engagement on the product and brand level. Furthermore, these findings (i.e., eye movements recorded via eye-tracking technology) correspond with the notion that observers (i.e., the visual system) 'fill in' or 'simulate' the trajectory suggested by visual stimuli (Barsalou, 1999; Downing & Treisman, 1997).

Importantly, however, this engagement-attitude effect varied in strength depending on the extent to which movement was considered brand appropriate. Thus, such movement effects may only work for those brands that are associated with dynamism and activity (a pillar of brand personality; Aaker, 1997; Geuens, Weijters, & De Wulf, 2009), such as sports brands or brands associated with ongoing innovation and development. Translated to packaging design, these findings suggest that brands highlighting tradition and ancestry may rather benefit from visuals suggesting stillness and stability rather than movement and change.

In elaborating on the embodied basis of such movement effects, consider everyday interactions in which we move from one place to another. In such actions, bodily movement is inherently associated with change of location, and hence with new sensations, new experiences, and new social and physical environments, whereas stillness and stability of bodily positions entail a lack of the 'new' and a focus on the status quo and the familiar. It would certainly be interesting to study whether manipulations

of packaging imagery (in terms of movement and stillness) affect taste evaluations in a manner that is consistent with this embodied line of reasoning. Thus, when looking back at the dairy package presented in Fig. 7.1 (presenting a very balanced and static 'green' scene), would it more readily trigger perceptions of drink/yoghurt taste as original or innovative when depicting imagery in a dynamic rather than in a static fashion (e.g., by using depictions of 'cow' and 'juicy lemon parts' in motion rather than in 'still life' style)? And considering the intuitive coupling between health and movement (i.e., physical exercise), would such a redesign for a healthy yoghurt indeed foster engagement with the brand and (thus) inspire healthy food choice?

In addition to the absence or presence of suggested movement, research indicates that the *direction* of such movement should be considered as well (e.g., Van Rompay, Fransen, & Borgelink, 2014). Reasoning that in our everyday interactions, the upper realm is readily associated with lightness and lightweight objects (such as leaves gently coming down), Van Rompay et al. (2013) demonstrated that movement visuals presenting upward, rather than downward, movement (embedded on a packaging for washing detergents) triggered perceptions of a less concentrated, fresher smell in a product sample test where shoppers were instructed to open the package and smell its contents (in all cases, an identical neutrally-scented washing powder). Downward movement was associated with a more concentrated 'heavy' smell. These findings are in line with previous research demonstrating a relationship between perceived moment and food freshness (Gvili, Tal, Amar, & Wansink, 2017) and highlight the importance of movement direction. However, the positive effect of upward movement on smell only surfaced when movement visuals were placed in a corresponding 'light' location on the package: the top-left (as opposed to the bottom-right) region.

The relevance of this latter finding aligns with research assessing location of imagery in consumer packaging (Deng & Kahn, 2009). To understand the relevance and embodied grounding of this dimension, consider only that people across cultures and regions associate similar meanings with basic spatial orientations such as the 'above' and 'below' (Osgood,

1960). The general line of reasoning accounting for this relationship holds that people associate the ground plane (or the lower region in a graphic design) with heaviness and constraint because we 'learn' from our bodily experiences that going up takes effort, and all the more so with increasing (bodily) weight or accompanying load (e.g., cycling uphill with a full shopping bag). Hence, we tend to associate heights with lightness or objects free from the forces of gravity, whereas the ground plane is readily associated with heaviness and people or objects that due to their weight are restricted to the ground plane.

Deng and Kahn (2009) illustrated that these principles also apply to the perception of product packaging. Specifically, they showed that product packaging appears more or less weighty dependent on whether imagery is presented in 'light' (top, top-left) or 'heavy' (bottom, bottom-right) locations. Building forth on these findings, Van Rompay et al. (2013) demonstrated (in addition to the 'movement-smell' effect discussed earlier) that shoppers actually experienced a packaging as heavier (i.e., as containing more washing powder) when the imagery was placed on the bottom part of the package rather than at the top. Specifically, participants were instructed to pick up the package and provide an estimation of packaging weight.

Fenko, De Vries, and Van Rompay (2018) showed that such perceptions may also translate to taste experience. Specifically, coffee taste was evaluated as stronger in a taste test when associated with a visually heavy package (with imagery presented at the bottom rather than at the top; see Fig. 7.2).

Finally, and of particular interest to initiatives centred on healthy food consumption, Karnal, Machiels, Orth, and Mai (2016) illustrated that heaviness perceptions may also follow from colour selection and typeface usage. In line with van Ooijen et al. (2017), Karnal et al. (2016) demonstrated, amongst others, that heavy (bold) typefaces are readily associated with non-healthy (sugary) product variants, but only so for consumers aiming at good health (i.e., consumers with a health promotion focus). These findings once again demonstrate that different design cues can activate health perceptions, but that a corresponding consumer focus on health might be required.

Fig. 7.2   Imagery location (left panel: top positioning of lion; right panel: bottom positioning of lion). Source: Fenko et al. (2018)

Tactile Design and Surface Textures

In the previous sections, the emphasis was on how visual appearances may affect product and brand perception and sensorial evaluations comprising taste, smell, and haptic sensations (i.e., the perception of volume). However, recent developments in 3D printing and coating technologies increasingly enable tactile manipulations in packaging design as well (see Spence, this volume). In line with such developments, a variety of studies have demonstrated that different materials make for qualitatively different taste experiences (Biggs, Juravle, & Spence, 2016; Piqueras-Fiszman & Spence, 2012; Schifferstein, 2009; Spence & Wan, 2015; Tu, Yang, & Ma, 2015). For instance, in studies by Schifferstein (2009) and Tu et al. (2015), participants tasted drinks from cups made of different materials. Whereas Schifferstein (2009) showed that participants enjoyed their soda better when drunk from a plastic (rather than ceramic) cup, Tu et al. (2015) demonstrated that participants evaluated ice tea contained in glass cups as tasting sweeter compared to cold tea contained in plastic cups (while controlling for weight). These findings testify to the importance of material

selection. However, when it comes to tactile sensations originating from surface textures or patterns (which can be applied on the same type of material, see Fig. 7.3), experimental research is limited (cf. Spence, 2016; Spence & Wan, 2015).

For that reason, Van Rompay et al. (2017) recently applied 3D printing technology to generate systematic variations in surface textures embedded in sample cups, and subsequently used these containers during a taste test for fictitious coffee and hot chocolate brands. The findings revealed, amongst others, that a bitter coffee was perceived as more bitter (and more intense) in a sample cup with an angular surface texture (Fig. 7.3, right panel), whereas a sweet chocolate became even sweeter when tasted from a sample cup with rounded tactile elements (Fig. 7.3, left panel).

These findings illustrate that tactile elements may accentuate the perception of basic taste. Specifically, the finding that an angular (as opposed to a rounded) 3D-printed pattern resulted in a more bitter taste experience was explained by arguing that an angular texture creates a sharper, more intense experience on the skin and that therefore consumers evaluate the taste as more bitter (a taste dimension high on intensity; cf. Ngo, Misra, & Spence, 2011). Sweetness, on the other hand, is generally expe-

Fig. 7.3 3D-printed sample cups used in taste test (left panel: rounded surface pattern; right panel: angular surface pattern). Source: Van Rompay et al. (2017)

rienced as more harmonious, soft, and round, and for that reason, sweetness ratings were arguably accentuated by the rounded surface pattern (however, see Machiels (2018) for research where round cups failed to induce a sweeter taste). Note that these findings on angularity (of tactile micro-elements) are fully in line with Becker et al. (2011) in which the same line of (embodied) reasoning was used to account for effects of an overall angular packaging shape on taste intensity (see Fig. 7.1).

Furthermore, findings from this study (again) confirmed the importance of congruence or fit between (tactile) design and product type (cf. Cian et al., 2014). Specifically, an angular surface texture better matched the overall bitterness of a coffee drink, whereas a rounded surface texture better matched the overall sweetness of a chocolate drink. Importantly, these matching combinations (e.g., a sweet chocolate drink tasted from a cup with rounded tactile elements) elicited more favourable taste and product evaluations compared to non-matching combinations (e.g., bitter coffee tasted from a cup with rounded tactile elements).

In addition to such 'design-product type' matches, the importance of coherence or congruence among different design elements making up a product or package (e.g., fit between shape and typeface design; Van Rompay & Pruyn, 2011) has been well established (e.g., Hekkert, 2006). To better understand (both types of) congruence effects, the processing fluency framework is of particular interest (Reber, Schwarz, & Winkielman, 2004). According to this account, those stimuli that can be easily processed elicit positive affect (because fluent processing indicates that things in the environment pose no danger or cognitive challenges), which is subsequently attributed to the stimulus at hand, resulting in favourable product evaluations (e.g., Lee & Labroo, 2004; Reber et al., 2004). When consumers face the task of integrating meanings connoted across, for instance, package materials, visuals, and product type into an overall impression, congruence facilitates impression formation (and this enhances product appeal), whereas mixed signals (i.e., incongruences) in terms of meaning portrayals elicit ambiguity with respect to product identity, prompting deliberative and effortful inference making (cf. Vallacher & Wegner, 1985), and thus thwarting automatic impression formation.

Now that we have come to the end of this chapter, it should be noted that we have presented a relatively straightforward story in which sensory impressions and meanings are relatively easily traced to their embodied underpinnings. Furthermore, the findings presented suggest that a fit between different (design) elements is key to product success. In the final section, however, we further elaborate on types of information processing instigated by design and discuss research warning against an oversimplified version of the role of design in food and beverage evaluation.

Discussion

Throughout this chapter, we showed how the embodied cognition framework may help us to account for (and thus also to anticipate) effects of design variables on product evaluation and sensory impressions in particular. To this end, a series of studies was discussed in which design variables, meaning portrayals, and sensory impressions were traced to their embodied underpinnings. Along the way, implications for research on healthy food consumption were hinted at. For instance, findings on tactile design and sweetness impressions may be relevant as far as they suggest that negative effects of reduced (artificial) sugar levels on taste may (at least to some extent) be remedied through packaging design. Likewise, effects of shape angularity (intensifying taste intensity) may perhaps counteract impressions of taste 'blandness' which consumers often report when tasting organic or healthy foods.

At the same time, however, it is also true that for other outcome measures important to health initiatives in the food context, the relevance of these findings is less straightforward. For instance, what about initiatives to reduce the salt content of foods (which are particularly high in processed foods)? How do impressions of saltiness relate to design factors, if at all? And even where relationships between health-relevant taste sensations and design are more straightforward, it should be acknowledged that so far, experimental, controlled studies in this specific context (involving effects of implicit design cues on healthy food consumption) are non-existent as far as we know.

Furthermore, the relationship between design and taste is in all likelihood more complex than perhaps suggested in this chapter. That is, in all studies discussed, transfer effects from impressions generated by exposure to packaging appearance to sensory evaluations were apparent. Thus, for instance, potency-related meanings triggered upon perception of an angular packaging shape 'transferred' to the evaluation of product taste (and, hence, triggered a stronger taste experience). But although such cross-modal influence (in which evaluations in one sense modality 'follow' those in another) has been demonstrated frequently, this is not to say that this is always the case. Particularly noteworthy are those findings from studies (e.g., Cardello & Sawyer, 1992; Davidenko et al., 2015; Yeomans, Chambers, Blumenthal, & Blake, 2008) showing that when the discrepancy between expectations (formed prior to tasting) and subsequent sensorial impressions becomes too large, a contrast (rather than assimilation) effect occurs (see Piqueras-Fiszman & Spence, 2015, for a review on sensory expectations based on product-extrinsic food cues).

To illustrate, Yeomans et al. (2008) studied the interplay between food labels and taste evaluations and they showed, for instance, that when confronted with a particular ice-cream label, strong expectations of a sweet, fruity flavour were generated. When participants next tasted a (very unexpected) salty ice-cream, saltiness ratings (as opposed to sweetness ratings) were further enhanced, clearly demonstrative of a contrast effect. A way to make sense of such findings is by realizing that in many encounters between shoppers and consumer products, processing occurs foremost in an automatic fashion involving little deliberate decision-making.

However, when sensations triggered by food tasting radically diverge from initial expectations, processing can arguably not proceed in a fluent, automatic fashion (Vallacher & Wegner, 1985), but instead requires deliberate 'intervention' to make sense of the encountered incongruence. Arguably, it is then that the source of the initial expectation (i.e., the package) is discounted and the taste is more critically evaluated. Under such circumstances, overcompensation may occur (resulting from attempts to factor out the role of the package when evaluating taste). A similar process has been observed in priming studies where consumers (once aware of the presence of a priming effect) overcompensate for the

influence exerted by the prime (i.e., reverse priming may be observed; Glaser & Banaji, 1999). In other words, these findings warn against over-simplified conclusions based on findings from studies demonstrating straightforward transfer effects from design to taste evaluation. Instead, they stress the importance of carefully managing and testing effects of design on taste evaluation. Clearly such practices should take into account the gap between taste expectations and 'actual' taste.

Additionally, we have discussed moderators of design effects on product and taste evaluation such as consumer values, personality, and environmental context. This latter factor is relatively neglected in research but may well be of critical importance as packaged products are usually encountered in supermarkets where consumer involvement and time spent on inspection of packaging appearance is generally very limited. Moreover, recent findings suggest that depending on environmental setting, the extent of consumer processing of packaging design may vary. For instance, Van Rompay, Deterink, and Fenko (2016) compared the effects of packaging design at a discount supermarket versus at an organic supermarket. Their findings revealed that effects of packaging design on taste evaluation surfaced at the discount supermarket only, suggesting that at the organic supermarket, the package was discounted as a source of taste evaluation.

To rule out that this effect was fully the result of different shopper segments (frequenting the respective supermarkets) with different health concerns (cf. Ooijen et al., 2017), a follow-up lab study involving a homogenous group of participants was conducted. These additional findings confirmed that this effect was at least in part due to the environmental context (and not only due to shopper type), indicating that environmental cues may affect the extent of processing, trigger scepticism with respect to packaging, or raise health awareness and related concerns. Although shoppers may increasingly shop online for groceries, note that there are also plenty means here for incorporating (health-related) design cues (i.e., web atmospherics comprising colour, shape, and product visualizations, see Hunter and Mukerji [2011] for a review). This is not to say, however, that healthy food choices should always be associated with stereotypical colours or visualizations. For instance, Tijssen, Zandstra, de Graaf, and Jager (2017) demonstrated that sugar-and-fat reduced products were considered less attractive

when presented in a light-blue package, perhaps indicating that some design cues may activate the 'healthy is not tasty' heuristic (Raghunathan et al., 2006).

Across several studies (e.g., Karnal et al., 2016; Ooijen et al., 2017), the importance of a focus on health was attested to, indicating that packaging design may foremost act as a diagnostic cue for making healthy food choices when shoppers are aware of the impact of food intake on health and well-being while shopping. In line with such findings, in a previous study (Papies & Hamstra, 2010), exposure to a poster including words like 'slim figure', 'extra slim', and 'weight' in a butcher's shop reduced consumption of free meat snacks for chronic dieters, whereas non-dieters were not affected by the prime. Taking note of the supermarket as the environment where most food choices are made, it would be very interesting to study if and how more implicit design elements such as natural colour and lighting schemes might also activate a focus on health (i.e., 'health goal priming'; Papies, 2016). In other words, the environment might set the stage (by inducing a health focus), on which packaging design might subsequently come to the fore and lead shoppers towards healthy food choices. Arguably, when using implicit design cues, this process is largely automatic and effortless ('Type 1' processing) whereas more explicit (textual) cues would rather involve more deliberate decision-making ('Type 2' processing; see Petit et al., 2016).

In closing this chapter, it is worth noting that recent developments in packaging technology (ranging from the usage of advanced materials to ever more sophisticated 3D printing and coating technologies), as well as virtual reality (VR) technology, will increasingly allow for realistic and ecologically valid fabrications and simulations of a wide range of packaging designs, environmental settings (e.g., supermarkets), and corresponding observations of consumer behaviours and decision-making (see Petit et al., this volume, for a review). However, this unprecedented and unlimited range of stimuli and research opportunities, all the more, calls for insights and frameworks allowing for evidence-based identification of relevant design factors and consumer behaviours. In our opinion, the embodied cognition framework as discussed in this chapter offers great promise in doing so.

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8

The Multisensory Analysis of Product Packaging Framework

Carlos Velasco and Charles Spence

Introduction: Packaging in the Context of Multisensory Marketing

It has been many years now since the visual aspects (e.g., colour, fonts, label, etc.) of product packaging were acknowledged as being critical to consumers' brand evaluations and behaviours (e.g., Crilly, Moultrie, & Clarkson, 2004; Hine, 1995; Mugge, Massink, Hultink, & Berg-Weitzel, 2014; Schoormans, den Berge, van de Laar, & van den Berg-Weitzel, 2010). Crucially, though, the majority of our everyday experiences are

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multisensory in nature (e.g., Calvert, Spence, & Stein, 2004; Obrist, Ranasinghe, & Spence, 2017; Stein, 2012). It is not only visual but more broadly auditory, olfactory, tactile/haptic, and even, on occasion, gustatory cues that guide a consumer's brand experiences, evaluations, and ultimately their behaviours (e.g., Batra, Seifert, & Brei, 2015; Schifferstein & Hekkert, 2008; Wiedmann, Labenz, Haase, & Hennigs, 2018). Just think, for a moment, of product packaging: It has a particular shape, a label (perhaps with images), colours, fonts; it must also have a specific feel, sounds may derive from the customer's interaction with the product and, in certain cases, it may even smell (be it the smell of the product itself or of its packaging). There has even been interest in packaging that is edible too (see Janjarasskul & Krochta, 2010, for a review).

The emerging field of multisensory marketing research offers a relevant and informative perspective here. The aim is to understand how and why it is that the different sensory characteristics of brand elements and marketing communications[1] guide consumers' perception, judgments, and behaviours in quite the way that they do (e.g., Hultén, 2011; Krishna, 2012; Spence, 2012a, 2016a). The rationale is that whilst brands might not need (nor necessarily be able) to stimulate *all* of the consumer's senses in a given brand element (think packaging, logo design, or sonic logo) or communication (e.g., advertisement, banner, etc.), they can nevertheless still capitalize on the best configuration of the available/manipulable sensory cues in order to deliver a given experience or brand proposition (e.g., Wiedmann, Hennigs, Klarmann, & Behrens, 2013). At the outset, though, it is important to clarify that, in this chapter, the focus is on the challenges and opportunities associated with the stimulation of the consumer's senses in the development and evaluation of product packaging.

Those working in the fields of marketing, applied psychology, and design who keep an eye on contemporary trends cannot help but have noticed the recent growth of interest in the area of multisensory design/marketing (e.g., Fenko, Schifferstein, & Hekkert, 2010; Schifferstein, 2006; Spence, 2016a; Velasco, Obrist, Petit, & Spence, 2018; Velasco, Reinoso-Carvalho, Petit, & Nijholt, 2016). Intertwined with this have

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[1] Note that packaging is considered both a key brand element but also a tool for marketing communications (see the Introductory chapter by Velasco & Spence, this volume).

been the many insights that have emerged concerning the mind of the consumer from the rapidly developing field of cognitive/consumer neuroscience (Karmarkar & Plassmann, 2017; Spence, 2016b; Spence, Velasco, & Petit, this volume). The idea that we should be designing for, or marketing to, more of the consumer's senses (than is currently the case) is one that has been promoted in recent years by a growing number of influential (sensory) marketers (e.g., Hultén, 2011, 2015; Hultén, Broweus, & van Dijk, 2009; Krishna, 2010, 2012; Lindstrom, 2005a; Neff, 2000; Vickers & Spence, 2007). In an era in which it is becoming increasingly difficult to differentiate between the ever-growing number of brands on the shelf, and where the notion of personalization/customization continues to gain traction (e.g., Dahlström & Edelman, 2013; Spence, 2017), a multisensory approach to branding offers an increasingly important opportunity for many firms (e.g., Haverkamp, 2014).

Even those interested in the area of design and emotion have found themselves drawn to the multisensory perspective, given that senses such as olfaction, touch, and taste appear to be particularly effective drivers of the consumer's emotional responses (see Norman, 2004; Spence, 2002, for a review). To summarize, researchers and practitioners working on branding, product and packaging design, store atmospherics, and experience design have all become increasingly interested in trying to stimulate the senses of the consumer in a manner that is more meaningful and effective (in terms of driving branding). The question, though, is how to do this most effectively? And, equally importantly, how to avoid overstimulation/sensory overload (e.g., Malhotra, 1984; Spence, 2002; though see also Kroeber-Riel, 1979; Sekuler & Blake, 1987). In the next section, we provide an overview of several key approaches that have been used to assess the multisensory impact of products, their packaging, and/or the experiences that they deliver. Thereafter, we introduce a novel framework for the Multisensory Analysis of Product Packaging (MAPP). These sections cover two key elements for the consideration of multisensory packaging design: (1) methods to understand the consumer's multisensory perception of packaging and (2) means to analyse and obtain creative inputs for the design of multisensory packaging.

Overview of Approaches to the Development of Effective Multisensory Packaging

In this section, we highlight some of the key ways in which researchers and marketers are increasingly starting to situate the human senses at the centre of the design process. After all, researchers and practitioners have long been interested in the different sensory properties of products, the brands that represent them, and their corresponding elements such as packaging, logos, and brand names.

Traditional Research Techniques

One of the earliest attempts to consider research and development whilst looking at the human senses as one dimension of analysis went by the name "consumer engineering" or "humaneering" (see Calkins, 1932). Consumer engineering considered subtle sensory cues in design as a means of approaching consumer preferences, with a focus on the subtle (often ignored) sensory cues, such as the influence of the feel of product packaging in the hands on consumers' product acceptance or rejection of the product. Another approach that has been rather more popular over the years involves the use of focus groups (or consumer panels) and questionnaires. Such means are used to understand and capitalize on the role of different kinds of sensory information associated with brands by explicitly asking groups of consumers what they think/feel about them (e.g., Catterall & Maclaran, 2006; Hine, 1995; Lunt, 1981; Moskowitz, Reisner, Lawlor, & Deliza, 2009; Stern, 1981).

In terms of the questionnaire-type approach, Gentile, Spiller, and Noci's (2007) study can be taken as a representative example here. These researchers conducted 2368 questionnaires in which they asked which sense was most important in relation to 12 popular brands. The results revealed broad consensus amongst the consumers who were quizzed that, for example, taste (by which they presumably meant flavour; Spence, Smith, & Auvray, 2015) was the most important sense for brands such as Gatorade and Pringles while vision was most important for Harley-Davidson motorcycles and iPod music players. One has to question,

though, how accurate introspection is in this regard. This is because other commentators/researchers have wanted to highlight the distinctive sound of the engine as being as important to Harley-Davidson's differentiation from its competitor brands as anything else (cf. Sapherstein, 1998). Meanwhile, part of the success of Pringles' likely has as much to do with the sound they make rather than their distinctive taste, if such there be (see Spence, 2009; Zampini & Spence, 2004). Meanwhile, people are mostly unable to discriminate the difference in sound quality amongst different portable music devices (see Spence & Zampini, 2006), and hence it is as much the tactile/haptic properties that are likely key differentiating features.

The Sensory Snapshot Technique

A more structured version of an introspective technique similar to those mentioned above (i.e., questionnaires, focus groups), comes from the sensory profiling, sensory audit, or sensory snapshot technique (e.g., Adank & Warell, 2008; Lindstrom, 2005b; see Fig. 8.1A). This approach involves consumers rating the extent to which each of the five traditional senses comes to mind when thinking about a given brand. It also further asks consumers to consider each sense as a function of three questions: (1) did the (sensory) impression make you feel positive or negative about the brand? (2) Was the impression distinctive? and (3) What specific related memories and emotions arise from the impression? This is undoubtedly an interesting exercise/approach. One could potentially go further by having the consumers detail what exactly it is they think that is driving their evaluation of each sensory attribute.

At the same time, however, it is also important to consider that the human senses have dramatically different representations in the cerebral cortex (what one might think of as very different amounts of "cortical real estate"; see Gallace, Ngo, Sulaitis, & Spence, 2012). Hence, they have markedly different cognitive capacities, and, as such, one might wonder whether the implicit underlying premise behind the sensory snapshot technique (namely that the senses are equally important) is not rather misleading. Nevertheless, despite its seemingly neurophysiological
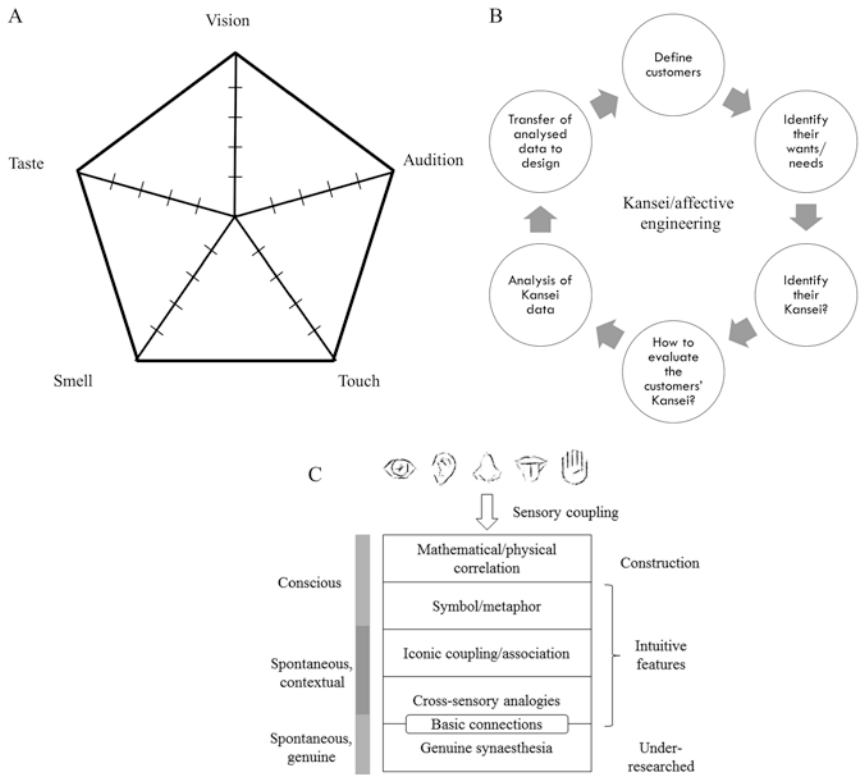
Fig. 8.1 (A) Lindstrom's (2005a, 2005b) sensory profiling or sensory snapshot technique and (B) The Kansei/affective engineering process (according to Nagamachi, 2011); (C) The key dimensions of "synesthetic design" (figure based on Haverkamp, 2015, Figs. 1 and 2)

implausibility/inaccuracy, it can still be argued that this technique does at least provide an interesting starting point for sensory analysis in that it captures (as do questionnaires) the subjective experience and value that consumers ascribe to the different senses, as they relate to a given brand. It also offers firms an initial opportunity to consider each sense (e.g., in the case of multisensory packaging design) as it relates to their brands by making consumers explicitly think about them. According to Adank and Warell (2008), there are further limitations associated with the sensory snapshot technique. For example, while measuring responses associated

with each of the senses individually, it does not do a good job in capturing the multisensory experience (how multiple sensory inputs interact). Moreover, the sensory snapshot technique only captures a temporally limited interaction or moment and, as such, it is really not appropriate when it comes to assessing longer or more complex interactions (i.e., beyond the moment consumers are asked to assess).

A different suggestion, which essentially seems to represent much the same information as in the sensory snapshot technique (though in a different format), has been put forward by Schifferstein (2006). In this case, though, participants are asked about the importance of each of the senses (e.g., "How important is it to you how a [product] feels/smells/sounds/ looks/tastes?") via 5-point Likert scales ranging from "very unimportant" to "very important", for a range of products in different categories (see also Schifferstein, Fenko, Desmet, Labbe, & Martin, 2013; Schifferstein et al., 2006; Schifferstein & Hekkert, 2011). One of the key findings to have emerged from this study was that, in general, and across numerous product categories, participants rate the importance of the senses as follows: vision > touch > smell > audition > taste. This might be able to help shed some light on differences in terms of how important (relatively) the senses are across and between product categories. However, it is rather less clear as to whether it can discriminate between products within a category (note that this criticism may also apply to the sensory snapshot technique as well).

Schifferstein and Desmet (2008) have integrated various tools that facilitate the process of designing multisensory products. For example, they suggested the use of sampling objects from standardized kits/systems (e.g., colour systems, smell kits, flavour characterizations, and so on), in order to draw attention, sample, and represent specific sensory descriptors (e.g., bright, intense, fruity). This sort of perceptual mapping approach may provide a means for people to map perceptual dimensions (e.g., curvature; a floral aroma) to specific products, categories, or their attributes (Gelici-Zeko, Lutters, ten Klooster, & Weijzen, 2013). In principle, this kind of systematic approach facilitates the evaluation of specific attributes in different senses, through concrete examples (physical or chemical stimuli), as they relate to multisensory product packaging (e.g., to the communication of specific attributes, functionalities, etc.).

Kansei/Affective Engineering

Kansei/affective engineering offers another systematic approach to the senses as key dimensions in product and packaging design. The Kansei approach capitalizes on early research by Osgood, Suci, and Tannenbaum (1957) on the semantic differential technique (SDT) (Morich, 1981). The SDT is a procedure where, by using rating scales with polar pairs of adjectives (e.g., bright-dark, light-heavy, quiet-noisy, sweet-sour), the connotative meaning of objects and concepts can be assessed. According to the SDT, through factor analysis of the different polar scales, the dimensions of potency, evaluation, and activity are identified, and objects and concepts can be mapped onto them. While Kansei engineering capitalizes on the different dimensions of connotative meaning, its primary focus is on the different dimensions of the polar scales, as they provide both sensory and emotional information about, say, consumers' associations with a product or its packaging.

