Journal of the Academy of Marketing Science (2020) 48:405–421
https://doi.org/10.1007/s11747-019-00684-4

REVIEW PAPER

Components of visual perception in marketing contexts: a conceptual framework and review

Kevin L. Sample [1] · Henrik Hagtvedt [2] · S. Adam Brasel [2]

Received: 14 August 2018 / Accepted: 30 July 2019 / Published online: 22 August 2019

Abstract

Visual perception is essential to marketing practice and theory. Based on literature in marketing and related fields, this article develops a conceptual framework comprising five main components of visual perception: illuminance, shape, surface color, materiality, and location. Additionally, a systematic review of related visual perception research within marketing over the past five decades engenders takeaways of theoretical and practical importance, and an analysis of gaps in the literature reveals promising avenues for future research. The material presented includes coherent definitions, illustrative infographics, and accessible tables.

Keywords Vision · Perception · Systematic literature review · Sensory marketing · Conceptual framework

Understanding visual perception is critically important for marketing managers and researchers, as the perception of products, places, promotions, and related objects is central to marketplace interactions (Krishna 2012). This need is further emphasized by the ever-growing utilization of imagery and visual assets in online marketing efforts (Kane and Pear 2016), combined with consumers' increasing penchant for visual versus verbal information to comprehend and evaluate offerings in the marketplace (DelVecchio et al. 2018). Opportunities abound for managers to strategically utilize the baseline components (e.g., shape, surface color) of marketing-relevant visual stimuli, but no actionable meta-framework exists to systematically illustrate what those components are and how they affect consumers.

The current research identifies and analyzes the individual components and facets (i.e., sub-components) of visual perception. In other words, this work focuses on the visually perceivable, piecemeal physical properties of objects, not on the internal functioning of the visual system. Deconstructing visual perception in this manner helps elucidate not only the rich experience that is vision but also how specific aspects of visual stimuli affect consumers' cognition and behavior. From a theoretical standpoint, understanding the individual parts is essential to understanding the whole of visual perception. From a practical standpoint, understanding how to manipulate or utilize individual parts can aid managers seeking to improve their visual communication; not only is it difficult to foresee the impact of entire visual marketing-relevant stimuli without understanding the influence of individual parts, but it is also often more efficient and effective to manipulate the parts rather than the whole.

In this manuscript, we systematically review marketing and related literature to identify and define these components and facets, and to discuss relevant research findings. While the marketing literature offers clear insights into certain facets (e.g., the surface-color facets of hue, saturation, and lightness), it is currently limited regarding others (e.g., the illumination facets of directionality and duration). This review bridges gaps, indicating managerially relevant implications and variables of interest as well as avenues for future research.

Mark Houston served as Editor for this article.

Electronic supplementary material The online version of this article (https://doi.org/10.1007/s11747-019-00684-4) contains supplementary material, which is available to authorized users.

✉ Kevin L. Sample
kevinsample@uri.edu

Henrik Hagtvedt
hagtvedt@bc.edu

S. Adam Brasel
brasels@bc.edu

[1] College of Business, University of Rhode Island, 237 Ballentine Hall, 7 Lippitt Road, Kingston, RI 02881, USA

[2] Carroll School of Management, Boston College, Fulton Hall 450D, 140 Commonwealth Avenue, Chestnut Hill, MA 02467, USA

Piecemeal perception, visual processing, and visual comprehension

According to perceptual psychology research, people see focal stimuli in both a holistic manner (Ellis 2013; Koffka 2013) and by parts (Coren 2003; Sekuler and Blake 2002). Marketing research reinforces this dual perspective (Bloch 1995). As consumers process stimuli within their perceptual field (the area of vision), they have a limited visual focus, which quickly moves between focal objects. The focal area of interest is termed the figure, and the non-focal context is termed the ground (Wagemans et al. 2012); these are constantly updated as attention shifts and mental representations are formed (Mace 1977; Rock 1983; Uttal 1981). We provide a momentary snapshot of this process in Fig. 1.

Our review of the marketing literature reveals three distinct areas of visual perception research: piecemeal perception, visual processing, and visual comprehension. The first area, *piecemeal perception*, refers to consumers' sensation of a stimulus' individual physical attributes and is the focus of the current review. Even when stimuli are processed and comprehended at the gestalt level, the components and facets of those stimuli can have individual and interactive influences on cognition and behavior. For example, Lee et al. (2018) demonstrate that the presence of a gold color in perceived objects increases tipping in service environments. As this example illustrates, an individual facet can be adjusted to alter perceptions and consequently consumer behavior.

The second area, *visual processing*, refers to the reception and automatic representation of stimuli in the brain as influenced by consumers' internal states. Whereas piecemeal perception research focuses on the external, physical properties of objects, visual processing research focuses on the internal states of consumers, including the firing of neurons through the perceptual pathways as moderated by emotional and physical states of being. For example, Deng et al. (2016) demonstrate that consumer eye-movements interact with product assortment displays such that horizontal displays result in greater processing fluency and subsequently perceived variety. This example illustrates how the functioning of the visual system can shape perceptions.

The third area, *visual comprehension*, refers to the categorizations and holistic evaluations that consumers make regarding perceived stimuli. For example, Liu et al. (2017) demonstrate that consumers make aesthetic evaluations of product designs based on segment prototypicality, brand consistency, and cross-segment mimicry. As this example illustrates, visual comprehension is an involved process focused on the output of piecemeal perception and visual processing.

Combining these three areas, we provide the following definition of *visual perception*: the processing and comprehension, via the eyes and the neural system, of holistic focal and non-focal stimuli, as comprised by their piecemeal components and as influenced by context and experience (Gibson 1950; Hoffman 1996; Kubovy and Pomerantz 2017; Peterson 2001; Rock 1983; Uttal 1981). This and our other perception definitions, along with a list of the most marketing-relevant frameworks and/or reviews, are displayed in Table 1. This table indicates both general overviews of main areas of visual perception (e.g., visual processing) and more focused treatments of a sub-area (e.g., eye-movement).

Several existing review articles examine visual processing (e.g., general sensory marketing: Krishna 2012; creativity-related: Zhu and Mehta 2017; of online assortments: Kahn 2017) and visual comprehension (e.g., gestalt perception: Wagemans et al. 2012; related to package

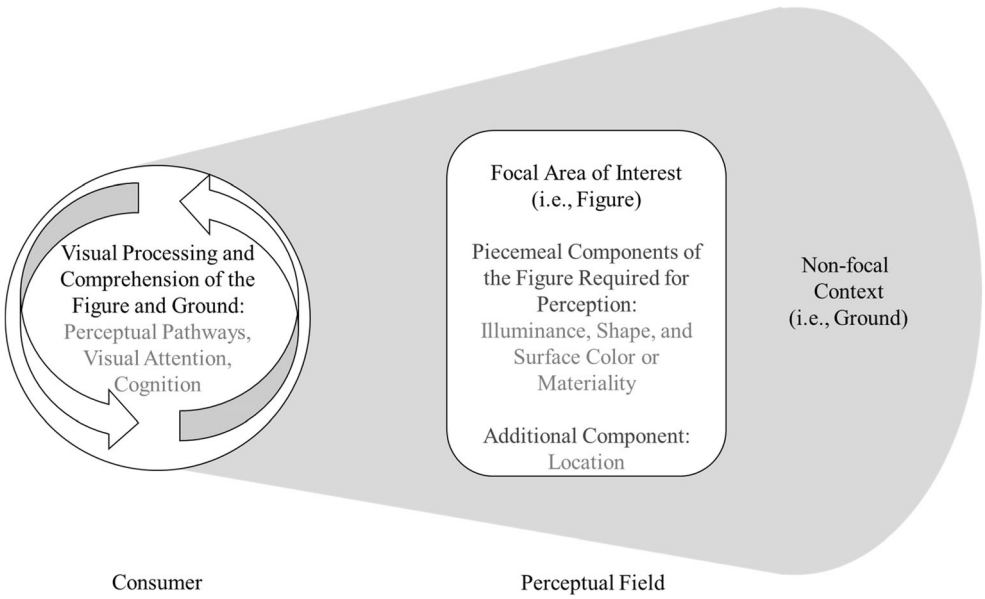


Fig. 1 A snapshot of visual perception

Table 1 Definitions of primary visual perception constructs

Construct	Definition	General Frameworks and/or Reviews	Focused Frameworks and/or Reviews
Visual Perception	The processing and comprehension, via the eyes and the neural system, of holistic focal and non-focal stimuli, as comprised by their piecemeal components and as influenced by context and experience	Raghubir 2009	Kahn 2017
Stages of Visual Perception			
Piecemeal Perception	Consumers' sensation of a stimulus' individual physical attributes	None	Labrecque et al. 2013
Visual Processing	The reception of and automatic representation of stimuli in the brain as influenced by consumers' internal states	Krishna 2012	Higgins et al. 2014; Zhu and Mehta 2017
Visual Comprehension	The categorizations and holistic evaluations that consumers make regarding perceived stimuli	Wagemans et al. 2012	Krishna et al. 2017

design: Krishna et al. 2017). Furthermore, a conceptual article (Raghubir 2009) straddles both areas, providing an informative model of visual processing and a taxonomy of visual stimulus categorizations. The taxonomy presented there touches on individual differences, types of processing, consumer judgments, context, and—most related to the current work—visual properties. Whereas Raghubir's work discusses visual properties in terms of, for instance, goals (e.g., informative, persuasive) or format (e.g., pictorial, semantic, digital), it is more focused on visual processing and comprehension than piecemeal perception and only briefly addresses some of the piecemeal facets presented in the current work.

