Sounds of scents: olfactory-auditory correspondences in the online purchase experience of perfume

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Abstract

Purpose – Perfume is arguably one of the most challenging experience products offered online. This article explores how the associations between the human senses of olfaction and audition can help consumers recognize the characteristics of the scent in the absence of the real scent.

Method – Given the scarcity of contributions regarding online shopping behavior for perfume, an exploratory qualitative approach was implemented. Twenty-seven in-depth interviews were conducted among individuals from three countries with prior experience of purchasing perfume online.

Results – The study highlights the associations made by the interviewees between the types of sounds/voice and types of scents and the complementary role of these cues in online shopping of perfume.

Practical implications – Both e-sellers and e-buyers can benefit from the findings of this research. In fact, it is likely that e-shoppers decide to either consider or ignore an unknown perfume for purchase based on the scent signals perceived from sounds, which can provide guidance for e-sellers as well.

Keywords – Audition, Consumer Behavior, Olfaction, Online Shopping, Perfume

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1 Introduction

Recent years have witnessed online shopping as a booming research theme in the area of marketing and consumer behavior. Although a great deal of attention has been dedicated to the subject in the extant literature, surprisingly, the informativeness of the internet regarding experience goods, in particular perfume, has been scarcely explored. Arguably, purchasing fragrances online without previous knowledge of the scent leads to problems with purchase decision making. To the best of the authors' knowledge, this issue has been neglected by the extant literature. Hence, this article aims to explore whether cross-modal correspondences between the human senses and, in particular, the senses of olfaction and audition, help e-shoppers with their purchase decision making given the absence of the real scent in online settings. Based on the work of Weathers, Sharma, and Wood (2007), to enhance product displays and to deal with customers effectively, it is crucial to understand the role of online communication strategies in consumer evaluations of products. Similarly, the olfactory-auditory correspondences that can convey the characteristics of scents are deemed to be of high value and importance both for perfume manufacturers and sellers that intend to boost their online sales. Therefore, this paper tries to answer the following research question: How can olfactory-auditory cues help e-shoppers recognize whether a certain scent/perfume is appropriate for them?

Overall, this article makes several contributions to the research and practice. It addresses a particularly complex topic that has been neglected by the consumer behavior and marketing literature, by bringing together contributions from diverse fields of research (e.g., consumer behavior, marketing, psychology, chemistry) that help to understand how sounds are expected to be associated with perceptions of scent. Building on dispersed contributions in the literature, this article offers a theoretical basis for further understanding of how perfume consumers, particularly e-shoppers, associate sounds with scents. The article also provides first-hand perspectives from e-shoppers who shared their views and experiences regarding online purchases of perfume, namely on how sounds (e.g., music, the human voice) induce scent. As such, it provides anecdotal evidence of associations between types of scents and sounds, resulting in valuable cues for practitioners interested in effectively communicating perfume products, and demonstrating that the topic is relevant for consideration by researchers, including in but not limited to the fields of digital marketing and consumer behavior.

The rest of the paper is organized as follows. After presenting the most pertinent literature, we discuss the results of a qualitative study including 27 in-depth interviews with consumers who have experienced online purchases of perfume. Then, we provide the conclusions, managerial implications, the study's limitations, and avenues for further research.

2 Literature Review

2.1 Challenges of selling experience goods online

It is widely acknowledged that experience goods present additional challenges for the consumer decision-making process, which, it can be argued, is particularly evident in the case of online purchases. As explained by Klein (1998, p. 196), "experience goods are dominated by attributes that cannot be known until purchase and use of the product or for which information search is more costly and/or difficult than direct product experience." In contrast, search goods are defined as "those dominated by product attributes for which full information can be acquired prior to purchase" (Klein, 1998, p. 196). Chiang and Dholokia (2003) explain that classifying goods as either search or experience is a common categorization. According to them, the possibility of evaluating search goods before purchase through external information is in obvious contrast with experience goods, which need to be personally checked before making the purchase. They believe this personal checking is the reason for the lower online purchase intentions of e-shoppers for such goods. Thus, search goods (e.g., books) can be purchased online with no significant difficulty, while experience goods such as perfume, due to their innate characteristics, are less likely to convince e-shoppers. As a result, online stores could not be as efficient as brick-and-mortar stores when experience goods are to be offered (Peterson, Balasubramanian, & Bronnenberg, 1997). In their research, Korgaonkar, Silverblatt, and Girard (2006) also have addressed consumers' concerns regarding online purchases of search (in this case books and personal computers), experience (in this case clothing, perfume, cell phones, and TVs), and credence (in this case vitamins and water purifiers) goods. Their findings showed that search goods

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were more favored by e-shoppers on the internet platform than both experience and credence goods. Moreover, the respondents were more willing to buy products such as clothing and perfume than cell phones, TVs, vitamins, and water purifiers. More recently, Verhagen and Bloemers (2018) have illustrated that when e-shoppers are planning their online purchase decisions regarding experience goods, in this case perfume and shampoo, they make a basic cognitive evaluation of the online outlet and the products offered prior to the affective reactions that will finally lead the e-consumers to make their purchase. Pan, Kuo, Pan, and Tu (2013) have revealed that the association between price surcharges and online purchase intention is moderated by the product category, i.e., whether it is search, experience, or credence goods/services.

