

Exploring crossmodal color correspondences through neuromarketing

Alessandro Bortolotti¹

¹University “G. D’Annunzio” of Chieti-Pescara, Chieti, Italy. Department of Neuroscience, Imaging, and Clinical Sciences. alessandro.bortolotti@unich.it

ABSTRACT

It is now well known that marketing is evolving. In this context, sensory marketing can be defined as a revolutionary approach to consumer engagement that leverages the five human senses to create immersive and memorable product experiences. This strategy aims to build stronger emotional connections and enhance interactions with the brand or the product itself by tapping into the complex web of sensory perception. A key concept in sensory marketing is crossmodal correspondence, which explores how the activation of one sense can influence the perception of another. For example, the perceived sweetness of a product can be heightened when associated with the color red. Integrating neuromarketing principles, which utilize insights from neuroscience, further enhances the effectiveness of sensory marketing. This integration allows marketers to understand the subconscious decision-making processes that drive consumer behavior. Visual elements, particularly color, play a crucial role, with studies showing that color significantly impacts initial product judgments. Sensory marketing transcends traditional sales tactics by fostering deep, lasting relationships with consumers through multi-sensory experiences that engage sight, sound, touch, taste, and smell. This holistic approach requires a comprehensive understanding of target demographics, consumer psychology, and the art of creating personalized, engaging experiences. As the marketing landscape evolves, sensory marketing stands at the forefront of innovation, offering a pathway to more meaningful consumer engagement and greater brand loyalty.

KEYWORDS Color, Neuromarketing, Sensation, Perception, Emotion, Behavioral Economics.

RECEIVED 06/02/2025; **REVISED** 27/03/2025; **ACCEPTED** 28/03/2025

1. Introduction

In the increasingly fast-paced world of marketing and advertising, companies are constantly seeking new ways to capture consumer attention and consequently boost their sales (Krishna et al., 2016; Würfel et al., 2022). Based on this, in his 1999 article, Schmitt explores a new approach to marketing called "Experiential Marketing" with the same approach as behavioral economics (Thaler, 2016). Traditional marketing tends to view consumers as rational decision-makers who focus primarily on the functional characteristics and benefits of products. However, Schmitt introduces Experiential Marketing, which sees consumers as both rational and emotional beings who seek enjoyable and memorable experiences (Schmitt, 1999). Schmitt outlines five distinct types of experiences that marketers can create for their customers. The first type is sensory experiences (SENSE), which engage the consumer's senses—sight, sound, touch, taste, and smell. Imagine walking into a store where the lighting is just right, the music is soothing, and there's a pleasant scent in the air. All these elements work together to create a welcoming and enjoyable atmosphere (Hultén, 2011). Next, we have affective experiences (FEEL), which aim to evoke emotions and feelings. Think of an advertising campaign that tells a heartwarming story, making you feel joy, nostalgia, or empathy. These emotional connections can make a brand more memorable and meaningful to consumers (Brakus, Schmitt, & Zarantonello, 2009). Creative cognitive experiences (THINK) are designed to stimulate the consumer's thinking and creativity. For example, a company might host a contest where customers can submit their ideas for a new product, or they might organize a workshop that encourages creative problem-solving. These activities engage the intellect and foster a deeper connection with the brand (Zaltman, 2003). Physical experiences, behaviors, and lifestyles (ACT) encourage consumers to take action and change their behaviors or lifestyles. A fitness brand, for instance, might offer interactive workout classes that motivate people to adopt healthier habits. By integrating the brand into their daily routines, consumers form a stronger bond with it (Pine & Gilmore, 1998). At the end, there are social identity experiences (RELATE), which are based on social relationships and group identity. A brand might create an online community where customers can share their experiences and feel part of a group with common interests. This sense of belonging and identity can enhance the overall brand experience (Muniz & O'Guinn, 2001). Schmitt in his work also discusses how these experiences are facilitated by what he calls experience providers (ExPros). These include elements like communication, visual and verbal identity, product

presence, and electronic media. The ultimate goal of Experiential Marketing is to create holistic experiences that integrate these individual elements into a cohesive and engaging whole. By focusing on creating these rich, multi-faceted experiences, marketers can move beyond the traditional emphasis on functional benefits and instead build strong emotional connections with their customers. This approach not only makes the brand more memorable but also fosters loyalty and long-term engagement (Schmitt, 1999).