Therefore, although researchers in marketing increasingly appear to recognize the importance of piecemeal perception, as indicated, for instance, by one review addressing the component of color (Labrecque et al. 2013), no article has provided a framework for or has fully addressed the breadth of piecemeal perception. The current article fills that gap by providing a framework and review for piecemeal perception research, including definitions of the various components and facets, summaries of findings, and graphical illustrations, as well as elucidating practical marketing implications and identifying avenues for future research. Although additional constructs and definitions are conceivable, this article includes the main components and facets of piecemeal perception that can be readily manipulated by researchers and marketers.

The rest of the article is structured as follows: First, we delineate the procedure for generating our conceptual framework and for conducting our systematic literature review. Next, we present each component and facet of piecemeal perception, providing definitions and explanations, briefly summarizing marketing findings, and identifying fruitful directions for future research. In these latter sections, we focus primarily on the marketing literature, but when that is inadequate, we supplement with literature from related fields.

Framework and literature review

Procedure for the conceptual framework development

To lay the groundwork for our conceptual framework, we synthesized findings from perceptual psychology, engineering, graphic arts, architecture, and marketing literature (see the following section for the marketing literature utilized). The development of this framework and the subsequent review entailed an iterative process: The framework's components served as structure for the review, but numerous articles in our initial review first served as input to the framework. These articles were cross-checked with research from the aforementioned fields to ensure that the primary components of piecemeal perception were captured in our framework.

Our synthesis of findings revealed five marketing-relevant components of piecemeal perception: illuminance, shape, surface color, materiality, and location. Illuminance, shape, and either surface color or materiality are necessary for perception of an object (Gibson 1950; Rock 1983; Uttal 1981). These components allow perceivers to interpret and differentiate aspects within and between the figure and ground. Although location is not necessary for perception, this component is also important, as location provides context information and our perceptual system is attuned to the location of objects in our perceptual field (Kubovy and Pomerantz 2017; Peterson 2001). To better explicate the roles of these five components in our framework, we illustrate their additive nature in Fig. 2. With each addition of a component, more visual information is given about what can be seen within the perceptual field, until all five components combined provide the entirety of a scene.

Our synthesis of findings also generated several facets associated with each component. We elaborate on the five components and 19 facets in subsequent sections, and we provide definitions and symbolic representations in Table 2 (in line with an increasingly visually focused society; DelVecchio et al. 2018; Kane and Pear 2016).

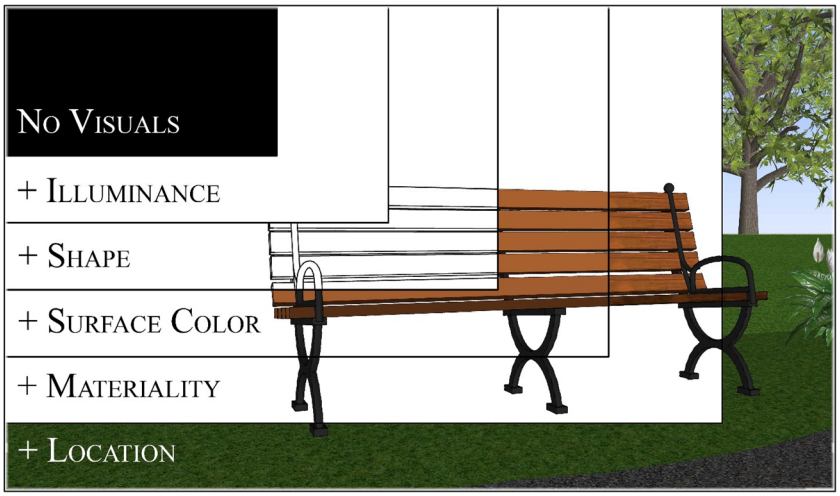


Fig. 2 The additive nature of the piecemeal components of visual perception

In sum, our conceptual model has five components (all of which have been studied by marketing researchers) comprised of 19 facets (of which 15 have been studied by marketing researchers). As discussed in subsequent sections, researchers in other fields have demonstrated the consumer relevance of the four remaining facets. Additional components and facets may exist, depending on research focus, but the components explored here provide a universal baseline with relevance across product category and usage scenarios.

Procedure for the systematic marketing literature review

Our systematic review of piecemeal perception comprised 19 high-quality marketing and marketing-related journals (Table 3) covering approximately the last half century (1970–2018). We focused on articles that explored piecemeal visual components as they related to visual perception, and we conducted additional EBSCOhost and Google Scholar searches with pertinent terms to ensure comprehensiveness. Relevant articles were then categorized according to our conceptual framework.

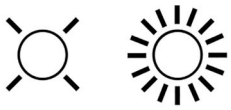
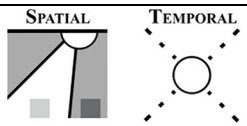
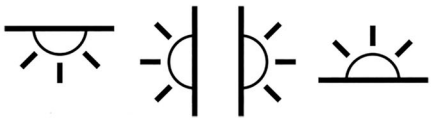
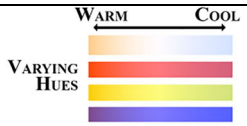
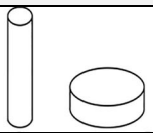
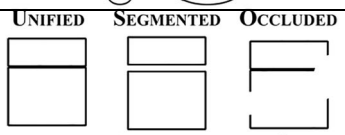
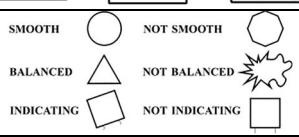
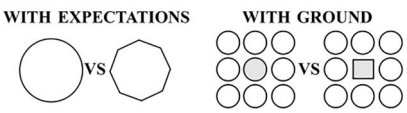
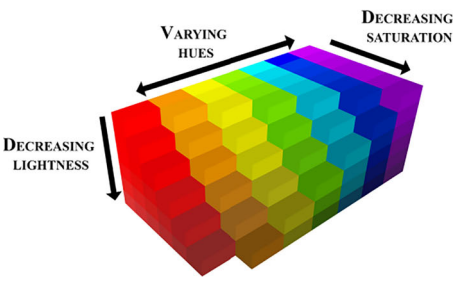
Numerous articles that initially appeared related to piecemeal perception were excluded from our review; only articles specifically focused on the act of visually perceiving piecemeal components were included. For example, we excluded articles focused on visual comprehension and processing, such as those dealing with store or brand image as an abstract concept, discussing the back-end cognitive effects of vision, or employing studies with visual imagery only as a prime or manipulation. Further, numerous articles utilize the word perception to mean beliefs or purely cognitive functioning; these do not fit the current focus. Notably, whereas the development of our conceptual framework included selected marketing-relevant articles from other fields, our subsequent systematic review included only marketing literature (72 articles in total). We deemed some facets (e.g., brightness) intuitive and straightforward, limiting the need for lengthy explanations (or citations) up front, especially if they also received treatment in the subsequent literature review sections. However, articles from related fields informed the framework if little or no marketing literature was available for a non-obvious facet (e.g., illuminance contrast) that appeared, based on the related literature, to be marketing-relevant. In fact, often the less intuitive facets were also the ones less researched in marketing, prompting a longer explanation for both reasons. Therefore, the initial facet descriptions in the following sections vary in length and detail.

A comprehensive overview of the findings from the review of marketing literature, organized by component and facet, is presented in Table 4. The key findings column provides simplified, general takeaways derived from literature in the related articles column. There are not yet any takeaways for some under-researched facets (e.g., illuminance directionality, illuminance color), whereas there are more than one primary takeaway for other facets (e.g., illuminance brightness). Some of the articles from our review are not listed in the related articles column, if their topics are too distant from other findings to draw general conclusions. However, the web appendix provides an alternative presentation, organized by category of finding, capturing the findings from all 72 articles.

Illuminance

We define *illuminance* as the amount of light perceived on an object (Table 2: I). As indicated in Fig. 2, visual perception cannot occur without light (Kubovy and Pomerantz 2017; Sekuler and Blake 2002). Illuminance is an environmental factor rather than an inherent feature of the perceived object,

Table 2 Definitions and symbolic representations of piecemeal perception's components and associated facets

Construct	Definition	Symbolic Representation(s)
I. Illuminance	The amount of light perceived on an object	
1. Brightness	The amount of lumens falling on a surface	
2. Illuminance Contrast	The differences that occur in the perception of light over space and/or time	
3. Directionality	The source of lighting in relation to the location of perception	
4. Illuminance Color	The temperature and hue of perceived light in an environment or projected onto an object	
II. Shape	The perceived space occupied by an object in the perceptual field as comprised by the outer boundaries of that object	
1. Dimensionality	An object's height, width, and/or length	
2. Unity	An object's perceived cohesiveness as allowed by segmentation and occlusion	
3. Demarcation	The outer boundary that contains the entirety of a perceived object	
3. Shape Contrast	The deviation of a perceived object from context or consumer experience	
III. Surface Color	The hue, saturation, and lightness of the perceived exterior layer of an object within the perceptual field	
1. Hue	The facet of a perceived color that allows for classification as red, yellow, blue, or any mixture of these	
2. Saturation	The degree of deviation of a perceived hue from a gray of the same lightness	
3. Lightness	A surface color's range from black to white	