Consequently, Choi, Choi, and Lee (2006), suggest that it is necessary to transform experience goods into search goods if the seller intends to offer them online. Zhang, Ge, Gou, and Chen (2018) further explain that online shopping is not a top priority for products such as perfume due to the high levels of perceived risk associated with the inability to test the real scents (Claudia, 2012; Kacen, Hess, & Chiang, 2013). Physical access to the products before purchasing them is highly valued among perfume shoppers (Levin, Levin, & Heath, 2003), therefore certain types of brick-and-mortar outlets could not be replaced by their online rivals (Phau & Poon, 2000). Lian and Yen (2013) also have found that higher prices, having less control of payment details, and having less access to product information compared with brick-and-mortar outlets are major obstacles for e-shoppers of cosmetics as experience goods. Therefore, in line with Lian and Yen's (2013) conclusion regarding the difficulty of online sales of experience goods, it is emphasized that communicating perfume properties while the real scent is absent is a real challenge both for consumers and companies (Schifferstein & Howell, 2015).

2.2 Olfactory-auditory correspondences

Shams and Seitz (2008) believe that life experience involves constant multisensory stimulation and it is likely that our brain operates best in multisensory environments. Crisinel and Spence (2010) also state that our everyday perception of the world is very often multisensory. There are everyday life examples in which a combination of olfactory and auditory cues are perceived, for instance, experiencing the aroma of food while hearing the

mastication process. Another example would be smelling a car's exhaust fumes while hearing the car's engine (Seo & Hummel, 2011). Stevenson, Rich, and Russel's (2012) findings show that odor cross-modal matches are both semantically and perceptually supported. They conclude that there are reliable associations between a scent and taste, color, pitch, and texture. Nehmé, Barbar, Maric and Jacquot (2015) also infer that cross-modal correspondences between all sensory modalities are likely to occur. In line with this, more than one sensory system is required to obtain information from the surrounding environment to be processed by the brain in order to experience coherent sensory stimuli, the importance of which is even greater for the human sense of olfaction, which is robustly dependent on cues from other sensory systems (Zhou et al., 2019). Given this, cross-modal correspondences, which are defined as matching information from different senses, are systematically experienced by human beings (Levitan, Charney, Schloss, & Palmer, 2015).

The long-held recorded belief that certain fragrances are associated with certain tones of music can be traced back as far as 150 years ago. The perfumer Piesse (1867, p. 38) highlighted this bond between scents and music, saying that "There is, as it were, an octave of odors like an octave in music." He even believed that the mechanisms responsible for interpreting olfactory and auditory cues work in nearly the same way. This tight bond between music and scents has also been echoed by contemporary perfumers. When interviewed by Ackerman (1990), Sophia Grojsman, a Belarusian perfumer, stated that composing music is similar to producing fragrance. There is also some resemblance between the professional terms used by perfumers when creating scents and those usually used by musical composers when creating music (Deroy, Crisinel, & Spence, 2013).

Recent laboratory experiments conducted by scholars have yielded interesting findings regarding the associations between olfaction and audition in humans. In one experiment, the participants were able match auditory pitches with certain odors. It was also revealed that odor quality could mediate this olfactory-auditory association (Seo & Hummel, 2011). Experiments conducted by Crisinel, Jacquier, Deroy, and Spence (2013) have revealed striking results. Their findings have shown that the olfactory-auditory association highlighted by previous research could be projected in more detail than ever. For instance, higher pitches were significantly matched to the odors of candied orange and iris flower rather than

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those of musk and roasted coffee. They have also revealed that most of the participants in the experiments could match the odor of candied orange to the intended piece of music. The study on the association between musical instrument type and type of scent has uncovered that the sound of piano and woodwind instruments match well with fruity smells, while smells like musk were found to be more associated with brass instruments. Also, their findings have shown that low-pitched sounds correspond with the smell of smoke, musk, dark chocolate, and cut hay, while high-pitched sounds were a better match for fruitier scents (Crisinel & Spence, 2012).

Certain background sounds, e.g., a Christmas carol, have been matched with specific scents such as cinnamon, clove, and orange (Seo, Lohse, Luckett, & Hummel, 2014). Moreover, certain odor stimuli commonly found in wine have been shown to match a certain pitch and particular musical instruments. For instance, fruity aromas such as apple and lemon were consistently matched with high pitched sounds and, interestingly, the piano was found to be a suitable match for pleasant scents (Crisinel & Spence, 2012). Velasco, Balboa, Mamolejo-Ramos, and Spence (2014) demonstrated that broadband white noise, noise containing many frequencies with equal intensities, had a greater impact on participants' odor ratings compared to consonant and dissonant musical selections. In fact, six smells used in the study were perceived to be less pleasant and less sweet when listening to white noise compared to the other music. There is also evidence that inputs from the other senses presented before and/or at the same time could influence olfactory perception (Calvert, Spence, & Stein, 2004; Stein, 2012). In an interesting experiment, a tone with the same frequency of vibration of molecules as an odorous substance was played during a TV show. As the participants in the experiment were told they would experience a smell, the responses by the viewers of the show were rich in reporting the experience of "hay" and "grass" smells. A radio broadcast also resulted in similar reports (O'Mahony, 1978).