Starting from this, since 2010, and perhaps experiencing its peak of interest today from both a scientific and non-scientific standpoint, one of the most effective strategies has been "Sensory Marketing" (Krishna & Schwarz, 2014). This tactic engages human senses to forge deeper emotional connections between brands, products, and consumers, ensuring that the product/brand-consumer interaction is an increasingly unique and memorable experience (Krishna, 2011; Hultén, 2011). The consideration and use of senses as an essential part of marketing strategies has a long history. However, the concept of "Sensory Marketing" or "Multisensory Marketing", or even "Sensehacking" (Spence, 2021), only emerged when branding and marketing professionals began to focus on the use of the senses of smell and hearing, in addition to sight, touch, and taste (Krishna et al., 2016). This demonstrated how senses interact with and influence our mind, body, and behaviours (Spence, 2021). Sensory marketing has proven to be particularly effective in creating lasting impressions and influencing consumer behavior. As Lindstrom (2005) notes, "The more sensory touch points consumers can access when buying a product, the higher the number of sensory memories activated, and the stronger their bond with the product." This multisensory approach can lead to what Hultén (2011) calls a "multi-sensory brand-experience," where consumers engage with a brand on multiple sensory levels simultaneously.

The power of sensory marketing lies in its ability to tap into subconscious processes. Zaltman (2003) argues that "95% of all cognition occurs below awareness in the shadows of the mind," highlighting the importance of targeting these unconscious processes through sensory cues. This aligns with findings from neuroscience, where studies have shown that sensory stimuli can activate specific brain regions associated with emotions and memory (Reimann et al., 2012). Moreover, sensory marketing can be particularly effective in differentiating products in crowded marketplaces. As noted by Spence and Gallace (2011), "In many mature product categories, traditional marketing approaches are no longer sufficient to differentiate brands." By leveraging unique sensory experiences, brands can create a distinct identity that sets

them apart from competitors. The application of sensory marketing extends beyond just product design and packaging. It can also be used to create immersive retail environments. As Pine and Gilmore (1998) famously stated, we are moving towards an "experience economy" where "experiences are the economic offerings that have shown the greatest ability to create value." Retailers who can create engaging sensory experiences in their stores are likely to see increased customer loyalty and sales (Doucé & Janssens, 2013).

Focusing on color, it plays a pivotal role in marketing, and obviously in sensory marketing (Bortolotti et al., 2023; Labrecque et al., 2013), and the role it plays on emotion is equally well known (Bortolotti et al., 2022). Color is not just a visual element, according to Hine (1995), color impacts consumers in three distinct and interconnected ways: physiological (Siniscalco & Bortolotti, 2022), associative (Spence, 2018), and cultural (Bortolotti, 2023; Shavitt & Barnes, 2020). Physiologically, humans display specific responses to certain colors, such as the alertness linked to exposure to the blue light of dawn (Lehr et al., 2007). Another example involves pinkish-red skin tones, like bubble-gum pink, which provide insights into the emotional state of individuals (Changizi, et al., 2006). There's a suggestion that exposure to hues within this range, like the well-known Baker-Miller pink, can influence us at a physiological level (Alter, 2013). The assumption that color meanings remain fixed across consumers and time due to common affective valence might not be accurate, given cross-cultural variations and historical shifts in color meanings (Labrecque et al., 2013; Madden et al., 2000). Abstract concepts might easily be associated with colors, while concrete concepts might have more rigid color representations. Furthermore, abstract concepts may carry underlying semantic meanings (Adams & Osgood, 1973). Color is a powerful communication tool that can influence our mood, feelings, and even consumer behavior. Brands strategically use color to evoke specific emotions and sensory experiences that align with their brand identity. For instance, warm colors like red or yellow can evoke feelings of warmth and comfort, while cool colors like blue or green can create a sense of calm and trust (Bakhshi & Gilbert, 2015). By understanding the psychology of color, marketers can create more impactful and memorable brand experiences for consumers. This focus on color in sensory marketing highlights its importance in creating deeper emotional connections between products -or brand- and consumers. The impact of color in marketing extends beyond mere aesthetics. As noted by Elliot and Maier (2014), color can significantly influence consumer perceptions and behaviors. Their color-in-context theory suggests that the meaning and effects of color are context-dependent, emphasizing the

importance of considering the specific marketing environment when selecting colors. Moreover, the associative power of color can be leveraged to create strong brand identities. Bottomley and Doyle (2006) found that the appropriateness of a color for a brand depends on the product category and the brand's positioning. For example, functional products are often associated with functional colors, while sensory-social products are linked with sensory-social colors.

The cultural aspect of color perception adds another layer of complexity to sensory marketing strategies. As highlighted by Aslam (2006), color meanings and preferences can vary significantly across cultures. For instance, while white is associated with purity and weddings in Western cultures, it's often linked to mourning in many Eastern cultures. This cultural dimension underscores the importance of tailoring color strategies to specific target markets and cultural contexts. In the digital age, the role of color in sensory marketing has taken on new dimensions. Research by Gorn et al. (2004) suggests that color can influence the perceived speed of website downloads, with warmer colors leading to perceptions of longer waiting times. This highlights the need for marketers to consider the holistic impact of color choices across various touchpoints in the consumer journey.