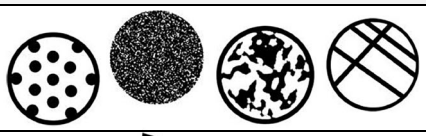
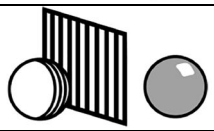
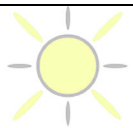
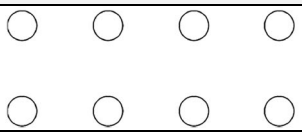
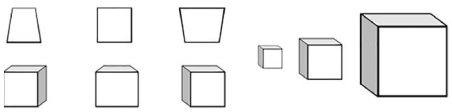
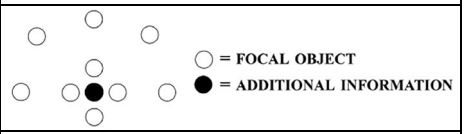
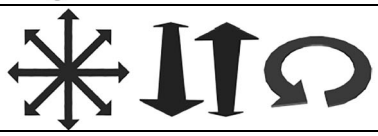
IV. Materiality	The visual texture and reactance of the exterior surface of an object as contained within the shape of that object	
1. Visual Texture	The apparent consistency of a perceived object's surface	
2. Reflectance	An object's propensity to produce an image of the surrounding context on its surface	
3. Opacity	The lack of transparency in an object's surface	
4. Fluorescence	The propensity of an object's surface to emit light through reflection or internal lighting	
V. Location	The positioning, orientation, spacing, and movement of an object in relation to other objects within an area	
1. Positioning	The placement of a figure within the ground or in relation to another object	
2. Orientation	The angle of perception of an object	
3. Spacing	The distance between an intended focal object and additional information	
4. Movement	A change in the location of an object	

Table 2 (continued)

yet it is a physical property of the stimulus during perception. Our review uncovered four facets of illuminance that can be consistently applied to marketing contexts (e.g., retail, digital, product, environment, media): brightness, illuminance contrast, directionality, and illuminance color. Table 2 presents definitions and symbolic representations. Table 4 presents key findings for some facets.

Illuminance facets

Brightness Brightness refers to the number of lumens falling on a surface (Lechner 2014; Tables 2 and 4: I.1.). Though ambient lighting is a holistic, environmental factor, its impact is of a piecemeal nature because it directly influences perception of visual stimuli. For instance, a product placed in bright ambient light will be perceived as more vivid than this same product placed in dim ambient light.

Illuminance contrast Illuminance contrast refers to differences in the perception of light over space and/or time (Table 2: I.2.). Spatially, different amounts of light can fall on various parts of the perceptual field, thereby creating contrasts within and between perceived objects. A common focus of perceptual psychology research has been on contrasts between figure and ground, giving rise to figure–ground separation (Regan and Beverley 1984) and influencing comprehension speed (Legge et al. 1990). Temporally, light can change over short or long intervals. Temporal fluctuation of light can be imperceptible

Table 3 Marketing sources reviewed (1970 - early 2018)*

International Journal of Research in Marketing	Journal of Service Research
Journal of Advertising	Journal of the Academy of Marketing Science
Journal of Advertising Research	Journal of the Association of Consumer Research
Journal of Business Research	Management Science
Journal of Consumer Psychology	Marketing Letters
Journal of Consumer Research	Marketing Science
Journal of Marketing	Marketing Theory
Journal of Marketing Research	Psychology and Marketing
Journal of Public Policy and Marketing	Quantitative Marketing and Economics
Journal of Retailing	

*- all journals with a start date after 1970 were reviewed from their first issue

or nonexistent in locations such as grocery stores, but quite evident in locations with erratic lighting, such as a dance venue. Perceptual psychologists have studied temporal contrasts in connection with dark/light adaptation and light constancy, as it impacts distal and proximal perceptions (Epstein 1977; Gilchrist 1988) and interactions with perception of color (Hamburger et al. 2007).

Directionality We define directionality as the source of lighting in relation to the location of perception (Table 2: I.3). Traditionally, most light was encountered from above (e.g., the sun), but technological innovations can generate light from any direction. This directionality of light can have a substantial impact on perception. For instance, perceptual psychologists have noted differential perceptions of shading produced by light from above versus below (Gibson 1950; Ramachandran 1988). Further, architectural research has relatedly shown that environmental "down-lighting" (vs. "up-lighting") leads to greater consumer approach (Tural and Yener 2006).

Illuminance color Illuminance color refers to the temperature and hue of perceived light in an environment or projected onto an object (Table 2: I.4). Temperature refers to the coolness or warmness of perceived light and is measured in Kelvin (Lechner 2014), whereas hue refers to the dominant wavelength, which allows for classification as red, yellow, blue, or any mixture of these (Beck 1972). These dimensions are not orthogonal; for example, one blue may be warmer or cooler than another blue, but both are cooler than red. For further clarification, illuminance color is differentiated from surface color (discussed in a later section), as illuminance color is additive while surface color is subtractive (Hagtvedt and Brasel 2017). For example, if an orange (or white) piece of clothing is under an orange light, it will appear white (or orange) because the orange light is adding that color back into the surface of the shirt. Research has revealed scattered findings regarding the influence of illuminance color of light on consumers, such as red (vs. blue) light being less likely to interfere with sleep (Gooley et al. 2003). More generally, since surface color (see subsequent section) has substantial effects on behavior and attitudes, the same could be applicable for illuminance color.

Marketing literature related to illuminance

Despite the ubiquitous role of illuminance in vision (Kubovy and Pomerantz 2017; Sekuler and Blake 2002), marketing scholars have devoted scant attention to this component. Thus far, marketing research on illuminance has primarily focused on brightness, which affects consumers' sense of connection with their surroundings; brighter lighting increases consumer arousal, leading to greater engagement and higher likelihood that products are picked up and examined (Areni and Kim 1994; Summers and Hebert 2001). Additionally, consumers make healthier and less hedonic food choices in bright lighting due to increased consumer alertness (Biswas et al. 2017) and because the felt presence of others results in less authentic choices (Huang et al. 2018). In one instance of research involving a different facet of illuminance, Babin, Hardesty, and Suter (2003) demonstrate that illuminance color can interact positively or negatively with surface colors in retail environments, depending on hue. Although focused mainly on surface color, that article was the only one in our review that considered an interaction across components.

Future directions for illuminance research

Every facet of illuminance appears to be fertile ground for research, despite the current dearth of research on illuminance contrast, directionality, and illuminance color. Much of the architecture, engineering, and health care literature examining illuminance focuses on daylight in contrast to artificial lighting, with the primary difference between these two types of lighting being captured by illuminance color (Grondzik and Kwok 2014; Lechner 2014). Similarly, future work in

Table 4 Piecemeal perception major findings

Component	Facet	Related Articles	Key Findings
I. Illuminance	1. Brightness	Areni and Kim 1994; Summers and Hebert 2001	Brighter lighting increases consumer product engagment, as brighter lighting falling on products tends to increase consumer arousal towards those products
		Biswas et al. 2017; Huang, Dong, and Labroo 2018	Consumers choose more hedonic options in dim lighting as dim lighting leads to lower consumer alertness and lower feelings of connectedness with others
II. Shape	1. Dimensionality	Chandon and Ordabayeva 2009; Koo and Suk 2016; Ordabayeva and Chandon 2013; Raghubir and Krishna 1999; Wansink and Van Ittersum 2003; Yang and Raghubir 2005	Consumers tend to make size estimations erroneously - typically anchoring on the dimension of height leading to perceptions that taller containers have more volume than wider containers
	2. Unity	Hagtvedt 2011; Sevilla and Kahn 2014; Veryzer Jr and Hutchinson 1998	Consumers use the unity, or the lack of unity, to make size estimations about products, to generate preferences for certain products, and to make assumptions about brand traits and personalities
	3. Demarcation	Bajaj and Bond 2018; Cian et al. 2014; Henderson and Cote 1998; Henderson, Giese, and Cote 2004; Jiang et al. 2016	Consumers generally have higher preferences and evaluations for products when the demarcation of the product is congruent with brand image (e.g., a dynamic brand needs a more dynamic demarcation)
	4. Shape Contrast	Folkes and Matta 2004; Huang and Kwong 2016; Landwehr et al. 2011; Trudel and Argo 2013; Veryzer Jr and Hutchinson 1998	Shape contrasts from prototypical shapes are more likely to grab attention and increase variety estimations, but typically these shape contrasts are harder to process and less likely to be valued
III. Surface Color	1. Hue	Bagchi and Cheema 2013; Bottomley and Doyle 2006; De Bock et al. 2013; Gorn et al. 2004; Lee et al. 2018	Hues tend to carry metaphorical meanings and when consumers are exposed to a specific hue they are more likely to behave in a manner with or expect outcomes similar to the associated metaphorical meaning of presented hues (e.g., consumers exposed to red tend to behave more aggressively)
	2. Saturation	Bellizzi et al. 1983; Fernandez and Rosen 2000; Lee et al. 2014; Lee, Fujita, Deng, and Unnava 2016; Sparkman Jr and Austin 1980	Color (i.e., saturated) images are received better by consumers than black-and-white (i.e., not saturated) images resulting in higher preferences and evaluations, unless a firm needs to emphasize a distal attribute such as a secondary feature or a future event
		Hagtvedt and Brasel 2017; Mead and Richerson 2018	Higher levels of saturation lead to greater estimations of size (due to increased attention-grabbing ability) and unhealthiness (due to prior experience)
	3. Lightness	Madzharov et al. 2016; Mai et al. 2016	Higher levels of lightness leads to greater consumption of hedonic food, as well as perceptions of healthiness
IV. Materiality	1. Visual Texture	Di Muro and Noseworthy 2012	Consumers estimate that items exhibiting deviations from visual texture expectations to be contaminated, resulting in a lowered retention desire
	2. Reflectance	Meert et al. 2014	Glossy, reflecting surfaces are inherently more attracting to consumers than matte surfaces due to consumers innate need for water
	3. Opacity	Deng and Srinivasan 2013	Consumers will consume greater quantities of larger and healthier foods when these foods can be seen through transparent packaging
V. Location	1. Positioning	Chae and Hoegg 2013; Deng and Kahn 2009; Huang et al. 2013; Romero and Biswas 2016; Sundar and Noseworthy 2014	Consumers exhibit higher evaluations and greater preferences when images are positioned in a location that is consistent with consumer expectations such that greater fluency occurs (e.g., more powerful brands should be positioned higher)
	2. Orientation	Leonhardt et al. 2015; Pillai et al. 2012; Pracejus et al. 2013; Salgado-Montejo et al. 2015; van Rompay et al. 2012	In general, image orientation gives way to greater evaluations about product quality and brand personality (e.g., a profile image facing towards the center of a promotion results in higher evaluations than when that image faces toward the edge of a promotion)
	3. Spacing	Chae et al. 2013; Coulter and Norberg 2009; Sevilla and Townsend 2016	Greater spacing between similar product images results in higher evaluations due to perceived quality inferences, but the spacing between product and desired outcome should be minimized as this is interpreted as greater effectiveness
	4. Movement	Brasel and Hagtvedt 2016; Park et al. 2005; Roggeveen et al. 2015	Moving, as opposed to static, images garner more attention from consumers resulting in higher purchase intentions for hedonic products