Deroy et al. (2013) state that describing scents through attributes that are usually used by people for other sensory modalities, such as pitch (audition), brightness (vision), and sweetness (taste), shows the existence of cross-modal correspondences between the senses. They propose hypotheses behind these cross-modal correspondences between auditory and olfactory cues. They believe that auditory and olfactory perceptions may converge in a common amodal dimension and both perceptions may

be connected through another independent dimension such as emotional similarity between cues. They go on to suggest that hedonic properties of the stimuli presented in both olfaction and audition could in part explain the correspondences between the two senses. Marks (1978, p. 181) also believes that sensory qualities "talk over their common feeling." For example, Seo and Hummel's (2011) findings indicate that the smell of coffee, as an olfactory stimulus, was perceived to be more pleasant when listening to the sound of drinking coffee, a congruent sound. They conclude that such hedonic attraction with sounds could be transferred cross-modally and hence affect people's scent evaluations. Velasco et al. (2014) suggest that there may be cross-modal transfer of hedonic evaluations of the information presented in and processed into two different sensory modalities. Additionally, in one experiment it was revealed that similar emotional responses could mediate the match between odor and music, i.e., perceived matches were higher when the emotional responses were similar. In order to further explain the correspondences between modalities, three classes of such correspondences have been introduced: structural, statistical, and semantic. For more details, please see Spence (2011).

From the neurophysiological standpoint, recent research has proved that the interactions between sensory modalities begin from the earliest stages of cortical processing, which therefore questions the validity of the traditional belief in the occurrence of such interactions only at the higher level of the cortex (Spector & Maurer, 2012). Shams and Seitz (2008) add that cues from different senses interact with each other in numerous brain areas and pathways. While the mechanisms under which humans' senses of olfaction and audition interact remain largely unknown (Velasco et al., 2014), animal studies suggest a strong possibility of the existence of evolutionary associations between the senses of smell and hearing (Cohen, Rothschild, & Mizrahi, 2011). For example, Cohen et al. (2011) used female mice and their pups to test whether pup odors would alter the way calls made by the pups, i.e., auditory cues, were processed by the mothers. The results are indicative of a strong alteration of auditory processing in the primary auditory cortex triggered by pup odors. They add that such links between the two senses are necessary for mothers to identify and locate their pups. Using anesthetized mice, Wesson and Wilson (2010, p. 3013) extended the knowledge of the role of the olfactory tubercle, which is "a trilaminar cortical-like structure that occupies a large portion of the

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basal forebrain," in olfactory-auditory interactions. Their findings show selective odor responses by single units in the olfactory tubercle. In addition, their study reveals a clear convergence of olfactory and auditory inputs with single units displaying responses to both odors and tones. They conclude that such cross-modal activities in the olfactory tubercle likely combine smell and sound information early in the olfactory processing function.

We narrow the present study down to human cross-modal correspondences between the senses of olfaction and audition, as the human sense of olfaction is highly dependent on other sensory cues, e.g., visual. There is a belief that the human sense of olfaction is dependent on auditory or visual cues received from the surroundings (Zhou et al., 2019). In order to address this issue, Zhou et al. (2019) recently used seven participants in an experiment where they were exposed to spoken descriptive words (rose or mint) and several seconds later an odor was made available. They were asked to tell whether the presented odor matched the auditory cue, i.e., spoken words. First, it was revealed that the spoken cue predicting the ensuing odors caused responses in the auditory cortex, followed by responses in the primary olfactory cortex (PC), which occurred before the arrival of the expected odor, suggesting the integration of olfactory and auditory information before the olfactory stimulus is presented. Second, their findings showed synchronization between oscillations in the PC and the auditory cortex. And third, a phase shift in low-frequency PC oscillations and modulation of the amplitude of PC beta oscillations were induced with the spoken words, which in turn was able to affect the timing of local computations in the olfactory cortex.

From the practical standpoint, Deroy et al. (2013) conclude that such relationships between olfaction and audition are not haphazard and, in addition to all these theoretical features, aging people can benefit from such cross-modal correspondences (Deroy et al., 2013). For example, sounds could be reliable substitutes for smell, with the intensity of sounds varying depending on the sniffing rate, and particular timbres corresponding to the pleasantness of scents (Cooke & Myin, 2011).