Understanding the full potential of sensory marketing through neuromarketing tools serves a dual purpose. On one hand, elucidating the processes underlying sensory integrations is undoubtedly of interest to current research in cognitive neuroscience and consumer psychology (Spence et al., 2019; Plassmann et al., 2015). On the other hand, comprehending how these intense sensory experiences can influence choices is invaluable to companies seeking to optimize their products and sales strategies (Krishna, 2012; Zaltman, 2003). In the early years of marketing strategies, the primary goal for many companies was predominantly to increase sales through traditional advertising methods. However, today we observe a paradigm shift; for many businesses, creating a lasting bond between the consumer and the brand has become as crucial as generating immediate purchases (Hultén, 2011; Lindstrom, 2005). This evolution reflects a deeper understanding of consumer behavior and the recognition that emotional and sensory connections play a pivotal role in decision-making processes (Damasio, 1994; LeDoux, 1996). Sensory marketing now takes into account human perception and its subjectivity, becoming a key component in the business strategy of companies (Krishna, 2012). This approach primarily focuses on customer experiences, embracing a holistic view of the brand, be it a product or a service (Schmitt, 1999; Pine & Gilmore, 1998). We recognize that human senses play a fundamental role in consumer purchasing behavior and

are therefore at the center of marketing strategies that aim to create engaging sensory experiences (Peck & Childers, 2008; Krishna & Schwarz, 2014). Expanding on this concept, it's important to note that sensory marketing has evolved from being a mere sales booster to an essential tool for building brand identity and customer loyalty (Brakus et al., 2009). It's no longer just about enticing customers to make an immediate purchase; it's about creating an immersive brand experience that resonates with customers on a deeper, more personal level. This shift in focus reflects a broader change in the business landscape, where customer experience and brand loyalty are becoming increasingly important (Lemon & Verhoef, 2016). Moreover, sensory marketing recognizes the subjectivity of human perception. It understands that each individual may perceive and interpret sensory stimuli differently, influenced by factors such as culture, personal experiences, and cognitive biases (Gentile et al., 2007; Yoon et al., 2012). Therefore, successful sensory marketing strategies are those that can cater to this diversity of sensory experiences and create personalized customer experiences (Puccinelli et al., 2009). Furthermore, sensory marketing embraces a holistic view of the brand. It's not just about the product or service; it's about the entire brand experience—from the initial interaction with the brand to post-purchase engagement. This holistic approach ensures that all aspects of the brand—its visual identity, its voice, its values—are aligned and contribute to a consistent and engaging sensory experience (Hultén et al., 2009; Krishna et al., 2010).

The purpose of this paper is to provide a comprehensive overview of the role of sensory marketing and how neuroscience, through neuromarketing, can help study the complex interactions between sensory stimuli and consumer behavior. This interdisciplinary approach has become increasingly crucial to understanding and shaping consumer experiences in today's competitive marketplace.

2. Sensory Marketing, Neuromarketing, and Crossmodal Correspondence: An Integrated Approach

Sensory marketing is a sub-discipline of marketing that aims to build a brand and its product through targeted stimulation of consumers' senses, employing a variety of techniques and technologies. It's not just a tool for understanding consumer emotions, but also a means to address emerging market challenges, thus contributing to the long-term success of a product (Bortolotti et al., 2023, 2024; Erenkol & Merve, 2015). The importance of engaging all human senses is clear, as this can create a

unique perception of a product compared to its competitors in the customer's mind. This approach can significantly contribute to creating a psychological competitive advantage for the product in the market. We can say that sensory marketing focuses on observing how a customer's different senses influence their purchasing behavior and buying decisions. This discipline leverages the five human senses—sight, hearing, smell, taste, and touch—to influence consumer purchasing decisions. This strategy is based on the understanding that the human brain is wired to respond emotionally and instinctively to sensory stimuli (Panksepp, 1982; Perlovsky, 2006). Adding focus on color, it's important to note that color is one of the most powerful elements of sensory marketing (Bortolotti et al., 2023). Research has shown that changing the hue or intensity/saturation of the color of food and beverage items can exert a sometimes dramatic impact on consumers' expectations (Spence, 2024; Spence et al., 2016; Spence, 2015). Warm and cool colors can drive consumer indulgence and interact with other visual cues. Furthermore, color temperature can affect consumption. Therefore, understanding the role of color in sensory marketing can provide valuable insights into consumer behavior and decision-making processes. Sensory marketing and neuromarketing are two emerging fields that have gained significant attention in recent years. While sensory marketing focuses on engaging the consumer's senses to influence their purchasing behavior, neuromarketing leverages insights from neuroscience to understand the underlying brain processes involved in consumer perception and behavior. Crossmodal correspondence, on the other hand, refers to the tendency of one sensory attribute to be associated with an attribute in another sense. This part aims to explore the connection between these three concepts and how they can be integrated to enhance marketing strategies.