Kansei engineering is a consumer-oriented methodology with its roots in Japanese engineering traditions. Specifically, the aim is to translate the mental imagery and emotional associations of consumers with a given experience into design elements that can be used in a product or brand (e.g., Nagamachi, 1989, 1995). While the Japanese term Kansei does not seem to have an exact English translation, it is said to encompass the concepts of "senses", "sensibility", "affect", "need", and "want" (see Nagamachi, 2011).

The analysis and design of products based on the Kansei approach is summarized in Fig. 8.1B (see also Schütte, Eklund, Ishihara, & Nagamachi, 2008). According to Nagamachi (2008), the process starts with a consideration of the product strategy as well as the target market. Next, Kansei words are collected (e.g., adjectives representing sensory and affective descriptors such as "beautiful", "colourful", or "tasty") and used to build a series of semantic differential scales. After that, product samples (typically 20–25 in number) in the category of interest are selected and their sensory and affective categories (e.g., colour, size, etc.), as well as their detailed sensory attributes (e.g., blue, red), are identified. Next, consumers are invited to evaluate the selected product samples in terms of the semantic differential scales of Kansei words defined earlier

(e.g., adjectives that capture sensations and affect, though only in positive form given that products do not aim to be negative; here, good-bad, becomes a rating scale of "good"). After this, the focus of the statistical analysis is on finding relationships between Kansei attributes (e.g., strong, beautiful) and design specifications (e.g., black, large) in order to obtain relevant insights for designers, which allow them to prototype.

Over the years, many products have been developed using the Kansei method. For example, the Kansei Engineering group at Linköping University, Sweden, has collaborated with various companies in different sectors to develop successful products such as a chocolate snack for Cloetta, a car interior at Volvo, and a mixer for Electrolux (see https://www.iei.liu.se/machine/kansei/products?l=en for more information). Relevant to the theme of the present chapter/volume, the Kansei approach has also been used in order to help design product packaging as well (e.g., see Barnes, Childs, Henson, & Lillford, 2008; Chen, Barnes, Childs, Henson, & Shao, 2009, for a couple of relevant examples).

Implicit Approaches and Neuroscience-Based Research

All of the approaches described so far rely on either unstructured or structured subjective assessments of various multisensory dimensions of product packaging. However, consumers are not always aware of how their senses work and contribute to their brand, or more specifically, packaging experiences (see Spence et al., in this volume). In this section, we move on to look at some of the more indirect or implicit methods that have emerged from the fields of cognitive psychology and cognitive neuroscience in recent years. What these methods have in common is an attempt to assess indirectly (i.e., without asking explicitly) how consumers associate sensory dimensions, brand attributes, and/or brand elements (see Spence, 2009).

Implicit methods include paradigms such as the Implicit Association Test (IAT) (e.g., Maison, Greenwald, & Bruin, 2004; Parise & Spence, 2012; Tijssen, Zandstra, de Graaf, & Jager, 2017), semantic priming (Calvert, Fulcher, Fulcher, Foster, & Rose, 2014; Pathak, Calvert, &

Velasco, 2017), as well as a range of psychophysiological and/or neuroimaging techniques (e.g., see Ariely & Berns, 2010; Spence et al., this volume, for reviews). It also includes approaches where researchers look at how one dimension in, say, product packaging (e.g., such as its dominant colour or shape) might influence the perception of the brand or a particular dimension of product experience (e.g., taste, Becker, van Rompay, Schifferstein, & Galetzka, 2011; Spence, 2016b, for a review of such indirect approaches).

For example, Parise and Spence (2012) conducted a series of speeded discrimination tasks (using a simplified version of the IAT) designed to assess the association between product packaging (as well as just the silhouette of certain packages) and specific brand attributes. By manipulating the mapping of stimuli to responses with which the participants had to respond to the packages and attributes, this research provided support for the notion that participants associated the packaging of Listerine mouthwash with "powerful" while associating Scope packaging with "gentle" (cf. Hine, 1995).

Meanwhile, Velasco, Salgado-Montejo, Marmolejo-Ramos, and Spence (2014) used a forced-choice task in order to assess the associations between packaging and font curvature, as well as brand name and sounds, on the one hand, with specific tastes (sweet and sour), on the other. Participants more often classified rounder packages, fonts, names (e.g., "Blum" vs. "Clax"), and an associated lower pitch sound with sweetness and their angular and higher pitch counterparts with sourness (see also Spence, 2011, 2012b). The idea is that such implicit techniques can be used to assess the strength of association between various elements of visual (or auditory, olfactory, tactile, etc.) packaging design, as well as between these elements and specific brand attributes, in order to guide design choices (this parallels with the classic literature on the meaning of "symbols", e.g., Levy, 1959).

Implicit methods may even build on explicit methods, often through the inclusion of subtle modifications of more traditional methods. For example, Durgee, O'Connor, and Veryzer (1996) had small groups of consumers engage in creative writing, in relation to packaging, as a means of seeing whether consumers would be able to decode the meaning of packaging. Their results suggested that people are surprisingly good at decoding designers' meaning or intentions. Moreover, it appears that,

when people do it, they relied on what they saw first. Durgee et al. suggested that designers and consumers may be communicating/decoding through the product packaging at a subconscious level. Perhaps also relevant here is Zaltman's "metaphor elicitation technique", wherein participants are asked to collect pictures in relation to a given topic, and these are then used to decode both implicit and explicit meanings associated with the topic (see Howes, 2005; Zaltman, 1996, 2003).

Interim Summary

Multiple research approaches have been used to assess how different sensory properties of packages and products influence consumer perceptions. In the preceding section, we presented a few questionnaire-based approaches (that are more or less structured) and also more implicit methodological approaches to packaging design, such as Kansei engineering. The latter not only relates product/packaging dimensions to sensations and emotions but, in so doing, provides the basis from which to derive practical design guidelines.

It can be argued that these different approaches may provide complementary, interesting insights as to the role that multisensory packaging cues may exert on consumers' perception. It is worth pointing out that it is difficult to assess which approach may lead to successful packaging. That is, the different approaches measure different elements of consumers' experiences around the senses and brands may have different aims in mind when studying the contribution of different kinds of sensory information in a product's packaging (e.g., convey a brand attribute, increase sales, enhance healthy eating). On the other hand, it is worth noting that it is common for both marketers and designers to think about the contribution of individual senses to the consumer experience, rather than the interrelations between them (e.g., Lindstrom, 2005a, 2005b). Based on these observations, we present MAPP, a new analysis approach that considers different kinds of sensory cues as well as their interrelationships and outlines a number of key questions that brand managers, marketers, and designers ought to be asking when designing packages or other brand-related sensory touch points. Whilst this approach considers the

contribution of each of the senses individually as well, the primary focus is on trying to understand the interrelations and the principles that guide such relationships and interactions between the senses. Moreover, this approach capitalizes on a number of the different methods to study the human senses presented above.

A Framework for the Multisensory Analysis of Product Packaging

The MAPP approach builds on previous work on both visual (e.g., by Crilly et al., 2004) and multisensory design (e.g., Haverkamp, 2014; Merter, 2017; Schifferstein & Desmet, 2008; Schifferstein & Spence, 2008; Velasco, Reinoso-Carvalho, et al., 2016), suggesting that the visual and, more generally, the multisensory aspects of brands and brand elements (e.g., a product's packaging) can influence consumer's perceptions and judgments about brands. It also acknowledges that different sensory cues interact with each other (e.g., the colour of the packaging may influence how the consumer experiences the smell of the packaging, the sound may influence the feel, etc.). Besides, it also emphasizes that such interactions take place as a result of the internalization of the statistical regularities of the environment (e.g., what happens in the marketplace) and also symbolic, iconic (or metaphorical), and more idiosyncratic or individual-based dimensions (these are what Haverkamp, 2001, 2014, calls synaesthetic[2]; see Fig. 8.1C; though in reality it seems to refer more to the emerging concept of crossmodal correspondences; see also Spence, 2011, 2012b).

Based on the above-mentioned work, the MAPP framework is introduced, which might well be applied to multisensory brand concept analysis more generally (see Fig. 8.2). Whilst guidelines for multisensory design have been proposed elsewhere (e.g., Adank & Warell, 2008; Dal

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[2] Whilst Haverkamp (2014) has called these synaesthetic relations, the term itself is misleading. Note that synaesthesia is a very specific condition that is experienced by only a few people, where a sensory input, such as a colour, leads to the experience of a concurrent sensation, often in a different sensory modality (e.g., hearing). For this reason, here we refer to these properties as crossmodal correspondences instead (see Spence, 2011, 2015). Note that crossmodal correspondences affect everyone, and hence are more useful as a basis for designing multisensory packaging that speaks to people (i.e., to the masses).
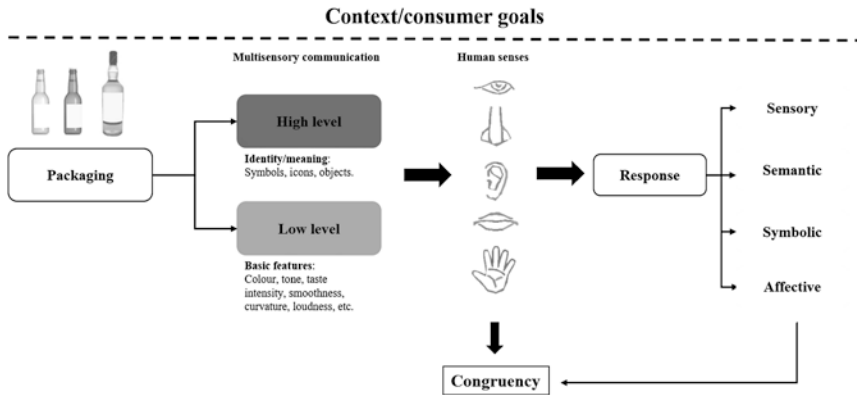
Fig. 8.2 The MAPP Framework. A product's packaging involves multiple low- and high-level attributes (note that Thompson, 2016, talks of high-level as conceptual attributes) that can be used to communicate to the senses. Such information may or may not be congruent (based on different response types), which, in turn, may reinforce or not the communication of a given meaning (e.g., a brand attribute such as premiumness or, say, an affective impression)

Palù, De Giorgi, Lerma, & Buiatti, 2019; Schifferstein & Desmet, 2008; Velasco, Reinoso-Carvalho, et al., 2016), here we focus primarily on the thinking process through which one can approach multisensory packaging design. This approach is based on the fact that there are different kinds of sensory cues and different mechanisms guiding their interaction. Moreover, it is based on the idea that there is a temporal component to our multisensory packaging and brand experiences (see also Adank & Warell, 2008). As such, the need to consider, analyse, and design for the different senses is highlighted in multiple moments of the consumer's interaction with a given packaging design or brand (e.g., Adank & Warell, 2008; Schifferstein, 2006).

On the Different Sensory Cues in a Product's Packaging: Low- and High-Level Attributes and the Responses They Evoke

Every brand element and touchpoint (e.g., packaging, ads, websites, logos, slogans, etc.) involves a number of low- and high-level stimulus

attributes (see Table 8.1). Low-level attributes here refer to what Stevens (1957) called prothetic and metathetic continua (see also Marks, 1978). Prothetic refers to those stimulus characteristics that can be expressed in terms of magnitude (i.e., more or less) such as loudness and brightness (e.g., of a colour). Metathetic, on the other hand, refers to a more qualitative organization such as in terms of colour hue where changes can lead to qualitatively different perceptions (such as red, blue, green, yellow, etc.). High-level attributes refer to more complex sensations based on objects (e.g., images, symbols, music) that integrated multiple low-level features. These may build from low-level characteristics (e.g., pitch, tempo, timbre, be they unisensory or multisensory) but result in more

Table 8.1 Low- and high-level attributes in each sensory modality, which may be considered by MAPP (cf. Kotler, 1974)

Senses	Low level	High level
👁	Colour (hue, saturation, brightness), spatial structure (spatial frequency, line orientation), object shape (golden ratio, symmetry, complexity, contour curvature, prototypically), spatial composition (balance)	
👂	Loudness, pitch, and timbre.	
✋	Temperature, weight, texture, hardness/compressibility	Images, logos, text, labels, packaging shape, video/story telling, music, soundscapes, signature sounds of objects and brands, objects, etc.
👄	Sweet, sour, bitter, salty, umami (others?)	
👃	Potentially aromas (e.g., fruity, floral) or sensory discriminative and hedonic characteristics (which also apply to other senses).	

Note that basic sensory features appear as low-level attributes but can also, on occasion, become high-level attributes as well/instead (think only of the distinctive purple hue of Cadbury's Dairy Milk chocolate packaging)

specific, perhaps concrete, identities and meanings (Velasco, Woods, Petit, Cheok, & Spence, 2016; e.g., as a package's prototypical sound or a brand's sonic logo, see Table 8.1). Whilst high-level features involve low-level attributes, the former derive from the integration of the latter into a sort of perceptual grouping or Gestalt (cf. Wagemans, 2015). It is important to mention here that there might be compatibility effects within and between low- and high-level features as a function of the different responses that they evoke, as we see below.

In order to illustrate the difference between low- and high-level attributes, think only about the distinctive Coke bottle. The bottle's image mould (considered a high-level attribute) is so strongly associated with the brand identity (through repeated co-exposure over the last century) that, even without any brand-related information, it may already convey the meaning/identity of Coke (see Prince, 1994; Spence & Gallace, 2011; see also http://www.coca-colacompany.com/timeline-the-evolution-of-the-coca-cola-bottle). Yet, one can still modify low-level features of the bottle (e.g., make the contour slightly rounder, the texture rough, make the colour brighter, or perhaps change the density of the material so that the bottle's opening sound is different from the prototypical sound found in the product category) to influence consumers' evaluations and responses to the brand (see Spence & Wang, 2015, for a review). Indeed, one might ask what would happen if the curvaceousness of the silhouette were caricatured to make it even more rounded? Would the drink taste even sweeter?

Based on the work of Crilly et al. (2004), it can be argued that the value of low- and high-level features of product packaging can be described by what can be referred to as the 3s model, that involves the sensory, semantic, and symbolic levels (see also Thomson, 2016). The sensory level describes the responses that may arise from sensory stimuli that do not necessarily have any obvious semantic meaning attached to them (e.g., a novel packaging shape, texture, or sound). The semantic level describes the specific identities or meanings that the sensory cues convey (e.g., a specific function or brand quality, think of a red strawberry on a products' packaging, signalling the taste of a sweet strawberry or attributes such as aroma, naturalness, etc.; or, potentially, a fragrance that can be classed as masculine or feminine, e.g., Krishna, Elder, &

Caldara, 2010; Thomson, 2016). The symbolic level refers to signature sensory cues (e.g., a logo, a typeface) that function as marks for specific concepts and which perhaps, by convention, stand and represent something else (e.g., think of the cartoon-like silhouette of Coke's bottle often displayed in the side of cans). And, independent of whether the value of a given multisensory packaging design is driven by the sensory, semantic, or symbolic cues, the consumer will also colour their evaluations with affect, that is, a specific valence (more or less positive/negative/neutral) and arousal (e.g., Velasco et al., 2016c).

Consumer goals (Karnal, Machiels, Orth, & Mai, 2016) can guide the effect of both low- and high-level sensory cues on people's evaluation and behaviour. So, for example, if a consumer is looking for a quality product (i.e., that is their consumer goal), their search might be guided by features that have co-occurred (e.g., perhaps the classic image it uses on the label) with such a product or quality and/or low- and high-level cues that represent such a concept (e.g., symmetrical objects might represent "better quality" from the point of view of evolutionary fitness, Little, 2014; see also Bajaj & Bond, 2018, for brand element design examples and their implications for brand perception). Of course, context can be critical here inasmuch as the meaning of many sensory features likely varies as a function of situation type and culture (just think of colour and the multiple meanings it can take, e.g., Wan, Velasco, et al., 2014, Wan, Wood, et al., 2014; see also Machiels & Orth, in this volume).

Multisensory Packaging Congruency

Both low- and high-level attributes are perceived by means of sensory cues. Importantly, the (in)congruence between (or appropriateness of) cues can influence how noticeable given brand attribute is to the consumer. This means that if two sensory features are congruent and embodied in a product's packaging, the consumers' perception of the brand attribute may be enhanced (though, as we see later, this is not necessarily always the case). This alignment, or congruency, between various different sensory attributes can be assessed by the extent to which they correspond with each other in terms of the crossmodal correspondences

between their features/attributes (feature compatibility) and/or semantic congruence (based on identity, meaning, function, and symbol, e.g., quality, authenticity, see Krishna et al., 2010; Velasco, Reinoso-Carvalho, et al., 2016; Zellner, McGarry, Mattern-McClory, & Abreu, 2008).

In other words, different sensory attributes might facilitate the communication of a given impression or experience when (1) the corresponding low- and high-level features are compatible in terms of sensory (e.g., saturation, pitch), semantic (e.g., product quality, premiumness), symbolic (e.g., the Coke contour bottle, "the Snapple pop"), and/or affective responses (e.g., valence and intensity). With these ideas in mind, it is important to understand the compatibility of multisensory attributes when designing product packaging. For example, it should be considered how congruent versus incongruent multisensory information can combine in different ways. The notion of multiplicative (1 + 1 = 3, see Fig. 8.3A) and sub-additive (1 + 1 = 0.5, see Fig. 8.3B) multisensory interactions (between individually weakly effective cues) has also been considered when it comes to enhancing specific attributes. This, in other words, may mean that certain combinations of cues may enhance/diminish a given outcome, such as how well a brand attribute is perceived or how much consumers like a given product.
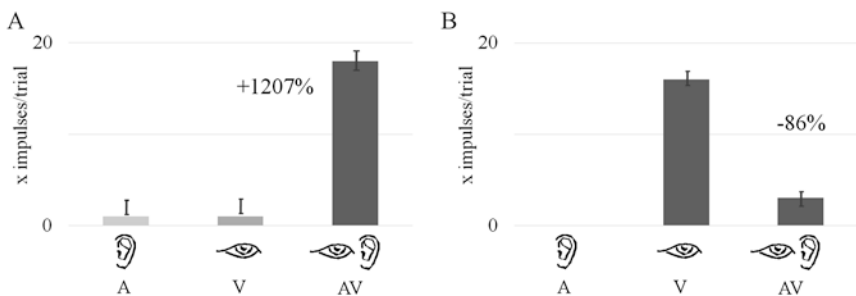
Fig. 8.3 (A) Schematic outlining the idea of multiplicative/super-additive and (B) sub-additive multisensory interactions. Such interactions have been demonstrated at the neurophysiological level (i.e., at the level of single-cell recording, and occasionally, in neuroimaging data). It is, though, an intriguing question as to how often such effects might also be seen at the level of consumer behaviour (e.g., when interacting with product packaging)

Littel and Orth (2013) conducted a study designed to assess the effects of semantic congruency, in terms of the following attributes: "excitement", "sophistication", and "competence" of packaging visual and haptic information on brand evaluations. Their results revealed that the evaluations of competence and sophistication were higher in the congruent than in the incongruent conditions (see also Lwin, Morrin, & Krishna, 2010). Importantly, though, the brand was also perceived as less exciting in the congruent than in the incongruent condition. Overall, though, their participants rated the brand as more attractive and expected its average price to be higher in the congruent relative to the incongruent condition.

The more general question here, though, is perhaps whether the packaging designer should always be aiming for multisensory congruency or not. Congruency leads to increased processing fluency (i.e., the ease with which the packaging is processed perceptually) which, in turn, may lead to increased liking (e.g., Winkielman, Ziembowicz, & Nowak, 2015).[3] However, whilst congruency might facilitate the processing of a brand or its packaging (given the consistency of the message transmitted across the different sensory channels), it is not always clear whether it is the best strategy (see also Sundar & Noseworthy, 2016, for brand-specific congruency effects). For instance, deliberately going against the crossmodal conventions of the category (e.g., think here only of "cheese and onion" and green packaging colour) "congruent" (e.g., "cheese and onion" and blue colour) flavour/colour associations in, say crisps packaging (as done by the Walkers brand here in the UK), might impair the consumer's ability to easily identify the flavour of a product. However, at the same time it might also surprise consumers (and/or attract their attention), at least initially, whilst the new mapping is internalized (e.g., Piqueras-Fiszman & Spence, 2012; Velasco, Michel, et al., 2016). Incongruency in packaging may also prevent automatic processing and encourage more elaborate

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[3] The concept of affordances, which relates to how sensory cues in an object guide action, is also key to processing fluency. Motor fluency, that is, the extent to which the package's form design facilitates or makes it difficult for a consumer to pick up the product and hold it may influence implicit liking of such a product (see Spence in this volume, for a review). This is also important when it comes to usability, given that the way a product is experienced also relates to the extent to which it's package is "usable" for a given consumer purpose (e.g., de la Fuente, Gustafson, Twomey, & Bix, 2015).

thinking and consideration (Celay & Remaud, 2018; Fenko, de Vries, & van Rompay, 2018; Scott, 1994). For instance, visual metaphors may be processed automatically or become a sophisticated form of visual rhetoric (Scott, 1994) or semiotic code that requires logical decoding (Celhay & Remaud, 2018; Fenko et al., 2018). Note though, that it is unclear whether the aforementioned effects of "going against the conventions of the category" only occur during the first interactions with the product or else are long-lasting.

Just as for other approaches to multisensory analysis and brand design (e.g., Haverkamp, 2014, 2015), based on MAPP, the brand manager and/or packaging designer might want to consider the following questions:

- What is the key strategic aim of product packaging? Is it to capture the attention of the consumer? Is it to become a representative prototype of a given category? Is the idea to differentiate enough whilst communicating relevant points of parity or difference relative to category members?
- What brand attribute(s) do one want to convey (e.g., quality, fresh, indulging) in the packaging of a given product (e.g., a yoghurt)? What senses dominate the product or product category? (This is something that can perhaps be assessed via the sensory snapshot technique.)
- What high- and low-level attributes convey those different properties most effectively?
- Are the different high-level sensory elements (e.g., the image of a ripe strawberry) in the packaging or brand conveying the brand attribute adequately (see Piqueras-Fiszman, Velasco, Salgado-Montejo, & Spence, 2013)? Given the specificity of the content of high-level attributes, it is likely that it can help disambiguate the identity of a given product.
- Do the different low-level sensory elements convey the attribute (e.g., the hue of the strawberry image on the packaging, the level of balance or symmetry of the design elements, Velasco, Woods, et al., 2016)?
- Do consumers interpret different low- and high-level packaging design elements (see Table 8.1) in an integrated manner?

- Are different cues perceived as congruent by the consumer? Does the product experience relate to what the packaging leads the consumer to expect? Does the sound of the packaging (and/or the sound of the brand name; see more in Roche, Shrum, & Lawrey, 2015) reflect how it looks?

Sensory Dominance and Overload in Packaging

Whilst multisensory packaging analysis and design aims to understand how to engage different senses in a product's packaging, the packaging analyst and/or designer should be aware of the potential dangers of both sensory dominance and sensory overload.[4] Sensory dominance here refers to the idea that the importance of different senses is relative to both product types and moments of interaction with the product (Fenko et al., 2010; Schifferstein et al., 2006). Research from Fenko et al. (2010) suggests that vision is possibly most important when buying a new product. However, after a month and then a year, touch and then touch and audition become more critical, respectively (see also Schifferstein et al., 2013).

The notion of sensory overload refers to the idea that too much multisensory stimulation might exert a negative influence over consumers (Lindstrom, 2005b; Malhotra, 1984; Spence, 2002). Think, for example, of noisy packaging that also involves salient textures and cluttered visual cues that make its processing/understanding difficult. Here it should also be borne in mind that different consumer groups may exhibit different patterns of sensory dominance (such as those pertaining to different age groups; cf. Nava & Pavani, 2013) and/or express a different preference in terms of the level of multisensory stimulation.

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[4] Something interesting to reflect on here is the extent to which overload might reflect an inverted U-shaped reaction to the intensity with which specific attributes (e.g., too much brightness or noise in a packaging) are used (see Kroeber-Riel, 1979).

Multisensory Analysis of Product Packaging Steps and Hypothetical Case Study

Multisensory Analysis of Product Packaging Steps

In order to facilitate the use of MAPP, the analyst (e.g., marketer, packaging designer) may want to consider the following steps (see Fig. 8.4):

1. *Brand meaning(s)*. The aim here is to establish the brand meaning(s) that one wants to convey (e.g., whether the product is "premium"; see Meyers, 1981; Velasco & Spence, this volume). Here, it is assumed that the resulting packaging, after following the steps outlined in the MAPP framework, will enhance the likelihood that the target consumer perceives the intended meaning correctly. However, it is key to consider what other meanings (e.g., "eco-friendly", "tasty") the consumers may want/aspire to, or look for, as they may sensitize consumers to specific sensory signals that represent such meanings (those which match the attribute they look for).
2. *Moments of experience*. Identify the key moments of experience with the product and the likely or intended relative involvement of each sense at each stage. Identify the extent to which the different senses dominate the product or category in each of these moments (here one might capitalize on the sensory snapshot technique and apply it in each moment or else use other research approaches, see Fig. 8.1).
3. *Low- and high-level attributes in different sensory modalities*. Identify the specific low- and high-level features that convey the brand attribute in each of the senses as a function of the sensory, semantic, and symbolic levels. That is, one might want to assess the 3s (sensory, semantic, and symbolic levels) in relation to each attribute, as well as the affective responses towards them.

Fig. 8.4 Schematic timeline of steps in MAPP framework

4. *Assess congruency/prototype*. The first thing to do here is to identify/ decide whether the aim is congruency or surprise (Velasco, Michel, et al., 2016). Following that, it is possible to assess the extent to which such low- and high-level features are compatible, given the brand attributes that are to be conveyed. This step might either be based on the available research (e.g., research on what colours best convey a taste property if that has been deemed a key brand attribute) or on new consumer research. Given that the selected cues (in Step 3) may be aligned as a function of a given meaning (e.g., premium), semantic congruency is initially guaranteed. However, while it may be expected that, as a result, they do not result in sub-additive effects, they may not necessarily result in enhanced effects either. Perhaps this might be furthered by considering the extent to which the low-level and high-level attributes are compatible. One may, for instance, ask questions, based on the theory of crossmodal correspondences, such as the following: (1) Do the different features co-occur naturally in the market-place or the environment? (2) Do they share a common affective valence?

As we see, if the aim is to design novel or update/modify existing packaging, this step also involves the process of considering different combinations, based on congruency, of the sensory cues identified in Step 3, and embodying them in a series of packaging prototypes. These, in turn, can be tested in order to evaluate the best option as a function of a brand's attribute(s).

Example: Premium Beer Packaging

The MAPP framework may be used to either analyse an existing brand's packaging and/or to determine the parameters for a given novel packaging design. Based on the chapter by Velasco and Spence on multisensory premiumness (this volume), one may follow the MAPP framework in order to determine the specific characteristics of, for example, premium beer packaging:

1. *Brand attributes*: The intended attribute here is premiumness. Consumers of the beer premium category might also look for more specific attributes such as "unusual", "complex", and "quality" (e.g., Cardello et al., 2016).

2. *Moments of experience*: Based on research by Salgado-Montejo, Velasco, Ariza, Salgado, and Moreno (2017) (see also Louw & Kimber, 2011), key moments of experience with a product's packaging might involve: navigation (product search), purchase (expectations and purchase decision), use/consume (packaging opening and product experience),[5] and discard (packaging disposal). At this point, it is key to consider what is the dominance of each sensory modality in each of these steps. How can different attributes identified in Step 3 help consumers navigate their experience with the product, whilst conveying the intended brand attribute? Whilst these questions likely need to be answered with research (unless the brand has established their moments of experience and sensory dominance), once they are established, they can be reused for further development.

3. *Specifying low- and high-level attributes in different sensory modalities*:

   (a) Low-level: darker colours, more symmetrical, vertical, louder, names with late-acquired phonemes, heavier, harder, more complex smell.
   (b) High-level: visual art (e.g., Lee, Chen, & Wang, 2015), product congruent music (Reinoso-Carvalho, Velasco, van Ee, Leboeuf, & Spence, 2016), in a bottle instead of can (Barnett, Velasco, & Spence, 2016).

4. *Assess congruency/prototype*: Based on the previous steps, it is possible to provide packaging designers with some initial input for the process of packaging design (based on Step 3). Ideally, packaging designers should develop multiple packaging prototypes (here, it is possible to capitalize on technologies such as virtual reality, see Petit, Velasco, & Spence, this volume) that embody different configurations of the low-

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[5] In the context of foods/drinks, whether the product is consumed from the packaging or not might be a key difference to consider.

and high-level attributes identified. For example, they may develop options such as the following:

(a) a bottle made from a hard material, with a black foregrounded label that has a vertical symbol in the centre of the packaging (see Van Rompay & Ferris, this volume);
(b) a bottle that is heavier than the average product packaging in the category whose label involves visual art; and
(c) a bottle whose opening sound is louder (though not distracting; see Horovitz, 2010; Spence & Wang, this volume) than the typical product in the category, with a symmetrical label with dark colours.

Conclusions

In this chapter, we have considered multiple perspectives on the design and analysis of multisensory product packaging. We have presented a short overview of research approaches to multisensory design, including traditional research techniques (e.g., surveys), as well as the sensory snapshot technique, Kansei/affective engineering, and more implicit research methods. The latter build on our growing understanding that the senses are not accessed individually, even though that is how it may feel. Note that these techniques do not necessarily conflict with each other but instead might be used at various stages of the design process. Ultimately, they can be seen as providing complementary information/insights about how sensory information is interpreted by the consumer.

We have also introduced a framework for the MAPP. In line with previous frameworks (e.g., Haverkamp, 2014; though see Spence, 2015), MAPP reconsiders the questions that marketers may well ask about packaging and branding in that it emphasizes the interactions between the senses. These questions probe the extent to which, say, a colour conveys a brand meaning but also whether such colour interacts with the sound of the packaging opening in conveying such meaning. In other words, questions are directed towards the individual and interaction effects of the different aspects of a product's packaging.