2.3 Nature sound and human voice: implications for advertising

In a unique investigation, Seo et al. (2014) considered a nature sound, in this case a beach sound, and

they recognized that this was by far the most congruent sound choice when the odor was a fish smell. In another rare and interesting study, Millot and Brand (2001) exposed both female and male subjects to the odors of lavender, as a pleasant source of smell, and pyridine, as an unpleasant source, and the subjects tended to read a text in a higher pitch when surrounded by the pleasant smell, while their voice pitch was generally low in the presence of the unpleasant smell. Furthermore, they emphasized that the obvious difference in the pitch levels between females and males could be a result of the smaller male sample size. Women's ability in terms of olfactory perception is greater than that of men (Millot & Brand, 2001). The authors conclude that neurological mechanisms and brain images have explained such vocal emotions and odorant hedonic associations. In another piece of research, Whipple and McManamon (2002) produced a series of advertisements, anouncing a range of fragrant products (in this case cologne, perfume, shampoo, and shower spray). They used both female and male voiceovers and asked the subjects to rate each voiceover associated with each product in terms of communication effectiveness. Their findings show that when the product was neutral (i.e., shampoo and shower spray), both the female and male voices were evaluated equally. However, while it was shown that the gender of the spokeperson or anouncer whose voice was used to describe a female-gender-imaged product, i.e., perfume, affected the evaluations of the advertisement, this impact was not observed for the commercials advertising the cologne, which was aimed at male consumers. Gelinas-Chebat and Chebat (1992) conducted an experiment in which the subjects were exposed to two messages, one low-involvement message advertising an automated teller machine and another high-involvement message advertising a student loan. The aim was to trace possible changes in the subjects' attitudes towards the messages based on the intonation, or tone, and intensity of the voiceovers played. They believe that such voice characteristics are representatives of the speaker's qualities, such as his/her emotion, persuasive capacity, and prestige. Their findings have revealed that voice characteristics, i.e., intonation and intensity, affected the subjects' attitudes towards the advertisement message more significantly in the case of the low-involvement message than for the high-involvement message.

As there are studies that suggest most people tend to relate specific odors to auditory aspects (e.g., Belkin, Martin, Kemp, & Gilbert, 1997; Crisinel & Spence,

2012; Deroy et al., 2013; Seo et al., 2014; Velasco et al., 2014), we conclude the literature review by presenting typical musical instruments ranked in order by subjects for selected odor sources (Table 1) and also olfactory adjectives under different pitch conditions (Table 2) based on the study by Crisinel and Spence (2012).

Given the extant literature, we expect sounds that originate from humans and nature, and those produced by musical instruments, to be able to help e-shoppers obtain reliable information in the absence of the real fragrance.

3 Methodology

3.1 Study design

Questions regarding the interviewees' experience of e-commerce, online shopping of perfume, and their views and opinions on the potential associations between the senses of olfaction and audition when purchasing scents, were outlined in the interviews. The interview was organized in three parts, first exploring the online shopping experience of perfume, then focusing on buying unknown perfumes online, and lastly inquiring about sounds and voices. This last section of the interview specifically covered types of music, sounds of nature, and the human voice, asking the participants to suggest and elaborate on the associations envisaged. Prompts were also used whenever necessary. One example of such prompts was "Would a perfume described in a soft voice and another described by a warm and intense voice have different scents?" On average, each interview took forty-five minutes and twenty seconds, all of which were audio-recorded, transcribed, and translated into English. The ethical principles applied to this research include making participation anonymous and voluntary and providing complete information in order for the interviewees to be able to provide their informed consent to participate in the study. The identification and coding of themes and categories was enabled through content analysis. Due to the scarce theoretical background regarding the association between scent and sound, and in line with the objectives and the exploratory nature of this study, the content analysis was data driven.

More specifically, inductive content analysis was implemented, which helped the authors in the codification of the data. Cole (1988) is among those scholars who have supported the suitability of such an approach for both verbal and written messages and, in particular, Neuendorf (2002) has highlighted the use of this approach for business themes. The inductive approach, which produces general concepts from specific ones (Chinn & Kramer, 1999), is suitable when there is fragmentation and scarcity of knowledge, as is the case of this study. Therefore, the procedure suggested by Mayring (2000) was implemented, that is, coding criteria was devised according to the existing literature and also guided by the study's research question. Then, the transcriptions collected in the interviews were gradually filtered until the main categories were yielded. The data were independently coded by two researchers, and the initial pool of categories and subcategories was compared. Next, a second round of codification was performed by three researchers based on the set of categories and subcategories already defined. The categories comprised sounds of nature, the human voice, music genres, and rhythm/beat. This second round of codification was compared and the differences in coding were analyzed by a third researcher.

3.2 Sample characteristics

Twenty-seven consumers from Brazil, Iran, and Portugal with previous experience of purchasing perfume online were selected through a purposive sampling method. The authors used their professional and personal networks to identify consumers who had bought perfume online, with a range of demographic profiles and online shopping activity, including information on how frequently they had made online purchases of perfume. With the help of those networks several possible interviewees were suggested, who were approached and invited to participate after confirming that they had experience in buying perfume online. The sample demographics, e-commerce experience, and experience of purchasing perfume online are presented in detail in Table 3. Sixteen of the participants were female consumers of perfume, and the whole sample was aged 34.1 years old, on average. Most of the participants (37%) reported their educational level as being post-graduate and the remaining ones held graduate degrees (33%) or were undergraduates (30%) at the time of the interviews. The results that emerged from the interviews are presented in the next section.