3. Sensory Marketing and Neuromarketing: A Synergistic Relationship

Sensory marketing aims to engage all five human senses—sight, hearing, smell, taste, and touch—to influence consumer purchasing decisions. This approach is grounded in the understanding that the human brain responds emotionally and instinctively to sensory stimuli. Companies leverage this knowledge to create memorable brand experiences that leave a lasting impression on consumers. For instance, the scent of freshly baked bread in a supermarket can evoke feelings of warmth and comfort, potentially increasing the likelihood of purchasing (Hultén, 2011). Neuromarketing, on the other hand, is closely linked to sensory marketing as it helps us understand the brain processes involved in perception and

behavior. It employs techniques from neuroscience, such as functional magnetic resonance imaging (fMRI) and electroencephalography (EEG), to study consumers' neural responses to marketing stimuli (Bortolotti, 2023). These insights provide a deeper understanding of cognitive and affective responses, revealing how sensory inputs can trigger specific brain regions associated with emotions and decision-making (Gallace & Spence, 2010). The relationship between sensory marketing and neuromarketing is synergistic. While sensory marketing strategies are designed based on an understanding of how different sensory stimuli influence consumer behavior, neuromarketing provides the scientific basis for these strategies by uncovering the underlying brain processes. This synergy allows marketers to create more effective and targeted campaigns. For example, by understanding that certain colors can evoke specific emotional responses, marketers can design packaging that not only attracts attention but also enhances the overall consumer experience (Krishna, 2013).

4. The Role of Crossmodal Correspondence

Crossmodal correspondence plays a crucial role in both sensory marketing and neuromarketing. It refers to the tendency of one sensory attribute to be associated with an attribute in another sense (Spence & Gallace, 2011; Nayak & Satpathy, 2024; Huang & Wan, 2019). For example, consumers might associate high-pitched sounds with bright colors or small shapes. In the context of sensory marketing, crossmodal correspondences can be leveraged to create a more immersive and memorable brand experience. For instance, a study on online sensory marketing found that background music that was crossmodally congruent with the online store environment led to more positive consumer reactions than music that was incongruent. In neuromarketing, understanding crossmodal correspondences can provide insights into how different sensory stimuli interact in the brain to influence consumer perception and behavior.

This theme is another relevant aspect in visual marketing. It refers to the general concept that a brand or a store wants to communicate to consumers through visual elements such as logo, style, colors, images, and graphics. Theme should be consistent with the brand personality and consumer expectations (Bortolotti et al., 2023). Theme can also affect the associations and emotions that consumers have towards the brand or the store. For instance, a nature-related theme can convey a sense of well-being, tranquillity, and sustainability. A technology-related theme can convey a sense of innovation, modernity, and quality. Spatial layout is another important element in the visual experience. It

refers to the arrangement of objects and spaces in a physical or virtual environment. Spatial layout can influence the ease of navigation, the perception of variety and quality of products, and the involvement and satisfaction of consumers (Siniscalco et al., 2022). Spatial layout should be designed to create an optimal flow among the visual elements, avoiding information overload or confusion. Spatial layout should also be adapted to the type of product and consumer. For example, a linear and orderly spatial layout may be more suitable for functional products or task-oriented consumers. A more free and creative spatial layout may be more suitable for experiential products or exploration-oriented consumers. Visual marketing is a discipline that uses visual elements to create engaging and distinctive brand experiences. Visual marketing is based on understanding how consumers perceive and respond to visual stimuli such as color, light, theme, graphics, and spatial layout. These elements can influence sensory, cognitive, and emotional perceptions of consumers as well as interact with other sensory stimuli from other senses. Visual marketing can thus contribute to creating a competitive advantage for the brand or store in the market.

Visual marketing is a multifaceted discipline that leverages various elements to create engaging and distinctive brand experiences. One of the key aspects of visual marketing is the theme, which refers to the overarching concept that a brand or store aims to communicate to consumers. This is often conveyed through visual elements such as logos, style, colors, images, and graphics. The theme should be consistent with the brand's personality and align with consumer expectations (Bortolotti et al., 2023). It can also influence the associations and emotions that consumers have towards the brand or store. For instance, a nature-related theme may evoke feelings of well-being, tranquillity, and sustainability, while a technology-related theme may convey a sense of innovation, modernity, and quality. Another crucial aspect of the visual experience is spatial layout. This refers to the arrangement of objects and spaces within a physical or virtual environment. The spatial layout can influence various factors such as ease of navigation, perception of product variety and quality, and consumer engagement and satisfaction (Siniscalco et al., 2022). It should be designed to create an optimal flow among visual elements, avoiding information overload or confusion. Moreover, the spatial layout should be adapted to suit the type of product and consumer. For example, a linear and orderly spatial layout may be more suitable for functional products or task-oriented consumers. Conversely, a more free and creative spatial layout may be more appropriate for experiential products or exploration-oriented consumers. Visual marketing relies on understanding how consumers perceive and react to

visual stimuli such as color, light, theme, graphics, and spatial layout. These elements can influence sensory, cognitive, and emotional perceptions of consumers. They can also interact with other sensory stimuli from other senses. Therefore, visual marketing can contribute significantly to creating a competitive advantage for a brand or store in the market.