MAPP considers the different mechanisms by which low- and high-level attributes relate to each other and provides a step-by-step process with which to approach multisensory packaging. It considers multisensory communication in packaging, and other brand elements, as involving both low-level and high-level features (see Table 8.1). Moreover, MAPP indicates that in order to assess the extent to which an attribute is conveyed via multiple sensory cues, designers should consider different levels of congruency between both low- and high-level attributes. The MAPP framework that has been outlined here serves as a thinking process for those interested in differentiating the packages of their products, as well as the corresponding brands, through multiple, integrated, sensory characteristics.

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Influencing Healthy Food Choice through Multisensory Packaging Design

Anna Fenko

Introduction

Despite the vast public policy efforts to promote the consumption of healthy foods and the public's growing concern with weight management, the proportion of overweight individuals continues to rise (Kopelman, 2007). The World Health Organization has identified effective nutritional labelling as an essential part of its global strategy on diet and health (see World Health Organization, 2014). Over the last decade, the number of products with front-of-pack health labelling has increased substantially and appears to be growing strongly (Bonsmann, Celemín, & Grunert, 2010; Lobstein & Davies, 2009).

However, while shopping for food, consumers tend to ignore health labels due to a lack of time, knowledge, and/or awareness (Grunert & Wills, 2007; Grunert, Wills, & Fernández-Celemín, 2010). According to

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Schor, Maniscalco, Tuttle, Alligood, and Kapsak (2010), only 10% of Americans report looking for a health label on food packaging. An experimental study conducted on 400 shoppers demonstrated that various nutrition labels failed to influence their food choices (Borgmeier & Westenhoefer, 2009). Meanwhile, a randomized controlled trial in 25 worksite cafeterias in the Netherlands investigated the influence of labelling foods with the 'Healthy (smart) choice' nutrition label familiar to Dutch consumers. No intervention effects were observed on sales of sandwiches, soups, snacks, fruit, and salads (Vyth et al., 2011). Another field study, this time conducted in a Dutch cinema, showed no effects of caloric Guideline Daily Amount (GDA) labelling on soft drink intake (Vermeer et al., 2011).

When walking into a grocery store, consumers are confronted with multiple informational and sensory stimuli all competing for their attention, including advertising boards, product packages, ambient stimuli such as music and scents, and the persuasive store design (Fiegel, Meullenet, Harrington, Humble, & Seo, 2014). Due to their limited cognitive abilities, consumers tend to focus their attention on more important product characteristics, including expected taste/flavour, price, brand, and convenience (Szanyi, 2010).

Store visitors can easily be distracted from their initial goals and persuaded by multisensory cues to buy products without necessarily considering their health benefits (Poehlman, Dhar, & Bargh, 2016). Purchase decisions often rely on multisensory cues, such as packaging design (Spence, 2016) and store environment (Spence et al., 2014). Moreover, the store environment can influence the health expectations of food products induced by package design. For instance, van Rompay, Deterink, and Fenko (2016) demonstrated that consumers are more affected by the 'healthy' packaging design in a discount supermarket than in an organic food store.

Current theoretical conceptualizations categorize different factors that influence consumer food choice. For instance, Lähteenmäki (2013) groups all factors influencing consumer choice into claim-related factors (e.g., benefit and familiarity), product-related factors (e.g., perceived healthiness of a product category), and consumer-related factors (e.g., attitudes and needs). Grunert (2002) identify the main factors as consumers' nutrition knowledge, understanding of nutrition information,

and attention to health labels in store. Köster and Mojet (2007) stress that the understanding of food choice behaviour should incorporate knowledge of perception, learning and memory, motivation and emotion, decision-making, cognition, and social behaviour.

I propose to look at healthy food choice using the theoretical framework of multisensory product experience (Hekkert & Schifferstein, 2008; Schifferstein & Spence, 2008). From this perspective, food choice can be described as a complex decision-making process that is influenced by four separate but interrelated factors (see Fig. 9.1):

1. product characteristics (e.g., product category and product's sensory properties);
2. sensory and informational packaging cues (e.g., colour, material, shape, brand names, and food labels);
3. store environment (e.g., store design, social and ambient cues); and
4. consumer characteristics, including taste preferences, health motivation, nutrition knowledge, and current psychophysiological state (e.g., appetite, time constraints, or fatigue).
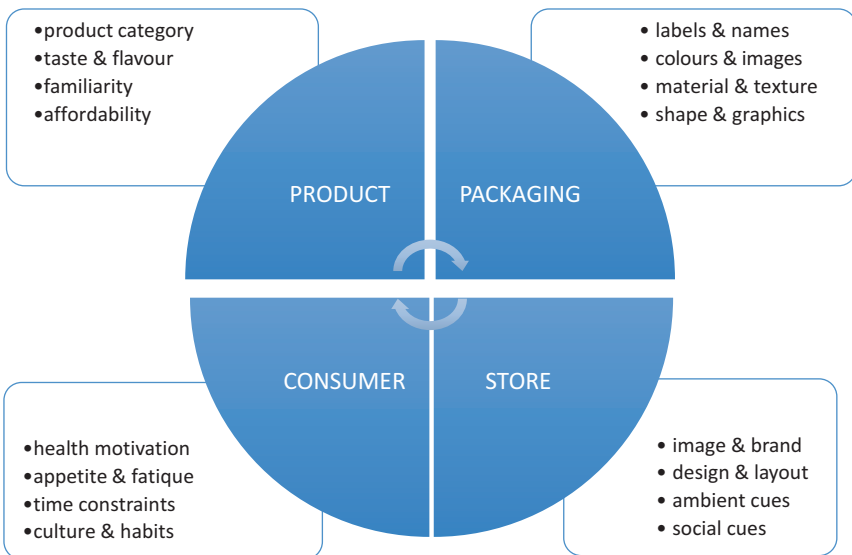

Fig. 9.1 Factors influencing food choice

The objective of this chapter is to summarize the current research into the effects of sensory packaging cues (including such factors as colour, material, shape, and sound) and informational cues (e.g., health and organic labels) on consumers' taste expectations, hedonic experiences, and food choices. The chapter also addresses the interactions between informational and sensory cues and the moderating role of consumer characteristics in processing those cues. The conclusions aim at developing practical recommendations for health authorities, food manufacturers, and packaging designers on the use of multisensory packaging cues in promoting healthy food choice.

Challenges in Promoting Healthy Food Choice

The current strategy of communicating the health benefits of food by using nutrition information and health labels relies mostly on systematic information processing and careful elaboration of persuasive messages (Lähteenmäki, 2013; Petty & Cacioppo, 1986). However, recent studies suggest that consumer food choice is often guided by heuristic information processing, which requires less time and cognitive resources than systematic processing (Chaiken & Maheswaran, 1994; Kahneman & Frederick, 2002; Sanjari, Jahn, & Boztug, 2017).

People tend to categorize food into pre-existing categories, such as 'snacks' or 'healthy food' (Hoch, 2002). According to Oakes (2006), the consumer's health expectations concerning a product are strongly influenced by the product category. Interestingly, these expectations are often inconsistent with reality. For example, consumers eating at a fast food restaurant perceived as 'healthy' (such as Subway) were more likely to underestimate the calorie content of their fast food than the consumers eating at a fast food restaurant that they perceived as 'unhealthy' (such as McDonald's; Chandon & Wansink, 2007).

One of the well-documented heuristics in food choice was defined as the 'unhealthy = tasty intuition' (Raghunathan, Naylor, & Hoyer, 2006). When information about the healthiness of food items is provided, the less healthy the item is portrayed to be, the better is its inferred taste, and the more it is enjoyed during actual consumption. The association

between the concepts of 'unhealthy' and 'tasty' operates at an implicit level. Emphasizing product healthiness may imply a negative impact on its taste, naturalness, and convenience (Brunner, van der Horst, & Siegrist, 2010; Lähteenmäki et al., 2010). For instance, Liem, Toraman Aydin, and Zandstra (2012) demonstrated that health labels informing consumers of a reduction in salt negatively affected not only consumers' taste expectations but also their actual rating of the taste of the soup itself. Food choice is primarily made on the basis of taste liking (Lappalainen, Kearney, & Gibney, 1998; Steptoe, Pollard, & Wardle, 1995). Therefore, by negatively affecting taste expectations and evaluation, health claims can actually dissuade consumers from making healthy food choice.

Some data indicate that 'unhealthy = tasty' intuition is not a universal phenomenon. In France, for instance, unhealthy food is associated with bad taste, while healthy food is linked to tastiness (Werle, Trendel, & Ardito, 2013). The effects of health labels on taste evaluations also differ between product categories. Research shows that health labels are more accepted on products that already possess a healthy image (Bech-Larsen & Grunert, 2003; Dean et al., 2007; Siegrist, Stampfli, & Kastenholz, 2008), while a health label displayed on the package of an unhealthy product (potato chips) negatively influences product evaluation (Bialkova, Sasse, & Fenko, 2016). However, Fenko (2016) found the effect of unhealthy = tasty intuition for a healthy product but not for unhealthy product. The latter study looked into the effects of the traffic light labels on taste expectations of a salad (a healthy product) and spring rolls (an unhealthy product) (see Fig. 9.2). A healthy traffic light label decreased taste expectations of a salad as compared to an unhealthy label, while the effect of a label was not significant for spring rolls. These results can be explained by the colour similarities between the 'unhealthy' traffic light label and the spring rolls' packaging colour, which made the label less salient. Therefore, in studying the effects of food labels, it is important to consider them not only in relation to the product category but also in relation to packaging design.

Another important factor contributing to unhealthy food choice is the misguided belief about the relationship between a meal's healthiness and its impact on weight gain. Because people tend to believe that healthier meals have fewer calories than hedonic meals, adding elements that make

A. Salad with a healthy traffic light label

B. Spring rolls with a healthy traffic light label

C. Salad with unhealthy traffic light label

D. Spring rolls with unhealthy traffic light label

Fig. 9.2 Packages of salad (A, C) and spring rolls (B, D) with healthy (A, B) and unhealthy (C, D) traffic light labels (Fenko, 2016)

the meal seem healthier can lower its perceived calorie content. Chernev and Gal (2010) showed that adding a healthy ingredient can lower the perceived calorie content of the combined meal even when the actual number of calories has increased. For example, people believe that a meal comprising a hamburger and a green salad has 500 calories even though they believe the hamburger alone has 600 calories when they evaluate it separately. Similarly, an image of healthy foods (e.g., vegetables) on a package of a non-healthy product (e.g., mayonnaise) might also suggest to consumers that the product has fewer calories.

Taken together, recent studies suggest that emphasizing product healthiness is not always beneficial for promoting healthy food choice. However, food labels remain the main tool as far as informing consumers about the health benefits of foods are concerned. In the next section, we summarize the current studies on the effects of food labels on consumer purchase decisions.

Food Labels

When shopping for food, consumers face multiple products differentiated by various attributes and claims communicated by health and quality labels, organic and fair trade logos, as well as natural and animal welfare, and many other labels (e.g., Grunert & Wills, 2007; Sirieix, Delanchy, Remaud, Zepeda, & Gurviez, 2013). The sheer number of food labels that have been introduced has been increasing steadily, awarded by groups of manufacturers, retailers, regional and national agencies, the EU authorities, as well as other organizations (Storcksdieck genannt Bonsmann, Fernandez Celemin, & Grunert, 2010).

Food labels can help consumers evaluate products before buying. However, consumers are often sceptical about the truthfulness of the information presented on labels and perceive some of them to be misleading (Chan, Patch, & Williams, 2005; Hamilton, Knox, Hill, & Parr, 2000). Consumers are more sceptical about claims made by manufacturers (Philipsen & Andersen, 1998) compared to claims approved by an independent body, such as public authorities and NGOs (Moussa & Touzani, 2008). However, consumers find it difficult to work out what

kinds of organizations are providing assurance and how well such schemes can work in practice (Eden, Bear, & Walker, 2008).

Health Labels

Given the potential role of food labels in promoting healthy diet, considerable research has assessed the impact of health labels on consumer behaviour (see Lähteenmäki, 2013; Van Kleef & Dagevos, 2015, for reviews). In most studies, health labels increased perceived healthiness, but the impact was relatively small (Lähteenmäki et al., 2010; Saba et al., 2010; van Trijp & van der Lans, 2007). Studies performed in a laboratory (Temple, Johnson, Recupero, & Suders, 2010) and in restaurant settings (Roberto, Larsen, Agnew, Baik, & Brownell, 2010) have shown that adding calorie labels to menus decreased the amount of calories consumed. However, another field study performed in a student cafeteria revealed that nutrition labels did not have a positive effect on food choices (Aaron, Evans, & Mela, 1995). Meanwhile, Fenko and Faasen (2014) looked into the effects of health labels on the choice of healthy or unhealthy menu items in a restaurant setting. Health labels displayed next to the menu items did not affect consumer choice. Other studies indicated that those foods labelled as 'low fat' or 'low calorie' may promote the consumption of large food portions (McCann et al., 2013).

Several eye-tracking studies have looked into the cognitive mechanisms that might mediate the effect of health labels on food choice. For instance, in a choice experiment combined with eye tracking (Bialkova et al., 2014), consumers had to choose the healthiest product or their preferred product. A health goal resulted in longer and more frequent fixations on health labels as compared to a preference goal. Furthermore, the product fixated on most had the highest likelihood of being chosen. This study suggests that attention mediates the effect of nutrition labels on choice. However, that said, it is worth noting that other studies (Coulthard, Hooge, Smeets, & Zandstra, 2017; Fenko, Nicolaas & Galetzka, 2018) did not find any relationship between visual attention to health labels and subsequent product choice.

Several studies suggest that consumer responses to products depend on the amount of sensory information that is available to consumers (Schifferstein, Fenko, Desmet, Labbe, & Martin, 2013; Villegas, Carbonell, & Costell, 2008). Villegas et al. (2008) found that nutrition information significantly influenced product acceptance of soymilk when consumers could taste the product, but did not change product acceptance when the consumers only looked at the picture of the product. Schifferstein et al. (2013) found that at the point of buying, when consumers can only see the product package, satisfaction and other positive emotions tended to be lowest, but when consumers have the opportunity to taste the product, positive emotions increase and consumer emotional judgments reflect their direct sensory experience.

Ford, Smith, and Swasy (1990) argued that scepticism towards product claims is determined by how easily consumers can verify the information. When they are unable to verify the claims, the credibility of the information is especially low. Fenko, Kersten, and Bialkova (2016) have suggested that consumer scepticism towards food labels may depend on the amount of sensory information that is available to consumers when evaluating a product. The experiment compared the influence of health and hedonic labels on consumer scepticism towards the labels and consumer responses to food products (apple juice and a chocolate cookie). The products were presented to participants under three conditions: looking at the product, holding a package, and the multisensory presentation (looking at the product, holding the package, and sampling the product). The multisensory presentation enhanced product evaluation for the hedonic product as compared to the visual and visual-tactile presentations. Moreover, sampling the product reduced consumer scepticism towards both types of labels. The results suggest that multisensory experience may reduce consumer scepticism towards food labels.

Organic Labels

Consumer research demonstrates the halo effects of food claims (e.g., 'natural', 'organic', 'no cholesterol') on misperceiving products more positively on other health-related dimensions (e.g., low calorie, low fat). The halo

effect suggests that an initial positive impression of a product fosters sub-sequent positive evaluations that may be unwarranted (Nisbett & Wilson, 1977). For example, the research demonstrates that a 'low-fat' label can lead consumers to perceive foods as lower in calories, while a 'no-choles-terol' label can lead them to perceive foods as being lower in fat (Andrews, Netemeyer, & Burton, 1998). Furthermore, cookies are perceived as lower-calorie when they are described as organic (Schuldt & Schwarz, 2010), an effect that persists after participants taste identical cookies with or without an 'organic' label (Lee, Shimizu, & Wansink, 2011).

Schuldt and Hannahan (2013) explored the effects of organic relative to conventional foods on healthiness and expected taste. Organic foods were perceived as healthier but less tasty than conventional foods. When judging a formula drink engineered to alleviate malnutrition, that is, in a context in which calories are likely construed as benefits, consumers expected that the organic product would be less effective, demonstrating that 'good' advertising information can sometimes promote 'bad' impres-sions in consumers' minds.

The studies described above suggest that health and organic labels can negatively affect taste expectations and product choice. In the following section, we will look into the possibilities to communicate food healthi-ness through multisensory packaging design, which is perceived more holistically and does not require elaborate information processing.

Multisensory Packaging for Healthy Food

The importance of multisensory experience in developing positive prod-uct and brand evaluation is increasingly being recognized (e.g., Krishna, 2012; Schifferstein & Spence, 2008; Spence, 2016). According to the processing fluency theory (Schwarz, 2004), congruent stimuli are pro-cessed more fluently and are generally evaluated more positively (Lee & Labroo, 2004). Moreover, people like products (e.g., food and drinks) more, when the products are predictable and confirm their expectations (Cardello, 1994; Deliza & MacFie, 1997; Meyers-Levy & Tybout, 1989; see Piqueras-Fiszman & Spence, 2015, for a review). Sensory congruence helps to set realistic expectations among consumers, which makes prod-ucts more predictable and more enjoyable.

When sensory packaging characteristics are congruent with product or brand attributes, it can result in a more positive consumer experience. For example, Fenko, Heiltjes, and van den Berg-Weitzel (2016) demonstrated that beer brands were evaluated more positively when tactile characteristics of bottles (such as heavy vs. light, smooth vs. rough) were congruent with brand values (such as premium vs. dynamic).

Colour, Health, and Taste

Colour is one of the most important cues guiding people's flavour expectations and perception (see Spence & Velasco, this volume, for a review). Colour can serve as a cue for calorie content (Foroni, Pergola, & Rumiati, 2016) and sweetness (Hoegg & Alba, 2007; Spence et al., 2015), suggesting the possibility to influence the perceived sweetness of food and drinks by manipulating the colour of the product or packaging. Since added sugar is considered one of the main threats to a healthy diet (Waxman, 2004), the compensation of sugar content by colour intensity seems like a promising strategy for increasing food healthiness without compromising on perceived taste. This idea is supported by a recent study on the effects of packaging colour on perceived healthiness and attractiveness of sugar- and fat-reduced products (Tijssen, Zandstra, de Graaf, & Jager, 2017). The study systematically investigated the effects of packaging hue, brightness, and saturation on expected and perceived product properties after tasting, for a low-sugar dairy drink and low-fat sausage. Less saturated, 'healthier' package versions were strongly associated with healthiness, while warmer, saturated, less bright packages were strongly associated with attractiveness. These results suggest that more saturated packaging colours can enhance sensory expectations and perceptions, potentially making them more appealing to consumers.

Packaging or container colour can communicate different meanings in different contexts. For instance, red colour elicits avoidance motivation across various contexts (Mehta & Zhu, 2009) and is universally used in warning signals. Genschow, Reutner, and Wänke (2012) investigated the effect of the colour red on snack and soft drink consumption. In the in-store experiment, participants were asked to sample a drink from a red or blue cup and a snack food from a red, blue, or white plate. Participants

drank less from a red cup than from a blue cup and ate less snack food from a red plate than from a blue or white plate. These results suggest that red can function as a subtle stop signal that works outside of focused awareness and thereby reduces incidental food and drink intake (see Spence & Velasco, this volume, for a review of packaging colour).

Schuldt (2013) demonstrated that green colour displayed on food packaging can be interpreted as an indication of food healthiness. Participants perceived a candy bar as healthier when it bore a green rather than a red calorie label, despite the fact that the labels conveyed the same calorie content. Furthermore, the perceived healthfulness of a candy bar bearing a green calorie label was higher compared to a colour-free (white) calorie label, especially among consumers who place high importance on healthy eating. These results suggest that green labels carry a health halo that encourages consumers to see a relatively poor-nutrition food (a candy bar) as healthier than they otherwise would.

Packaging colour can also communicate information about the product category that is culture specific (see Piqueras-Fiszman & Spence, 2011). Fenko, van Lith, and Galetzka (2015) showed that packaging colours associated with healthy and unhealthy products depend on the product category (see Fig. 9.2). For crisp bread, the healthiest packaging colour among the ten colours was light brown, while the least healthy colour was bright yellow. For chocolate, the least healthy colour was also bright yellow. Surprisingly, the healthiest colour turned out to be bright red. This result can be explained by the colour code typically used for different varieties of chocolate in the Netherlands (red for dark chocolate, blue for milk chocolate, and green for hazelnut chocolate). Therefore, for Dutch consumers, the red package suggests dark (i.e., healthier) chocolate.

Packaging Material

Naturalness is an important product attribute (Overvliet & Soto-Faraco, 2011). Consumers associate food naturalness with healthiness and have strong preference for natural foods (Rozin et al., 2004). Labbe, Pineau, and Martin (2013) looked into the effects of visual, tactile, and auditory properties of packaging material on perceived naturalness of the food.

The perceived naturalness of the food was impacted not only by visual cues but also by tactile and to a lesser extent by auditory cues. Roughness, suppleness, and low sound intensity were found to be the material sensory characteristics impacting expected food naturalness.

Fenko, van Lith, et al. (2015) investigated the effects of packaging colour and material on the perceived healthiness of two products: crisp bread and chocolate. Four packages combining colours and materials associated with healthy versus unhealthy foods were created for each product (see Fig. 9.3). Participants sampled the products and evaluated the product's taste, naturalness, and healthiness. Rough paper material associated with healthy food increased the perceived healthiness and naturalness of crisp bread but negatively affected its taste evaluation as compared to plastic. Paper packaging material also increased the perceived healthiness and naturalness of chocolate as compared to plastic. However, 'healthy' material did not influence taste evaluation of chocolate. These results therefore suggest that the material of the packaging might influence the perceived healthiness and taste of a product, but the effects seem to be product specific.

Fenko, Kroese, and Karreman (2017) examined the effects of two types of packaging (plastic and paper) compared to unpackaged food on the responses of consumers (perceived healthfulness, freshness, product liking, and purchase intention) towards two products (nuts and jelly beans). Consumers perceived unpackaged products and those products presented in paper packaging to be fresher, healthier, and liked them more than products in plastic packages. Interestingly, health labels placed either on product packages or on product dispensers did not influence the responses of consumers. These results therefore demonstrate that paper packaging and unpackaged products can communicate product freshness and healthiness and increase product liking compared to plastic packaging.

In both studies, paper packages were associated with naturalness and healthiness and were preferred to plastic packages. These findings therefore suggest that selecting paper or another natural coating for food packaging can increase product liking and people's health expectations.

Another possibility to promote healthy food is to use packaging with transparent windows. For visually appealing products, transparent packag-

A) "Healthy" crisp bread package

B) "Unhealthy" crisp bread package

C) "Healthy" chocolate package
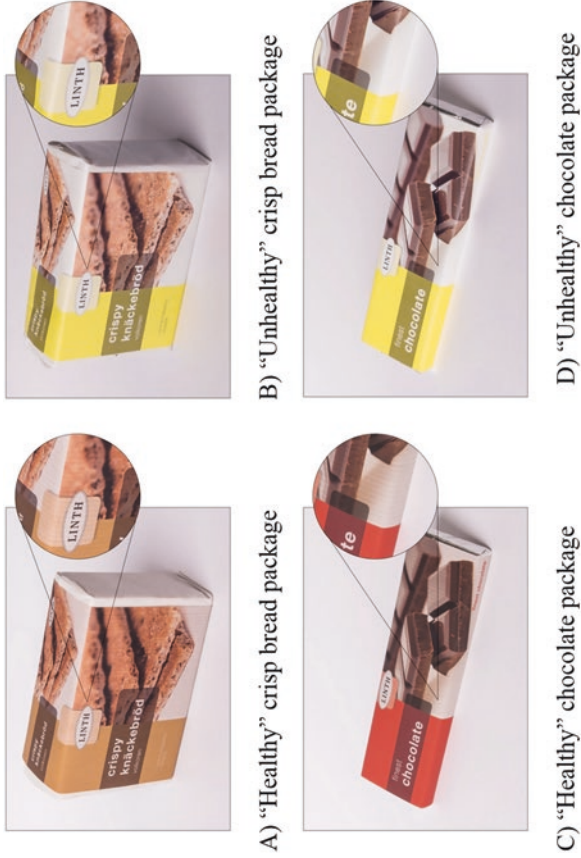
D) "Unhealthy" chocolate package

Fig. 9.3 Examples of crisp bread (A, B) and chocolate (C, D) packages associated with healthy (A, C) and unhealthy (B, D) products (Fenko, van Lith, et al., 2015c)

ing can increase consumption, perceived quality, brand trust, and purchase intentions (Simmonds & Spence, 2017). However, studies into the influence of transparent packaging on perceived healthfulness of a product resulted in somewhat contradictory findings. For instance, Sioutis (2011) found that transparent packaging induced more perceived healthiness of a cereal and an orange juice product as compared to non-transparent designs, while Riley, da Silva, and Behr (2015) found that transparent windows were less associated with perceived product healthiness compared to an image for coffee, carrot soup, and carrot baby food. Simmonds and Spence (2017) argue that less aesthetically pleasing products were perceived as less healthy within transparent packaging. These results suggest that transparency may be preferred when it comes to showing healthiness in some categories, while imagery would be more beneficial in others.

Shape Roundness and Angularity

Shape angularity (vs. roundedness) is one of the important determinants of product preference (see Velasco & Spence in this volume for an overview). A considerable body of research has shown crossmodal correspondences between roundness and taste qualities across various food and beverage categories (see Velasco, Woods, Petit, Cheok, & Spence, 2016, for a review). In several studies, sweetness was consistently matched to round shapes (Ngo, Misra, & Spence, 2011; Velasco, Salgado-Montejo, Marmolejo-Ramos, & Spence, 2014)

In a recent study, Van Rompay, Finger, Saakes, and Fenko (2017) have shown that round and angular surface textures of serving containers influenced taste evaluation of coffee and chocolate drinks. An angular, as opposed to a rounded, surface texture inspired a more bitter and less sweet taste experience. Furthermore, appropriateness of material surface textures for specific beverage type turned out to be important. Whereas the rounded surface texture enhanced overall evaluations of chocolate, the angular surface texture did so for coffee. Meanwhile, another recent study (Machiels, 2018) used clear plastic cups of round and angular shapes to test associations between round shape and sweet taste for a buttermilk drink and a mate-based soft drink. Results were not able to con-

firm sweetness-roundness correspondence effect, but a correspondence was found between the angular cup and a more bitter taste for the soft drink.

Together, these studies suggest that packaging shapes and surface textures could be used to accentuate dominant taste attributes of foods and beverages. Rounded shapes and surface textures could be used to increase sweetness perception in food products without increasing the actual sugar content (see Spence, 2014). Therefore, shape and surface texture manipulation could be a promising strategy to promote healthier foods and drinks without compromising on perceived taste.

Another effect of packaging shape on perceived product healthiness is related to the associations between health and the shape of human body. For instance, Van Ooijen, Fransen, Verlegh, and Smit (2017) have shown that packaging that simulates a slim body shape acts as a symbolic cue for product healthiness (e.g., low in calories), as opposed to packaging that simulates a wide body shape. Furthermore, the effect of slim package shape on consumer behaviour is goal dependent. Whereas simulation of a slim (vs. wide) body shape increases choice likelihood and product attitude when consumers have a health-relevant shopping goal, packaging shape does not affect these outcomes when consumers have a hedonic shopping goal. Similarly, Fenko, Lotterman, and Galetzka (2016) have shown that package shapes (round versus angular) influenced perceived healthiness of cookies. Angular packages were associated with healthier product than round packages. However, this effect was more pronounced for consumers with low interest in healthy eating compared to more health-motivated consumers.

Sound Symbolism

Spence (2012) describes sound symbolism as the association between specific sounds and particular stimulus attributes. In early experiments, Köhler (1929) asked people to match the meaningless non-words 'maluma' and 'takete' to abstract shapes. Rounded shapes were matched with the soft sounding 'maluma', while angular shapes were matched to the sharp sound of 'takete'. Since then, sound symbolism has been examined in a

variety of contexts and languages. Research suggests that the soft, rounded-sounding names match with sweet-tasting food. For example, people are more likely to match a creamy milk chocolate truffle with the brand name 'Lula' rather than 'Koko' (Ngo et al., 2011). People also believe that an ice cream has a creamier taste if it is called 'Frosh' rather than 'Frish' (Yorkston & Menon, 2004). Participants in the study of Crisinel, Jones, and Spence (2012) rated the bitter taste in a bittersweet cinder toffee as being more prominent when they were listening to lower-pitched sounds, and the sweeter taste as more prominent when listening to higher-pitched sounds (see also Knöferle & Spence, 2012, for a review of crossmodal correspondences between sounds and tastes).

Fenko, Lotterman, et al. (2016) investigated the effects of sound (foreign brand names 'Asahi' and 'Ramune' that were unfamiliar to Dutch consumers at the time of the study) and package shapes (round and angular) on perceived healthiness, taste expectations, and purchase intention of two products that varied in perceived healthiness (muesli cookie vs. butter cookie). The congruent combinations of product shape and brand name (round 'Ramune' cookie and angular 'Asahi' cookie) were preferred to incongruent combinations. Consumers associated the brand name Ramune with butter cookies and round shapes and the name Asahi with muesli cookies and angular shapes, and they preferred congruent combinations to incongruent.

These findings suggest that symbolic congruence between the sound of a brand name and the product category can positively influence taste expectations and purchase intentions. Thus, while introducing a new, healthier product on the market, it is important to consider the congruence between the product category, the sound symbolism of the brand name, and other packaging cues.

Consumer Characteristics

The research demonstrates that the effects of sensory and informational packaging cues on healthy food choice can be moderated by individual consumers' characteristics, such as food neophobia (Fenko, Leufkens, & van Hoof, 2015), scepticism towards food labels (Fenko, Kersten, et al.,

2016), health promotion focus (Karnal, Machiels, Orth, & Mai, 2016), dietary restraint (Bublitz, Peracchio, & Block, 2010) and General Health Interest (GHI) (Fenko, Backhaus, & van Hoof, 2015; Fenko, Lotterman, et al., 2016).