4 Results

As expected, at first some of the participants in this study tended to consider the association between scents and sounds to be odd or even non-existent. For instance, Interviewees BR8, PT9, and PT6 started by affirming that

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Table 1.
Choice of instrument as a function of odor

Odor source	Choice rank order			
	1st	2nd	3rd	4th
Apricot	Piano	Woodwind	Strings	Brass
Blackberry	Piano	Strings	Woodwind	Brass
Musk	Brass	Strings	Woodwind	Piano
Raspberry	Piano	Woodwind	Strings	Brass
Vanilla	Piano	Woodwind	Strings	Brass

Table 2.
Choice of instrument as a function of olfactory adjective and pitch

Olfactory adjective	Pitch	Choice rank order			
		1st	2nd	3rd	4th
Acrid	Low	Piano	Woodwind	Strings	Brass
	Medium	Woodwind	Strings	Piano	Brass
	High	Brass	Woodwind	Strings	Piano
Floral	Low	Woodwind	Brass	Strings	Piano
	Medium	Piano	Strings	Woodwind	Brass
	High	Piano	Woodwind	Strings	Brass
Fruity	Low	Woodwind	Strings	Brass	Piano
	Medium	Strings	Piano	Woodwind	Brass
	High	Piano	Woodwind	Strings	Brass
Spicy	Low	Woodwind	Piano	Strings	Brass
	Medium	Woodwind	Strings	Piano	Brass
	High	Strings	Brass	Piano	Woodwind

Table 3.
Sample Characteristics

Code	Age	Gender	Education level	Occupation	Online shopping activity	Type of online stores	Buy perfume online	Bought unknown scent online
BR1	42	Female	Post-graduate	Teacher	Frequent	Both	Occasionally	Yes
BR2	48	Female	Post-graduate	Manager	Frequent	National	Frequently	Yes
BR3	27	Female	Undergraduate	Clerk	Frequent	International	Frequently	Once
BR4	47	Female	Graduate	Clerk	Occasional	International	Occasionally	No
BR5	34	Female	Post-graduate	Psychologist	Occasional	National	Frequently	Yes
BR6	33	Male	Graduate	Business Owner	Frequent	Both	Occasionally	Yes
BR7	47	Female	Undergraduate	Beautician	Frequent	Both	Occasionally	Yes
BR8	50	Female	Undergraduate	Hairdresser	Occasional	Both	Occasionally	No
BR9	49	Female	Post-graduate	Purchasing manager	Occasional	Both	Occasionally	No
IR1	30	Male	Post-graduate	Self-employed	Frequent	National	Frequently	Yes
IR2	22	Male	Graduate	Pilot	Occasional	Both	Frequently	Yes
IR3	29	Male	Post-graduate	Teacher	Occasional	National	Occasionally	No
IR4	28	Male	Undergraduate	Clerk	Frequent	Both	Frequently	No
IR5	24	Male	Graduate	Student	Frequent	National	Occasionally	Yes
IR6	28	Female	Post-graduate	Accountant	Occasional	National	Occasionally	No
IR7	28	Male	Post-graduate	Coach	Occasional	National	Frequently	Yes
IR8	35	Male	Graduate	Business Owner	Frequent	Both	Frequently	Once
IR9	24	Female	Graduate	Beautician	Occasional	National	Frequently	Yes
PT1	22	Female	Undergraduate	Student	Frequent	Mainly national	Frequently	No
PT2	24	Male	Graduate	Student	Frequent	Mainly international	Occasionally	No

Table 3.
Continued...

Code	Age	Gender	Education level	Occupation	Online shopping activity	Type of online stores	Buy perfume online	Bought unknown scent online
PT3	26	Female	Post-graduate	Translator	Frequent	Both	Frequently	Yes
PT4	59	Female	Graduate	Unemployed	Occasional	Both	Occasionally	Once
PT5	24	Female	Undergraduate	Clerk	Frequent	International	Frequently	Yes
PT6	20	Female	Undergraduate	Student	Frequent	International	Frequently	No
PT7	48	Male	Undergraduate	Shopkeeper	Frequent	Both	Frequently	Yes
PT8	24	Female	Graduate	Clerk	Frequent	Both	Frequently	Yes
PT9	50	Male	Graduate	Business Owner	Frequent	Both	Frequently	No

Table 4.
Codification of categories and subcategories

Categories	Subcategories
Human voice	Voice gender
	Voice intensity
	Voice tone
Music	Music genre (e.g., classical, blues, folk, pop)
	Music intensity (e.g., soft, strong)
	Music mood (e.g., romantic, relaxed)
	Music rhythm/beat (e.g., slow music)
Scent	Fragrance family (e.g., floral, woody, fresh)
	Scent intensity (e.g., soft, strong)
	Scent perception (e.g., warm, sweet)
Sounds of nature	Sound of rain
	Sound of the sea
	Sound of the wind

they "don't associate perfume with music and sound." However, during the interview, all participants recognized clear associations between characteristics of sounds and scents, as the next sections demonstrate. As an example, when comparing intimate music with sounds of nature, Interviewee BR4 stated "I feel a different smell… these are different smells," hence verbalizing the scent of sounds. As a result of the content analysis of the interview transcripts, this article highlights spontaneous associations between scent and sound characteristics. The next sections are organized according to three themes: sounds of nature, music, and the human voice.