5. The role of sight as the most dominant sense

Sight is undoubtedly the most used sense in marketing. Colors, product and packaging design, logos, and images are all visual elements that can influence consumer perceptions (Bortolotti et al., 2023). Sight is one of the most powerful and crucial senses in human experience, providing up to 80% of the information we receive from the surrounding world (Bortolotti et al., 2024; Hutmacher, 2019; Spence & Deroy, 2013; Palmer et al., 2013). The connection between the brain and the eyes is incredibly fast, with humans taking only a few milliseconds to visually identify an object in their field of vision. Within sensory marketing, visual marketing focuses on visual elements such as color, light, theme, graphics, and spatial layout, which together contribute to the creation and evaluation of brand identity. Color is one of the main aspects in visual marketing. Consumers perceive colors subliminally, creating associations and shaping opinions before they even realize it consciously (Bortolotti et al., 2023). Color perception can vary from person to person and can change over the course of each individual's life (Bortolotti et al., 2022). However, colors also have symbolic meanings, often rooted in cultural traditions, that can influence perception. The careful choice of colors can help shape the brand identity positively and elicit positive feelings in customers, as well as facilitate brand recognition. The use of colors can also affect other sensory perceptions, such as the link between color and scent or between color and sound (Spence et al., 2010). For example, the combination of a specific color with a particular scent can create a consistent sensory connection. Moreover, the choice of color can influence the perception of weight, area, or volume of an object. Light intensity is another important element in the visual experience (Siniscalco et al., 2022). Lighting in a store has multiple purposes, including achieving the required level of light for safety and hygiene, creating a pleasant atmosphere for customers, and attracting attention to the displayed products.

6. Conclusion

To sum up, sensory marketing, neuromarketing, and crossmodal correspondence are interrelated concepts that

can be combined to create effective marketing strategies. By understanding how different sensory stimuli interact with each other (crossmodal correspondence) and how they affect brain processes (neuromarketing), marketers can design strategies that engage all five senses (sensory marketing) to influence consumer behavior and create memorable brand experiences (see Figure 1). Sensory marketing is a powerful strategy to engage consumers emotionally and create lasting connections with brands. By using the five human senses, companies can create unique experiences that positively influence consumer purchasing decisions. So, the next time you buy a product or enter a store, pay attention to your senses: you might be a victim of an effective sensory marketing strategy. Traditional marketing assumes that consumers systematically consider concrete factors of the product such as price, features, and utility. Sensory marketing, on the contrary, tries to use the consumer's life experiences and feelings. These life experiences have identifiable sensory, emotional, cognitive, and behavioral aspects. Sensory marketing assumes that people, as consumers, act according to their emotional impulses rather than their objective reasoning. In this way, an effective sensory marketing effort can lead consumers to choose to buy a certain product, rather than an equal but cheaper alternative. The application of sensory marketing to the brand building processes has become an essential strategy in the competitive global market. This approach offers companies the opportunity to differentiate themselves from the competition and create deeper emotional relationships with customers. In a world where consumers are constantly bombarded by information and choices, stimulating the senses through sensory marketing becomes an effective way to capture attention and create lasting connections. Sensory marketing is not just a sales tactic, but a philosophy that involves all senses to offer a unique shopping experience.

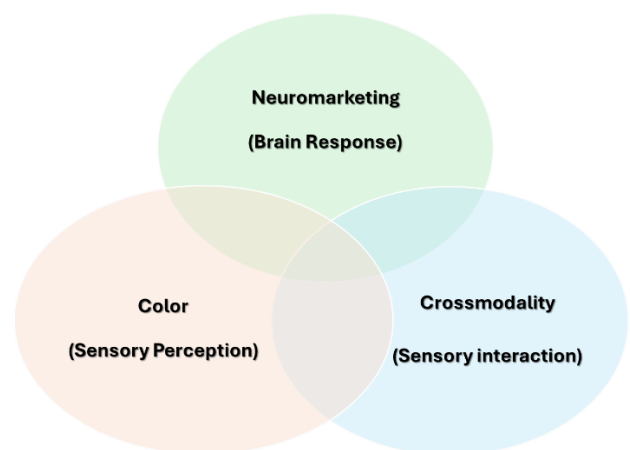


Figure 1. The concept of crossmodal color correspondences in marketing

This approach requires a deep knowledge of the market and customers, as well as the ability to adapt creatively to meet consumer needs. Many successful companies have already adopted this strategy, strengthening their corporate identity and customer loyalty.