General Health Interest

Interest in healthy eating, measured by the GHI scale, appears to influence food intake and healthy dietary behaviour (Roininen, Lähteenmäki, & Tuorila, 1999; Zandstra, de Graaf, & van Staveren, 2001). People with high GHI are more likely to purchase food products based on their health benefits rather than on their hedonic benefits (Lähteenmäki, 2013) and are more likely to choose low-fat foods (e.g., an apple) over a chocolate snack (Roininen et al., 2001).

In the study reported by Fenko, Lotterman, et al. (2016), consumers with low GHI perceived Asahi cookies to be healthier than Ramune cookies, but consumers with high GHI were not affected by the sound symbolism of the brand name. Furthermore, three-way interactions between health interest, brand name, and product category demonstrated that participants with low GHI preferred congruent combinations of names and products (Asahi muesli cookie and Ramune butter cookie) to incongruent (Ramune muesli cookie and Asahi butter cookie), while participants with high GHI preferred muesli cookies irrespective of their name.

The moderating effect of health interest on consumer choice was also demonstrated in a recent mobile eye-tracking study of the visual attention towards health labels (Fenko, Nicolaas & Galetzka, 2018). While time constraints negatively influenced visual attention towards health labels for all participants, the absence of constraints increased attention towards the health labels only for participants with high GHI. This result suggests that giving consumers extra time to process health information may encourage healthy food choice only if the consumer already has an interest in eating healthily.

These findings can be explained by the differences in information processing between consumers with a high and low interest in health. People

who are interested in healthy eating probably analyse information more systematically (Petty & Cacioppo, 1986) and are more likely to respond to informational cues (i.e., health labels and product category) than to sensory congruence. Visschers, Hess, and Siegrist (2010) also found that health motivation stimulates deeper processing of nutrition information. People with a low interest in health might process information more intuitively and use peripheral cues, including packaging shapes and sounds of brand names. For people with a low motivation to process information, congruence between different product properties (shape, name, product category) is more important, since congruence increases processing fluency and requires less effort to make a purchase decision.

Similarly, Karnal et al. (2016) have shown that the effects of visual design of food packages (typeface and colour) conveying weight (or a lack thereof) on healthiness perceptions of a soft drink are moderated by consumers' health promotion focus. Consumers with a more pronounced health promotion focus perceived a product with a less heavy typeface as healthier which, in turn, increases their intent to purchase. This finding is in line with research showing that a promotion focus enhances the reliance on heuristics instead of elaborated cognitive processing (Pham & Avnet, 2009).

Dietary Restraint

Restrained eaters use their self-regulation and cognitive resources in order to lose weight. Maintaining perpetual dietary restraint is a cognitively demanding task that depletes consumers' regulatory resources (Bublitz et al., 2010). Therefore, restrained eaters may be particularly susceptible to external influences. For instance, Ouwehand and Papies (2010) investigated the effect of tempting food cues on wanting to eat high-calorie snacks in normal-weight and overweight restrained eaters. Participants were primed with tempting or neutral food cues. Exposure to attractive food cues increased wanting in overweight restrained eaters but not in normal-weight eaters. Hofmann, Rauch, and Gawronski (2007) have shown that eating behaviour is predominantly influenced by automatic attitudes when self-regulation resources are low but by personal standards

when self-regulation resources are high. In their experiment, participants were given an opportunity to taste candies in low or high self-regulation resources conditions. When self-regulation resources were high, candy consumption was related to dietary restraint standards. When self-regulation resources were low, candy consumption was primarily predicted by automatic attitudes. Therefore, providing congruent multisensory cues that are processed automatically on the packaging of healthy products is even more important for overweight restrained eaters than for normal-weight eaters.

Recently, Petit and her colleagues (Petit et al., 2016) investigated activity in brain areas involved in self-control when individuals with a high body mass index (BMI) focus their attention on either the taste or the health benefits of food. The findings suggest that individuals with a high BMI do not necessarily have lower self-control. Instead, they may be facilitated by external cues to direct their attention towards the tastiness of healthy food. Thus, promoting the taste of healthy food on product packaging may lead to more successful self-control and healthy food behaviours for overweight consumers.

Food Neophilia and Neophobia

While food neophilics enjoy trying unknown foods, food neophobics show the tendency to reject and avoid unfamiliar foods without even tasting them (Fenko, Leufkens, et al., 2015). Food neophobia is one of the barriers for the consumer acceptance of new healthy products. For instance, soy products have various health benefits, including the protective effects against osteoporosis, obesity, cancer, and heart diseases (Friedman & Brandon, 2001). However, soy products are still not popular among Western consumers (Yeu, Lee, & Lee, 2008). Consumers' negative perceptions regarding soy (unappetizing taste and inconvenience) have a substantially greater impact on soy consumption behaviour than their perceptions about soy health benefits (Moon, Balasubramanian, & Rimal, 2005).

Fenko, Backhaus, et al. (2015) investigated the effects of product-related factors (perceived familiarity and expected healthiness) and

person-related factors (food neophobia and health interest) on consumer hedonic responses to soy products. Four soy products that differed in familiarity and healthiness were presented to consumers supplemented by product claims stressing either health or taste benefits. Neophilic consumers showed more positive responses to soy products as compared to neophobic consumers. The neophobic consumers exhibited more positive responses to familiar soy products (such as soy sauce and soymilk), whereas the responses of neophilic consumers were not influenced by product familiarity. The effect of healthiness manipulation on hedonic responses to experimental products was non-significant. The results of the study suggest that perceived familiarity might be more important for the acceptance of soy products than expected healthiness. Thus, successful marketing strategies for healthy products should aim to increase product familiarity rather than necessarily the health benefits (cf. Fenko, Leufkens, et al., 2015). For instance, when reducing the amount of unhealthy ingredients (such as sugar) and replacing them with new healthier ingredients, food manufacturers might consider keeping the familiar packaging and stressing the 'familiar taste' of the product.

Conclusions

Emphasizing product healthiness is not always beneficial when it comes to promoting healthy food choice. Using multisensory packaging cues can be a more successful strategy to encourage healthier choice through 'nudge'-type interventions. For instance, increasing packaging colour intensity can enhance sensory expectations and perceptions, potentially making them more appealing to consumers (Tijssen et al., 2017). Rounded packaging and container shapes and textures can also increase the perceived sweetness of a drink compared to an angular packaging (Ngo et al., 2011; van Rompay et al., 2017). Using natural packaging material (e.g., paper) can increase perceived product healthiness and general product liking (Fenko, van Lith et al., 2015, 2017; Labbe et al., 2013). Furthermore, providing food samples at the point of sale can reduce consumer scepticism towards a product and enhance product liking and choice (Fenko, Kersten et al., 2016; Villegas et al., 2008).

Many studies have also demonstrated positive effects of congruent packaging attributes on consumer responses to a range of food and beverage products (e.g., Fenko, van Lith et al., 2015, Fenko, Heiltjes 2016; van Rompay et al., 2017). These studies suggest that congruence between packaging colours, shapes, materials, imagery, and informational cues is key to successful communication of food healthiness, especially for consumers that have little motivation or time to process health information. While selecting congruent sensory cues, it is important to take into account cognitive, symbolic, and cultural aspects of multisensory congruence (see Fenko, van Lith, et al., 2015; Piqueras-Fiszman & Spence, 2011).

However, there are possible limitations to the nudge-type interventions. Research suggests that peripheral cues (such as packaging colours and shapes) can be ignored by people with high health motivation and cognitive resources as non-relevant for their food choice. Furthermore, the growing public awareness of certain interventions, such as using ambient scents and music in supermarkets, might reduce the effect of these interventions. At the moment, the studies into the effect of shopping environment on consumer choice are limited. Further research is needed to look at the packaging influence on healthy food choice in the context of the shopping environment (for a review, see Spence, Puccinelli, Grewal, & Roggeveen, 2014). Further studies are needed to look into the effects of ambient sensory cues, social cues, time constraints, product position on the shelf, and other contextual factors that might influence healthy food choice in the retail environment.

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10

Multisensory Premiumness

Carlos Velasco and Charles Spence

Introduction

In recent years, a growing number of researchers in the fields of psychology, marketing, and consumer neuroscience have highlighted the need to consider the multisensory aspects of brands when thinking about the consumers' perception, experience, and associated brand behaviours (Haverkamp, 2014; Hultén, Broweus, & Van Dijk, 2009; Velasco, Reinoso-Carvalho, Petit, & Nijholt, 2016b). Whilst much progress has undoubtedly been made in this field under the banner of sensory (or

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257

multisensory)[1] marketing (e.g., see Krishna, 2012; Spence, 2012a, for reviews), there remain a number of open questions. Particularly relevant to the present chapter, whilst it has, on occasion, been suggested that multisensory attributes (or features) might be used to help convey the notion of a premium or luxury brand (Wiedmann, Hennigs, Klarmann, & Behrens, 2013), research on this topic is currently limited. Here, we focus on the extent to which premiumness can be conveyed through different sensory cues, as captured in product packaging.

With this in mind, we present an overview of the extant literature concerning the different sensory attributes that are associated with the concept of premiumness in the food and beverage category (and other product categories where relevant) or some of its component dimensions (e.g., quality, price). In the first section, we present a short overview of what premiumness is and why it is especially important that this attribute is communicated via multiple senses. In the second section, we present a summary of the key attributes that have been claimed to link to this concept for each sense. Finally, we present some general conclusions and directions for future research. We also discuss how researchers and practitioners will need to move forward from simply assessing/using unisensory packaging attributes to understanding, and capitalizing on, the interplay between different sensory attributes, in order to convey the concept of multisensory premiumness.

On Premium and Luxury Products

At the outset, it is important to highlight that the difference between the concepts of luxury and premium is not always clear (Miller & Mills, 2012). For instance, some authors have argued that the difference between a premium and a luxury brand is merely a matter of degree, and one that

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[1] Whilst the term sensory marketing is typically used to refer to "marketing that engages the consumers' senses and affects their perception, judgment and behaviour" (Krishna, 2012, p. 332), multisensory marketing not only considers how information in each individual sensory modality influences consumer behaviour but also how different sensory modalities interact with, and influence, each other when it comes to consumers' behaviour (see more on this in Velasco & Spence, this volume).

depends on both the context(s) and the consumer(s) involved (Vigneron & Johnson, 2004). According to Miller and Mills (2012), for instance, luxury brands are magnificent, extravagant, opulent, sumptuous, and lavish, whilst premium (or prestige) brands have reputation, honour, esteem, kudos, and are held in high regard. Meanwhile, for marketing expert Seth Godin (2009), luxury products and services are exclusive and expensive, where "price is related to scarcity, brand and storytelling", whereas premium goods are, by contrast, "expensive variants of commodity goods". This distinction becomes somewhat more complicated given that, over the last few decades, the marketplace has witnessed what has been referred to as a "democratization of luxury" (Truong, McColl, & Kitchen, 2009; see also Hine, 1986, for a historical perspective on a consumer tendency in the 1950s and 1960s in the USA, that combines the popular and luxury). There are, in other words, more consumers interested in, and wanting to access, luxury and premium products nowadays than ever before, and hence those firms wanting to compete at this end of the market need to adapt to the changing landscape. Nevertheless, the first definition of "premium" that one finds in the Merriam-Webster dictionary (https://www.merriam-webster.com/dictionary/premium) is "a regard or recompense for a particular act", though perhaps the more suitable definition of premium for this chapter's context is "a high value or a value in excess of that normally or usually expected". By contrast, amongst the dictionary definitions of "luxury" one finds the following "a condition of abundance or great ease and comfort" and "something adding to pleasure or comfort but not absolutely necessary" (https://www.merriam-webster.com/dictionary/luxury). In the strict sense, therefore, both terms would seem to refer to added "value".

When it comes to the definition of premium or luxury brands in research, one sees variation from one author to the next (see Ko, Costello, & Taylor, in press; Miller & Mills, 2012, for reviews). However, broadly speaking, most researchers would seem to agree that a premium brand usually offers an additional tangible or intangible value, and that the price is somewhat higher, relative to non-premium (i.e., more basic) brands (Pathak, Calvert, & Velasco, 2017). Further, as noted by Quelch some years ago, "premium brands are typically of excellent quality, high priced, selectively distributed through the highest quality channels, and

advertised parsimoniously" (Quelch, 1987, p. 39; see also Anselmsson, Bondesson, & Johansson, 2014; Lyons & Wien, 2018; Sjostrom, Corsi, & Lockshin, 2016).

Given the dimensions that appear to be important to the concept of premiumness and luxury (e.g., quality, authenticity, prestigious image, price, and resonance/loyalty; see Ko et al., in press), it has been suggested that these concepts are context-dependent. Moreover, what is premium to some individuals might not necessarily be treated as such by others (Cristini, Kauppinen-Räisänen, Barthod-Prothade, & Woodside, 2017; Phau & Prendergast, 2000). Importantly, the concepts of premiumness and luxury here are defined from the point of view of the consumer and can be measured based on the consumers' perceptions of attributes such as quality, uniqueness, authenticity, and their willingness to pay (Ko et al., in press).

Why Talk about a Multisensory Approach to Packaging Premium Products?

The visual aspects (e.g., colour, fonts, label) of brands are undoubtedly critical to consumers' evaluations (e.g., whether a brand is premium or not) and behaviours (Mugge, Massink, Hultink, & van den Berg-Weitzel, 2014; Crilly, Moultrie, & Clarkson, 2004; Schoormans, Berge, Laar, & Berg-Weitzel, 2010). Relevant to the present review, it has been shown that visual branding influences everything from product identification through to the assessment of perceived quality (Allison & Uhl, 1964; Jacoby, Olson, & Haddock, 1971; Martin, 1990). Crucially, though, most of our everyday experiences are fundamentally multisensory in nature. Based on this premise, the field of multisensory marketing research aims to understand how and why the different sensory characteristics of brands (e.g., what are known as brand elements and marketing communications)—such as a product's distinctive packaging—influence consumers' perception, judgments, and ultimately their behaviours (see Hultén, 2011; Hultén et al., 2009; Krishna, 2012, for reviews on sensory marketing; see Spence, 2016a, for a multisensory

perspective on packaging). The rationale behind this field of study is that whilst many brands clearly might not need (and in some cases, might not be able) to stimulate *all* of the consumer's senses in say, their product packaging, they can nevertheless still capitalize on their best, or optimal, configuration of the available senses in order to differentiate and deliver a given experience or brand proposition (e.g., premiumness, Wiedmann et al., 2013). Furthermore, whilst the personalization, customization, or optimization of brands based on multisensory cues will likely lead to higher production costs, costs that a commodity brand might not want to take or be able to afford (e.g., just imagine adding smell to otherwise odourless packaging or creating packaging that is edible), it presents a great opportunity for the premium category to differentiate itself from their competitive set (e.g., Kim, 2013; King, 2014a, 2014b).

Communicating Premiumness via Multisensory Features

Based on the idea that brand concepts can be conveyed via multiple sensory attributes, we now present an overview of those attributes that have been shown to relate to the concept of premiumness, luxury, or their component dimensions. Notably, we focus on each sense individually, given that this is the approach that has been adopted by the majority of the research that we review. Nevertheless, as argued below, the focus of both researchers and practitioners should ultimately be on how different multisensory attributes interact with one another (i.e., ensuring that the senses communicate as congruent a message as possible) when trying to convey a specific brand attribute or meaning to the consumer. Moreover, as shown in Table 10.1, the literature on multisensory design and premiumness/luxury is by no means extensive (when compared, say, to the literature on "naturalness" as a brand attribute), though it has been growing rapidly in recent years. This trend might be taken to suggest the potential of this approach for both research and application in that it can give rise to innovative branding and marketing.

Table 10.1 Sample keywords (though not, note, necessarily continuous phrases) searched for in scientific article titles on Google Scholar and the corresponding number of articles (on 24.10.2017)

Keywords	No. of Google Scholar articles
Sensory marketing premium	0
Multisensory premium/premiumness	0
Sensory premiumness	0
Premiumness brand	0
Multisensory luxury	1
Sensory luxury	4
Sensory premium	15
Multisensory brand	15
Premium branding	22
Premium packaging	25
Premium advertising	29
Multisensory design	114
Luxury branding	124

Vision

Vision is key as far as branding is concerned (e.g., Crilly et al., 2004; see also the other chapters in this volume). In particular, research undoubtedly suggests that visual attributes (colour, pictures, typefaces, etc.) associated with different brand elements can be used to help position a brand as premium (e.g., Dawar & Parker, 1994; Mugge et al., 2014), something that is particularly important for packaging (Spence, 2016b). Perhaps unsurprisingly, most of the available literature on conveying premium, luxury, or their component dimensions, in the context of packaging, and more broad sensory branding, comes from the role of visual aspects of brands, and in particular, packaging-related cues (e.g., Bourdieu, 2005).

Whilst Table 10.2 presents an overview of representative and influential research on the topic, below we highlight some relevant points concerning visual packaging and premiumness. Colour has traditionally been considered as a key attribute of brands (see Labrecque, Patrick, & Milne, 2013, for a review). This is especially noticeable in the context of food and drink brands (Garber, Hyatt, & Starr, 2000; Wei, Ou, Luo, & Hutchings, 2012). Whilst the meaning of colour cues and, perhaps more specifically, hue is very often context-dependent (Aslam, 2006; Spence & Velasco,

Table 10.2 Overview of visual attributes associated with dimensions of premiumness and/or luxury

Attributes/dimensions		Premiumness or dimensions thereof	Brand element	Products	Authors (year)
Colour hue	Black	(a) Refined, sober, elegant aesthetics, excellence, high price, variety (b) Luxury	(a) Packaging (b) Not specified	General	(a) Ampuero and Vila (2006); (b) Mahnke (1996)
	Red	Durability, guarantee, and safety	Packaging	General	Ampuero and Vila (2006)
	Colour (red vs. green)/ product type (hedonic vs. utilitarian) congruence	Higher premiumness	Packaging	Coffee/cod	Lyons and Wien (2018)
Colour lightness	Dark	(a) Refined, sober, elegant aesthetics, excellence, high price, variety, (b) Premium	Packaging	(a) General, (b) Chocolate	(a) Ampuero and Vila (2006); (b) Ares, Besio, Giménez, and Deliza (2010)
	Light (dark) + upper (lower) location	Higher willingness to pay	Packaging	General	Sunaga, Park, and Spence (2016)
Colour saturation	50 vs. 100% saturation	More expensive (*trend)	Packaging	Yoghurt	Becker, van Rompay, Schifferstein, and Galetzka (2011)
Colour value	Value	Higher quality, price, and brand perceptions	Packaging	Coffee/crisps	van Ooijen, Fransen, Verlegh, and Smit (2017)

Table 10.2 (continued)

Attributes/dimensions		Premiumness or dimensions thereof	Brand element	Products	Authors (year)
Symmetry	Symmetrical	Durability, guarantee, safety, excellence, high price, variety	Packaging	Not specified	Ampuero and Vila (2006)
	Symmetrical/harmony/elaborated	High quality, prestige	Packaging	Wine	Orth and Malkewitz (2008)
Orientation	(a) Vertical, straight lines, (b) verticality	(a) Durability, guarantee, safety, excellence, high price, variety, (b) Quality	Packaging	General	(a) Ampuero and Vila (2006); (b) Machiels and Orth (2017);
	Downward vs. upward	Higher price (though relationship complex)	Packaging	Wine	Velasco, Woods, and Spence (2015);
	Upward vs. downward	Purchase likelihood	Packaging	Water/vodka	Westerman et al. (2013)
Complexity	One or more elements	Durability, guarantee, safety, excellence, high price, variety	Packaging	General	Ampuero and Vila (2006)
Contour curvature	Straight outline	(a) Durability, guarantee, safety, excellence, high price, variety, (b) Premium	Packaging	General	(a) Ampuero and Vila (2006); (b) Corredor (2017);
	Angularity	More positive attitude, more expensive	Packaging	Yoghurt	Becker et al. (2011)
	Roundness	Higher purchase likelihood	Packaging/label	Water/bleach	Westerman et al. (2012, 2013)
Rectangle's side ratio	1.62 vs. 1.38	Higher purchase intent	Advertisement	Fast food invitation	Raghavan (2010)

(continued)

Table 10.2 (continued)

Attributes/dimensions		Premiumness or dimensions thereof	Brand element	Products	Authors (year)
Images	Ready to consume food images	Higher willingness to buy	Packaging	Crisps	Rebollar et al. (2017)
	Picture, product	Durability, guarantee, and safety	Packaging	General	Ampuero and Vila (2006)
	Visual art	(a) Perceived value, (b) Luxury, willingness to buy/pay	(a) Product (b) Advertisement	(a) Wallet, (b) General	(a) Lee et al. (2015); (b) Peluso, Pino, Amatulli, and Guido (2017)
	Round latte art (vs. angular)	Higher quality, higher price	Product	Coffee	Van Doorn, Colonna-Dashwood, Hudd-Baillie, and Spence (2015)
	Transparency (vs. images vs. neither)	Higher quality and willingness to buy for transparency vs. all, and for images vs. neither			Simmonds, Woods, and Spence (2018)
Fonts	Bold, expanded, upper case, large, roman	Refined, sober, elegant aesthetics, excellence, high price, variety	Packaging	General	Ampuero and Vila (2006)

this volume), it would appear that darker hues (e.g., black, which it should be noted, is an achromatic "colour") are often taken by the consumer to indicate premiumness (Ampuero & Vila, 2006; Ares et al., 2010). When it comes to the shape properties of product packaging, typically preferred visual features (e.g., symmetry, less complex, curved) influence product preference (e.g., Westerman et al., 2012, 2013). Nevertheless, this is somewhat paradoxical as less typically preferred shape properties might also hint at a certain rarity, therefore signalling that a product might be more expensive and/or be of higher quality (see Corredor, 2017; Velasco et al., 2015). Note that consumers may also learn to associate certain premium products or product categories with specific forms (think of Coke's signature bottle or the bottle of a whisky or champagne), which may in turn become symbols of such an attribute.

Moving on to some more high-level visual attributes (i.e., moving away from stimulus features and their corresponding perceptual qualities), brands generally use both images and symbols that are concrete and abstract, of the product on the packaging or in a context associated with the packaging (Keller, 2009; Simmonds & Spence, 2017; Velasco, Woods, Petit, Cheok, & Spence, 2016c). For example, pertaining to the latter, presenting products together with visual art (e.g., on the packaging) has been shown to promote the perception of luxury (Lee, Chen, & Wang, 2015; cf. Hagtvedt & Patrick, 2008; see also Hagtvedt & Patrick, 2014). In that sense, it is critical to establish a link between images, brand positioning, and a corresponding product, so that the brand concept that a firm wants to convey is based on the congruency between all such attributes.

Premium brands have also generally used cursive and also more complex typographies (e.g., elaborate, bold, expanded, upper case, large, roman; see Ampuero & Vila, 2006) relative to more basic brands. This is an interesting observation, in that distinctive fonts might well be used to help differentiate a brand from its competitors (Velasco, Hyndman, & Spence, 2018; see Velasco & Spence, this volume, for a review). For instance, brands such as Dior, Salvatore Ferragamo, and Dom Perignon have all adopted typographies that are more similar to handwriting, presumably as a way of differentiating themselves from others (note, however, that this is not limited to these brands, see Coca-Cola's font). Importantly,

though, it has been suggested that the fit between a product type and a font might be critical, thus highlighting product-specific effects (e.g., Doyle & Bottomley, 2006). Similar to shape, whilst easy-to-process fonts generally result in higher liking (Song & Schwarz, 2008), luxury or premium products may vary the fluency of their fonts to signal uniqueness, even if this implies either an easy-to-read font and/or a less readable, though attractive font (Gmuer, Siegrist, & Dohle, 2015).

In conclusion, the different visual factors associated with brand elements, such as with a product's packaging, can highlight/signal premium characteristics such as uniqueness, originality. They can also be used to enhance effective differentiation (Silayoi & Speece, 2007). Based on Table 10.2, it could be argued that any brand wanting to elevate itself to premium status will need to find the right balance between conforming to what people prefer but, at the same time, being able to surprise them with sensory elements that might be unexpected and which signal rarity and/or uniqueness (see Velasco et al., 2016a).

Audition

After vision, audition is perhaps the second most important sense as far as premiumness/luxury is concerned. Sound has certainly received its fair share of attention with regard to product design and branding over the years (e.g., Byron, 2012; Knöferle, 2012; Spence & Zampini, 2006; Velasco, Jones, King, & Spence, 2013). Velasco, Reinoso-Carvalho, et al. (2016b) highlighted the various sounds that are associated with our eating and drinking experiences, such as jingles, ads, packaging, food, mastication, and atmospheric sounds, all of which hold the potential to be systematically associated with food and drink packaging. Over the years, sound designers and researchers have worked towards identifying, measuring, and ultimately towards enhancing the sounds of products as diverse as cars, packets of crisps, coffee makers, toothbrushes, and aerosol sprays (see Spence & Zampini, 2006, for a review; see also Velasco et al., 2013; Wang & Spence, this volume).

Whilst not a great deal of research on "the sound of premium" or "the sound of luxury" has been conducted outside of the world of engine (e.g.,

car/motorbike) sounds,[2] a few studies have provided relevant insights as to what sounds might signal specific dimensions of these concepts (see Table 10.3 for an overview). The overall rationale here is that sounds are nearly always part of brand experiences and, given that they typically convey meaning, can be systematically used in the context of brand experience design (Özcan & van Egmond, 2012; Spence & Zampini, 2006). Note that getting the sound of the packaging wrong may have negative consequences for a brand. Back in 2010, for instance, Frito-Lay brought out a compostable chip bag that consumers found too noisy (making 100 dB of noise when gently rustled in the hands) and, apparently, this led to a fall in sales that eventually led to the brand withdrawing the packaging from the shelves, never to be heard (of) again (Byron, 2012).

Relevant to one of the dimensions of product premiumness, Lyon (2003) has suggested that the sound of a product can be summarized in terms of the following attributes: strength or magnitude (sound level), annoyance value (noisiness, roughness, sharpness), amenity value (regularity, harmonicity, appropriateness), and information content (identification, performance, and condition of the product). Such attributes might help one to design sounds that target specific premium dimensions such as quality. It is worth highlighting that it is somewhat surprising to see that many categories invest so much in the development of the visual branding conveying luxury/premium while at the same time seemingly neglecting the sound of their products/brands entirely. Sometimes the signature sound of a brand can be sufficient to enhance the consumers' perception of the brand (e.g., Byron, 2012; Sapherstein, 1998; Spence & Wang, 2015).

Whilst (again) not much research has yet been conducted on opening sounds and premiumness, anecdotal reports by food and drink professionals suggest that sounds such as the fizziness of a drink, the opening of beers, soft drinks, and champagne (e.g., just think of the characteristic sound and impact of Snapple and Grolsch), and the sound that derives from a product's packaging, might make a difference as far as the perception of quality,

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[2] One of the only studies was conducted by Lageat, Czellar, and Laurent (2003). These researchers assessed which of the sounds that are associated with the operation of cigarette lighters led to the perception of luxury. Intriguingly, two groups of consumers were identified, the first associated the luxury of the sounds of the lighters with the sound descriptors "matte, even, and low in pitch" and the other with the sound descriptors "clear, resonant, and clicking" instead.

Table 10.3 Overview of auditory attributes associated with dimensions of premiumness and/or luxury

Attributes/dimensions		Association with premium (or dimensions of premium)	Brand element	Products	Study
Loudness	Louder opening	Excellence, authenticity, authority	Packaging opening	Beer	Fenko, Heiltjes, and Berg-Weitzel (2016)
Carbonation	Higher carbonation	Excellence, authenticity, uniqueness	Product	Beer	Fenko et al. (2016)
Speech sounds	Late- (sh, ch, j, th) vs. early acquired (e.g., m, n, b, f, w, h) phonemes	Luxury	Brand name	General	Pathak et al. (2017)
Music	Congruent (country vs. classical) with product kind (utilitarian vs. social identity)	Higher price	Product	Utilitarian (e.g., orange juice, toothbrush) vs. social identity (e.g., pin badge, greetings card)	North, Sheridan, and Areni (2016)
	Rap music	Higher mentions of luxury products relative to other genres (e.g., pop, country)	Music	General	Baksh-Mohammed and Callison (2014)
	Congruent music or label vs. no label	Higher willingness to pay	Product	Beer	Reinoso-Carvalho, Velasco, van Ee, Leboeuf, and Spence (2016)

pricing, and uniqueness/distinctiveness[3] are concerned (Komatsuzaki, Han, & Uchida, 2016; Spence & Wang, 2015; see also Wang & Spence, this volume). For instance, Spence and Wang (2017) recently provided evidence for the idea that wines contained in a cork-stopped bottle are considered (at least by British wine drinkers) as being of higher in quality (with ratings of quality c. 10% than the same wine in a screw-top bottle). In other words, those products and brands that have "signature sounds" associated with their elements and marketing communications might generate an overall positive evaluation (just as long, obviously, as the sound is not disturbing). Similar to the visual properties of brands, the congruency of sound cues and products is important when conveying specific brand attributes, therefore once again highlighting the role of context (Carron, Dubois, Misdariis, Talotte, & Susini, 2014; Reinoso-Carvalho et al., 2016).

There is undoubtedly an untapped opportunity here for more brands to differentiate themselves as premium or luxury based on both the sounds associated with their packages (e.g., how differentiating the sound is and how much it conveys the concept of premiumness or its dimensions), as well as the interaction such packaging sounds may have with, for example, the product/brand's visual attributes. Whilst much investment is, as has always been the case, directed at the visual aspects of product packaging, brands would be well advised not to neglect the sonic attributes of the packaging or product/packaging interaction (see Wang & Spence, this volume, for more on the topic of sonic packaging).