4.1 Sounds of nature

The participants in this study reported that sounds of nature tend to induce cool scents, that is to say, particularly fresh fragrances. This was clearly the case of the sound of water. Sea waves and rain were often mentioned as being associated with fresh perfume.

As explained by Interviewee BR7, "sounds that represent freshness, such as rain, the sound of water, symbolize a fresh aroma." This view was shared by Interviewee IR8, who mentioned that "rain and wind sounds can tell me the scent is cool. Sea waves, to some extent, can induce the coolness of the scent." According to the participants in this study, these mental associations have the ability to affect consumer decisions. Take for instance the case of Interviewee PT4, who said she only likes warm-scented perfume. She stressed that most sounds of nature tell her that the perfume is not for her:

Somehow, the sounds of nature give me some [scent] identification. For example, noises of the sea, of the wind, this gives me cues that this type of perfume isn't the type I like. I can't explain why, but scents associated with the sea and the wind are cold, so I know immediately that I don't like them. (Interviewee PT4)

Interviewee PT1 also considered that "nature elements imply that it's a light and natural fragrance." Two of the words often used by the participants to describe the aroma of the sounds of the sea were "freshness" and "softness." For instance, "freshness sensation" was mentioned by Interviewee BR1, and "smell of freshness" was proposed by Interviewee BR3 to generally describe sounds of nature in perfume communications. Moreover, Interviewee BR6 said that the softness of the sea sound induced the smell of a fresh-scented perfume. In fact, sounds of nature were generally associated with soft (i.e., as opposed to intense) perfumes, as mentioned for instance by Interviewee BR8: "sounds of the sea, sounds of rain… soft perfume." Interviewee BR5 added that "there are sounds of nature, sounds of water, which are soft blue perfume," further corroborating the immediate association with fresh fragrances.

The sound of the forest, often described as the sound of a breeze, was also associated with refreshing feelings, and consequently with cool and soft scents. This was attested for instance by Interviewee IR9, who mentioned that "the sound of the wind in the forest induces a cool scent." Yet, other elements of the natural environment were associated with warm scents. This was the case for the sound of birds, which was associated with warm scents by many interviewees (e.g., Interviewee IR9).

Moreover, some of the participants also suggested associations between some sounds of nature and particular fragrances. Interviewee BR6 considered that sounds of nature in general reminded him of fruity scents, while Interviewee BR4 agreed, considering them to be particularly adequate to represent citrus-scented perfume. In line with this, Interviewee IR5 mentioned that "[the sounds of nature] help the imagination. For example, if you hear the sounds of sea waves, oceanic scents come to mind." Interviewee BR4 further suggested that floral scents would be associated with other types of sounds from nature:

> If for example it's (…) a lavender [fragrance] (…) I don't think of the beach, I just think of a flowery field, I think of the sound of the wind. (Interview BR4)

Interviewee IR6 also mentioned the significance of nature sounds, which might act in either hindering or encouraging thoughts of specific scents: "I hate the

sound of the wind. I get angry. Just like sea waves. Not a burning wood sound."

Hence, these results are basically in line with the findings of previous studies such as those of Crisinel et al. (2013), Seo et al. (2014), and Zhou et al. (2019), which emphasize the associations between the senses of olfaction and audition in humans, although the physical structure of the auditory cues in their studies is different from the nature sounds studied here. In fact, only in one rare case did Seo et al. (2014) realize that a fish odor was most congruent with a beach sound, as a nature sound, compared to a Christmas carol and the sound of brushing teeth. They also revealed that an orange smell was most congruent with a beach sound compared to the other two sources of sounds in their study. These findings provide interesting cues on the immediate associations between sounds of nature and certain fragrance groups, particularly the fresh categories.

4.2 Music

The interviewees' reflections regarding music were particularly rich, comprising several musical characteristics. Interviewee PT8 demonstrated the overall importance of music when inferring scent, as she explained that music helps her "understand whether [the scent] is something that I like or dislike." These conclusions are enabled by musical characteristics. The most naturally discussed characteristic was music intensity, with all participants considering that different music intensities "smell different," Other dimensions suggested by the participants were rhythm, music genre, and music mood.