marketing may find that responses to retail displays depend on lighting and time of day, and perhaps certain products or product attributes are better presented in daylight or in the artificial lighting that dominates at night. In visual marketing communications, images featuring such contrasts could also be presented side-by-side or one-after-the-other; whereas prior work has considered the effects of lighting effects in isolation, it is unknown how consumers might react to the juxtaposition of different kinds of lighting. In general, illuminance contrast may influence the clarity and comprehension of marketing communications (Legge et al. 1990; Regan and Beverley 1984), while contrast fluctuations might either draw attention or elicit annoyance, depending on the circumstances (Epstein 1977).

Whereas prior work has focused on effects of lighting from above or below (Gibson 1950; Tural and Yener 2006), research in marketing could expand such investigations to lighting from other angles. Especially with advances in LED, OLED, and EL-Wire technologies, lighting can be increasingly applied to any surface and pointed in any direction. Further, influences of illuminance directionality may depend on a variety of variables, ranging from display characteristics (e.g., shape or color of the visuals) to psychological traits of the viewers (e.g., unusual lighting angles might peak some consumers' curiosity but make others skeptical of the product or brand).

Future research might similarly consider effects of illuminance color beyond the influence on sleep (Gooley et al. 2003), whether the colors are presented in isolation or in combination with each other. As LED lighting replaces traditional retail illumination, the hue and color temperature of illumination is increasingly under marketer and consumer control (e.g., Philips Hue, Dyson Lightcycle), yet little is known about how these changes affect consumer behavior. Research on these topics could also incorporate the role of constancy, that is, a consumer's ability to accurately estimate a certain color (i.e., color constancy) or shading (i.e., lightness constancy) relative to other colors in bright or dim light (Gilchrist 1988; Sekuler and Blake 2002).

Shape

Our definition of s*hape* is the perceived space occupied by an object in the perceptual field as comprised by the outer boundaries of that object (Ching 2014; Hoffman 1996; Peterson 2001). That is, shape allows for a distinction to be made between the figure and the ground, along with connotations derived from that shape. Our literature review revealed four pertinent facets of shape: dimensionality, unity, demarcation, and shape contrast.

Shape facets

Dimensionality Dimensionality refers to an object's height, width, and/or length (Tables 2 and 4: II.1.). Two perceived figures may appear identical in every way except for the size; a good example is Matryoshka (i.e., Russian nesting dolls), which vary in height, width, and length, but otherwise appear identical. However, changes in dimensionality can also be restricted to one or two dimension(s).

Unity Unity refers to an object's perceived cohesiveness as allowed by segmentation and occlusion (i.e., the blocking of view of some aspect of a perceived object; Kellman and Shipley 1991; Tables 2 and 4: II.2.). As an example of segmentation, a desktop computer and separate monitor tend to appear less unified than a laptop does. As an example of occlusion, a house may appear less unified if a car is parked in front of it, partially blocking the view.

Demarcation Demarcation refers to the outer boundary that contains the entirety of a perceived object (Tables 2 and 4: II.3.). The demarcation of a figure can vary in smoothness, balance, and indication. Smoothness is a lack of or gradual variation in the outer boundary, balance refers to the symmetry of the outer boundary, and indication refers to a shape's implied meaning. The latter appears somewhat cognitive in nature, so its role in the current context is questionable, but a good example of indication is visual inertia; a shape may imply movement without actual motion taking place (e.g., a silhouette of a deer jumping; Ching 2014).

Shape contrast Shape contrast is the deviation of a perceived object from context or consumer experience (Tables 2 and 4: II.4.). As for context, there may be varying levels of contrast between the figure and the surrounding stimuli that make up the ground. For example, one brand of conditioner in a retail store can contrast minimally with conditioners of the same brand (due to similar colors, shapes, and design used across brand lines), contrast more with conditioners by other brands, and contrast greatly with adjacent hairbrushes. Similarly, varying levels of contrast arise between a figure or ground and existing consumer expectations about how marketplace offerings should appear (c.f., prototypicality; Veryzer Jr and Hutchinson 1998). Perceptual psychology research has demonstrated the tendency for figures to "pop out" in visual searches (Maljkovic and Nakayama 1994; Nothdurft 1993; Wang et al. 1994), thus illustrating the importance of shape contrasts from contexts.

Marketing literature related to shape

Research on the dimensionality, unity, demarcation, and contrast of shapes has revealed perceptual and downstream

effects. Most of the work on dimensionality has demonstrated influences on volume estimations, along with responses such as preference and consumption (Ordabayeva and Chandon 2013). To date, most research in this vein has focused on simple dimensionality differences such as longer or shorter sides, leaving much room for exploration. Research has similarly revealed influences of unity and demarcation on size perceptions, with perceptually incomplete shapes appearing volumetrically smaller than perceptually complete ones (Sevilla and Kahn 2014). Additionally, unity and demarcation influence consumers' emotional responses and brand- and product assessments (Bajaj and Bond 2018; Hagtvedt 2011; Jiang et al. 2016). Research on shape contrast has primarily focused on consumer expectations, demonstrating that products deviating from prototypical product category shapes reap more consumer attention yet lower consumer evaluations than prototypical shapes (Folkes and Matta 2004; Landwehr et al. 2011). Relatively less work has focused on contrasts with context or neighboring products (Patrick and Hagtvedt 2011).

Future directions for shape research

Future work might examine increasingly complex constellations of dimensions, whether in products, packaging, or elsewhere. Relatedly, whereas much marketing research has focused on dimensionality in objects such as containers (Ordabayeva and Chandon 2013; Raghubir and Krishna 1999; Wansink and Van Ittersum 2003), less work has explored the dimensionality of retail interiors, buildings, or outdoor areas. Given the central role of size estimations in dimensionality effects, it seems feasible that those effects may depend on context. For instance, consumers might respond differently to the perception of a compact phone than to the perception of a cramped retail space, and they might apply different parameters when assessing the interior of a sports car versus an SUV. In addition to exploring emotional and cognitive responses to dimensionality, unity, and demarcation in isolation, future research could focus on interactive influences between these facets. For example, perhaps a demarcated ad space with a depiction of a large (vs. small) product seems more cramped.

From a perceptual standpoint, whereas most prior work on shape contrast has focused on product-exemplar contrasts, future research may explore contrasts such as the ones between figure and ground, as this plays an important role in drawing attention (Hummel and Stankiewicz 1998) and in memory retention (Fiser and Aslin 2002). From a practical standpoint, research in marketing might illuminate outcomes such as consumers' assessments of product ergonomics. As more shopping and product search takes place on digital screens (Luo et al. 2013), the visual component of shape perceptions may become even more important than haptic evaluations of shape when considering characteristics such as ergonomics.

Surface color

In addition to illuminance and shape, any object within the perceptual field (i.e., the figure or part of the ground), unless spatially located so that it appears distinct, must have a contrasting surface property that distinguishes it from other objects within the perceptual field for perception of that object to occur. This property can be either surface color or materiality. *Surface color* is the hue, saturation, and lightness of the perceived exterior layer of an object within the perceptual field (Beck 1972; Labrecque et al. 2013; Uttal 1981). As recommended by Hagtvedt and Brasel (2017), we use the term lightness instead of value to avoid confusion; value has other connotations in a marketing context. We provide a cursory overview here; for an in-depth review of surface color research prior to 2013, see Labrecque et al. (2013).

Surface color facets

Hue Hue is the facet of a perceived color that allows for classification as red, yellow, blue, or any mixture of these (Beck 1972; Tables 2 and 4: III.1.); it corresponds to the color's dominant wavelength in the electromagnetic visible spectrum (Hagtvedt and Brasel 2017).

Saturation Saturation is the degree to which a perceived hue deviates from a gray of the same lightness (Beck 1972; Tables 2 and 4: III.2.). In other words, it refers to the color's purity (Hagtvedt and Brasel 2017).

Lightness Lightness is a surface color's range from black to white (Tables 2 and 4: III.3.).

Marketing literature related to surface color

Surface color, with its three facets of hue, saturation, and lightness, has unique practical advantages. It is the component perhaps most easily manipulated by the firm and can apply to innumerable marketing contexts in physical and digital formats. Researchers have examined all three facets of surface color.

For example, brands and behaviors are both viewed more favorably when presented with congruent color hues (Bottomley and Doyle 2006; De Bock et al. 2013), whereas gold can increase tipping (Lee et al. 2018), blue elicits relaxation (Gorn et al. 2004), and red increases aggression (Bagchi and Cheema 2013) but enhances perceptions of savings (Puccinelli et al. 2013).

Prior work has found generally favorable consumer responses to saturated color (vs. black and white; Bellizzi et al. 1983), although more recent work has found mixed effects (Lee et al. 2016). Other research has demonstrated influences of more versus less saturation on judgments such as size (Hagtvedt and Brasel 2017) and health (Mead and Richerson 2018).