8. Conflict of interest declaration

The author declares that there is no conflict of interest regarding the publication of this paper.

7. Funding source declaration

The author received no specific funding for this work.

9. Short biography of the author(s)

Alessandro Bortolotti - Is a PhD and Postdoctoral Researcher at the University "G. d'Annunzio" of Chieti-Pescara. He is involved in research activities related to decision-making, neuromarketing, and the role of color in various contexts. His research interests include Psychology, Cognition, Behavioural Economics, Neuromarketing, and Color.

Licensing terms

Articles published in the "Cultura e Scienza del Colore -Color Culture and Science" journal are open access articles, distributed under the terms and conditions of the Creative Commons Attribution License (CC BY). You are free to share (copy and redistribute the material in any medium or format) and adapt (remix, transform, and build upon the material for any purpose, even commercially, under the following terms: you must give appropriate credit to authors, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use, you may not apply legal terms or technological measures that legally restrict others from doing anything the license permits.

Copyright: The author keep the rights to further publish their contents where they want and can archive pre-print and post-print (submitted version and accepted version) and the published version of the PDF of their article with no embargo period.

References

- Adams, F. M., & Osgood, C. E. (1973). A cross-cultural study of the affective meanings of color. *Journal of cross-cultural psychology*, 4(2), 135-156. <https://doi.org/10.1177/002202217300400201>.
- Alter, A. (2013). *Drunk tank pink: The subconscious forces that shape how we think, feel, and behave*. Simon and Schuster.
- Aslam, M. M. (2006). Are you selling the right colour? A cross-cultural review of colour as a marketing cue. *Journal of marketing communications*, 12(1), 15-30. <https://doi.org/10.1080/13527260500247827>.
- Bakhshi, S., & Gilbert, E. (2015). Red, purple and pink: The colors of diffusion on Pinterest. *PloS one*, 10(2), e0117148. <https://doi.org/10.1371/journal.pone.0117148>.

Bortolotti, A. (2022). *Neuromarketing e scelte inconsapevoli: il ruolo del colore*. economiacomportamentale.it.

Bortolotti, A. (2023) *Neuromarketing and unconscious choices in the wine market: The role of color*, Free Press. ISBN:979-8852729538.

Bortolotti, A., Cannito, L., Anzani, S., & Palumbo, R. (2023). The promise of color in marketing: use, applications, tips and neuromarketing. *Cultura e Scienza del Colore-Color Culture and Science*, 15(01), 76-85. <https://doi.org/10.23738/CCSJ.150110>.

Bortolotti, A., Cannito, L., Anzani, S., & Palumbo, R. (2024). *Wine Chromatics: The Colorful Language of Wine's Characteristics*. *Cultura e Scienza del Colore-Color Culture and Science*, 16(01), 15-22. <https://doi.org/10.23738/CCSJ.160102>.

Bortolotti, A., Cannito, L., Anzani, S., Rossi, M., & Palumbo, R. (2022). About the influence of color perceived lightness on psychological functions. *Cultura e Scienza del Colore-Color Culture and Science*, 14(01), 112- 122. <https://doi.org/10.1016/j.actpsy.2025.104785>.

Bortolotti, A., Chen, N., Spence, C., & Palumbo, R. (2025). Color-taste correspondences influence visual binding errors. *Acta Psychologica*, 254, 104785.

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. <https://doi.org/10.1177/1470593106061263>.

Brakus, J. J., Schmitt, B. H., & Zarantonello, L. (2009). Brand experience: What is it? How is it measured? Does it affect loyalty? *Journal of Marketing*, 73(3), 52-68. <https://doi.org/10.1509/jmkj.73.3.052>.

Changizi, M. A., Zhang, Q., & Shimojo, S. (2006). Bare skin, blood and the evolution of primate colour vision. *Biology letters*, 2(2), 217-221. <https://doi.org/10.1098/rsbl.2006.0440>

Damasio, H., Grabowski, T., Frank, R., Galaburda, A. M., & Damasio, A. R. (1994). The return of Phineas Gage: clues about the brain from the skull of a famous patient. *Science*, 264(5162), 1102-1105. <https://doi.org/10.1126/science.8178168>

Douc , L., & Janssens, W. (2013). The presence of a pleasant ambient scent in a fashion store: The moderating role of shopping motivation and affect intensity. *Environment and Behavior*, 45(2), 215-238. <https://doi.org/10.1177/0013916511410421>.