4.2.1 *Music intensity, rhythm, and beat*

One recurrent association involved intensity. The participants agreed that intense scents (e.g., warm and strong perfumes) were associated with intense music. As Interviewee PT1 explained, "I always associate calm music with light perfume, and intense music with a strong perfume." In fact, the participants who at the start of the interview had most difficulty identifying scent in music stated that in the case of music intensity the association for them was clear. Take for instance the case of Interviewee BR8, who said that "the only association that comes to my mind involves [music] intensity. Rock reminds me of intense perfume, male perfume… and ballads remind me of a perfume with a sweet smell." Interviewee BR2 added

that "the intensity of the music is linked to the fragrance, to the strength of the scent."

Another recurrent topic in the interviewees' narratives was the association between the music's rhythm and beat with scent characteristics. Similarly to what they said regarding music intensity, they clearly matched slow music with a soft scent, and faster beats with stronger perfume. Interviewee BR1 said that "Subliminally, I'll link softer music with a soft scent, and stronger music with a heavy rhythm is linked to strong perfume." Some participants proposed that the intensity and rhythm characteristics of music are associated with some types of fragrance, such as floral or woody ones. Here are some examples offered in the interviews:

> [A floral, warm perfume] is soft music, lively but still smooth … with rhythm, but still soft. (Interviewee BR5)

> I prefer woody-type perfumes, which I associate with romantic music… well, actually it doesn't have to be romantic, but more of a smooth type, you know? Nothing too exciting. (Interviewee BR4)

As such, this study demonstrates an unambiguous connection between music intensity and characteristics of perfume, namely by converting the intensity from music to scents. Since to the authors' knowledge no previous study has ever explored the connections between music properties or elements and the characteristics of scents, except for music pitch, which has been studied by scholars such as Crisinel and Spence (2012), no reference is available to check the consistency of the current study's findings with those of others. The findings appear to be new.

4.2.2 *Music genres*

Regarding music genres, rock was already mentioned in one of the transcripts as being associated with a strong scent. This was also confirmed by Interviewee IR4, who said that "rock can be associated with one of my [oriental scent-type] perfumes." As for pop music, according to the participants in this study, it conveys light scents. For example, Interviewee BR3 mentioned the following: "if I had to associate [a light-scented perfume] with any music, it would have to be pop music, a younger style." Interviewee IR7 added that pop music invokes fruity scents, providing detailed examples of the associations between music genre and scent:

> For example, sweet scents, or generally fruity scents, give me the feeling of pop music. Scents with a top note of bitterness and base note of sweetness give the sense of Western classical music. And those with a top note of sweetness and base note of bitterness remind me of traditional Iranian music. (Interviewee IR7)

Some participants mentioned that classical music reminded them of sweet and bitter scents. Here are some examples provided in the interviews:

> Whenever I listen to a piece of classical music, it reminds me of a sweet scent. (Interviewee IR3)

> For example, bitter scents are more related to classical music. Warm scents are more related to the Spanish flamenco style, in which people dance. For example, [woody perfume] is blues. [My other favorite perfume] because of the flowery scent in it is folk or traditional style. (Interviewee IR5)

The evidence mainly from the Iranian sample seems to suggest the possible connections between the music genre and type of scent, which is unique in this study.

4.2.3 *Music mood*

As emphasized by several participants, each music genre comprises very different musical settings, namely regarding the combinations of rhythm and intensity. Based on the literature review, we expected another topic mentioned by the interviewees to be music tone, but in fact the participants in this study addressed it in terms of "music mood," namely intimate and romantic music.

Overall, intimate and romantic music was associated with warm scents, as stated by several participants. Here are some examples provided by the Brazilian participants:

> I associate romantic music with stronger aromas, ones that leave memories. (Interviewee BR7)

> Intimate music, sophisticated music, it's an evening perfume, warmer. (Interviewee BR1)

> Intimate music reminds me of an intense perfume. (Interviewee BR8)

Interviewee PT4 agreed, and stated that "if the music is intimate, obviously it doesn't have the same scent as the sea and the wind," asserting that this music mood is

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associated with woody and oriental scents. Overall, none of the participants associated an intimate and romantic music mood with either floral or fresh scents.

As is evident, the Brazilian and Portuguese participants were better than the Iranian participants at expressing the music mood they perceived in relation to different sources of scent. This may be explained in part by sharing some cultural aspects, in particular language.