Recent research has found a general preference for light over dark colors (Kareklas et al. 2014), although more so among women than men (Semin and Palma 2014). Lightness also increases consumption of hedonic foods (Madzharov et al. 2016) and a perception that food is healthy (Mai et al. 2016).

In addition to examinations of individual surface color facets, marketing researchers have investigated various combinations, interactions, and patterns that arise from them (e.g., Deng et al. 2010; Labrecque and Milne 2012; Moore et al. 2005).

Future directions for surface color research

As mentioned, surface color is possibly the piecemeal component most readily manipulated by firms, which underscores the need for research to inform its strategic use. Future research might, for example, uncover other metaphorical meanings of hues, which may or may not vary between cultures (Chattopadhyay et al. 2009), along with emotional, cognitive, and behavioral outcomes. Further, given the substantial role of color in product design and visual communication, it could be useful to investigate the theoretical underpinnings of color beyond hue metaphors (O'Connor 2015). For instance, the co-creation of made-to-order products typically involves adjustments to surface colors (e.g., NIKE BY YOU, BMW customizations), and the myriad of color options available to consumers suggest many potential interactive effects, yet little work to date has investigated combined influences of color hues, or combined effects of hue, saturation, and lightness.

Given saturation's capacity to stir arousal and attract attention, it seems feasible that this facet might affect creativity or the ability to parse information. Additionally, future work may identify other process mechanisms than attention and arousal in the various effects of saturation. Relatedly, research in psychology has demonstrated color effects such as objects with lighter colors appearing to weigh less than objects with darker colors (Walker et al. 2010). Future research might uncover other perceptual effects of this nature, perhaps also investigating the extent to which such effects rely on evolved, universal responses or specific cultural learning. Advances in screens and paint technologies are also enabling products to display changing colors. Research on adaptive color technologies is relevant in contexts ranging from 'chameleon' paintjobs on high-end sports cars to e-ink watch bracelets that can vary from light to dark.

Materiality

The other surface property that can aid in perception is *materiality*: the visual texture and reactance of the exterior surface of an object as contained within the shape of that object (Ching 2014; Gibson 1950; Hoffman 1996; Peterson 2001). Reactance refers to the amount of light absorbed, transmitted, and/or emitted by an object's surface via reflectance, opacity, and/or fluorescence (Lechner 2014; Sekuler and Blake 2002). Thus, visual texture, reflectance, opacity, and fluorescence are the four marketing-relevant facets of materiality as it relates to visual perception.

Materiality facets

Visual texture Visual texture is the apparent consistency of a perceived object's surface (Tables 2 and 4: IV.1.). Note that this definition differs from the typical tactile understanding of texture; it relates to visual instead of haptic perception (Ching 2014; Lechner 2014). For instance, a tree and a photograph of a tree both have the same visual texture regardless of the actual feel of a tree being rough and the picture being smooth to the touch.

Reflectance For the purposes of this research, reflectance is defined as an object's propensity to produce an image of the surrounding context on its surface, which interacts with the texture of the figure (Tables 2 and 4: IV.2.). Objects such as mirrors (high reflectance and smooth visual texture) and brass doorknobs (high reflectance and hazy visual texture) lie on one end of the reflectance continuum, while regular white copier paper (low reflectance and smooth visual texture) and sandpaper (low reflectance and jagged visual texture) lie on the other end.

Opacity Opacity refers to the lack of transparency in an object's surface (Tables 2 and 4: IV.3.). For example, walls are typically opaque, windows are not, and frosted glass lies somewhere in between.

Fluorescence Fluorescence is the propensity of an object's surface to emit light through reflection or internal lighting (Table 2: IV.4.). That is, whereas some materials produce their own light, others reflect a different wavelength than received such that the surface appears to glow (Lechner 2014). Fluorescence is typically constrained to this latter glowing effect, but we include objects that emit their own light through some form of electronics, as this is an important consideration for marketers. Consumers are increasingly engaged with products, such as mobile phones (Luo et al. 2013; Verhoef et al. 2017), that exhibit fluorescence, which can have psychophysical effects on variables such as sleep patterns (Chellappa et al. 2013; Hamblin and Wood 2002).

Marketing literature related to materiality

As with illuminance, scant research in marketing has investigated materiality, despite it being an important component of piecemeal perception. To date, that research has produced only one article on visual texture (demonstrating that crumpled money is perceived to be contaminated—and is therefore spent quickly—because it exhibits a deviation from the preferred visual texture; Di Muro and Noseworthy 2012), one on reflectance (showing that consumers prefer glossy over matte surfaces due to the former's connotations of water; Meert et al. 2014), one on opacity (investigating the influence of package opacity on food consumption; Deng and Srinivasan 2013), and none on fluorescence.

Future directions for materiality research

Materiality rapidly informs recognition regardless of surface color information (Sharan et al. 2009) and plays an important role in visual processing (Zhu and Meyers-Levy 2009). Its scope of influence is expanding as consumers view numerous potential purchases via digital screens without physically handling the product, yet it has been relatively under-investigated, even by perceptual psychologists (Maloney and Brainard 2010). The substantial and increasing importance of materiality in the marketplace, combined with the paucity of research on this topic, suggest that this ground is particularly ripe for future investigations.

For example, the introduction of translucent iMacs created a wave of imitations in other fields, and the mid-1990s saw a rush of transparent beverages from Crystal Pepsi to Miller Clear Beer, whereas the fashions for transparent and opaque smartphone cases seem to switch at an ever-increasing rate. As these fashions come and go, it would benefit managers to know what the materiality connotations are, when and how they arise, and how to use them strategically. For example, there may be an association between transparency and novelty or with opacity and permanence, given that sturdy materials have tended to be opaque, whereas such associations might change as consumers become increasingly familiar with sturdy, transparent materials, ranging from diamonds to Gorilla Glass. Technological advances have also facilitated packaging with opaque sections and transparent windows to the product inside, yet little work has explored combinations of this kind. Visual texture also has a logical analog in physical texture, which increasingly has been investigated in the field of embodied/grounded cognition. Future work could explore whether exposure to actual haptic texture is necessary to trigger effects on, for instance, social judgments and decisions (Ackerman et al. 2010), or whether the mere perception of a texture is sufficient.

Reflectance may similarly go through cyclical fashions; matte-finish paint jobs on cars have begun to penetrate the super-luxury market, and a move from magnesium or titanium bodies to glass-backs has shifted the general reflectance level of smartphones. Little is known about how such design features might affect brand or attribute associations. Further, ever-more products are emitting some type of light in one form or another. Modern laptops glow not only from their screen, but also from their keyboards, notification LEDs, and illuminated brand logos. In this age of connectivity, how do these products emanating light alter consumer behavior? Although consumers are increasingly engaged with fluorescent products, the current lack of marketing research on fluorescence leaves much to be investigated.

Location

We define *location* as the positioning, orientation, spacing, and movement of an object in relation to other objects within an area (D'amelio 2004; Gibson 1950; Sekuler and Blake 2002; Uttal 1981). For example, a product can be located anywhere within an ad's boundaries or a retail outlet's display areas. Whereas a specific location is not necessary for perception to occur, this component can have substantial implications for perception and provides context information.

Location facets

Positioning Positioning refers to the placement of a figure within the ground or in relation to another object (Tables 2 and 4: V.1.). For example, a print advertisement may show a toothbrush to the right or to the left of a smiling spokesperson.

Orientation Orientation refers to the angle of perception of an object (e.g., above, below, the side, or close-up vs. far away; Tables 2 and 4: V.2.). For instance, the aforementioned toothbrush can be oriented such that it is pointing toward viewers or such that they see it from the side.

Spacing Spacing is defined as the distance between an intended focal object and additional information, regardless of respective positioning (Tables 2 and 4: V.3.). For example, the aforementioned toothbrush could be spaced within an inch of a spokesperson's mouth or several inches away from the spokesperson's mouth.

Movement Movement is defined as a change in an object's location (i.e., positioning, orientation, or spacing; Tables 2 and 4: V.4.). This change can be accomplished via directional translation (e.g., up, down, left, right), in relation to the consumer (e.g., closer or further away), by rotation, or by any combination of these. Given humans' hardwired propensity to perceive and anticipate movement (Mace 1977; Rock

1983; Uttal 1981), this facet is perhaps most obviously useful to attract attention.

Marketing literature related to location

Researchers have examined all four facets of location, with effects ranging from weight estimates to brand attitudes. For example, product images positioned low and to the right on packaging convey an impression of weightiness (Deng and Kahn 2009), while consumers prefer logos to be depicted high (low) on a package for more (less) powerful brands (Sundar and Noseworthy 2014), and they prefer healthy items to be positioned to the left, rather than right, of unhealthy items (Romero and Biswas 2016). Similar effects have been found for orientation: Prior work has shown that an impression of luxury or prestige may arise from the vertical depiction of a product (van Rompay et al. 2012), or from the white space surrounding it (Pracejus et al. 2013), while consumers respond favorably to products facing toward the center of a visual space (Leonhardt et al. 2015), and to ones that exhibit a concave (smiling) rather than convex (frowning) line (Salgado-Montejo et al. 2015).

Greater spacing between visual objects can have both positive and negative effects, contingent on what those objects are. Higher evaluations arise for greater spacing between similar products (Sevilla and Townsend 2016), but not for greater spacing between a product and the claimed outcome of that product (Chae et al. 2013). Other research has documented favorable consumer responses to movement. For instance, preferences have been found for moving over static images (Park et al. 2005; Roggeveen et al. 2015) and from movements in specific directions (Brasel and Hagtvedt 2016; Guido et al. 2016; Kim and Lakshmanan 2015).