Elliot, A. J., & Maier, M. A. (2014). Color psychology: Effects of perceiving color on psychological functioning in humans. *Annual review of psychology*, 65(1), 95-120. <https://doi.org/10.1146/annurev-psych-010213-115035>

Erenkol, A. D., & Merve, A. K. (2015). Sensory marketing. *Journal of Administrative Sciences and Policy Studies*, 3(1), 1-26. <https://doi.org/10.15640/jasps.v3n1a1>

Gallace, A., & Spence, C. (2010). The science of interpersonal touch: an overview. *Neuroscience & Biobehavioral Reviews*, 34(2), 246-259. <https://doi.org/10.1016/j.neubiorev.2008.10.004>

Gentile, C., Spiller, N., & Noci, G. (2007). How to sustain the customer experience: An overview of experience components that co-create value with the customer. *European management journal*, 25(5), 395-410. <https://doi.org/10.1016/j.emj.2007.08.005>.

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. <https://doi.org/10.1509/jmk.41.2.215.28668>.

- Huang, J., & Wan, X. (2019). The color-flavor incongruity effect in product evaluation and brand perception. *Journal of Consumer Behaviour*, 18(6), 484-495. <https://doi.org/10.1002/cb.1787>.
- Hultén, B. (2011). Sensory marketing: The multi-sensory brand-experience concept. *European Business Review*, 23(3), 256-273. <https://doi.org/10.1108/09555341111130245>.
- Hultén, B., Broweus, N., Van Dijk, M., Hultén, B., Broweus, N., & van Dijk, M. (2009). What is sensory marketing? (pp. 1-23). Palgrave Macmillan UK. https://doi.org/10.1057/9780230237049_1.
- Hutmacher, F. (2019). Why is there so much more research on vision than on any other sensory modality? *Frontiers in Psychology*, 10, Article 2246. <https://doi.org/10.3389/fpsyg.2019.02246>.
- Krishna, A. (2011). Sensory marketing: Research on the sensuality of products. Routledge. <https://doi.org/10.4324/9780203892060>.
- 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. <https://doi.org/10.1016/j.jcps.2011.08.003>.
- Krishna, A. (2013). Customer sense: How the 5 senses influence buying behavior. Springer. <https://doi.org/10.1057/9781137346056>.
- Krishna, A., & Schwarz, N. (2014). Sensory marketing, embodiment, and grounded cognition: A review and introduction. *Journal of Consumer Psychology*, 24(2), 159-168. <https://doi.org/10.1016/j.jcps.2013.12.006>.
- Krishna, A., Cian, L., & Sokolova, T. (2016). The power of sensory marketing in advertising. *Current Opinion in Psychology*, 10, 142-147. <https://doi.org/10.1016/j.copsyc.2016.01.007>.
- Krishna, A., Elder, R. S., & Caldara, C. (2010). Feminine to smell but masculine to touch? Multisensory congruence and its effect on the aesthetic experience. *Journal of Consumer Psychology*, 20(4), 410-418. <https://doi.org/10.1016/j.jcps.2010.06.010>.
- Labrecque, L. I., Vor Dem Esche, J., Mathwick, C., Novak, T. P., & Hofacker, C. F. (2013). Consumer power: Evolution in the digital age. *Journal of Interactive Marketing*, 27(4), 257-269. <https://doi.org/10.1016/j.intmar.2013.09.002>.
- LeDoux, J. (1996). Emotional networks and motor control: a fearful view. *Progress in brain research*, 107, 437-446. [https://doi.org/10.1016/S0079-6123\(08\)61880-4](https://doi.org/10.1016/S0079-6123(08)61880-4).
- Lehrl, S., Gerstmeier, K., Jacob, J. H., Frieling, H., Henkel, A. W., Meyrer, R., ... & Bleich, S. (2007). Blue light improves cognitive performance. *Journal of neural transmission*, 114, 457-460. <https://doi.org/10.1007/s00702-006-0621-4>.
- Lemon, K. N., & Verhoef, P. C. (2016). Understanding customer experience throughout the customer journey. *Journal of marketing*, 80(6), 69-96. <https://doi.org/10.1509/jm.15.0420>.
- Lindstrom, M. (2005). Broad sensory branding. *Journal of Product & Brand Management*, 14(2), 84-87. <https://doi.org/10.1108/10610420510592554>.
- Lindstrom, M. (2005). Brand sense: Build powerful brands through touch, taste, smell, sight, and sound. Free Press.
- Madden, T. J., Hewett, K., & Roth, M. S. (2000). Managing images in different cultures: A cross-national study of color meanings and preferences. *Journal of international marketing*, 8(4), 90-107. <https://doi.org/10.1509/jimk.8.4.90.19795>.