Touch

The tactile/haptic properties of brands and their different elements undoubtedly influence many aspects of consumer perception and behaviour (Grohmann, Spangenberg, & Sprott, 2007; Spence & Gallace, 2011; Spence, this volume). Many studies have linked tactile/haptic properties with perceived or expected price as well as quality (see Table 10.4). For example, it has been suggested that firm and heavy

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[3] Something which is reminiscent of the literature on psychoacoustic properties of cars' features (e.g., engines), which in many cases focus on quality perception (e.g., Miśkiewicz & Letowski, 1999; Parizet, Guyader, & Nosulenko, 2008; *The Economist*, 2015, see also http://radium-audio. com/bentley-continental-gt/).

Table 10.4 Overview of tactile/haptic attributes that are associated with dimensions of premiumness and/or luxury

Attributes/dimensions		Association with premium (or dimensions of premium)	Brand element	Product	Study
Textures	Firmer (vs. flimsy)	Excellence	Packaging	Beer	Fenko et al. (2016)
	Harder	(a) Authenticity, authority, (b) Quality	Packaging	(a) Beer, (b) Water	(a) Fenko et al. (2016), (b) Krishna and Morrin (2008)
	Rougher	Uniqueness	Packaging	Beer	Fenko et al. (2016)
	Heavier	(a) Excellence, authenticity, authority, (b, d) Higher price, (c) Higher price and quality	(a, d) Packaging, (b) Bowl	(a) Beer, (b) Yoghurt, (c) Wine, (d) Chocolate, canned soft drink	(a) Fenko et al. (2016), (b) Piqueras-Fiszman, Harrar, Alcaide, and Spence (2011), (c) Piqueras-Fiszman and Spence (2012), (d) Kampfer, Leischnig, Ivens, and Spence (2017)
	Glossy, silky, wood (visual)	Elegant	–	–	Thumfart et al. (2008)

Table 10.4 (continued)

Attributes/dimensions		Association with premium (or dimensions of premium)	Brand element	Product	Study
Temperature	Colder	Excellence	Packaging	Beer	Fenko et al. (2016)
	Warmer	Higher premium (willingness to pay, evaluation)	Ambient temperature	–	Zwebner et al. (2014)
Objects	Bottle (vs. can)	Seemingly higher perceived quality	Packaging	Beer	Barnett, Velasco, and Spence (2016)
	Cylindrical (vs. rectangular) container	Higher price	Packaging	Ice cream	Cheskin (1957)
	Elongation	Purchase less	Packaging	Beer	Yang and Raghubir (2005)
	Size	Higher price (wider diameter and taller mugs; wider diameter and taller mugs in Colombia and the UK, not in China tall/ wide > short wide > tall narrow)	Cup	Coffee	Van Doorn et al. (2017)

packages are associated with excellence, authenticity, and authority (concepts that are related to premiumness, Fenko et al., 2016, see also Spence and van Rompay & Fennis, this volume). Additionally, it has been suggested that visual textures (some of which might well be perceived through the sense of touch) like glossy, silky, and woody, might also be expected to convey elegance (Thumfart et al., 2008). Furthermore, attributes such as a product's temperature, or the temperature of the atmosphere in which it is presented, might also be expected to influence the overall product evaluation (Fenko et al., 2016; Gómez-Corona, Chollet, Escalona-Buendía, & Valentin, 2017; Zwebner, Lee, & Goldenberg 2014).

When it comes to more high-level attributes of tactile premiumness (such as packaging with a hyper-realistic surface feel; e.g., see Hara, 2004; Spence & Gallace, 2011), the available research is currently somewhat scarce. Nevertheless, there is evidence to suggest that some consumers appear to evaluate a product as being of better quality when it is presented in a bottle rather than a can (Barnett et al., 2016). It is worth following up on such observations and studying what other types of receptacle are considered by consumers to be more premium or luxurious (see also Schifferstein, 2009), something which one might well expect to be category and/or context-dependent (see Wan et al., 2014).

As a final note on touch, which also applies to other senses, it is worth stressing that one need not directly stimulate this sense directly in order to activate tactile representations—one can, for example, give consumers a sense of what a product might feel like by means of synaesthetic metaphor. This refers to a metaphor that exploits the similarities that exist between the different senses (e.g., Nelson & Hitchon, 1995, 1999; Spence, 2012b). Premium brands (e.g., perfumes) often link concepts such as scents and skin touch (e.g., the softness of cashmere in Donna Karin's new perfume), whereas basic brands such as Purex Toss 'N Soft, a fabric product which used much the same approach but with a more literal use of words (i.e., "Softness you can smell"; see Gallace & Spence, 2014). Either through literal or metaphorical means, then, brands can stimulate the different senses in the form of brand statements or product claims.

Smell and Flavour

Whilst the use of olfactory cues in product packaging is slowly becoming more popular (Spence, 2015, for a review), there is, to the best of our knowledge, no research on the use of packaging smells to convey premiumness (though perhaps some brands explore this, such as Anne Fontaine, whose shirts are sprayed with scent once the shirt is placed in a bag at the cash register). Similarly, when it comes to the smell of the product itself, it is not clear whether there is a difference in the distribution of product smells for premium versus non-premium brands. However, it is clear that olfactory cues can be critical diagnostic cues that signal product quality in the mind of the customer (Bone & Jantrania, 1992; Moore, 2014; see also Spence, 2015). Recent evidence would seem to suggest that more complex smells are associated with quality, even though as pointed out recently by Spence and Wang (2018), it is not always clear what "complexity" means (its perception might be based on different cues and perhaps highly idiosyncratic, cf. Kramer, 2012).

Early research by Laird (1932) suggested that odour pleasantness influences the perceived quality and evaluation of silk hose (see also Demattè, Sanabria, Sugarman, & Spence, 2006). Bone and Jantrania (1992) provided further evidence suggesting that odour/product fit or congruency (household cleanser + lemon smell and sunscreen + coconut smell) relative to incongruency (household cleanser + coconut smell and sunscreen + lemon smell) can lead to enhanced, more positive, product evaluations. Furthermore, correlational research reported by Fenko et al. (2016) suggests that perceived spiciness, bitterness, and intensity of beer correlate with dimensions of premiumness. Higher perceived spiciness seemed to correlate with authenticity, whilst bitterness and intensity correlated with rated excellence, authenticity, and authority. Moreover, intensity also correlated with uniqueness. Note, though, that spicy and bitter are not olfactory sensations, per se. However, Fenko et al. (2016) used scales with such dimensions in order to evaluate olfactory quality.

The idea that smell intensity, pleasantness, and pleasantness/product congruence influence dimensions of premiumness is interesting but needs to be approached with some degree of caution at this stage. That is, the relationship between such variables might not necessarily be linear. It

may, for example, follow an inverted U-shaped function such that, only at middle intensities are the olfactory stimuli thought pleasant (this might also well apply to many sensory attributes described in this chapter). Notably, given that scent is currently not part of product packaging in many categories (yet, in some cases, you can smell the product through its packaging, as in the case of many coffee brands), the very act of introducing scent to the packaging might already be expected to influence consumers' overall brand evaluation (so that the very presence of some sensory cue, as long as it is not unpleasant, becomes a distinctive feature). Think, for example, of the smell of a new car (Spence, 2002). This scent is not necessarily inherently pleasant, but the "new car" smell may become meaningful and positively valenced because of the association between a possibly arbitrary scent and the rewarding act of making a high-value purchase (see also Herman, 2001; Moran, 2000a, b). Future research might aim at understanding how such associations are created and perhaps capitalize on them in the context of product packaging, not only for high-value food and beverages (e.g., alcohol beverages such as whisky) but perhaps also for other high-value goods such as electronics (e.g., the smell of new Apple Mac product packaging, e.g., Ionescu, 2012) or homeware.

On the other hand, whilst certain products come in natural edible packaging (e.g., some fruits), a few researchers have also shown interest in developing synthetic edible packaging, though this still remains largely unexplored territory (e.g., Spence, 2016b). For the same reason, research on packaging "taste" and "flavours" and their associations with the concept of premiumness is, to date, non-existent. Moreover, research on how the different basic tastes are associated with the concept of premiumness appears to be limited. Evidence from Fenko et al. (2016) would appear to suggest a positive relationship between the dimensions of bitterness and premiumness and a negative relationship between sweetness and authenticity in the case of beers. However, given that basic tastes are rarely presented in isolation in a product (and there would likely be context- or category-specific effects), it is perhaps more sensible to focus on flavour, which involves at least taste (gustation) and retronasal olfaction (Prescott, 2015; Spence, Smith, & Auvray, 2015). It appears that certain dimensions of premiumness have a positive relationship with how

refreshing, full-bodied, smooth, crispy, foamy, natural, thirst-quenching, and sharp a beer is perceived to be, whilst certain others have a negative relationship with how light, mild, and watery the beers are perceived to be (Fenko et al., 2016).

Multisensory Premium Packaging Design and Conclusions

Having gone through some of the representative literature concerning how sensory information relates to premiumness and/or its component dimensions, it is now time to highlight the fact that consumers do not process each feature or attribute of products or their packaging separately/independently. Instead, multiple packaging cues are integrated into the customers' impression of a brand (in ways that are not yet well documented). Whilst some sensory inputs might be more salient than others, it is likely that whether a consumer perceives a brand as having a specific degree of premiumness may well depend on the interaction between such cues. Based on research on multisensory perception as a reference here, one might conceptualize the perception of "premiumness" as an inference problem whereby perceived sensory attributes, the consumers' goals, and previous experiences together help them to assess the most likely attribute to expect in a given product (e.g., price, see Martin, 2013).

As in any innovative area of research, there are a number of questions that will be key to furthering our understanding in the future. For example, what sensory attributes are distinctively associated (or not) with all the dimensions of premiumness? What is the hierarchy of sensory dominance for premiumness? When (if ever) do additive or subadditive effects take place in respect to the communication of premiumness? What cross-cultural (see also Machiels & Orth, this volume), context-dependent, and/or cross-marketing communications differences exist in more or less salient multisensory attributes? Can consumers be segmented into different groups (based on individual differences) as a function of premium/multisensory associations? How can such groups be targeted?

Moreover, there are three points that need to be considered that we would like to highlight: (1) whilst most of this review has focused on seemingly generalizable results, there are both individual differences and contextual factors (including cross-cultural differences, see Machiels & Orth, this volume) that need to be considered when considering the branding of multisensory premiumness. (2) Most of the studies reviewed here have either systematically manipulated one or two senses at a time and/or are based on correlational studies. However, when experiencing brands, consumers are exposed to more than one sensory cue at a given time. (3) Do any specific senses dominate when it comes to the communication of premiumness through product packaging (and how do these differ between product categories)? Are there any specific sensory hierarchies to consider (e.g., Fenko, Schifferstein, & Hekkert, 2010)? In other words, are certain senses more important in conveying the notion of premiumness than others?

Finally, in terms of the latter point, future research will need to consider the extent to which specific senses dominate, and perhaps the extent to which they dominate, specific premium experiences. For example, one might ask whether the weight of the packaging may be more important in conveying such an attribute than the use of a specific colour. Dominance may not only apply to specific senses but also to specific combinations of senses. Perhaps using a heavy bottle with a black label might better convey the concept of premiumness, relative to using packaging that produces a loud opening sound and a black label. It should certainly help maximize the perceived weight (see Spence, this volume).

It is clear that brands can differentiate themselves from the competition through the use of multisensory cues in the premium or luxury market. Nevertheless, this seems to be happening mostly at the visual level. The general suggestion to emerge from this chapter is that such brands may want to think more carefully about multisensory premiumness than commodity brands (Aroche, 2015). Thus, these brands should consider how to differentiate in the premium market, through sensory cues that are both distinctive and meaningful and at the same time protectable.

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11

Multisensory Packaging Design across Cultures

Casparus J. A. Machiels and Ulrich R. Orth

Introduction

In a globalized world, consumers encounter a myriad of choices when it comes to packaged consumer goods, pushing marketers to ever more carefully tailor their offers to target segments, in order to attract and persuade buyers (Lee & Lopetcharat, 2017). Yet, people vary in how they perceive (Zeithaml, 1988), process (Celhay & Trinquecoste, 2015), and behave (Madzharov & Block, 2010) in response to the sensory input provided by packaging design. This raises the question of what variables should be used for defining target groups beyond the traditional ones used for segmenting markets (e.g., socio-demographics and lifestyle). This need for better

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understanding the differences and similarities in consumer response to packaging is particularly evident with international markets and with domestic markets composed of highly diverse cultural groups (Jameson, 2007). It should come as little surprise, therefore, that designing multisensory packaging across cultures to more successfully market products has thus attracted the attention of both researchers and practitioners.

Using multisensory packaging design for marketing to consumers in a psychologically sophisticated manner provides at least two major challenges. The first lies with understanding design characteristics as sources of sensory information. The second challenge traces back to characteristics of the person (including person-within-situation variables). The many stages of consumer response to multisensory packaging design (i.e., perception, processing, and behaviour) are then impacted by distinct combinations of design characteristics and individual characteristics which interact, leading to unique patterns of psychological responses and therefore demand attention separately as well as in combination. These relationships (see Fig. 11.1) provide the structure for the sections to follow.
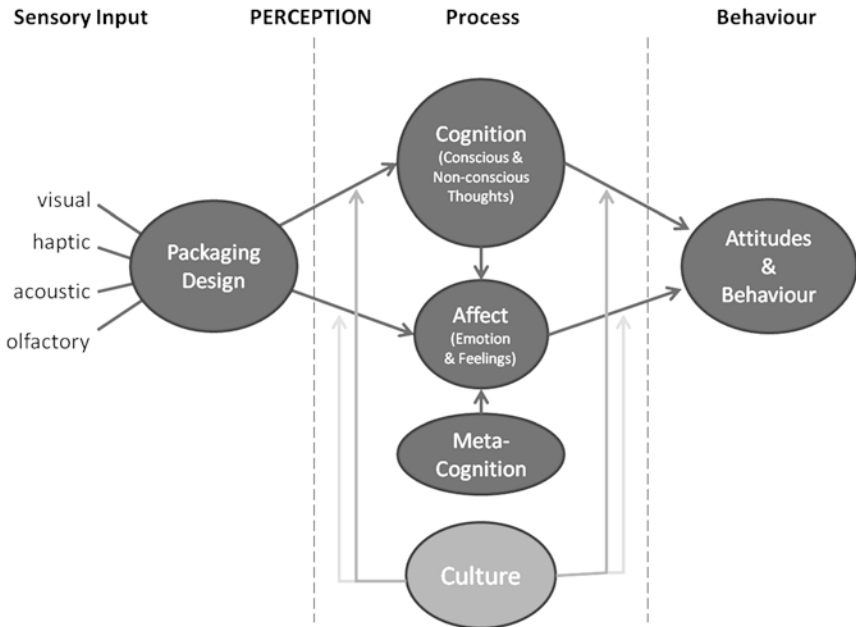
Fig. 11.1 Conceptual framework and chapter structure

This chapter advances the understanding of multisensory packaging design by bringing together sensory science, consumer psychology, and the design of marketing artefacts to further both business practices and research. The chapter summarizes and refines what we know about cultural and individual difference variables impacting marketing and consumer psychology in relation to multisensory packaging design. We start with a brief discussion of cultural dynamics. The chapter then reviews the culture-specific factors that impact perception. Section 3 illustrates how cultural differences impact consumer processing of multisensory information contained in packaging. Special emphasis is given to activation and cognitive processes. Section 4 highlights the interplay between packaging design and consumer behaviour before the chapter concludes with an outline of avenues for future research.

Section 1: Fundamentals of Packaging Design and Culture

Effective Characteristics of Multisensory Packaging Design

Discussing how to design effective multisensory packaging is beyond the scope of this chapter, especially since packaging design characteristics are reviewed in detail in other chapters of this book (see Chap. 8, Spence & Velasco, this volume). It is important to note, however, that multisensory packaging is made up of many different design elements, including colour (Mai, Symmank, & Seeberg-Elverfeldt, 2016), imagery (Machiels & Karnal, 2016), shapes (Yang & Raghubir, 2005), sizes (Folkes & Matta, 2004), weight (Piqueras-Fiszman & Spence, 2012a), and sounds (Spence & Wang, 2015, 2017; see Chap. 5, Wang & Spence, this volume), which consumers perceive together and organize into more holistic types of design that achieve particular sensory effects (Orth & Malkewitz, 2008).

These design elements, in turn, drive consumer response but are dependent on a number of individual and situational factors including a person's

construal level (Trope & Liberman, 2010), field dependence-independence (Berry, 1991), and regulatory focus (Karnal, Machiels, Orth, & Mai, 2016), all factors that correlate with cultural characteristics. Readers should keep in mind, though, that focusing on a very specific element of packaging design may yield different results than examining the same element in the context of other design elements (Orth & Crouch, 2014). This limitation becomes especially relevant in the face of findings that the congruence of information obtained through two or more senses (i.e., sensations elicited by two or more design elements) can greatly enhance consumer acceptance (Krishna, Elder, & Caldara, 2010; Spence, 2012). We next discuss cultural characteristics before we proceed to link the two concepts to explain how culture can influence consumer response to multisensory packaging design.

Definitions of Culture

Should marketers adapt packaging to cultural markets, or is standardization acceptable? The answer to this question greatly depends on differences and similarities in how consumers respond to multisensory packaging design in culturally different markets, as cultural norms and beliefs are powerful forces shaping people's perceptions, dispositions, and behaviours (Markus & Kitayama, 1991). The failure to take cultural differences into account has been the cause of many business failures (Steenkamp, 2001). For example, when Kellogg's entered the Indian market for breakfast products, the brand failed to take into account Indian preference to not start the day with a breakfast containing cold milk (Chavan, Gorney, Prabhu, & Arora, 2009). Practitioners thus need to know what cultural and individual characteristics impact consumer decision-making and how their impact functions. A first step towards a better understanding of the factors and processes involved is gaining insight into what definable characteristics are of culture.

Unfortunately, no commonly accepted definition exists of culture, even within the narrower confines of sensory marketing (Lee & Lopetcharat, 2017). Yet, frequently used definitions converge on at least three key properties of culture, referring to culture as (1) consisting of both visible and invisible elements (McCort & Malhotra, 1993), which conspire to

(2) represent a unique configuration of values, attitudes, norms, and behaviours (Kroeber & Kluckhohn, 1952), and (3) are shared, transmitted, and learned by the members of a particular group in society (Linton, 1945; Rohner, 1984). Important to the current context is that culture and its constitutive elements can impact how sensory information contained in consumer goods packaging is perceived, decoded, and processed: 'Most social scientists today view culture as consisting primarily of the symbolic, ideational, and intangible aspects of human societies. The essence of a culture is not its artifacts, tools, or other tangible cultural elements but how the members of the group interpret, use, and perceive them […]. People in a culture usually interpret the meanings of symbols, artifacts, and behaviors in the same or in similar ways' (Banks, 2016, pp. 5–6).

The diversity of cultural characteristics, specifically the combination of psychographic and behavioural elements, makes it difficult to separate fundamental characteristics of culture from reactions possibly triggered by packaging design. A number of approaches have been used to identify and operationalize culture allowing for its inclusion in empirical research (Lenartowicz & Roth, 2001). One commonly accepted approach is to operationalize culture through language, material goods, and artefacts and through beliefs and value systems (Sojka & Tansuhaj, 1995). Because language and possessions are thought to lack the capability to sufficiently differentiate among subcultures and cultures, values and belief systems are deemed instrumental in understanding cross-cultural consumer behaviour (Soares, Farhangmehr, & Shoham, 2007). In line with this way of thinking, we focus on individual difference factors that function as differentiators among cultures and are commonly studied as powerful influencers of consumer response to marketing artefacts. In so doing, we adopt an etic (i.e., out-group) rather than emic (i.e., cultural in-group) perspective on cross-cultural research, assuming that cultures share universal constructs and processes, specifically the stepwise progression from perception to processing and decision-making (Slater & Yani-de-Soriano, 2010).

Importantly, this approach diverges from international marketing perspectives in at least two key regards. First, cultures are more homogeneous than countries or nations as the latter frequently include more than one cultural group (Tharp, 2001). For example, some brands in Germany

(i.e., Telekom) design their brand communication to appeal to German consumers but communicate differently to other large cultural groups including consumers with a Turkish, Greek, Italian, Danish, or Croatian background (e.g., Gerpott & Bicak, 2011). Second, focusing on individual difference factors enables more aggregate comparisons at the group level (culture) while preserving the ability to explain and predict reactions to packaging at the individual level. In other words, while two cultures may, on average, differ on a specific individual difference variable (e.g., their attitude towards packaging), individuals in one culture may be more similar to the other culture than to their own. Contrasting international marketing, our perspective thus accounts for the very likely case that within each culture, some individuals may exhibit characteristics more in line with another culture (see Fig. 11.2). Next, we present a major framework commonly used for grouping cultural variables (Soares et al., 2007) and illustrate how its dimensions impact consumer response to packaging design.

Individual and Cultural Differences
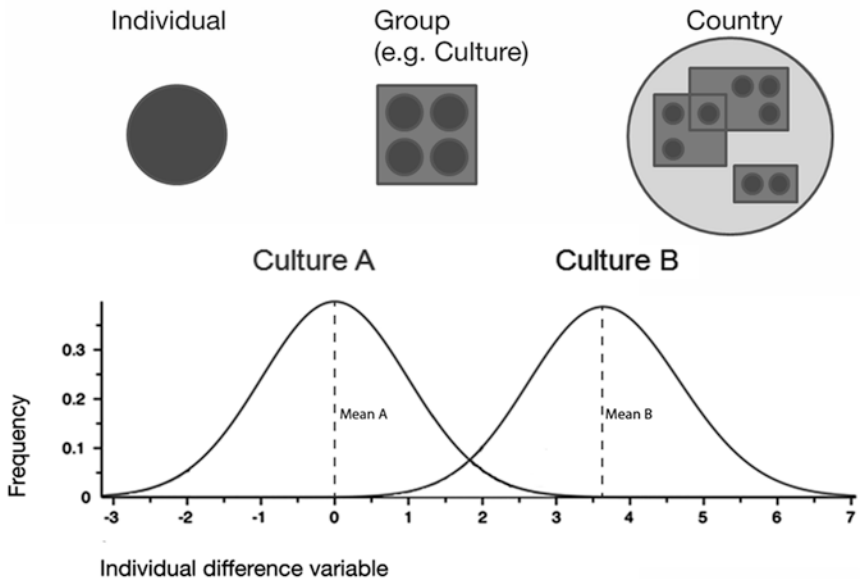
Fig. 11.2 Individual and cultural differences

Hofstede's Dimensions of Culture

According to Hofstede's (1980) framework, cultures can be classified and distinguished along five key dimensions: power distance, individualism-collectivism, uncertainty avoidance, femininity-masculinity, and short-term versus long-term orientation.

Power distance represents the degree to which less powerful members in a society expect and accept that power is unequally shared. In cultures low on power distance (e.g., Germany, the Netherlands, and Argentina), people focus less on social roles, hierarchy, and group affiliation, necessitating packaging that de-emphasizes the social, symbolic, sensory, and experiential benefits of products. By contrast, for packaging aimed at high power distance cultures (e.g., China, France, Belgium), emphasis should be placed on social and/or sensory needs (de Mooij, 2013).

Individualism-collectivism reflects the prevalence of closely knit groups in a culture versus loose social ties between individuals. Cultures high on individualism (e.g., Western Europe and the United States) respond more favourably to brand packaging that emphasizes functional, variety, novelty, and experiential needs, whereas cultures high on collectivism (e.g., Asians) are more amenable to communications that emphasize group membership and affiliation benefits (Limon, Kahle, & Orth, 2009). Furthermore, consumers in individualistic cultures prefer to be addressed textually in a direct and personalized way (i.e., emphasizing 'Me' or 'I'), whereas in collectivist cultures, communication includes more imagery (de Mooij, 2013).

Uncertainty avoidance relates to people feeling threatened by uncertain or unfamiliar situations. For designers, strong uncertainty avoidance translates into the need for explanation, providing structure, evidence of product tests, certification, scientific proof, and advice but also a high regard for technology. Regarding logos, evidence from ten countries suggests that elaborateness, naturalness, and harmony may be universal, but high uncertainty avoidance cultures find elaborate design less attractive (van der Lans et al., 2009).

Feminine cultures are characterized by an overlap in social sex roles; masculine cultures clearly differentiate them with important implications for marketing communications. For example, in Slovakia (a high masculinity

culture), Danone designed their yoghurt brand Dobra Mama ('Good Mom') to highlight the importance of the traditional mother role (as it would be expected in a masculine culture) as a teacher on their packaging. In more feminine cultures, however, packaging emphasizes a more equal flow of information from mother to daughter (de Mooij, 2013). Aggressive typology and layout (e.g., Gillette shaving cream in the United Kingdom) are commonly used reflectors of competitiveness with masculine cultures, whereas designs aimed at feminine cultures favour caring, softness, harmony, and understatement (de Mooij, 2013).

In perhaps the most comprehensive study on packaging using the Hofstede dimensions, van den Berg-Weitzel and van de Laar (2001) cross-referenced packaging design characteristics with Hofstede's cultural dimensions across five product categories (deodorant, mineral water, soup, cigarettes, and cigars) and seven countries (Japan, Thailand, the United States, the United Kingdom, Germany, Spain, and the Netherlands). Five design factors emerged, termed expressiveness (soft versus bright colours, angular versus rounded shapes, aggressiveness of typography), context (information being conveyed explicitly versus implicitly), symbolism (use of symbols, amount of detail), information (amount of text), and identification (size of company name, use of upper versus lower case lettering). Several close correlations emerged between cultural dimensions and packaging design contingent upon the product category. For example, female deodorants in masculine societies have packaging designed to be especially feminine (e.g., the Venus shaving line by Gillette in the United Kingdom). For mineral water, the design factor expressiveness was associated with increased uncertainty avoidance, and the factor information correlated with low power distance, individualism, and low uncertainty avoidance. The latter finding is not surprising as consumers in high uncertainty avoidance cultures buy more bottled (rather than tap) water, and thus need less explicit product information (de Mooij, 2013).

While a large number of studies on cross-cultural differences in consumer response to marketing artefacts have used one or more of Hofstede's (1980) dimensions, a substantial number of studies exist where researchers have used cultural variables that are simply not included in his framework. The next sections review those and other studies organized along a chain of effects starting with consumer perception.

Section 2: Culture and Perception

Scholars in marketing and sensory science view perception as the process of acquiring, interpreting, selecting, and organizing sensory input (Peck & Childers, 2008). Readers should note that perception is highly selective and subjective (Orth & Crouch, 2014) and thus readily influenced by cultural factors. In Western cultures, the sense of vision is thought to be the main source of perceptual input, whereas cultures more attuned with nature might make more use of other senses to perceive their environment (Classen, 1999).

Sense of Vision: Field Dependence-Independence

A fundamental difference between cultures relates to the uptake of visual information, specifically, holistic (configural) perception versus elemental (analytic) perception (Miyamoto, Nisbett, & Masuda, 2006; Nisbett, 2004). Holistic perception refers to people paying increased attention to relationships between objects (e.g., informational cues on packaging), whereas analytic perception is characterized by a tendency to categorize objects according to specific rules and properties. Cultural variables have a profound influence on perception (Unsworth, Sears, & Pexman, 2005) with corresponding differences often assessed in terms of field dependence-independence (Nisbett & Miyamoto, 2005). More field-dependent individuals (those exhibiting a more holistic processing style) are more influenced in their visual perception by characteristics of their physical and social environment (Miyamoto et al., 2006). In contrast, more field-independent individuals tend to perceive objects as separate entities from their environment (Kühnen et al., 2001), implicating a more analytic perceptual processing.

A cultural discriminator, field dependence-independence impacts consumer perception of multisensory packaging (e.g., see Chen, Huang, Woods, & Spence, 2016, for a cross-cultural example of cross-modal correspondence between shapes and sounds). Field dependence as a cognitive style influences packaging perception to the extent that consumers who are more field dependent are less likely to correctly remember which

brand they saw (Foxman, Muehling, & Berger, 1990). Brand or product confusion through design can have far-reaching consequences. For example, after Sunlight Dishwasher Liquid was introduced in the United States, some consumers mistakenly thought it to be Minute Maid Lemon Juice and became ill after drinking it (Reiling, 1982, see also Basso et al., 2014). East Asians (compared to Western individuals) are visually biased towards global visual properties (Lao, Vizioli, & Caldara, 2013), urging marketers to reflect this in their packaging. For example, Fruittella (a brand of chewy sweets) traditionally pictured an image of a dinosaur on their packaging marketed in Western countries (which are thought to be less field dependent) but modified it to show the dinosaur embedded in a contextual landscape for the presumably more field-dependent Chinese consumers (Visser, 2009, p. 63).

Sense of Touch: Contact and Non-Contact Cultures

Regarding the sense of touch, individuals vary in their need for touch (Peck & Childers, 2003), and, more specifically, in their quest for tactile input when shopping (Ackerman & Tellis, 2001). Extending differences from the individual to the group level, cultures can be classified as contact versus non-contact (Hall, 1985), leading to divergent influences on consumer behaviour (Dibiase & Gunnoe, 2004). In general, individuals in contact cultures (e.g., on the Arabian Peninsula and around the Mediterranean) seek tactile input more so than individuals in non-contact cultures (e.g., in Germany and the northern United States; Hertenstein, Verkamp, Kerestes, & Holmes, 2006). Although these differences are mostly interpersonal, they plausibly apply to interaction effects with packaging. Given that the tactile sensation provided by packaging can impact perceptions of quality and product experience (Spence & Gallace, 2011), cultural differences in touching behaviour can drastically impact not only perception but additionally shopping practices. For example, Chinese consumers use more senses when examining food and inspect more items than American shoppers (Ackerman & Tellis, 2001).