Future directions for location research

Consumers appear to be sensitive to the orientation and relative positioning of various items in the marketplace, and marketers continually make presentation choices of these kinds. As initially explored in a visual processing context by Meyers-Levy and Peracchio (1992), it seems likely that preference for specific orientations might depend on a variety of circumstances, which complicates the strategic use of these facets and highlights the need for further research.

Our review indicated that most research to date has been limited to two-dimensional promotions such as print/screen advertisements or packaging. As more opportunities for virtual reality and other consumer interactions in a three-dimensional space arise, along with the currently existing ones in contexts such as in-store displays, research on positioning, orientation, and spacing might benefit from a three-dimensional focus. To some extent, even research in real three-dimensional space has focused on two-dimensional effects. For instance, although Sevilla and Townsend (2016) examined product spacing in field settings, the spacing was adjusted in a two-dimensional manner. Meyers-Levy and Zhu (2007) and Levav and Zhu (2009) investigated a three-dimensional space, but their work focused more on visual processing (i.e., how consumers feeling freedom or confinement from ceiling heights process information differently) than piecemeal perception. Future work might expand the investigations to include spacing along the other spatial axes (i.e., up vs. down, or farther back vs. closer to the front). The z-plane has remained largely unexplored in consumer vision and need not be limited to product or retail environment perception. Interface design trends such as 'Material Design' and 'Superflat' suggest that levels of (or lack of) depth may influence consumer processing of real or implied three-dimensional scenarios, including those presented on flat screens.

Digital screens have also made movement—a budding topic in marketing—increasingly central through, for instance, animations and gifs. Since consumers' perception is attuned to movement and marketers are increasingly engaging consumers through animations, a better understanding of the facet of movement is needed. Logos (e.g., Google's daily animations) and other promotional materials can be manipulated in many ways, especially as digital screens have become the primary marketing medium, and scholarly investigations are lagging developments in the marketplace.

Discussion

While there has been much research on visual processing and comprehension, piecemeal perception has received sporadic but increasing attention. This latter area of research formed the focus of the current work.

We began by assembling a conceptual framework of marketing-relevant components and facets of piecemeal perception, based primarily on marketing research and informed by fields such as perceptual psychology, engineering, graphic arts, and architecture. Our framework emphasizes five components, which can all influence downstream consumer responses: illuminance, shape, surface color, materiality, and location. These five components comprise 19 facets that can be readily investigated by researchers and manipulated by marketers. Our systematic review of 19 high-quality marketing and marketing-related journals over the past five decades illuminated findings to date on how piecemeal perception influences consumers, and we discussed potential avenues for future research on this topic.

In addition to the main figures, we created symbolic representations to illustrate the various facets. Supplementing the main tables, which summarize definitions and research

findings, the web appendix also provides comprehensive tables with an alternative categorization scheme.

Facet gaps and interconnections

Thus far, research has clustered around certain components and facets and not around others. Part of the reason for this may be their perceived importance. For example, shape and surface color represent ubiquitous, salient perceptual inputs that appear to have a strong influence on consumers across many contexts. However, it is also possible that researchers have neglected less obvious but equally potent sources of influence; examples may include illuminance and materiality. Further, some components or facets might be particularly difficult to investigate. Perhaps movement falls into this latter category; manipulations and measurements of movement require technologies that, although present in the marketplace, are not prevalent in academic research labs. These issues are potentially compounded when interactions between dimensions are considered.

Promising interactions During our discussions of future research, we sometimes mentioned interactions between a component's facets. However, interactions can occur across components, too, and research in marketing can build on foundations from perceptual psychology (Gibson 1950; Kubovy and Pomerantz 2017; Rock 1983; Uttal 1981). For example, location and illuminance seem like a logical pairing, as movement can be an easy trigger of illuminance shifts. Illuminance's interaction with surface color or materiality enables the separation of the figure and ground, a process in which edge detection is central (Sekuler and Blake 2002). Such interactions are among the many aspects of illuminance that feature prominently in the marketplace and influence perception and behavior. Recent work has demonstrated that responses to color lightness may also depend on simultaneous stimuli in other sensory modalities, such as sound frequency (Hagtvedt and Brasel 2016). In a similar fashion, future research may establish increasingly nuanced insights regarding influences of color lightness. For example, scholars might investigate relationships between the lightness of color and the lightness of illumination. Relatedly, perceptual psychologists have noted how background reflectance can shape perceptions of light on a figure (Warren and Poulton 1966), suggesting that interactions between this facet of materiality and those of illuminance are worthy of consideration. Further, shape facets seem likely to interact with visual texture. As mentioned, haptic information is increasingly assessed through visuals, and it seems feasible that visual texture and shape interact to influence these assessments. Despite consumers' increasing reliance on visuals, only one article (Babin et al. 2003) has addressed a component interaction.

Additional considerations As alluded to in the conceptual framework development, other components and facets could arguably have been included. Although the existing literature guided our framework development, technologies continue to generate more dynamic attributes of piecemeal perception. Thus, there are aspects of dynamism, besides movement, that are not captured in our conceptual framework. For instance, animations can generate objects (e.g., a distorting brand logo) with dynamic shifts in all the components discussed in this review.

Alongside the manipulation of target objects, marketers can increasingly control and manipulate what constitutes the 'ground,' especially as retail increasingly moves online. Simulated shelves are not constrained by physical requirements to hold products of certain shapes and sizes, and they can appear to be made of any material displaying various visual characteristics stipulated by the marketer. The surrounding product environment can be as cluttered or uncluttured, saturated or desaturated, bright or dark as desired by the company. Therefore, even when it may be difficult to manipulate the target product or package, it can still be useful to understand principles such as figure-ground contrast. Further, understanding figure-ground contrast appears particularly relevant for firms implementing (or considering) augmented reality (AR) for product evaluations, as these consumer-controlled grounds could have substantial implications on purchase decisions.

Outcomes of interest

In piecemeal perception research, outcome variables such as product evaluation, brand attitudes, and brand personality characteristics are managerially important and relatively easy to measure, whereas variables such as attention may require technologies such as eye trackers or brain-scanning equipment. The field of marketing benefits from triangulation and the utilization of multiple methods at multiple levels of inquiry. It is not surprising that the bulk of perception research in marketing currently focuses on outcomes such as product or brand evaluation, comparative judgments, and information processing, but visual effects also include outcomes such as consumer affect and non-conscious behavior. Supplementing traditional questionnaires with methods such as direct observation, biometrics, and longitudinal investigations may help to broaden and deepen the understanding of piecemeal perception.

Concluding remarks

The proliferation of screen-based media, along with advances in printing and packaging, allows marketers more control than ever before in the visual construction and presentation of their product or brand. Whereas prior work has presented visual

processing and comprehension models, we present a comprehensive overview of the piecemeal components of visual perception. Our review of marketing literature on the effects of illuminance, shape, materiality, surface color, and location outlines managerially relevant outcomes and identifies gaps for future research. From a practical standpoint, the components and facets discussed in this review can increasingly be controlled by marketers, and their strategic use may offer competitive advantages in the marketplace.

References

Ackerman, J. M., Nocera, C. C., & Bargh, J. A. (2010). Incidental haptic sensations influence social judgments and decisions. *Science, 328*(5986), 1712–1715.

Areni, C. S., & Kim, D. (1994). The influence of in-store lighting on consumers' examination of merchandise in a wine store. *International Journal of Research in Marketing, 11*(2), 117–125.

Babin, B. J., Hardesty, D. M., & Suter, T. A. (2003). Color and shopping intentions: The intervening effect of price fairness and perceived affect. *Journal of Business Research, 56*(7), 541–551.

Bagchi, R., & Cheema, A. (2013). The effect of red background color on willingness-to-pay: The moderating role of selling mechanism. *Journal of Consumer Research, 39*(5), 947–960.

Bajaj, A., & Bond, S. D. (2018). Beyond beauty: Design symmetry and brand personality. *Journal of Consumer Psychology, 28*(1), 77–98.

Beck, J. (1972). *Surface color perception*. NY: Cornell University Press.

Bellizzi, J. A., Crowley, A. E., & Hasty, R. W. (1983). The effects of color in store design. *Journal of Retailing, 59*(1), 21–45.

Biswas, D., Szocs, C., Chacko, R., & Wansink, B. (2017). Shining light on atmospherics: How ambient light influences food choices. *Journal of Marketing Research, 54*(1), 111–123.

Bloch, P. H. (1995). Seeking the ideal form: Product design and consumer response. *Journal of Marketing, 59*(3), 16–29.

Bottomley, P. A., & Doyle, J. R. (2006). The interactive effects of colors and products on perceptions of brand logo appropriateness. *Marketing Theory, 6*(1), 63–83.

Brasel, S. A., & Hagtvedt, H. (2016). Living brands: Consumer responses to animated brand logos. *Journal of the Academy of Marketing Science, 44*(5), 639–653.

Chae, B., & Hoegg, J. (2013). The future looks "right": Effects of the horizontal location of advertising images on product attitude. *Journal of Consumer Research, 40*(2), 223–238.

Chae, B., Li, X., & Zhu, R. (2013). Judging product effectiveness from perceived spatial proximity. *Journal of Consumer Research, 40*(2), 317–335.

Chandon, P., & Ordabayeva, N. (2009). Supersize in one dimension, downsize in three dimensions: Effects of spatial dimensionality on size perceptions and preferences. *Journal of Marketing Research, 46*(6), 739–753.

Chattopadhyay, A., Gorn, G. J., & Darke, P. (2009). Differences and similarities in hue preferences between Chinese and Caucasians. In A. Krishna (Ed.), *Sensory marketing: Research on the sensuality of products (pp. 219–239)*. Routledge.