- Muniz, A. M., & O'Guinn, T. C. (2001). Brand community. *Journal of Consumer Research*, 27(4), 412-432. <https://doi.org/10.1086/319618>.
- Nayak, A., & Satpathy, I. (2024). The Sensory Marketing Theory: A Journey Into Multisensory Marketing. In *Sensible Selling Through Sensory Neuromarketing* (pp. 43-67). IGI Global.
- Palmer, S. E., Schloss, K. B., & Sammartino, J. (2013). Visual aesthetics and human preference. *Annual Review of Psychology*, 64, 77-107. <https://doi.org/10.1146/annurev-psych-120710-100504>.
- Panksepp, J. (1982). Toward a general psychobiological theory of emotions. *Behavioral and Brain sciences*, 5(3), 407-422. <https://doi.org/10.1017/S0140525X00012759>.
- Peck, J., & Childers, T. L. (2008). Sensory factors and consumer behavior. *Handbook of consumer psychology*, 4, 193-219.
- Perlovsky, L. I. (2006). Toward physics of the mind: Concepts, emotions, consciousness, and symbols. *Physics of Life Reviews*, 3(1), 23-55. <https://doi.org/10.1016/j.plrev.2005.11.003>.
- Pine, B. J., & Gilmore, J. H. (1998). Welcome to the experience economy. *Harvard Business Review*, 76, 97-105.
- Plassmann, H., Venkatraman, V., Huettel, S., & Yoon, C. (2015). Consumer neuroscience: applications, challenges, and possible solutions. *Journal of marketing research*, 52(4), 427-435. <https://doi.org/10.1509/jmr.14.0048>.
- Puccinelli, N. M., Goodstein, R. C., Grewal, D., Price, R., Raghubir, P., & Stewart, D. (2009). Customer experience management in retailing: understanding the buying process. *Journal of retailing*, 85(1), 15-30. <https://doi.org/10.1016/j.jretai.2008.11.003>.
- Reimann, M., Zaichkowsky, J., Neuhaus, C., Bender, T., & Weber, B. (2012). Aesthetic package design: A behavioral, neural, and psychological investigation. *Journal of Consumer Psychology*, 20(4), 431-441. <https://doi.org/10.1016/j.jcps.2010.06.009>.
- Schmitt, B. H. (1999). Experiential marketing. *Journal of Marketing Management*, 15(1-3), 53-67. <https://doi.org/10.1362/026725799784870496>.
- Shavitt, S., & Barnes, A. J. (2020). Culture and the consumer journey. *Journal of retailing*, 96(1), 40-54. <https://doi.org/10.1016/j.jretai.2019.11.009>.
- Siniscalco, A., Bortolotti, A., & Rossi, M. (2022). Do color and light affect physiology and psychology in proportional ways?. *Research Culture And Science Books*, 6, 105-110.
- Spence, C. (2018). Background colour & its impact on food perception & behaviour. *Food Quality and Preference*, 68, 156-166. <https://doi.org/10.1016/j.foodqual.2018.02.012>.
- Spence, C. (2021). Sensehacking: How to use the power of your senses for happier, healthier living. Viking.
- Spence, C. (2024). On the psychological effects of food color. In *Handbook on natural pigments in food and beverages* (pp. 33-60). Woodhead Publishing.
- Spence, C. On the psychological impact of food colour. *Flavour* 4, 21 (2015). <https://doi.org/10.1186/s13411-015-0031-3>
- Spence, C., & Deroy, O. (2013). How automatic are crossmodal correspondences? *Consciousness and Cognition*, 22(1), 245-260.
- Spence, C., & Gallace, A. (2011). Multisensory design: Reaching out to touch the consumer. *Psychology & Marketing*, 28(3), 267-308.
- Spence, C., & Piqueras-Fiszman, B. (2016). Food color and its impact on taste/flavor perception. In *Multisensory flavor perception* (pp. 107-132). Woodhead Publishing.

Spence, C., Reinoso-Carvalho, F., Velasco, C., & Wang, Q. J. (2019). Introduction to the special issue on auditory contributions to food perception and consumer behaviour. *Multisensory Research*, 32(4-5), 267-273.

Thaler, R. H. (2016). *Misbehaving: The making of behavioral economics*. W.W. Norton & Company.

Wörfel, D., Schumann, J. H., & Wangenheim, F. V. (2022). The impact of digital transformation on marketing and consumer behavior. *Journal of Business Research*, 123, 520-532.

Yoon, S. J., & Park, J. E. (2012). Do sensory ad appeals influence brand attitude?. *Journal of Business Research*, 65(11), 1534-1542.

Zaltman, G. (2003). *How customers think: Essential insights into the mind of the market*. Harvard Business School Publishing.