Sense of Smell

Cross-cultural research established a significant effect of culture on perceptual dimensions of olfactory information such as familiarity, pleasantness, intensity, and edibility for everyday odours. This variation is thought to trace back to culture-specific experiences—particularly of foods (Ayabe-Kanamura et al., 1998). Cultural variables impacting consumer perception include odour sensitivity, identification, and representation (Chrea et al., 2004). For example, some Asian cultures identify odours as easily as individuals from Western cultures identify colours (Majid & Burenhult, 2014) and this can be explained through specific cultural variables (e.g., subsistence; Majid & Kruspe, 2018). This indicates that packaging that enables consumers to smell the product inside may yield divergent responses with consumers. For example, recent advances in microcapsule technology allow applying Scratch'n'Sniff patches that are representative of the scent of a product contained within (e.g., coffee). To better match the smell of packaging to cultural markets, differences in odour sensitivity may force marketers to adjust odour concentrations (e.g., in patches). Differences in identification may require culture-specific provision of additional (verbal) descriptions, and differences in categorization may mandate careful research on odour-related memories and pleasantness to ascertain effectiveness (Lwin & Wijaya, 2009).

Packaging Acoustics and the Sense of Hearing

For an overview of research on packaging sound, we direct the reader to Wang and Spence (Chap. 5, this volume). Although we are unaware of cross-cultural research regarding packaging acoustics, it should be noted that relative processing dominance of auditory brand information varies between cultures. Chinese consumers recall brand names better when they see them, whereas for Western consumers memory is enhanced when they hear the names (Schmitt, Pan, & Tavassoli, 1994). Similarly, preferences for vowels and consonants in brand names differ between languages (Kuehnl & Mantau, 2013; Shrum, Lowrey, Luna, Lerman, & Liu, 2012). Getting

the sound right is becoming increasingly important, and major brands have come up with interesting solutions such as Colgate, which is marketed in China as Gao lu jie, 'revealing superior cleanliness' (Wines, 2011). For China, combining the original English name with a Chinese version is thought to be most appropriate (Liu, Murphy, Li, & Liu, 2006), but some brands even modify their name to make it sound alike in several major markets (e.g., Danone > Dannon in the United States).

Section 3: Culture and Processing of Packaging

Consumer processing of packaging design cues involves, among others, the formation of cognitions, the experience of emotion, and meta-cognition. The following paragraphs briefly explain each of those processes and discuss how they can be influenced by cultural variables.

Culturally Divergent Cognitions Elicited by Packaging Characteristics

Cognitions derived from a packaging design include a variety of judgments such as a product's flavour (Velasco et al., 2014), quality (Machiels & Orth, 2017), naturalness (Labbe, Pineau, & Martin, 2013), healthiness (Mai et al., 2016), and expected price (Orth, Campana, & Malkewitz, 2010).

Cultural variables influence cognitions through learned and spontaneous associations, specifically, symbolism and semiotics. For example, assessing cross-cultural flavour associations for several examples of potato chips packaging, Velasco et al. (2014) found that only two colour-flavour associations were consistent across cultures: green with cucumber and red with tomato, likely because of the products' universal associations with these colours. Packaging styles and materials can lead consumers to form divergent impressions of a product's sustainability (Chandra Lal, Yambrach, & McProud, 2015). Even the sound of a brand name conveys information about salient properties of a product (Klink, 2000), enticing marketers to adapt linguistic properties to culture-specific markets (Francis, Lam, &

Walls, 2002). Similarly, acoustic properties of a dehydrated soup pouch influence consumer perception of naturalness (Labbe et al., 2013). It is not unusual for packaging to be decoded into differential meanings across cultures despite a brand's attempt to standardize (across cultures). For example, consumers in Austria, Germany, the Netherlands, Singapore, the United Kingdom, and the United States perceive the energy drink Red Bull quite differently regardless of the company's attempt to position the brand identically (as exciting) in all cultures (Foscht, Maloles, Swoboda, Morschett, & Sinha, 2008).

Colour associations vary greatly across cultures (Madden, Hewett, & Roth, 2000). For example, US consumers associate the colour blue with wealth, trust, and security; grey with strength, exclusivity, and success; and orange with cheapness. In Japan, China, and Korea, people associate purple with expensive, whereas in the United States the most common association for purple is with inexpensive. A good example is the healthiness of olive oil consumers infer from the bottle colour: bottles should be dark in colour to convey healthiness to Italian consumers, whereas transparent bottles work better with consumers in the Netherlands (Cavallo & Piqueras-Fiszman, 2017). Cultural differences further extend to the pairing of colours, an important consideration as creating packaging often involves combinations of colours rather than single ones (see the Chap. 2 on colour, Spence & Velasco, this volume). For example, the colour that goes best with green is yellow in Canada, Hong Kong, China, and Taiwan, blue in Colombia, and white in Austria. In contrast, pairing green with red yields best results with consumers in China and Taiwan (Madden et al., 2000). Kleenex, for instance, opts for mostly pastel colours on their packaging in China (Labbrand, 2009).

Illustrating cultural differences in cognitions derived from packaging shape, the Suntory brand uses a bamboo-shaped PET bottle for their green tea drink so as to better convey the key characteristics of naturalness to domestic consumers in Japan (Visser, 2009, pp. 8–9). However, using this uniquely shaped container depends on consumers recognizing the bamboo and associating it with naturalness, a link that may not function with consumers in those cultures where bamboo is less known. Designers may thus be better off incorporating design features less likely to differ much in perception across cultures, such as embodied product

characteristics (van Rompay, Hekkert, Saakes, & Russo, 2005; see also the Chap. 7 on embodiment, van Rompay, this volume) or the 'divine' proportion of logos (Pittard, Ewing, & Jevons, 2007).

Furthermore, packaging-induced cognitions vary depending on consumers' self (Haberstroh et al., 2018). As a cultural discriminator, self-construal is the way individuals see themselves in relation to others (Markus & Kitayama, 1991). Interdependent individuals define their self through their relations with others, whereas independent individuals construe their selves separate from social contexts (Singelis, 1994). A person's self-construal is culture-bound, and it impacts consumer response to packaging (Ng & Houston, 2006). For example, visual harmony associates with attractiveness, especially with interdependent consumers (Haberstroh et al., 2018).

Even more fundamental differences in consumer thoughts can trace back to images displayed on packaging. For example, an exporter of French cheese placed the image of a shepherd surrounded by sheep on their packaging. In France, the home culture, this traditional image conveyed naturalness and home-made, whereas in Germany, the export market, the shepherd was perceived as filthy, hindering a successful extension of the product to a foreign culture (Usunier & Lee, 2013). While consumers in Spain and Denmark did not differ in their perception of the symbolism contained in food packaging images (i.e., heart, stethoscope, olives), they arrived at a different meaning attached to the symbols (Carrillo, Fiszman, Lähteenmäki, & Varela, 2014).

Cultural Differences in Cross-Modal Correspondences

A research branch that is important in packaging design is research on cross-modal correspondences, specific mappings within the mind between, for example, different shapes and tastes (Velasco, Woods, Petit, Cheok, & Spence, 2016). There is some evidence that cultural differences shape correspondences. For example, many (Western) consumers associate angularity with carbonation and bitterness, whereas the Himba tribe in Namibia does not show this correspondence for carbonation, and it is reversed for bitterness (Bremner et al., 2013). Other cultural differences

derived from shapes and textures include, for example, that a heart shape is perceived as more sweet by Americans than by Chinese, and Indians associate smooth texture with sour taste, whereas Americans show no correspondence between the two (Wan et al., 2014). More general cross-modal correspondences do not show much cultural variations, for example between sweetness and roundness (Ngo et al., 2013), or between auditory information and taste (Knöferle, Woods, Käppler, & Spence, 2015).

Consumer Affective Responses to Packaging

A variety of affective responses can be evoked by the design of packaging (Desmet & Schifferstein, 2012). For example, images, colours, and typeface on chocolate bars can elicit nostalgia, a bitter-sweet yearning for the past (Orth & Gal, 2014). Packaging visual cues to a brand's heritage can stimulate purchase behaviour by evoking global positive emotions (Rose, Merchant, Orth, & Horstmann, 2016). These emotions vary, however, across cultures (Scollon, Diener, Oishi, & Biswas-Diener, 2004).

Perhaps most prominent among packaging-evoked affective responses are aesthetics-based feelings of joy and pleasure (Reimann, Zaichkowsky, Neuhaus, Bender, & Weber, 2010). Aesthetics are a strong influencer of consumer behaviour, paralleling effects of perceived quality (Orth et al., 2010), especially with consumers who are more sensitive to, and aware of, differences between designs (Celhay & Trinquecoste, 2015). While cultures diverge in both antecedents and consequences of aesthetics (see Masuda, 2017, for a review), it is extremely relevant for packaging design. Beyond aesthetic appreciation, additional differences exist between cultures in the emotions evoked by packaging design as well as in the impact of those emotions on consumer behaviour. Specifically, variations in language use, cultural context, or prior experience produce variation in whether emotions are experienced, which emotions are experienced, and how they are experienced (Mesquita & Leu, 2007). As a result, it is important for marketers to understand what emotional response to packaging is constant and what varies from one culture to the next.

Meta-Cognitions Elicited by Processing Packaging Cues

When forming judgments based on packaging design, consumer meta-cognition can play an important role beyond cognition and affect (Orth & Malkewitz, 2012). Consumer processing of informational cues can be characterized by three parameters such as the ease, speed, and accuracy of forming judgments (Reber, Wurtz, & Zimmermann, 2004). Commonly referred to as processing fluency (Novemsky, Dhar, Schwarz, & Simonson, 2007), fluent meta-cognitive experiences evoke processing-related positive affect (Winkielman & Cacioppo, 2001), influence salient judgments (Lee & Labroo, 2004), preference (Sundar & Noseworthy, 2014), and behaviour (Gomez, Werle, & Corneille, 2017). In essence, culture impacts the link between packaging design characteristics and processing fluency through culture-specific symbolism and associative judgments (Chattaraman, Rudd, & Lennon, 2010). For example, consumers in Japan may easily and speedily associate the shape of the previously mentioned Suntory bottle with bamboo, hence experiencing positive processing affect and associated greater liking. In contrast, consumers in cultures unfamiliar with the bamboo plant may find it more difficult or even impossible to make the connection, thus lacking the positive emotional charge and forming less positive attitudes.

Section 4: Culture and Consumer Attitudes and Behaviour

Culture and the Influence of Packaging-Induced Cognitions on Behaviour

Cultural factors moderate many of the relationships between packaging-evoked cognitions and consumers' behaviour. For example, while the material of packaging evokes similar thoughts of sustainability across consumers in the United States, England, Germany, and China, the influence of those cognitions on willingness to pay and purchase is more positive with Americans than it is with Chinese consumers (Young,

2008). Consumers in Turkey and Germany not only infer divergent brand impressions from the design of salt and chocolate packaging, but they additionally vary in the extent to which they base their purchase intent on those impressions (Limon et al., 2009). Individual values (Kahle, Rose, & Shoham, 2000) are thought to be an important individual cultural difference factor and moderator of these relationships.

Another important cultural moderator is consumer ethnocentrism (Siamagka & Balabanis, 2015). Conceptualized as the beliefs held by consumers about the appropriateness of purchasing products originating in a foreign culture (Sharma, Shimp, & Shin, 1995), ethnocentrism impacts how the origin inferred from packaging (e.g., the brand's name, national symbols, or images) influences attitudes and behaviour. For example, as ethnocentrism of Greek consumers increased, they were less likely to purchase cheese, ham, and beer products originating from Italy or the Netherlands (Chryssochoidis, Krystallis, & Perreas, 2007). More ethnocentric consumers in the Czech Republic formed lower purchase intentions for yoghurt when the packaging indicated Russia, Germany, and France as origin (Orth & Firbasová, 2003). Noteworthy, more individualist cultures favour ethnocentric products when they think the product is superior, whereas collectivists favour ethnocentric products regardless of superiority (Gürhan-Canli & Maheswaran, 2000).

Cultural Variables Moderating Effects of Packaging-Evoked Affect

Cultures differentially encourage and reinforce emotional responding (Mesquita, 2001), resulting in differences in which emotional responses to packaging design affect behaviour under what circumstance. For example, consumers in the United States rely more on packaging-evoked emotion when making purchase decisions than Korean consumers (Moon, Miller, & Kim, 2013). Emotion regulation is a major cultural discriminator (Matsumoto, Yoo, & Nakagawa, 2008) and thought to be a major driver of cultural differences in response to packaging-evoked affect. As consumers attempt to get into or prolong a good mood, or get out of a bad mood, the emotions and feelings evoked by packaging may

be viewed as means to those ends, leading to divergent behavioural outcomes. In other words, depending on their self-regulatory focus (promotion of positive affect or prevention of negative affect), behaviour may be influenced more by feelings of pleasure, joy, and happiness or irritation and sadness (Aaker & Lee, 2001; Karnal et al., 2016).

Section 5: Gaps in Knowledge as Avenues for Future Research

While substantial progress has been made towards a better understanding of how multisensory packaging design impacts consumers' behaviour contingent upon their cultural background, significant gaps in our knowledge still exist. From our vantage point, there are at least three promising avenues for obtaining valuable insights through future studies: adopting an even more multisensory perspective on design characteristics, advancing cross-cultural research methods, and advancing analytics.

Probably the most limiting factor to research on cross-cultural differences in consumer response to multisensory packaging design is the slow growth in the number of studies focusing on senses other than vision. It was only recently that researchers started to examine packaging characteristics pertaining to other senses including touch (Piqueras-Fiszman & Spence, 2012b, see also the Chap. 6 on tactile aspects of packaging, Spence, this volume), odour (Krishna, Lwin, & Morrin, 2009; see also Spence, 2015, and Nibbe & Orth, 2017, for an overview of research on odours in marketing), and acoustics (Spence & Wang, 2015), or to study two or more sensory modalities simultaneously (Gatti, Bordegoni, & Spence, 2014; Krishna et al., 2010), with studies regarding cultural differences only scarcely following suit.

Second, in spite of the substantial body of cross-cultural research discussed here, many studies struggle with definitions of culture (Lee & Lopetcharat, 2017) and cross-cultural equivalence (Ares, 2018). Specific challenges lie with ascertaining that sampling procedures, concepts, linguistics, data collection procedures, measures, and response styles are comparable across cultural groups. For example, cultures can vary in how basic concepts such as beauty and aesthetics (Redies, 2015) and health

(Carrillo et al., 2014) are articulated and weighted, and researchers must adjust accordingly when researching packaging design across cultures. Cultures diverge in people's willingness to cooperate, social context response bias, and response style (Ares, 2018; Baumgartner & Steenkamp, 2001). Similarly, basic functions may vary across cultures, such as preparing breakfast, and researchers must ascertain that the activities and methods used capture possible differences. With the help of sound cross-cultural research techniques, applied to study effects of multisensory packaging design, a more revealing view into the 'black box' of the culture-dependent consumer should be feasible.

Recent advances in sensory marketing research include more sophisticated and powerful analytics. For example, state-of-the-art processors allow 'big data' processing, 'crunching' large numbers of variables for huge numbers of consumers in relatively short periods of time (Zikmund & Babin, 2007). On the human side, statisticians developed ever more sophisticated methods including conditional process modelling (Hayes, 2012) to better quantify how (through mediator variables) and when (conditional values of moderator variables) an independent variable influences a dependent variable. Conceivably, many of the studies on cross-cultural differences in consumer response to multisensory packaging design suggest an indirect effects model, whereby the relationship between design (e.g., visual or haptic informational cues) and consumer response (e.g., intention to purchase) is transmitted by a mediator (e.g., a shift in healthiness evaluation or affect) or is contingent upon a moderator (e.g., cultural characteristics). It is thought that conditional process models yield far more complete results than do traditional approaches (Edwards & Lambert, 2007), and the application of these novel methods and analytical tools may therefore aid practitioners and researchers alike in understanding how the design of packaging functions with consumers across cultures.

Conclusion

The previous sections covered numerous insights, elaborating on differences in the response to multisensory packaging based on cultural dependencies, ranging from perception to cognitions and behaviour. Yet, in the space available, we have just scratched the surface on the number and

diversity of packaging design phenomena directly or indirectly attributable to cultural variables. Readers may find other important areas of research, in packaging design, cross-cultural consumer behaviour, and sensory marketing that have been omitted here. As new research becomes available, updates, revisions, and amendments to the insights discussed here will become not only possible but necessary. We trust that the current chapter facilitates understanding and possibly ignites discussion about using multisensory packaging design for marketing across cultures. This truly is an interdisciplinary field, and we are pleased to have the opportunity to provide these viewpoints.

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Part III

The Future of Multisensory Packaging

12

The Consumer Neuroscience of Packaging

Charles Spence, Carlos Velasco, and Olivia Petit

Introduction

With the evident growth of interest in multisensory packaging (e.g., see the other chapters in this volume) comes increased interest in the development of more sophisticated tests/techniques with which to better predict the efficacy/success of novel exemplars of product packaging (see Calvert & Brammer, 2012; see also Falk, Berkman, Mann, Harrison, &

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319

Lieberman, 2010). For example, everyone from brand managers through to packaging designers and consumer neuroscientists/neuromarketers would like to know which of a range of new packaging design solutions and/or existing design modifications set the right expectations and/or prime the most appropriate associations in the mind of the target consumer group. Ultimately, the hope is that by learning more about the mind of the consumer, companies can market their products more successfully. However, that said, to date, many of the insights that have been uncovered from the limited number of peer-reviewed academic research studies that have been published in this area[1] have tended to be rather abstract/theoretical in nature (i.e., simply detailing some of the brain networks involved; see Kühn, Strelow, & Gallinat, 2016)—of more interest, perhaps, to the academic research than necessarily to the brand manager.

We have already come across a number of examples of implicit testing techniques (that promise to pick up on the kinds of information that the participant may not be consciously aware of and/or necessarily be willing to divulge) such as the so-called Implicit Association Test (IAT) (e.g., Parise & Spence, 2012; Piqueras-Fiszman & Spence, 2011; Tijssen, Zandstra, de Graaf, & Jager, 2017, or semantic priming; e.g., Calvert, Fulcher, Fulcher, Foster, & Rose, 2014; Pathak, Calvert, & Velasco, 2017) being used to address such questions in the other chapters in this volume. Similarly, the use of large-scale online testing (e.g., using the box-scale task; see Velasco & Spence, typeface chapter, this volume) has also become much more popular in recent years too. One question that remains, though, concerns whether such approaches should be described as neuromarketing or whether instead they are better described as neuroscience-inspired techniques? And what, anyway, is the nature of the relationship between neuromarketing and consumer neuroscience? We start this chapter by addressing the latter questions before going on to summarize what the few published neuroimaging studies of branding and packaging that have been conducted to date have, in fact, revealed about the network of brain areas involved in the visual assessment of

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[1] As captured in Google Scholar searches, on February 28, 2018, of article titles, the literature on the topic is not extensive: Packaging + Neuroscience = 2 articles; Packaging + Neuromarketing = 3 articles; Brand + Neuromarketing = 14 articles; Brand + Neuroscience = 9 articles; Packaging + Psychology = 65 articles.

product packaging. And while visual aspects of packaging design are undoubtedly hugely important (see Durgee & O'Connor, 1996; Gallace, Ngo, Sulaitis, & Spence, 2012; Spence & Velasco, this volume), it is crucial to realize that packaging is inherently multisensory and so neglecting packaging's other sensory components is potentially limiting. Next, we draw attention to various constraints associated with the commercial use of neuroimaging in the context of the assessment of multisensory product packaging (highlighting that the majority of the research published to date has focused solely on the visual attributes of packaging, or branding, more generally). At present, it can be argued that these limitations prevent neuroimaging from providing a comprehensive (not to mention cost-effective) tool for those wanting to assess their innovative multisensory product packaging. We then summarize the results of the latest neuroimaging research suggesting that composite neural response measures might be used to predict the success of new product communications in the marketplace. Finally, we briefly summarize the other neuroscience-inspired (i.e., physiological) measurement techniques that the academic researchers and marketing practitioners have considered over the years when evaluating product packaging (see Kroeber-Riel, 1979; Weinstein, 1981) in order to possibly replace, or at the very least to augment, the more traditional focus group research and surveys (e.g., Catterall & Maclaran, 2006; Lunt, 1981; see also Spence, 2009).

On the Relationship between Neuromarketing and Consumer Neuroscience

According to Ariely and Berns (2010, p. 284), neuromarketing can be defined as "The application of neuroimaging methods to product marketing" (see Editorial, 2004, and Fugate, 2007, for similarly narrow definitions). As yet, however, the majority of the published research in this area (e.g., answering packaging relevant questions) has tended to be at the more academic rather than commercial end of the spectrum—what Javor, Koller, Lee, Chamberlain, and Ransmayr (2013) refer to as 'consumer neuroscience' rather than 'neuromarketing'. In this context, neuromarketing refers to the commercial offerings of the more than 150 companies

globally that provide neuroscience solutions for their clients (Petit, Merunka, & Oullier, 2014; Spence, 2016b). By contrast, according to Plassmann, Ramsøy, and Milosavljevic (2012, p. 18), "*The goal of consumer neuroscience is to adapt methods and theories from neuroscience—combined with behavioral theories, models, and tested experimental designs from consumer psychology and related disciplines such as behavioral decision sciences—to develop a neuropsychologically sound theory to understand consumer behaviour*". Consumer neuroscience studies are based on rigorous protocols and are subject to a scientific and administrative approach that involves endorsement of ethics and protection of people committees and are then published after expertise scientist (Petit et al., 2014; Spence, in press).[2]

Branding on the Brain

One area where neuroimaging really has provided some useful insights, which are, in a sense, relevant to packaging, relates to the effects of branding (e.g., Chan, Boksem, & Smidts, 2018; Kühn & Gallinat, 2013; McClure et al., 2004). Given that some examples of signature product packaging have become instantly recognizable image moulds, think Coca-Cola (Gates, Copeland, Stevenson, & Dillon, 2007; Spence & Gallace, 2011), then the neuroimaging of branding could potentially provide some useful answers as far as packaging design is concerned.[3] It has, after all, been known for years that branding, pricing, and other forms of product-extrinsic information change what people have to say about a product (see Davis, 1987; Martin, 1990; Moskowitz, 1981; Petit, Merunka, et al., 2016; Plassmann, O'Doherty, Shiv, & Rangel, 2008; Spence, 2010).

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[2] Note, however, that a recent review by Lee, Chamberlain, and Brandes (2018) suggests that the available literature in neuromarketing and consumer neuroscience (both terms which they use interchangeably) appears to be somewhat fragmented. Furthermore, clear guidelines as to what constitutes good practice in the field seem to be lacking.

[3] It should, however, always be remembered that it is more the brand than specifically the packaging that is doing the work in this case. That said, signature packaging is a valuable brand asset for many companies.

What has never been clear, though, at least not from the early research, has been whether such information really changed the consumer's sensory experience of the product, or merely influenced what people chose to say about the experience (i.e., a kind of demand artefact).

The classic experiment on the neural substrates of branding was conducted by McClure et al. (2004). The participants in this consumer neuroscience study had their brains scanned while a small amount of a cola drink (either Coke or Pepsi) was periodically squirted in their mouth while different visual information concerning the brand of cola that they were apparently tasting was projected onto a screen. Under blind tasting conditions, activity in the ventromedial prefrontal cortex (PFC) (vmPFC), a reward-related outcome brain area (Hare, Camerer, & Rangel, 2009), was found to correlate with the participant's behavioural preference. Interestingly, however, qualitatively different patterns of brain activation were observed depending on which brand of cola the participants thought that they were tasting. On being led to believe that they were tasting Coke (e.g., as might be expected to occur were another cola to be served in Coca-Cola's distinctive packaging), increased activation was observed in the participants' hippocampus, dorsolateral PFC (DLPFC) and midbrain. The DLPFC is commonly involved in situations of conflicting desires requiring self-control (Hare et al., 2009; Petit, Merunka, et al., 2016) and the hippocampus in recalling affect-related information (Iidaka et al., 2003). For McClure et al., the greater activity in these brain areas during Coca-Cola delivery might suggest that they are implicated in biasing perception based on prior affective bias for the Coke label.

Kühn and Gallinat (2013), meanwhile, observed greater activation in the left ventral striatum (a reward-related processing brain area, Delgado, 2007) when their participants believed that the cola that they were tasting was a strong rather than a weak brand (e.g., Coke or Pepsi versus a national or fictitious brand). Intriguingly, the effect of visually presented brand imagery was stronger in those participants who only drank cola infrequently, possibly hinting at a greater reliance on brand cues in less regular consumers (see Plassmann et al., 2012, for a review of the consumer neuroscience literature on branding). This kind of neuroimaging research has, then, helped to address the Pepsi Paradox (see Van Doorn & Miloyan, 2018, for a review).

Labelling on the Brain

Meanwhile, in terms of the impact of the kinds of copy, or labelling that might be expected to appear on food and beverage (F&B) packaging, the neuroimaging research has also provided insights into the changes that are seen neurally. So, for example, Linder et al. (2010) demonstrated that labelling a food as organic led to increased activity in the ventral striatum. Elsewhere, a number of studies have, by now, demonstrated how descriptive labels (such as saying that something will taste very bitter, or else not bitter at all) can change the neural response to a drink, expressed even at the level of the primary taste cortex (Nitschke et al., 2006; Woods et al., 2011; see Spence, 2016a, for a review).

Neuroimaging Studies of Packaging Design

In recent years, there has been a great deal of interest in the potential of neuroimaging techniques such as electroencephalography (EEG) using event-related potentials (ERPs) and functional magnetic resonance imaging (fMRI) to measure the blood-oxygen level dependent (BOLD) response in the world of marketing (see Ariely & Berns, 2010, for a comprehensive review, and a recent special issue of the *European Journal of Marketing*, http://www.emeraldinsight.com/toc/ejm/52/1%2F2).[4] That said, unrealistic claims for the usefulness of such approaches have, in the past, sometimes been made by the more outgoing neuromarketing practitioners out there (Stanton, Sinnott-Armstrong, & Huettel, 2017), and the world of packaging design evaluation is certainly no exception in this

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[4] Event-related potentials (ERPs) are electrical potentials generated by the brain related to specific internal or external events. The electroencephalography (EEG) records the electrical activity of the brain. EEG data provide indications on different brain rhythms depending on the activation state of the neurons. EEG has very high temporal resolution (milliseconds) but a low spatial resolution. Functional magnetic resonance imaging (fMRI) provides indirect measures of brain activity, based on the blood-oxygen-level dependent (BOLD) contrast. The method is based on the magnetic properties of oxygenated/deoxygenated blood. fMRI can produce high spatial resolutions (1–3 mm) but has a poor temporal resolution (seconds). Other neuroimaging techniques such as, for example, positron emission tomography (PET), that rely on the injection of a radioactive tracer into the participant's bloodstream are understandably less popular in commercial neuromarketing research than they have been in medical research.

regard (e.g., see Lindstrom, 2008; Pradeep, 2010, for some particularly egregious examples; and Spence, in press, for a critical assessment). It is, in part, for this very reason that Ariely and Berns provide a number of concrete guidelines for those working in business (and who may not be familiar with the intricacies of the highly complex neuroimaging techniques) to make sure that they spend their budgets wisely, and, more importantly, choose the most appropriate method to answer the questions of interest to them. At the same time, however, it is also worth being sanguine about the fact that colourful brain scans undoubtedly have a remarkable persuasive power all of their own, that is, regardless of what the data may actually say (see Spence, 2016b, in press).

Neuroimaging Research: Brain Correlates of Packaging Design

While many people tend to think of neuroimaging as a very recent suite of techniques (indeed Stoll, Baecke, & Kenning, 2008 claim that they are the first researchers ever to use neuroimaging to study product packaging), it is worth noting that EEG has actually been around for more than a century now. And, in perhaps the earliest study of packaging to use such an approach, Sidney Weinstein (1981) assessed the electrophysiological response to product packaging using ERP (see also Kroeber-Riel, 1979).[5] In particular, Weinstein's research focused on the percentage interest levels and the percentage of right and left Beta brain activity[6] evoked by each package (supposedly providing a measure of activation and involvement, respectively). In the case study described, differences in these metrics between five different packages were used by Weinstein to make recommendations to the client regarding which packaging design to go with. However, despite Weinstein's evident enthusiasm for these electrophysiological brain-wave measures, it doesn't seem that they have been all that

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[5] However, the fact that his research appears in an edited book, rather than a high-impact peer-reviewed journal article, probably says something about the perceived usefulness of his approach at the time in was published.

[6] Beta wave is a neural oscillation in the brain with a frequency range of 13–30 Hz. Beta wave is mostly related to alertness and concentration.

popular amongst packaging researchers subsequently (e.g., according to Google Scholar, only eight articles have cited it subsequently).

More than a quarter of a century later, Stoll et al. (2008) used fMRI to assess the neural responses elicited by visually presented images of different packaging designs that had been pre-selected to vary in terms of their attractiveness. The 11 participants who took part in this preliminary study had to decide whether each of 120 images of fast-moving consumer good (FMCG) packaging were attractive or not. These images constituted the 10 top/middle/bottom packages ranked in terms of attractiveness out of an initial set of 131 packages from the food and non-food categories. Before the scan began, the participants were able to visually and haptically examine the 30 packages for 5 minutes. The neuroimaging results revealed that different patterns of cortical activity were associated with the more attractive as compared to the less attractive product packaging.[7] In particular, at a group level, contrasting attractive versus unattractive packaging revealed significant increases in cortical activity in visual areas of the occipital lobe and precuneus. These brain regions are known to be associated with the processing of visual stimuli and attention. The analysis of the neuroimaging data from a single exemplary participant also revealed evidence of significant changes in neural activation in those areas coding for the reward value of stimuli (e.g., orbitofrontal cortex and the anterior and posterior cingulate cortex). Meanwhile, contrasting unattractive versus attractive packaging revealed increased activity in frontal lobe and insula cortex, brain regions that might be associated with aversive stimuli, such as unfair offers and disgusting pictures (Knutson, Rick, Wimmer, Prelec, & Loewenstein, 2007, see https://www.talyarkoni.org/blog/2011/10/01/the-new-york-times-blows-it-big-time-on-brain-imaging/, for a critique concerning the interpretation of insular activations).