Chellappa, S. L., Steiner, R., Oelhafen, P., Lang, D., Götz, T., Krebs, J., & Cajochen, C. (2013). Acute exposure to evening blue-enriched light impacts on human sleep. *Journal of Sleep Research, 22*(5), 573–580.

Ching, F. D. (2014). *Architecture: Form, space, and order*. John Wiley & Sons.

Cian, L., Krishna, A., & Elder, R. S. (2014). This logo moves me: Dynamic imagery from static images. *Journal of Marketing Research, 51*(2), 184–197.

Coren, S. (2003). Sensation and perception. Wiley Online Library.

Coulter, K. S., & Norberg, P. A. (2009). The effects of physical distance between regular and sale prices on numerical difference perceptions. *Journal of Consumer Psychology, 19*(2), 144–157.

D'amelio, J. (2004). *Perspective drawing handbook*. Courier Corporation.

De Bock, T., Pandelaere, M., & Van Kenhove, P. (2013). When colors backfire: The impact of color cues on moral judgment. *Journal of Consumer Psychology, 23*(3), 341–348.

DelVecchio, D. S., H. Jae, & J. L. Ferguson. (2018). Johnny can read your ad, but he won't: Effects of consumer aliteracy on information processing. In Goldenberg, J., Laran, J., & Stephen, A. (Eds.), *Integrating Paradigms in a World Where Marketing is Everywhere 2018 Winter AMA Conference Proceedings Vol. 29* (pp. A-80). Chicago: American marketing association.

Deng, X., Hui, S. K., & Hutchinson, J. W. (2010). Consumer preferences for color combinations: An empirical analysis of similarity-based color relationships. *Journal of Consumer Psychology, 20*(4), 476–484.

Deng, X., & Kahn, B. E. (2009). Is your product on the right side? The "location effect" on perceived product heaviness and package evaluation. *Journal of Marketing Research, 46*(6), 725–738.

Deng, X., Kahn, B. E., Unnava, H. R., & Lee, H. (2016). A "wide" variety: Effects of horizontal versus vertical display on assortment processing, perceived variety, and choice. *Journal of Marketing Research, 53*(5), 682–698.

Deng, X., & Srinivasan, R. (2013). When do transparent packages increase (or decrease) food consumption? *Journal of Marketing, 77*(4), 104–117.

Di Muro, F., & Noseworthy, T. J. (2012). Money isn't everything, but it helps if it doesn't look used: How the physical appearance of money influences spending. *Journal of Consumer Research, 39*(6), 1330–1342.

Ellis, W. D. (2013). *A source book of gestalt psychology*. Routledge.

Epstein, W. (1977). *Stability and constancy in visual perception: Mechanisms and processes*. Wiley.

Fernandez, K. V., & Rosen, D. L. (2000). The effectiveness of information and color in yellow pages advertising. *Journal of Advertising, 29*(2), 61–73.

Fiser, J., & Aslin, R. N. (2002). Statistical learning of higher-order temporal structure from visual shape sequences. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 28*(3), 458.

Folkes, V., & Matta, S. (2004). The effect of package shape on consumers' judgments of product volume: Attention as a mental contaminant. *Journal of Consumer Research, 31*(2), 390–401.

Gibson, J. J. (1950). *The perception of the visual world*. Oxford, England: Houghton Mifflin.

Gilchrist, A. L. (1988). Lightness contrast and failures of constancy: A common explanation. *Perception & Psychophysics, 43*(5), 415–424.

Gooley, J. J., Lu, J., Fischer, D., & Saper, C. B. (2003). A broad role for melanopsin in nonvisual photoreception. *The Journal of Neuroscience: The Official Journal of the Society for Neuroscience, 23*(18), 7093–7106.

Gorn, G. J., Chattopadhyay, A., Sengupta, J., & Tripathi, S. (2004). Waiting for the web: How screen color affects time perception. *Journal of Marketing Research, 41*(2), 215–225.

Grondzik, W. T., & Kwok, A. G. (2014). *Mechanical and electrical equipment for buildings*. John Wiley & Sons.

Guido, G., Pichierri, M., Nataraajan, R., & Pino, G. (2016). Animated logos in mobile marketing communications: The roles of logo

movement directions and trajectories. *Journal of Business Research, 69*(12), 6048–6057.

Hagtvedt, H. (2011). The impact of incomplete typeface logos on perceptions of the firm. *Journal of Marketing, 75*(4), 86–93.

Hagtvedt, H., & Brasel, S. A. (2016). Cross-modal communication: Sound frequency influences consumer responses to color lightness. *Journal of Marketing Research, 53*(4), 551–562.

Hagtvedt, H., & Brasel, S. A. (2017). Color saturation increases perceived product size. *Journal of Consumer Research, 44*(2), 396–413.

Hamblin, D. L., & Wood, A. W. (2002). Effects of mobile phone emissions on human brain activity and sleep variables. *International Journal of Radiation Biology, 78*(8), 659–669.

Hamburger, K., Hansen, T., & Gegenfurtner, K. R. (2007). Geometric-optical illusions at isoluminance. *Vision Research, 47*(26), 3276–3285.

Henderson, P. W., & Cote, J. A. (1998). Guidelines for selecting or modifying logos. *Journal of Marketing, 62*(2), 14–30.

Henderson, P. W., Giese, J. L., & Cote, J. A. (2004). Impression management using typeface design. *Journal of Marketing, 68*(4), 60–72.

Higgins, E., Leinenger, M., & Rayner, K. (2014). Eye movements when viewing advertisements. *Frontiers in Psychology, 5*, 210.

Hoffman, J. (1996). Visual object recognition. In W. Prinz & B. Bridgeman (Eds.), *Handbook of perception and action* (*Perception*) (Vol. 1, pp. 297–344). NY: Academic Press.

Huang, X. I., Dong, P., & Labroo, A. A. (2018). Feeling disconnected from others: The effects of ambient darkness on hedonic choice. *International Journal of Research in Marketing, 35*(1), 144–153.

Huang, X., Li, X., & Zhang, M. (2013). "Seeing" the social roles of brands: How physical positioning influences brand evaluation. *Journal of Consumer Psychology, 23*(4), 509–514.

Huang, Z. T., & Kwong, J. Y. (2016). Illusion of variety: Lower readability enhances perceived variety. *International Journal of Research in Marketing, 33*(3), 674–687.

Hummel, J. E., & Stankiewicz, B. J. (1998). Two roles for attention in shape perception: A structural description model of visual scrutiny. *Visual Cognition, 5*(1–2), 49–79.

Jiang, Y., Gorn, G. J., Galli, M., & Chattopadhyay, A. (2016). Does your company have the right logo? How and why circular-and angular-logo shapes influence brand attribute judgments. *Journal of Consumer Research, 42*(5), 709–726.

Kahn, B. E. (2017). Using visual design to improve customer perceptions of online assortments. *Journal of Retailing, 93*(1), 29–42.

Kane, G. C. and A. Pear. (2016, January 4). The rise of visual content online. Retrieved from http://sloanreview.mit.edu/arti-cle/the-rise-of-visual-content-online. Accessed 10 April 2018

Kareklas, I., Brunel, F. F., & Coulter, R. A. (2014). Judgment is not color blind: The impact of automatic color preference on product and advertising preferences. *Journal of Consumer Psychology, 24*(1), 87–95.

Kellman, P. J., & Shipley, T. F. (1991). A theory of visual interpolation in object perception. *Cognitive Psychology, 23*(2), 141–221.

Kim, J., & Lakshmanan, A. (2015). How kinetic property shapes novelty perceptions. *Journal of Marketing, 79*(6), 94–111.

Koffka, K. (2013). *Principles of gestalt psychology.* Routledge.

Koo, J., & Suk, K. (2016). The effect of package shape on calorie estimation. *International Journal of Research in Marketing, 33*(4), 856–867.

Krishna, A. (2012). An integrative review of sensory marketing: Engaging the senses to affect perception, judgment and behavior. *Journal of Consumer Psychology, 22*(3), 332–351.

Krishna, A., Cian, L., & Aydınoğlu, N. Z. (2017). Sensory aspects of package design. *Journal of Retailing, 93*(1), 43–54.

Kubovy, M., & Pomerantz, J. R. (2017). *Perceptual organization*. Routledge.

Labrecque, L. I., & Milne, G. R. (2012). Exciting red and competent blue: The importance of color in marketing. *Journal of the Academy of Marketing Science, 40*(5), 711–727.

Labrecque, L. I., Patrick, V. M., & Milne, G. R. (2013). The marketers' prismatic palette: A review of color research and future directions. *Psychology & Marketing, 30*(2), 187–202.

Landwehr, J. R., Labroo, A. A., & Herrmann, A. (2011). Gut liking for the ordinary: Incorporating design fluency improves automobile sales forecasts. *Marketing Science, 30*(3), 416–429.

Lechner, N. (2014). *Heating, cooling, lighting: Sustainable design methods for architects*. John Wiley & Sons.

Lee, H., Deng, X., Unnava, H. R., & Fujita, K. (2014). Monochrome forests and colorful trees: The effect of black-and-white versus color imagery on construal level. *Journal of Consumer Research, 41*(4), 1015–1032.

Lee, H., Fujita, K., Deng, X., & Unnava, H. R. (2016). The role of temporal distance on the color of future-directed imagery: A construal-level perspective. *Journal of Consumer Research, 43*(5), 707–725.

Lee, N. Y., Noble, S. M., & Biswas, D. (2018). Hey big spender! A golden (color) atmospheric effect on tipping behavior. *Journal of the Academy of Marketing Science, 46*(2), 317–337.

Legge, G. E., Parish, D. H., Luebker, A., & Wurm, L. H. (1990). Psychophysics of reading. *XI. Comparing color contrast and luminance contrast. JOSA A, 7*(10), 2002–2010.

Leonhardt, J. M., Catlin, J. R., & Pirouz, D. M. (2015). Is your product facing the ad's center? Facing direction affects processing fluency and ad evaluation. *Journal of Advertising, 44*(4), 315–325.

Levav, J., & Zhu, R. (2009). Seeking freedom through variety. *Journal of Consumer Research, 36*(4), 600–610.

Liu, Y., Li, K. J., Chen, H., & Balachander, S. (2017). The effects of products' aesthetic design on demand and marketing-mix effectiveness: The role of segment prototypicality and brand consistency. *Journal of Marketing, 81*(1), 83–102.

Luo, X., Andrews, M., Fang, Z., & Phang, C. W. (2013). Mobile targeting. *Management Science, 60*(7), 1738–1756.

Mace, W. M. (1977). James J. Gibson's strategy for perceiving: Ask not what's inside your head, but what's your head inside of. In R. Shaw & J. Bransford (Eds.), *Perceiving, Acting, and Knowing: Towards an Ecological Psychology (pp. 43–65)*. Lawrence Erlbaum.

Madzharov, A. V., Ramanathan, S., & Block, L. G. (2016). The halo effect of product color lightness on hedonic food consumption. *Journal of the Association for Consumer Research, 1*(4), 579–591.

Mai, R., Symmank, C., & Seeberg-Elverfeldt, B. (2016). Light and pale colors in food packaging: When does this package cue signal superior healthiness or inferior tastiness? *Journal of Retailing, 92*(4), 426–444.

Maljkovic, V., & Nakayama, K. (1994). Priming of pop-out: I. role of features. *Memory & Cognition, 22*(6), 657–672.

Maloney, L. T., & Brainard, D. H. (2010). Color and material perception: Achievements and challenges. *Journal of Vision, 10*(9), 19.

Mead, J. A., & Richerson, R. (2018). Package color saturation and food healthfulness perceptions. *Journal of Business Research, 82*, 10–18.

Meert, K., Pandelaere, M., & Patrick, V. M. (2014). Taking a shine to it: How the preference for glossy stems from an innate need for water. *Journal of Consumer Psychology, 24*(2), 195–206.

Meyers-Levy, J., & Peracchio, L. A. (1992). Getting an angle in advertising: The effect of camera angle on product evaluations. *Journal of Marketing Research, 29*(4), 454–461.

Meyers-Levy, J., & Zhu, R. (2007). The influence of ceiling height: The effect of priming on the type of processing that people use. *Journal of Consumer Research, 34*(2), 174–186.

Moore, R. S., Stammerjohan, C. A., & Coulter, R. A. (2005). Banner advertiser-web site context congruity and color effects on attention and attitudes. *Journal of Advertising, 34*(2), 71–84.

Nothdurft, H. (1993). Faces and facial expressions do not pop out. *Perception, 22*(11), 1287–1298.

O'Connor, Z. (2015). Colour, contrast and gestalt theories of perception: The impact in contemporary visual communications design. *Color Research & Application, 40*(1), 85–92.

Ordabayeva, N., & Chandon, P. (2013). Predicting and managing consumers' package size impressions. *Journal of Marketing, 77*(5), 123–137.

Park, J., Lennon, S. J., & Stoel, L. (2005). On-line product presentation: Effects on mood, perceived risk, and purchase intention. *Psychology & Marketing, 22*(9), 695–719.

Patrick, V. M., & Hagtvedt, H. (2011). Aesthetic incongruity resolution. *Journal of Marketing Research, 48*(2), 393–402.

Peterson, M. A. (2001). Object perception. In E. B. Goldstein (Ed.), *Blackwell handbook of perception* (pp. 168–203). MA: Blackwell Publishers.

Pillai, K. G., Katsikeas, C. S., & Presi, C. (2012). Print advertising: Type size effects. *Journal of Business Research, 65*(6), 865–868.

Pracejus, J. W., O'Guinn, T. C., & Olsen, G. D. (2013). When white space is more than "burning money:" economic signaling meets visual commercial rhetoric. *International Journal of Research in Marketing, 30*(3), 211–218.

Puccinelli, N. M., Chandrashekaran, R., Grewal, D., & Suri, R. (2013). Are men seduced by red? The effect of red versus black prices on price perceptions. *Journal of Retailing, 89*(2), 115–125.

Raghubir, P. (2009). Visual perception an overview. In A. Krishna (Ed.), *Sensory marketing: Research on the sensuality of products (pp. 201–215)*. Routledge.

Raghubir, P., & Krishna, A. (1999). Vital dimensions in volume perception: Can the eye fool the stomach? *Journal of Marketing Research, 36*(3), 313–326.

Ramachandran, V. S. (1988). Perception of shape from shading. *Nature, 331*(6152), 163–166.

Regan, D., & Beverley, K. (1984). Figure–ground segregation by motion contrast and by luminance contrast. *JOSA A, 1*(5), 433–442.

Rock, I. (1983). *The logic of perception*. Cambridge, Mass: Bradford Books.

Roggeveen, A. L., Grewal, D., Townsend, C., & Krishnan, R. (2015). The impact of dynamic presentation format on consumer preferences for hedonic products and services. *Journal of Marketing, 79*(6), 34–49.

Romero, M., & Biswas, D. (2016). Healthy-left, unhealthy-right: Can displaying healthy items to the left (versus right) of unhealthy items nudge healthier choices? *Journal of Consumer Research, 43*(1), 103–112.

Salgado-Montejo, A., Tapia Leon, I., Elliot, A. J., Salgado, C. J., & Spence, C. (2015). Smiles over frowns: When curved lines influence product preference. *Psychology & Marketing, 32*(7), 771–781.

Sekuler, R., & Blake, R. (2002). *Perception*. Boston: McGraw-Hill.

Semin, G. R., & Palma, T. A. (2014). Why the bride wears white: Grounding gender with brightness. *Journal of Consumer Psychology, 24*(2), 217–225.

Sevilla, J., & Kahn, B. E. (2014). The completeness heuristic: Product shape completeness influences size perceptions, preference, and consumption. *Journal of Marketing Research, 51*(1), 57–68.

Sevilla, J., & Townsend, C. (2016). The space-to-product ratio effect: How interstitial space influences product aesthetic appeal, store perceptions, and product preference. *Journal of Marketing Research, 53*(5), 665–681.

Sharan, L., Rosenholtz, R., & Adelson, E. (2009). Material perception: What can you see in a brief glance? *Journal of Vision, 9*(8), 784–784.

Sparkman, R., Jr., & Austin, L. M. (1980). The effect on sales of color in newspaper advertisements. *Journal of Advertising, 9*(4), 39–42.

Summers, T. A., & Hebert, P. R. (2001). Shedding some light on store atmospherics: Influence of illumination on consumer behavior. *Journal of Business Research, 54*(2), 145–150.

Sundar, A., & Noseworthy, T. J. (2014). Place the logo high or low? Using conceptual metaphors of power in packaging design. *Journal of Marketing, 78*(5), 138–151.

Trudel, R., & Argo, J. J. (2013). The effect of product size and form distortion on consumer recycling behavior. *Journal of Consumer Research, 40*(4), 632–643.

Tural, M., & Yener, C. (2006). Lighting monuments: Reflections on outdoor lighting and environmental appraisal. *Building and Environment, 41*(6), 775–782.

Uttal, W. R. (1981). *A taxonomy of visual processes*. NY: Psychology Press.

van Rompay, T. J., De Vries, P. W., Bontekoe, F., & Tanja-Dijkstra, K. (2012). Embodied product perception: Effects of verticality cues in advertising and packaging design on consumer impressions and price expectations. *Psychology & Marketing, 29*(12), 919–928.

Verhoef, P. C., Stephen, A. T., Kannan, P., Luo, X., Abhishek, V., Andrews, M., et al. (2017). Consumer connectivity in a complex, technology-enabled, and mobile-oriented world with smart products. *Journal of Interactive Marketing, 40*, 1–8.

Veryzer, R. W., Jr., & Hutchinson, J. W. (1998). The influence of unity and prototypicality on aesthetic responses to new product designs. *Journal of Consumer Research, 24*(4), 374–394.

Wagemans, J., Elder, J. H., Kubovy, M., Palmer, S. E., Peterson, M. A., Singh, M., & von der Heydt, R. (2012). A century of gestalt psychology in visual perception: I. perceptual grouping and figure–ground organization. *Psychological Bulletin, 138*(6), 1172.

Walker, P., Francis, B. J., & Walker, L. (2010). The brightness-weight illusion: Darker objects look heavier but feel lighter. *Experimental Psychology, 57*(6), 462–469.

Wang, Q., Cavanagh, P., & Green, M. (1994). Familiarity and pop-out in visual search. *Perception & Psychophysics, 56*(5), 495–500.

Wansink, B., & Van Ittersum, K. (2003). Bottoms up! The influence of elongation on pouring and consumption volume. *Journal of Consumer Research, 30*(3), 455–463.

Warren, R. M., & Poulton, E. (1966). Lightness of grays: Effects of background reflectance. *Perception & Psychophysics, 1*(3), 145–148.

Yang, S., & Raghubir, P. (2005). Can bottles speak volumes? The effect of package shape on how much to buy. *Journal of Retailing, 81*(4), 269–281.

Zhu, R., & Mehta, R. (2017). Sensory experiences and consumer creativity. *Journal of the Association for Consumer Research, 2*(4), 472–484.

Zhu, R., & Meyers-Levy, J. (2009). The influence of self-view on context effects: How display fixtures can affect product evaluations. *Journal of Marketing Research, 46*(1), 37–45.