Elsewhere, Reimann, Zaichkowsky, Neuhaus, Bender, and Weber (2010; Experiment 3) conducted an fMRI study of aesthetic product packaging in which 17 participants made decisions concerning aesthetic versus standardized visual stimuli (2720 choices in total) while lying in a brain scanner. On each trial, the product category was displayed first (e.g., 'Soda'). Next, an image of the product packaging was presented for

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[7] In total, 30 exemplars of product packaging (e.g., pizza boxes) were shown 4 times in a random order for 10 seconds each. The participants had to make a speeded forced choice response to each image of product packaging.

four seconds. The price information was then added to the display for a further four seconds, before the participants had to choose (Yes or No) whether they would purchase that product at the price shown. Both well-known and unknown exemplars of brand packaging were displayed. Increased neural activation was seen in the reward pathway when participants were viewing the more aesthetic packaging: Specifically, in the vmPFC, the striatum (specifically, the right nucleus accumbens—involved in reward anticipation),[8] and the cingulate cortex. Additionally, the primary visual cortex and the precuneus also exhibited increased activation. Interestingly, it was the unknown brands with aesthetic packaging that gave rise to the largest activation in the vmPFC (more even that aesthetic packaging for a well-known brand).

More recently, Hubert, Hubert, Linzmajer, Riedl, and Kenning (2018) highlighted that differences in consumers' impulsive buying tendencies affect the modulation of the brain activity during the presentation of images of attractive, unattractive, and neutral packaging. The 22 individuals who took part in this fMRI study viewed a selection of images of product packaging and had to indicate whether they considered the packaging images attractive or not. After the scanning session was over, the participants completed a questionnaire including a scale to measure their impulsive buying tendencies. The authors observed a corresponding relationship between increasing scores in impulsive buying tendencies of the participants and increasing activity in the caudate, the putamen, and the thalamus (this was labelled the 'impulsive' system, Bechara, 2005; Strack & Deutsch, 2004) during the exposure to attractive as compared to neutral packaging. By contrast, the increase in participants' buying impulsiveness scores was associated with a decrease of activity in the vmPFC and DLPFC (called the 'reflective' system) in the same conditions.[9]

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[8] Note that in a highly cited early consumer neuroscience study, Knutson, Rick, Wimmer, Prelec, and Loewenstein (2007) were able to demonstrate that the purchase decision (for a product shown on the screen while participants lay in the brain scanner) was associated with activity in the nucleus accumbens (NAcc). Meanwhile, high prices resulted in increased activation in the insula and reduced activity in medial orbitofrontal cortex (mOFC).

[9] Meanwhile, Hubert, Hubert, Sommer, and Kenning (2009) conducted a study ($N = 11$) in order to assess the attractiveness of different packages with and without framing information, in this particular case, retail brands. Their analyses revealed variations across participants in terms of the latter's susceptibility to retail (framing) brand information, as reflected in the patterns of cortical activation (in particular in the vmPFC, which was higher for more susceptible participants).
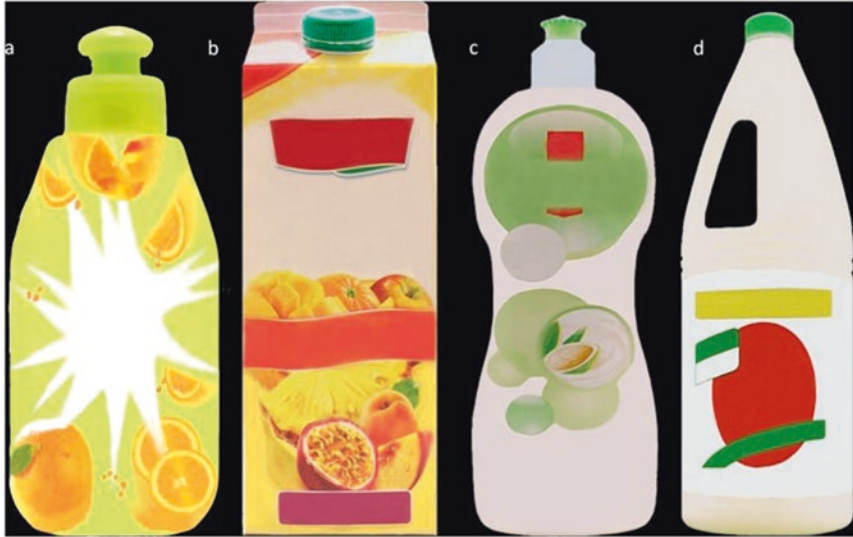
Fig. 12.1 Visual packaging exemplars shown to participants in Basso et al.'s (2014, CC BY) study. © 2014 Basso et al. http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0100368

Basso et al. (2014) used neuroimaging in order to investigate what it was about certain fruity bathroom products that encouraged people to ingest them (note that they are potentially poisonous). The 14 participants who took part in this fMRI study viewed a sequence of 4 exemplars of product packaging (see Fig. 12.1) while performing a 1-back task—basically pressing a button whenever the current visual stimulus happened to match the previously presented package.[10] The analysis of the neuroimaging data revealed that viewing the 'Food Imitating Packaging', when compared to a basic hygiene product, resulted in increased neural activation in the insular cortex, the orbitofrontal cortex (OFC), and the fusiform gyrus, areas that are generally involved in visual food processing (Spence, Okajima, Cheok, Petit, & Michel, 2016; Van der Laan, de Ridder, Viergever, & Smeets, 2011). Note that all of these areas have

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[10] Note that a surprisingly large number of consumers are poisoned in this way every year (i.e., by accidentally ingesting such home and personal care [HPC] products that are packaged to remind people of food products).

previously been implicated in the gustatory/food network. That said, as Basso and his colleagues pointed out, one of the problems with the neuroimaging approach relates to ensuring that the realistic packaging exemplars are matched in terms of their visual complexity (to avoid any stimulus-complexity related artefacts in the neuroimaging data).

Basso et al.'s (2014) study also suggested that it might, in specific circumstances, be interesting to find a way to reduce the attractiveness of packaging, to limit, for instance, the consumption of unhealthy products (e.g., junk food, alcohol, or cigarettes; Petit, Basso, et al., 2016). Indeed, in the context of anti-smoking campaigns, several studies have been conducted that have analysed the brain responses to smoking cues (see Martin, 2014, for a review; Wang et al., 2015). For instance, Wang et al. conducted an EEG study to analyse whether the presence of graphic warning labels (GWLs) eliciting high emotional reactions on cigarette packs can reduce the brain responses to smoking cues. The 25 non-treatment-seeking smokers who took part in this study were exposed to smoking and nonsmoking cues, randomly preceded by GWLs or neutral images and had to indicate their cigarette craving. These researchers found that a participant's craving response to smoking cues was significantly reduced when the picture was preceded by a GWL image. They also found that the P300 amplitude response (generally modulated by motivated attention, Cuthbert, Schupp, Bradley, Birbaumer, & Lang, 2000)[11] to smoking cues was reduced when the GWLs were rated high on an emotion reaction scale, suggesting that such images can have beneficial effects on smoking-related cognitions and behaviours. Similar studies might be conducted to test whether plain packaging (used to reduce a smoker's craving by removing branding information) can produce the same effects (Martin, 2014).

Predictive Neuroimaging in the Field of Branding and Packaging Design

Neuroimaging techniques can also be helpful in predicting consumer's response to packaging design. For instance, Van der Laan, De Ridder,

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[11] The P300 is an evoked potential measure. P means that the wave has a positive amplitude, and 300 means that it appears 300 ms after the onset of the relevant stimulation.

Viergever, and Smeets (2012) used multivariate pattern analysis (MVPA), a method that uses associations between voxels that can more easily identify brain regions that contain predictive information than mass-univariate analysis in particular. The 22 female participants who took part in this study were exposed to 19 food products in two different designs, one healthy and the other unhealthy. For the healthy version, the authors used white, green, blue, and low intensity colours; elegant, cursive, and slim typography; pictures of ingredients (e.g., grains for cookies); pictures/silhouettes of active persons; textual information (e.g., 'healthy'); and the Dutch Healthy choice logo. For the unhealthy version, yellow, red, brown, and high-intensity colours; playful/bold fonts; and textual information (e.g., 'With real butter') were used instead.

During each trial, the images of the two designs were presented sequentially before both alternatives were shown simultaneously and the participants indicated which of the two food products they would prefer to eat at that moment (see Fig. 12.2). MVPA revealed that in the product period 1, brain activity in the medial part of the right superior frontal gyrus significantly predicted food choice (peak accuracy: 60.0%). In the product period 2, food choice was significantly predicted (peak accuracy: 61.2%) by the modulation of brain activity in the left middle occipital gyrus instead.

In one of the most exciting recent examples of neuromarketing/consumer neuroscience, Kühn et al. (2016) demonstrated that a composite measure of neural activation taken from various sites across the brain (in particular, based on previous research, these researchers focused on neural activity in eight specific regions of interest [ROIs], based in the nucleus accumbens [NAcc], medial orbitofrontal cortex [mOFC], DLPFC,
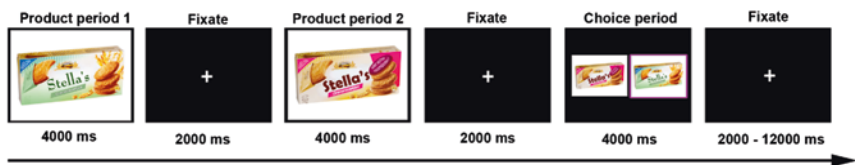
Fig. 12.2 Food choice task trial structure (CC BY). © 2012 Van der Laan et al. http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0041738

insula, amygdala, hippocampus, inferior frontal gyrus, and dorsomedial prefrontal cortex [PFC]) could be used to predict (or at the very least, correlate with) sales data in store. This study involved a popular brand of chocolate and the researchers varied the visual communications that were shown. In particular, the participants first viewed the product packaging for two seconds, then the brand communication for three seconds, before viewing the product for a further two seconds. In total, the 6 communications were shown to the 18 female participants (all regular consumers of the brand) 12 times while lying in the fMRI scanner. At the end of the study, the participants had to rate their liking for each of the six communications.

Each of the six different visual communications was subsequently placed directly at the point-of-sale in a store for one week and sales data were collected. The remarkable result to emerge from this groundbreaking study was that the fMRI-derived sales prediction value based on viewing the product communication correlated with the percentage of the 63,617 consumers quizzed who actually bought the product in store. Crucially, the relative sales data for the six visual communications was better predicted by the combined BOLD signal collected while participants viewed the communication than by their self-report (with the BOLD signal in response to viewing the product falling somewhere in between).[12] While it is important to note that, strictly speaking, this study does not directly concern product packaging, it is nevertheless easy to see how a similar approach could, in the future, potentially be used to make predictions concerning the sales success of different packaging designs. However, that said, it is perhaps also worth drawing attention to the fact that Kühn et al. were able to exert more control over the context in which the product display was seen in store than is the case for many brands that appear on our store shelves.

One other thing that it would be nice to see in future studies in order to demonstrate the predictive validity of such composite brain measures would be study pre-registration (see Center for Open Science, 2015;

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[12] That said, it should be remembered that the participants only ranked their liking of the visual communications once at the end of the fMRI study, whereas the BOLD response to each visual communication was assessed six times.

Chambers, 2014; Gonzales & Cunningham, 2015). Such an approach would certainly help to alleviate the concern that the composite brain measure reflects *post hoc* data fitting, rather than genuinely useful predictive sales forecasting. Alternatively, however, it would also be helpful to see that the same 'fMRI sales forecast value' measure proving useful in predicting sales data in other situations too. Nevertheless, despite these caveats/limitations, Kühn et al.'s (2016) study is clearly a step in the right direction as far as moving from the more academic end of the consumer neuroscience spectrum to the delivery of more business-relevant findings.

Limitations of Neuromarketing Approach to Packaging Evaluation

Despite the limited progress that neuroimaging research has thus far achieved as far as the assessment of product packaging is concerned, there are a number of key limitations that need to be borne in mind, and which limit progress in this field, especially as far as the assessment of the non-visual (i.e., genuinely multisensory) aspects of product packaging are concerned. These include:

1. *Small N*: Many of the studies that have been conducted to date tend to have scanned only a very limited number of participants (e.g., 11 participants in Stoll et al., 2008; 17 in Reimann et al., 2010; 14 in Basso et al., 2014 and 18 in Kühn et al., 2016). One might therefore rightly worry about how representative such research findings really are, especially when it is realized that much of the psychology/neuroscience research tends to draw from a very narrow range of participants—as it so happens, typically North American students studying psychology (Henrich, Heine, & Norenzayan, 2010; Jones, 2010). Furthermore, commentators have, in recent years, started to draw attention to the problems associated with such small sample sizes in neuroimaging research, and that includes difficulties in reproducibility (see Button et al., 2013).

2. *Availability/Legality of Neuromarketing*: In many developing countries, it may not be possible to access a brain scanner to address neuromarketing (i.e., rather than medical) questions. What is more, a few coun-

tries, such as France, have actually made it illegal to conduct neuromarketing research without the agreement of an ethical committee (see Oullier, 2012). Both factors obviously limit the potential uptake of the neuroimaging approach to packaging design evaluation/ innovation.

3. *Expense/Timing*: A third pair of important issues concerns the expense of conducting some types of neuroimaging research (e.g., fMRI; see Ariely & Berns, 2010; Spence, 2016b). Perhaps more seriously, though, is the delay between conducting the study in the scanner and having the finished analysis and recommendations ready. While the analysis of neuroimaging data is becoming faster all the time, it still typically requires months rather than days. This often means that there is an undesirable delay when results are needed to feed into marketing-related decision-making (see Spence, 2016b, in press).

4. *Reverse Inference*: A brain area can have different functions depending on the task performed, the context, and its connectivity with other brain areas (Petit et al., 2014). It is important to remember that there is no unique relationship between a specific brain region and a complex behaviour such as the evaluation of multisensory product packaging (see Spence, in press, for some examples of this kind of error). If it is possible to make an inference on the role of a brain area in a cognitive function: *If the cognitive process X is engaged, the area cerebral Z is activated*, it is not deductively valid to infer a cognitive function based on a brain activation (Ariely & Berns, 2010; Poldrack, 2006). One way to improve the quality of inverse inferences is not to be limited to an area but rely on functional networks highlighted by meta-analyses and connectivity analyses (Petit et al., 2014).

5. *Limited Sensory Assessment*: One other very important issue is that the confines of the majority of fMRI scanner currently means that participants are lying down in a very noisy machine. Earplugs and headphones are used to block out the background noise—hence presumably obscuring all but the loudest of packaging sounds (see Wang & Spence, this volume). The participants in most fMRI studies also need to keep their head absolutely still and hence cannot examine the product in its packaging (e.g., drink directly from the can). Similarly, the delivery of olfactory cues is also very challenging in the scanner environment. Thus, fMRI is much better suited to the evaluation of the

visual design of product packaging but struggles as far as delivering a fair and valid assessment of the relevance/importance of the other multisensory packaging cues discussed in this book are concerned. While EEG does allow the participant to engage in everyday activities while data acquisition is taking place, the spatial resolution is much poorer (see Ariely & Berns, 2010), and the resulting data images tend to be less persuasively colourful (Barrera-Valencia, 2015; Spence, 2016b, in press). These concerns are obviously particularly worrisome for those interested in the multisensory (and non-visual) aspects of packaging (and products) design.

6. *Assessing Packaging in Context*: All of the neuroimaging studies of packaging that have been reported to date have only studied the brain responses to individually presented examples of product packaging. However, as has been stressed in several of the other chapters in this volume, product packaging is very often seen in context, for example, in amongst hundreds or even thousands of other packaging designs. As yet, it is mostly unclear whether the neuroimaging findings have anything relevant to say about how the product packaging will perform in a more ecologically valid context. Eye-tracking and visual search paradigms provide a more useful alternative here (e.g., Clement, 2007). While portable neuroimaging solutions are slowly starting to appear (e.g., Stopczynski, Stahlhut, Larsen, Petersen, & Hansen, 2014), their usefulness has yet to be convincingly demonstrated. Mobile functional near-infrared spectroscopy (fNIRS) is also starting to provide some valuable insights in this area (see Krampe, Strelow, Haas, & Kenning, 2018). Similar to fMRI, mobile fNIRS measures brain activity by detecting changes associated with blood flow. It projects infrared light through the scalp and records optical density fluctuations that are converted to haemoglobin concentration changes. Krampe et al. (2018) successfully recorded neural activation of the PFC, when participants were exposed to video sequences of grocery shopping scenarios, by using mobile fNIRS in a computer lab.

7. *Surprise in Product Packaging*: Neuroimaging data is inherently noisy and, as such, repeated measures experimental designs are the norm. However, this means that it is next to impossible to use neuroimaging techniques to assess surprise on first experiencing a new packaging format, say (see Ludden & Schifferstein, 2007; Ludden, Schifferstein, & Hekkert, 2009, on the concept of surprise in product design).

Given such limitations with the use of neuroimaging techniques to assess product packaging, especially when one wants to assess the multisensory, and not just the visual aspects of product packaging, it should come as little surprise to realize that a number of researchers, as well as the majority of neuromarketing companies, are increasingly moving their focus towards the use of neuroscience-inspired (i.e., more physiological) testing techniques instead, and it is to these that we turn next. That said, it is perhaps also important to reiterate the fact that there are also multiple initiatives aiming to develop smaller, perhaps more portable/mobile, brain imaging solutions (e.g., Bleichner & Debener, 2017; Debener, Emkes, De Vos, & Bleichner, 2015; Stopczynski et al., 2014), though their implementation/informativeness in consumer research is yet to be assessed.

From Neuromarketing to Neuroscience-Inspired Techniques for the Assessment of Packaging

Given the difficulties associated with providing relevant answers by using neuroimaging techniques, especially amongst those wanting to go beyond the primarily visual (and to a lesser extent auditory) aspects of packaging design, then, other cognitive neuroscience techniques have increasingly come to the fore. Very often, this involves large-scale online testing (though again this is primarily useful for assessing the visual and to a lesser extent, auditory aspects of packaging design) and carefully controlled laboratory-based research (especially if one wants to assess the influence of usability, olfaction, or the packaging's tactile/haptic properties). While some researchers have studied the influence of the product in pack, there are others who only show an image of the product packaging on the screen while participants sample the product away from the packaging (e.g., Becker, Van Rompay, Schifferstein, & Galetzka, 2011). While such techniques were certainly not traditionally considered within the field of 'neuromarketing', a trip to any commercial neuromarketing conference (e.g.,, the Neuromarketing World Forum; e.g., see http://www.neuromarketingworldforum.com/) soon makes clear that while many neuromarketing companies do still lure their clients in with the

colourful brain images (e.g., see Spence, 2017), they typically end up offering them one of these other 'neuroscience-inspired' techniques instead. The latter techniques tend to be more rapid and cost effective and can also be used more easily to assess the multisensory aspects of packaging. Other physiological measures that have, over the years, been considered include eye-tracking, galvanic skin response (GSR) otherwise known as the Skin Conductance Response (SCR),[13] pupillometry (pupil dilation), electromyography, and the analysis of facial micro-expressions (see Weinstein, 1981; see also Cacioppo, Tassinary, & Berntson, 2007, for a description of many of such measures).

In fact, recent definitions of neuromarketing capture this shift in focus. Just take, for instance, Stanton, Sinnott-Armstrong, and Huettel (2017, p. 3): "*We consider neuromarketing to be the use of neuroscience and physiological research techniques to gain new insights into consumers' behavior, preferences, and decision making, as well as other aspects of human cognition and behavior related to marketing.*" The latter authors go on to say: "*Neuromarketing seeks information and insights beyond that revealed by traditional techniques such as surveys, focus groups, experiments, and ethnography—with the goals of enhancing marketing theory and practice…*"[14] This, note, is a much broader definition than that given by Ariely and Berns (2010), quoted earlier, since it would seem to incorporate physiological, psychophysical (Moskowitz, 1981), and implicit measures.

Eye-Tracking as a Consumer Neuroscience Method

Eye-tracking has been used in the field of packaging design evaluation for many years now (Clement, 2007; Wedel & Pieters, 2008; Young, 1981; see also https://www.tobiipro.com/fields-of-use/marketing-consumer-research/packaging-design/). Eye-tracking studies have certainly found a

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[13] According to an analysis conducted by Fisher, Chin, and Klitzman (2010), galvanic skin response (GSR) is a particularly popular offering amongst neuromarketing companies.

[14] It is unclear quite what the "experiments" in the second sentence is really supposed to refer to here, given that both behavioural scientists and cognitive neuroscientists would, we imagine, insist that they conducted experiments. One could, we think, also legitimately claim that certain neuroimaging techniques, specifically ERPs, should actually be considered as traditional given that marketing and advertising researchers have been using them for almost half a century (e.g., Eckstrand & Gilliland, 1948; Krugman, 1971; Weinstein, 1981; Weinstein, Drozdenko, & Weinstein, 1984).

place as far as assessing shelf standout at the first moment of truth is concerned (e.g., Knoeferle, Knoeferle, Velasco, & Spence, 2016; see also Frary, 2016). However, that said, there is quite some debate as to whether fixation patterns necessarily predict consumer preference/choice (e.g., Husić-Mehmedović, Omeragić, Batagelj, & Kolar, 2017; Orquin & Loose, 2013; Shimojo, Simion, Shimojo, & Scheier, 2003). Furthermore, and as presciently noted by Weinstein (1981) some years ago, while eye-tracking can be used to determine what aspects of the packaging capture the consumers' overt visual attention, the question of whether the consumer perceives that attention-capturing feature in a positive or negative light is much harder to evaluate solely from the pattern of visual fixations. Moreover, the question of whether shorter or longer fixations are better from a product design perspective is again an important question for which there isn't yet a simple answer. Nor does eye-tracking necessarily provide a meaningful index of where a consumer's covert visual attention is focused either.

That said, linking patterns of visual fixations to the consumer's top-of-mind thoughts using techniques such as Word Association has been shown to help here as far as interpreting the eye-tracking data is concerned (see Piqueras-Fiszman, Velasco, Salgado-Montejo, & Spence, 2013). Meanwhile, elsewhere, Juravle, Velasco, Salgado-Montejo, and Spence (2015) used eye-tracking to assess the link between visual fixation and consumers' grasping behaviour. The participants in this study were presented with a range of tall cylinders with indentations that afforded grasping at different heights from the base of the can. The participants had to grasp the packaging and eye-tracking data was collected. The results suggested that affordance points on product packaging could be introduced in order to bias the consumers' gaze patterns (i.e., given that the eye tends to lead the hand in grasping).

Intriguingly, eye-tracking data and even mobile EEG can now be collected and synchronized on smartphones when people are moving about. For example, Khushaba et al. (2013) used both the Emotiv EPOC EEG headset (https://www.emotiv.com/) and an eye-tracker to detect phase synchronization between the left and right frontal and occipital regions while participants make a choice between different crackers. During each set, participants viewed three crackers on a screen and were asked to click on the cracker that they liked the most and on the cracker that they liked the least. The eye-tracker was used during this phase to relate the EEG

data to the specific choice options (crackers). The Emotiv EPOC EEG was able to record the brain activity of walkers in an urban environment (Aspinall, Mavros, Coyne, & Roe, 2015). Therefore, it might be possible to analyse the pattern of customers' eye movements when they are looking at different product packaging on the supermarket shelf and make a distinction between simple visual scanning and an attentive visual search thanks to mobile EEG (Petit et al., 2014). In conclusion, while eye-tracking undoubtedly creates colourful, and thus persuasive, data images, it is an open question as to whether they reveal anything more than regular behavioural, that is, button-press techniques can do.

Perhaps the way forwards will, as is so often the case, come from a combined methodologies approach. We have just seen a couple of examples of this. Indeed, some researchers have combined physiological with neuroimaging measures. In the context of predictive neuroimaging for branding, for instance, Guixeres et al. (2017) conducted a study ($N = 35$) that was designed to assess whether neurophysiological metrics (heart rate, eye-tracking, and EEG), as well as neural networks, could be used to predict the effectiveness of digital ads. Their results revealed correlations between neurophysiological measures, ad effectiveness (e.g., recall, liking), and number of views of the ad on YouTube. Importantly, a neural network based on the neurophysiological measurements was able to classify and estimate online views with an impressive degree of accuracy.

Conclusions

While there are undoubtedly significant challenges as far as the use of neuroimaging techniques to evaluate product packaging are concerned (see above for details), the latest evidence does at least start to suggest that such techniques may, indeed, find their role in predicting meaningful choices between packaging alternatives (Kühn et al., 2016). That said, the majority of the small-scale neuroimaging studies of product packaging that have been conducted to date have more the feel of basic academic research (what some have termed consumer neuromarketing) than so obviously having any business-relevant implications. There is perhaps also a sense that the focus of research should perhaps be more directed at process/mechanism,

be it attention, memory, and so on than specifically at the neuroimaging technique used. Of course, in the future, given the multiple 'moments-of-truth' framework (Louw & Kimber, 2011), one might well ask what role neuroscience techniques (specifically neuroimaging and other consumer neuroscience techniques) play at the different stages, from product selection on the shelf through product usage, and perhaps even, ultimately, packaging disposal.

While the majority of early consumer neuroscience studies involved both behavioural and neuroimaging, the aim was more about trying to understand, from a theoretical point of view, which parts of the brain/brain networks were involved in the visual analysis of packaging designs; the latest research represents a step-change in terms of using the combined activity in a network of brain areas (or rather a composite weighted measure of brain activity) to predict (or forecast) the relative success of different packaging designs in store. That said, while such results are undoubtedly far more impressive than anything that has gone before, it is always hard to know whether the brain response that happens to correlate with sales was determined *a posteriori* or *a priori*. Obviously, studies of the former type would be needed if we are to really enter the era of predictive consumer neuroscience and packaging design. In order for this to be convincingly demonstrated, study pre-registration would obviously be advantageous. It is also worth noting that an additional problem as far as it comes to the implementation of neuroimaging (or any other kind of research) findings are concerned is the tendency of brand managers to rely on gut instinct more often than perhaps they should when making decisions. In fact, the evidence suggests that they are, in many cases, tempted to rely on 'gut feel', as apparently they have always done (Blakeman, 2017). According to one online survey of more than 1000 marketers, almost half reported 'trusting my gut' when it came to deciding where to invest their marketing budgets (see Anonymous, 2014).[15] Thus, even if the neuromarketers' predictions about the future success of the neuromarketing techniques that they use are

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[15] And the marketers are by no means exceptional in this regard. Psychologist Gerd Gigerenzer had the following to say on the topic: "*I've worked with large companies and asked decision makers how often they base an important professional decision on that gut feeling. In the companies I've worked with, which are large international companies, about 50% of all decisions are at the end a gut decision*" (quoted in Fox, 2014).

proved correct, that still does not necessarily mean that the marketing managers would take their findings/recommendations on board anyway.

Taken together, despite the hype, the neuromarketing approach to multisensory packaging design is currently limited in its usefulness. While consumer neuroscience has undoubtedly provided insight about the networks of neural activity associated with various aspects of packaging design (e.g., aesthetic appeal, attentional-capture, branding) and so on, there are, as yet, few market-relevant insights to assist the brand manager in choosing intelligently between packaging alternatives.

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13

Multisensory Consumer-Packaging Interaction (CPI): The Role of New Technologies

Olivia Petit, Carlos Velasco, and Charles Spence

Introduction

Packaging plays an important role both as a brand element and marketing communication tool. By means of multisensory characteristics that include images, typography, colour, shape, size, sounds, and materials (Ampuero & Vila, 2006), the so-called silent salesman (Pilditch, 1961) conveys sensory pleasure (i.e., aesthetic value) and may encourage/facilitate product usage (i.e., ergonomic value). Product packaging also plays a key role in helping to create an impression of quality (i.e., functional

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349

value), as well as supporting other brand characteristics (i.e., symbolic value, Creusen & Schoormans, 2005). Above all, packaging is a substantial part of the experience of buying, consuming, and also discarding a product (Salgado-Montejo, Velasco, Ariza, Salgado, & Moreno, 2017; Underwood, 2003). However, despite its obvious importance, multisensory product packaging has often been considered as secondary when compared to promotion and product in the marketing mix (e.g., McCarthy, 1960; Van Waterschoot & Van den Bulte, 1992).

That said, the various new sensory-enabling technologies (SETs) that are now starting to appear in the marketplace could potentially give packaging a whole new "voice". These technologies allow users to receive sensory inputs from product visualization technologies, and haptic, sonic, and even flavour-enhancing interfaces (e.g., Obrist, Gatti, Maggioni, Vi, & Velasco, 2017). The development of SETs in the fields of Human-Computer Interaction (HCI) (Obrist et al., 2016, 2017) has already started to attract the interest of researchers in the fields of Human-Food Interaction (HFI) (Choi, Foth, & Hearn, 2014; Comber, Choi, Hoonhout, & O'Hara, 2014; Velasco, Obrist, Petit, & Spence, 2018; Velasco, Karunanayaka, & Nijholt, 2018) and marketing (Bonetti, Warnaby, & Quinn, 2018; Javornik, 2016; Kim & Forsythe, 2008a, 2008b; Pantano & Naccarato, 2010; Petit, Cheok, Spence, Velasco, & Karunanayaka, 2015; Petit, Velasco, & Spence, in press; Scholz & Smith, 2016). However, to date, there has been little work on their role specifically in Consumer-Packaging Interaction (CPI) (Mumani & Stone, 2018; Spence, 2015; Velasco, Carvalho, Petit, & Nijholt, 2016; Velasco et al., 2018), the topic of this chapter.

We firmly believe that better understanding the role of the SETs in CPI is all the more important given that the sensory aspects of package design start to be recognized as a key part of consumer experience (Krishna, Cian, & Aydınoğlu, 2017; Spence, 2012, 2016; Velasco, Woods, Petit, Cheok, & Spence, 2016). In this chapter, we highlight how these technologies might be used to help enhance the scope of packaging as a tool for marketing communication in the store, as well as a novel—though increasingly essential—element of the consumer's multisensory experience. We conclude by presenting some limitations and research

perspectives in order to improve the integration of these new technologies into packaging design.

Digitally Enhanced Packaging: A New Form of Marketing Communication?

In store, packaging is the last/ultimate means that brands have to convince consumers to buy their products (Ampuero & Vila, 2006). Product packaging serves both to attract the consumer's attention and to provide information regarding product features (Creusen & Schoormans, 2005; Krishna et al., 2017; Silayoi & Speece, 2007; Underwood, 2003). Keiichi Matsuda's concept film (2016) entitled *Hyper-Reality* presents a vision of the future in which a woman does her shopping at the supermarket using augmented reality (AR). In front of the trolley, and through glasses, the woman sees in AR her shopping list, her budget while a dog avatar acts as a personal advisor. Promotions appear in AR in front of the supermarket shelves, and simply by approaching the products, she can know their composition and price and virtually see the products through their packaging (www.youtube.com/watch?v=YJg02ivYzSs&t=151s).

In 2018, Matsuda's vision no longer seems so far-fetched and futuristic. Actually, several brands (e.g., Heinz, Walkers, Lego, and Amazon) have already developed mobile apps to facilitate brand selection and decision-making while at the supermarket (e.g., https://www.zappar.com/solutions/packaging/). For example, Amazon recently launched a supermarket with no checkouts in Seattle in 2018. Meanwhile, the Amazon go app uses sensors to detect what items customers take from the shelves and charges them to their account (https://www.youtube.com/watch?v=NrmMk1Myrxc). By working on such apps, which are connected to product packaging, marketers can create/modify consumer's sensory expectations (Spence, 2012; Velasco, Woods, et al., 2016), influence perceived healthiness (Karnal, Machiels, Orth, & Mai, 2016) and luxury perceptions (Van Rompay, De Vries, Bontekoe, & Tanja-Dijkstra, 2012; see Velasco & Spence, this volume), or even symbolically reinforce a brand's power (Sundar & Noseworthy, 2014). In the sections that

follow, we highlight the potential improvements made by SETs to the consumers' in-store experience.

Visual Search

Usually the first thing that a brand aims in retail spaces is to attract the attention of the consumer (Krishna et al., 2017; Milosavljevic, Navalpakkam, Koch, & Rangel, 2012). This is by no means an easy task, given that many consumers may already have a representation of the desired product in mind (i.e., from previous purchases, advertisements, and perhaps from online search). On top of that, there is usually a great deal of brand competition in the supermarket. Thus, when looking for products in the store aisles, customers "scan" many products simultaneously/successively, in order to get a quick impression about their properties, while making a preliminary selection.

According to Milosavljevic et al. (2012), visual saliency might influence choices more than preferences during speeded decision-making, particularly when the shopper is under cognitive load. Similarly, Reimann, Zaichkowsky, Neuhaus, Bender, and Weber (2010) have highlighted how unknown brands with aesthetic packaging may be chosen over well-known brands with standard packaging. The latter researchers found that simply looking at the aesthetic packaging of various unknown brands led to greater activity in those brain areas coding reward value (ventromedial prefrontal cortex) than standardized packaging and well-known brands. Thus, it might be interesting for marketers to use, let's say, AR applications in order to improve the visual saliency and aesthetic design of their packaging. In this way, and as a relevant example, Esko's Studio developed a mobile app allowing the customer to visualize packages in 3D overlaid onto the store shelves (www.esko.com). Such technology could be used to help accentuate the contrast between the targeted product and other items appearing on the shelves (Vazquez, Gevers, Lucassen, van de Weijer, & Baldrich, 2010). Brands might also use plain packaging (which would obviously help reduce costs), while providing all the visual interest by means of AR. Thus, the design might be more dynamic and adapted to (selected) consumers.

The aforementioned AR solutions for visual search may seem relevant as long as they are used by a limited number of brands. In the long term, it may be more difficult to distinguish oneself visually from the competition by means of this kind of technology. Additionally, unlike conventional packaging, consumers can choose to use (or not to use) AR to display content on the packaging during their search for information. Therefore, it is by no means sure that the augmented packaging will always be used by the consumer. Marketers should therefore think carefully about how to encourage their consumers to adopt such technologies. For instance, the usage of mobile apps that allow such interaction with packaging (i.e., in the supermarket) may depend on the level of consumer involvement in the buying process. Customers might be more interested in those mobile apps that are able to highlight the kinds of information that they actually care about (just think about different groups of consumers, such as vegan, halal, cost-conscious, free-range, etc.). On the other hand, customers might prefer technologies that can provide some kind of entertainment in low-involvement situations (Silayoi & Speece, 2004; Underwood, Klein, & Burke, 2001). Therefore, it appears important to improve both sensory and information aspects of the packaging to facilitate CPI.

Information Attributes

Once the customers' attention has been captured (most likely visually), they will probably analyse a number of elements in more detail in order to get an idea of the product's quality (Dawar & Parker, 1994). There is often insufficient space on the packaging in order to clearly describe product characteristics. Moreover, consumers do not necessarily have the time (or interest) to read an overly detailed description. AR apps should ideally allow brands to provide more detailed information concerning the products to consumers without necessarily crowding the packaging (and possibly annoying them). For instance, Heinz Tomato Ketchup launched an AR app experience in collaboration with Blippar providing ideas on how to use their tomato sauce. Simply by pointing a mobile phone at the packaging, the users can get a list of recipes that just so happen to include Heinz Tomato Ketchup (see Fig. 13.1a).
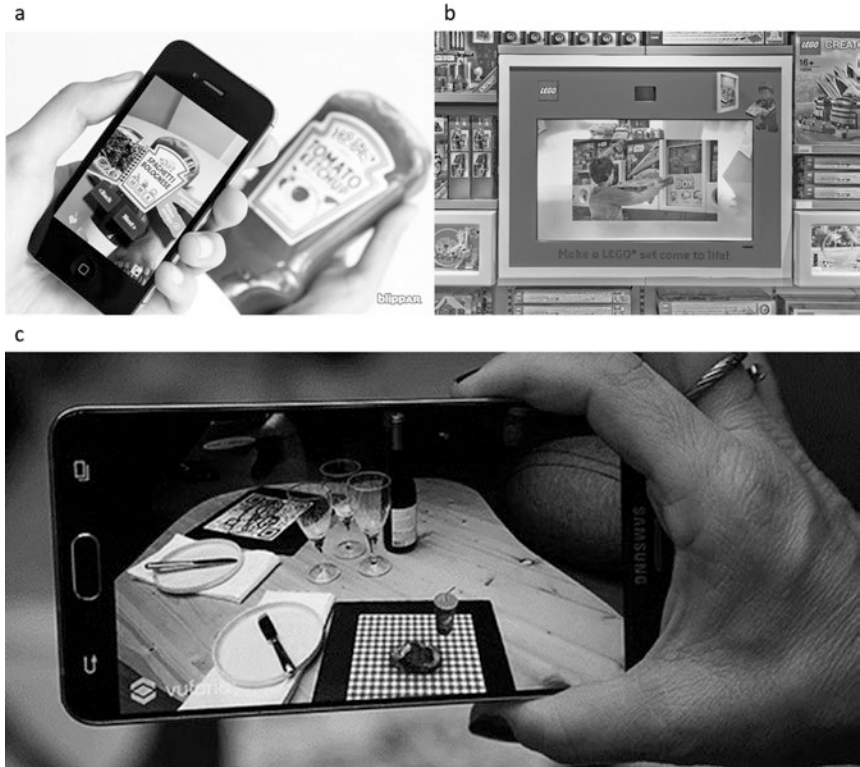
Fig. 13.1 (a) Heinz Tomato Ketchup's hidden recipes with AR, with permission of Blippar (www.blippar.com). (b) The LEGO digital box. Photos used with permission. ©2018 The LEGO Group, (c) KabaQ app enables customers to rotate AR food images in front of them (www.kabaq.io/)

Improving product knowledge through AR may be particularly relevant when consumers are highly involved in the product purchase (Silayoi & Speece, 2004; Underwood et al., 2001). For example, in the context of food packaging, people tend to have a higher level of involvement when it comes to health-oriented product packaging (allergenic, diet) and/or religious (halal, kosher) reasons. Unfortunately, however, it can often be hard to find and understand the corresponding nutritional information. Moreover, people overestimate their use of nutritional labels in product evaluation (Cowburn & Stockley, 2005; Grunert, Wills, & Fernández-Celemín, 2010). In order to better communicate and/or evaluate the

composition of food products, both brands and consumers could rely on AR technologies. For example, according to the United States Department of Agriculture (USDA), added sugar is present in 74% of all packaged foods sold in supermarkets. This is particularly problematic since they are often not labelled as sugar on the ingredients list. Thus, in order to help the consumer to better evaluate how much added sugar a product actually contains, SugAR Poke app uses AR to display just how many teaspoons of added sugar are lurking in a given product.

Consumers may also want to trace the origin of the food and/or the conditions of slaughter of their protein. For instance, Lam et al. (2017) developed an application for Muslims using the barcode of a product to display in AR its halal status. Bringing the consumers closer to the farming sites through the AR could be relevant for marketers. Consumers tend to perceive both the safety and quality of food products as being related to traceability (Van Rijswijk & Frewer, 2008). In order to improve the traceability of their food products, McDonald's® (in Australia) developed, an app, called TrackMyMacca, using AR to show to consumers where the ingredients of their burger came from. Similarly, Nescafé developed an app to show users a coffee plantation in 360° by using Google viewer (www.beveragedaily.com/Article/2015/09/30/Nescafe-and-Google-launch-virtual-reality-coffee-experience).

Consumers might one day be able to scan their product packaging in order to find out, for example, how far the food travelled before reaching the shelf of a supermarket. Think of the fact that customers already have the possibility to compare the prices of several brands and stores, for the same kind of product, by simply scanning the barcodes present on the packaging (e.g., BuyVia, ScanLife, Walmart Savings Catcher). However, the credibility of the source could play a complementary role while persuading the consumers to buy a product in such context (Tormala & Petty, 2004).

Seeing Inside the Box

Besides the characteristics of packaging, an important part of a product's evaluation concerns the visualization of the product itself. Using a picture or seeing the product through the actual packaging may help the consumer to determine what to expect from the product while shopping

(see Simmonds & Spence, 2017, for a review). Like this, they could more easily imagine the multisensory properties of the product itself (Spence, Okajima, Cheok, Petit, & Michel, 2016; Underwood & Klein, 2002). As a result of the visualization of the product, consumers could develop higher purchase intentions (Billeter, Zhu, & Inman, 2012; Petit, Spence, Velasco, Woods, & Cheok, 2017; Piqueras-Fiszman, Velasco, Salgado-Montejo, & Spence, 2013). In some cases, however, transparent packaging and/or images may not provide enough visual quality for properly evaluating a product. Due to the danger of sun damage/exposure, some products cannot be sold in transparent packaging (e.g., think of cream-based products, or liqueurs, such as Baileys). Moreover, it may be difficult for consumers to estimate the final characteristics of products that are not sold in its final form (e.g., estimate volume and/or the texture of a cake/pancake mix, or construction games). To help fix these kind of issues, mobile AR systems that allow the user to view a three-dimensional model of product package contents, via their mobile phone (Välkkynen, Boyer, Urhemaa, & Nieminen, 2011), have already been developed. For example, Lego customers can see what the Lego model within the box would actually look like in 3D once constructed (see Fig. 13.1b). In the same way, the Kabaq Company enables customers to rotate 3D food images through their smartphone, in front of the packaging (see Fig. 13.1c, www.kabaq.io/). Like this, consumers can better visualize the volume and also zoom in/on those parts of the product that are of their interest.

All these apps are examples of how AR images could help the consumer to better evaluate products. However, marketers would need to ensure that consumers have confidence in these images. Consumers are not accustomed to see virtual images through their mobile phones (at least, not yet). Hence, it is somehow necessary for them to engage their trust in such virtual imaging solutions. Importantly, product trust has been shown to play a mediating role in the process of making inferences concerning the quality of the product based on its packaging (Chandran, Batra, & Lawrence, 2009). The challenge here is that the results of several online studies suggest that trust towards virtual environments (as in VR) is still lower than the trust for websites, even though consumer confidence in these technologies has certainly increased over the last ten years or so (Goel & Prokopec, 2009; Kim & Forsythe, 2008a, 2008b).

Nevertheless, the experience of AR is significantly different from the 3D experience in VR (and perhaps more suitable for use at the supermarket). By overlaying the physical environment with virtual images, AR allows the user to interact with the physical space (e.g., real shelves, products, vendors, and other customers), what seems to inspire more confidence than virtual reality (Javornik, 2016).

Enhancing Sensory Expectations

The image of a product on the packaging helps people to represent their consumption experience, which facilitates the choice of the brand, by creating sensory expectations (Krishna et al., 2017; Underwood et al., 2001). However, consumers do not rely solely on the image of the product when creating such sensory expectations. The shape and colour of the packaging, as well as the typeface, and the brand name, can, almost subliminally, also guide people's taste and flavour expectations (see Spence, 2012, for a review). For instance, people tend to categorize round shapes as sweeter than angular shapes, which might translate in increasing the expectations of sweetness for food products that are presented in round packaging (Velasco, Woods, et al., 2016). Hence, AR can be used, for instance, to change the colours of packaging and even to modulate its apparent shape (Nishizawa, Jiang, & Okajima, 2016). An interesting recent mobile application has made possible wobbling a Dr. Pepper's can (www.youtube.com/watch?v=UNiyT7qwHGA).

SETs provide ways to marketers to capitalize on different cross-modal correspondences that can potentially improve the sensory expectations of packaged products (Petit et al., in press; Velasco, Carvalho, et al., 2016). For example, the texture of product packaging has been shown to influence the perceived texture of the food (Biggs, Juravle, & Spence, 2016; Piqueras-Fiszman & Spence, 2012; Van Rompay, Finger, Saakes, & Fenko, 2017; Van Rompay, Kramer, & Saakes, 2018). Similarly, packaging texture might be able to modify the sensory expectations of consumers at the store. However, due to hygiene, safety, and cost reasons, marketers may be limited in the choice of textures that they can provide to their packaging ideas. By means of AR, however, it would be easier to

change the appearance of packaging, make it more flexible, softer or rather rigid, all of this in order to influence the consumer's expectations. Similarly, the sound of the product (e.g., just think of the sounds made while biting into a potato chip, or the sounds made while unscrewing the cap from a bottle) can work as an indicator of freshness/quality (Zampini & Spence, 2004; see Spence & Wang, 2015a, for a review). Relevant here, Spence and Wang (2017) recently highlighted how the opening sound of a bottle of wine (cork vs. screw-cap) impacts the perceived quality of a wine. Elsewhere, Velasco, Jones, King, and Spence (2013) highlighted that the perception of water temperature can be artificially modulated by modifying the sonic properties of the sound that hot and cold water makes when poured into a receptacle. Given such results, it is easy to imagine how artificially reproducing (or modulating) these sounds during a product's evaluation (let's say, while in a store) might enhance the consumer's sensory expectations of the product concerned. Such sound features might also have the added benefit of capturing the shopper's visual attention as well (Knoeferle, Knoeferle, Velasco, & Spence, 2016).

Marketers can also use such SETs to provide multisensory buying experiences to consumers. In this regard, Bombay Sapphire has created an AR app, in which users can see around the bottle a crown of flowers and fruits, while hearing the sound of foraging bees (www.youtube.com/watch?v=qcoPlvhi_LI). Guinness has gone one step further by offering UK Tesco customers the chance to sample their beer under the influence of an enhanced multisensory VR environment (Glenday, 2017). The latter displayed colourful shapes and sounds that where created with the objective of enhancing the multisensory flavour experience of the Guinness. By creating a (virtual) atmosphere around the packaging, marketers could presumably project the consumer into enjoyable futuristic experiences (Pine & Gilmore, 1998; Spence, Obrist, Velasco, & Ranasinghe, 2017; Spence, Puccinelli, Grewal, & Roggeveen, 2014). Here, scent encapsulation as part of the packaging may be helpful in order to elicit perceptual reenactments of previous experiences (Barsalou, 2008). Odours are particularly powerful when it comes to triggering, for instance, autobiographical experiences, while improving the memorability

of product-related information (e.g., Chu & Downes, 2000; Krishna, Lwin, & Morrin, 2010). Some companies have been working on solutions to diffuse artificial scents onto the packaging (e.g., ScentSational Technologies, scentsationaltechnologies.com; though see Spence, 2015).

With the above being exposed, important issues, such as sensory overload, should be evaluated (and potentially fixed) in order to improve CPI in the store (Petit et al., in press; Spence, 2015; Spence et al., 2017). On top of that, marketers should be careful not to create unreasonable expectations through SETs. Such type of expectations may then adversely affect the brand image, the consumer's perception of the contents, and ultimately their intention to repeat purchase (Krishna et al., 2017; Labrecque, Patrick, & Milne, 2013; Spence, 2015). Actually, the usage of SETs would not necessarily be effective in improving the experiential expectations of all products. As a matter of fact, back at the turn of the century, Underwood et al. (2001) highlighted how VR only increased shoppers' attention for low familiarity brands within product categories that offered a relatively high level of experiential benefits. It should be further assessed if this would be also the case for AR devices.

Digitally Enhanced Packaging: A New Form of Multisensory Consumer Experience

As highlighted by the previous chapters in this volume, packaging is not only useful for facilitating the selection of a product in a store but it is also an important part of the consumer's experience (Underwood, 2003). It has been suggested that as many as one-third of all food, and beverage, products are actually consumed directly from the packaging, or at least very close to it. Hence, brands can also use the SETs to provide a more pleasant experience for the consumer experience, while, in parallel, improving the brand's image. In other words, what was once a fixed offline experience is now becoming increasingly interconnected with the digital world, thus opening up a number of exciting interaction possibilities for branding strategies.

Designing Multisensory Consumption Experiences around Packaging

SETs have shown their usefulness for improving the online and offline retail experiences (Javornik, 2016; Kent, Dennis, Cano, Helberger, & Brakus, 2018; Petit et al., in press; see Spence et al., 2014, for a review of multisensory store atmospherics). SETs may help to create a sense of immersion and potentially make the buying experience more enjoyable (Animesh, Pinsonneault, Yang, & Oh, 2011; Kim & Forsythe, 2008a, 2008b; Klein, 2003; Lee & Chung, 2008; Li, Daugherty, & Biocca, 2002; Nah, Eschenbrenner, & DeWester, 2011). Several companies have already developed mobile applications, using AR, with the objective of improving the consumer's experience while interacting with a product's packaging. Häagen-Dazs, for example, developed a mobile app that projects the image of a group of musicians performing a "concerto" over the tub of an ice cream. Users have the opportunity to listen to this "concerto" while the ice cream starts to soften (www.youtube.com/watch?v=vYJWifof8vY). Similar to the in-store experience, it might be interesting to look at the effects of SETs on the consumer's behaviour around packaging in order to see if these technologies increase the pleasantness and/or the immersion of the experience (Javornik, 2016; Petit et al., in press).

SETs could also be used to enhance the multisensory flavour experience. For example, the Champagne brand Krug selected a number of melodies that can be listened to, from a mobile phone, during a tasting experience. All of this by scanning a code on a champagne bottle (see Wang & Spence, this volume). Given that music has been shown to modify the perceived sweetness, acidity, fruitiness, astringency, and length of the wine (see Spence & Wang, 2015b, for a review), one could certainly imagine how, similar to birthday cards, music could also be played at the opening of a soft drink, or a bottle of wine, to enhance the flavour (Velasco, Carvalho, et al., 2016, e.g., Heinz Beanz Flavour Experience, http://bompasandparr.com/projects/view/heinz-beanz-flavour-experience/). Packaging diffusing artificial odours and digitally modulating the taste could also be born to modify the flavour of the products (Velasco, Obrist, et al., 2016).

Improving Consumer-Brand Interactions

Packaging, through its multisensory attributes (e.g., colours, materials, picture, and shapes), is likely to generate inferences about the brand, thus facilitating the settlement of a brand's identity (Underwood, 2003; Underwood & Klein, 2002). For example, Parise and Spence (2012) found that people associate the shapes of product packaging with different adjectives (e.g., powerful, gentle) and that such associations might be used to improve brand personality. Similarly, Batra and Homer (2004) highlighted that the picture of a celebrity endorser on the front of the packaging can reinforce the consumer's beliefs around a brand's fun and sophistication. For instance, by displaying a vivid 3D avatar of George Clooney, offering customers to share a coffee, in front of the Nespresso boxes, the brand potentially facilitates sensations of personality transfer. Similarly, the Shreddies cereal brand developed a mobile app with Blippar, allowing the users to see, in AR, the image of Nana, a grandmother sending "pearls of wisdom" in front of the packaging (e.g., if you blow out all of the candles on your birthday cake with the first puff, you'll get your wish—see Fig. 13.2a). A recent Budweiser campaign is also an interesting example. The company donated $1.5 million to the Folds of Honor Foundation (programme for military families). Here, the brand proposed to its consumers to virtually meet some of those individuals who have benefitted from the programme by using an AR app linked to the packaging's logo (www.youtube.com/watch?v=WCNUXEUfiZw). It might be interesting to see if these type of applications actually is able to enhance the image of the brand or is rather seen as an attempt to take advantage of a humanitarian cause. Understanding the extent to which such campaigns strengthen brand identity will undoubtedly be of great interest to researchers and marketing practitioners.

It might also be relevant to test the effects of the aforementioned type of applications on brand attachment and loyalty. Product packaging is a meaningful part of brand experience, and, as such, has been argued to affect the consumer's general satisfaction and loyalty (Brakus, Schmitt, & Zarantonello, 2009; Iglesias, Singh, & Batista-Foguet, 2011). Today, several brands have developed interactive games with the packaging through AR apps teamed with Blippar (e.g., Nesquik, Pringles, Lucky charms).

Fig. 13.2 Interactive AR games around packaging: (a) Shreddies, (b) Pringles, (c) Lucky charms, (d) Nesquik. Photos used with permission of Blippar (www.blippar. com)

For example, Pringles allows their consumers to play football in AR with the packaging as a background. Then, through the mobile app, the users can dive these animals into the deep sea and get information about them (see Fig. 13.2b). Similarly, Lucky charms created a new version of a children's game behind their cereal box. In front of the box, players see a colourful road on their mobile screen and try to collect every charm that they can (see Fig. 13.2c). Some apps are also educative. For example, Nesquik proposes to the children to build 3D cardboard sea animals by using the packaging of the brand (see Fig. 13.2d).

Apart from the fact that these applications can serve to support further research on loyalty and attachment, they also raise a number of ethical questions concerning the possibility of children's credulity being some-

how negatively exploited.[1] Further research could determine whether AR packaging would operate in similar ways.

Nudging Consumption Behaviour

SETs can potentially be used to nudge consumer behaviour. Nudges are about redesigning the social and/or physical environment to help people make choices, improving individual and/or collective health and well-being (Thaler & Sunstein, 2008). In the context of food packaging, nudges have proven useful in helping consumers regulate their food intake. For example, consumers tend to regulate their consumption according to the size of the package, leading them to consume more food from a large package than from a small package (Petit et al., 2017; Rolls, Morris, & Roe, 2002; Wansink & Chandon, 2006). In order to help people regulate their consumption, Geier, Wansink, and Rozin (2012) inserted a coloured chip at regular intervals in a tube of potato chips to give them a norm of food intake. Such techniques of consumption regulation might be improved by using the SETs.

It is interesting to note that several SETs have already been developed in order to help people to regulate their consumption (see Petit, Cheok, & Oullier, 2016; Spence et al., 2016, for reviews). Some of these technologies could presumably be adapted to the packaging in order to reduce the portion size effect. For example, Narumi, Ban, Kajinami, Tanikawa, and Hirose (2012) used an AR device to virtually increase the size of food products while eating. By using this system, people may be guided to consume less, while digitally stimulated to visualize a larger portion of food (Morewedge, Huh, & Vosgerau, 2010; Petit et al., 2017). One could similarly imagine virtually manipulating the amount of food in the package during consumption to give the impression to the consumers that they have already eaten a larger amount of food. Another application, ServAR allows the user to visualize the standard serving size of their food

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[1] Children do not possess sufficient capacity to defend effectively against advertisements. They develop positive affects for featured characters of cereal brands (e.g., Tony the Tiger, Coco the Monkey), biasing their product evaluation that persist into adulthood (Connell, Brucks, & Nielsen, 2014).

items on their plate (Rollo, Bucher, Smith, & Collins, 2017). A similar app could be developed for popcorn, ice cream, chips, and other portioned food products, indicating the standard serving size, or even a recommendation that is personalized to the size/weight/age/activities/eating goals of the consumers concerned.

The nudges do not only go through the structural reorganization of the environment, as they can also rely on a better consideration of sensory inputs that is also called "embodied self-regulation" (Petit et al., 2016). SETs might be used to modify the packaging environment in order to improve the sensory experience of healthy food. Highlighting the pleasure of eating healthy food via SETs could perhaps be used to induce multisensory food inferences that facilitate the selection of healthy food items (i.e., by nudging people towards healthier choices—see Petit, Basso, et al., 2016; Petit & Spence, 2017). For instance, Petit et al. (2016) showed how asking people to imagine the sensory pleasure of eating healthy food leads to greater activity in the brain areas involved in gustatory inferences (insula), reward value (orbitofrontal cortex), and self-regulation (inferior frontal gyrus). Their participants also made healthier food choices when focused on the sensory pleasure of eating healthy food, especially amongst those individuals with a high body mass index (BMI).

Projecting appetizing images of healthy foods on the packaging could help consumers to make healthier choices and appreciate more their consumption experience. For instance, in order to promote higher pleasure while consuming baby carrots, Bolthouse Farm launched a campaign entitled "Eat 'em like junk food" in 2010. The brand developed packaging that was similar to those of chips to suggest that their baby carrots are likely to lead to similar levels of pleasure, and saw their sales increase (www.youtube.com/watch?v=sDewR2jM138). With AR, it would be possible, for example, to give the appearance of French fries to carrots and thus potentially enhance the consumer experience (Narumi, Nishizaka, Kajinami, Tanikawa, & Hirose, 2011; Okajima & Spence, 2011). For example, Narumi et al. developed an AR called "MetaCookie+", which produces flavour illusions by overlaying visual and olfactory stimuli onto a real food product experience. Participants experienced a chocolate flavoured cookie while tasting a plain cookie. This was achieved when the appearance and the scent of a chocolate cookie were displayed through

a state-of-the-art AR system. Such a system could be further used to modify the flavour of vegetables, which are often little appreciated by children. Such systems could also be used to enrich the "food porn" trend for unhealthy food as well without caloric intake (Petit, Cheok, & Oullier, 2016; Spence et al., 2016; Victor, 2015). For instance, Project Nourished is a virtual reality system using a headset, cutlery with sensors, aromatic diffusers, and low-calorie 3D printed food that allow the user to experience junk food without worrying about calories.

Conclusions and Future Applications

The last few years have been accompanied by an explosion of interest in digitally enhanced packaging solutions. So far, the most successful of these solutions have relied on the hand-held/mobile technologies that so many of us carry around with us, which are being used to entertain, inform, and to a lesser degree, to nudge people towards more sustainable food behaviours. These digitally enhanced packaging solutions also prove to be means for creating much closer and credible interactions between the consumer and the brand, when comparing to what digital technologies can currently provide for the online environment (Petit et al., in press). However, this digitalization of product packaging raises a number of challenges, both practical and ethical, for researchers and marketers, concerning the acceptance of these technologies by consumers and their potential effects on product evaluation and perception. For example, immersion and telepresence have often been put forward as the most explanatory variables when it comes to the evaluation of consumers' digital experience (Animesh et al., 2011; Klein, 2003; Li et al., 2002; Nah et al., 2011). Nevertheless, in the context of CPI, consumers are already grounded in the physical environment, so it is by no means certain that immersion and telepresence are necessarily the most important (or appropriate) variables in explaining the effect of SETs on consumer evaluation.

Other variables may play a more important role in packaging evaluation. For instance, AR devices might increase the mental simulation of product interaction through the packaging (Choi & Taylor, 2014;

Elder & Krishna, 2012). It might also be interesting to see how the credibility of AR images, as part of the packaging, affects consumers' buying intentions (Chandran et al., 2009). Multisensory devices might boost consumer confidence in digitalized packaging, for example, by reducing the psychological distance between the consumer and the product (Elder, Schlosser, Poor, & Xu, 2017). There is also the need to better understand how digitally enhanced packaging can change consumers' sensory expectations and perceptions. For example, some sensory modalities (e.g., sound) are still underutilized and could perhaps be enhanced by means of SETs (Velasco, Carvalho, et al., 2016). Addressing these points will likely improve our understanding of how to engage the consumer's senses more effectively via the packaging (Krishna et al., 2017).

An important development brought by the rise of SETs in the CPI and, more generally, in marketing communication strategy is the need to put the consumer at the heart of the process. Consumers can choose to activate (or not) a mobile application in order to digitally enhance their packaging experience. Thus, marketers must first convince the consumer to use their application before convincing them to buy their product. Therefore, brands will need to figure out how to go about familiarizing their consumers with their mobile apps and improve their confidence in the content they broadcast. It should also be noted that many of the applications presented here are still in the form of prototypes. That is, few of these apps have yet been designed for mass consumption, and long-term usability. In this regard, brands should think carefully before investing in the development of long-term relationships with packaging by means of such technology. The undesired effect of generating light buzz through "funny" applications may end up tiring the consumers, rather than engaging them.

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Index[1]