4.3 Human voice

As expected, the participants recognized that they are particularly moved by the human voice, not only regarding the message conveyed, but also regarding its characteristics, such as tone. The participants also tended to agree that human voice characteristics are effective ways to communicate scent characteristics. As affirmed by Interviewee IR3, "it can be an effective factor to tell you about the scent." Interviewee IR2 also mentioned that human voices "will help in creating some images and indirectly help me understand the type of scent." Moreover, Interviewee BR1 said that the human voice "has a lot to do with the person's personality traits," which leads Interviewee IR9 to suggest that perfume communications should use what she called a "congruent voice:"

> A congruent voice or a sound should be chosen to describe the perfume scent. Then I can guess the type of scent according to that voice or sound. Congruency is important. (Interviewee IR9)

4.3.1 *Gender and age*

Regarding specific characteristics of the human voice, some participants suggested that gender impacts on perceptions of scent. Interviewee PT1 said that a man's voice insinuates strong scents: "if it's a man, I immediately realize it's a strong scent, more aimed at men." Interviewee IR3 also agreed that male voices are better to communicate fragrances for men:

> Generally speaking, I think using female voices for advertising is more effective. But when it comes to advertising a fragrance for men, it's better to use a masculine voice rather than a female voice. It's much more effective for me. (Interviewee IR3)

Interviewee BR3 further added that the perceived age of the person is also an important factor to induce scent. As she explained in detail:

> If who's talking is a more mature person, I'll associate it with a perfume that I like, a strong, intense perfume. If it's a young person, I'll associate that it with a perfume that I don't like as much, a fresh aroma. (...) If I listen to the voice of a mature man, I'll associate it with a woody, stronger, more intense type of perfume. If I listen to the voice of a young man, I associate it more with adventure, with freshness. (Interviewee BR3)

So, according to these findings, although younger voices are associated with fresh scents, male voices generally suggest strong and intense perfumes. These findings are consistent with those of Whipple and McManamon (2002), who have discovered the link between the spokesperson's/announcer's gender and the effectiveness of the communication when advertising fragrant products.

4.3.2 *Tone and pitch*

Other characteristics of the human voice such as tone and timbre also affect the perceived scent of a perfume. The participants mentioned voice pitch as an important indicator of scent. Indeed, a treble voice (often associated with young voices) conveys fresh aromas, while low and bass voices are associated with intense and warm scents. In line with the relationship between voice tone and pitch and scent, Interviewee IR9 stated that she associated a warm perfume with the voice of one famous Iranian artist, and a bitter fragrance with the tone of another famous Iranian actor. Interviewee PT4 explained that "the voice helps me feel whether the perfume is warm or cold. (…) A warm sensual voice makes me think of warm perfume." In fact, sensuality of the voice was another attribute generally associated with warm perfume by several interviewees (e.g., Interviewees BR4, BR8, and PT2). Indeed, what the participants stated here is consistent with the findings of Millot and Brand (2001), who have shown that high-pitch human voices are associated with pleasant scents, while the opposite is true for unpleasant aromas.

4.3.3 *Voice intensity*

In line with the findings regarding music, voice intensity was also associated with warmer fragrances. The participants unanimously associated soft voices with fresh aromas, and some thought that soft voices can also induce the idea of floral fragrances. The interviewees' statements include the following:

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A soft voice induces the idea of a citric perfume, and also floral. (Interviewee BR4)

Soft, fresh perfume, fruity aromas, they are more related to soft voices. (Interviewee BR7).

Similarly, the participants in this study emphasized that more intense voices go with stronger fragrances, for instance oriental scents, as pointed out by Interviewee PT6. Interviewee PT2 particularly appreciated oriental fragrances, and explained that the intensity of the voice affects her desire to try out an unknown perfume:

> [A strong voice] will, just like the words themselves, indicate warmer, more intense perfume... that is, a perfume that I'll have more desire to try and wear. (Interviewee PT2)

This impact of human voice intensity on perceptions of perfume scent type is coherent with the findings of Gelinas-Chebat and Chebat (1992). They have shown that the intensity and intonation of the voiceover in ads could affect the audiences' attitudes towards those ads. Please see Table 4 which briefly illustrates categories and subcategories found in the present study.

4.4 Possible association bias when feeling the scent of sounds

To conclude the analysis, it is important to note that the interviews also provided relevant cues regarding possible bias concerning the scent of sound that may result from personal preferences. Indeed, it was apparent in the participants' narratives that in some cases the clear preference for a particular type of scent and for instance a particular type of music would lead the participant to automatically associate them. This was clearly stated by Interviewee IR7, who recognized that although his music preferences are congruent with his perfume preferences, he associated his perfume with only his favorite type of music:

> As my favorite type of music is [heavy] metal, I would associate this genre with all my fragrances. They all smell bitter and hot, where the major components are Eastern spices such as cumin. (Interviewee IR7).

Furthermore, Interviewee PT1 realized that her music preferences lead her to make associations that may contradict her anticipated music scent. Indeed, despite her general association between strong perfume and strong music, she explained that she clearly associates her favorite perfume, which she classifies as a strong scent, with calmer music, because that is what she enjoys listening to:

> The perfume I wear usually has a strong scent, but it isn't associated with rock or anything like that, because that's not my style of music. I associate [my perfume] with a song like… I don't know … I don't know... a song that I'm identified with, so calmer, late afternoon music with a nice beat. (Interviewee PT1)

Considering that consumers' preferences such as perfume type could be rooted in their personality traits (Janssens & De Pelsmacker, 2009), this study suggests that although several types of sounds have a very marked type of scent, individual profiles could still play role in such olfactory-auditory relationships. In fact, Janssens and De Pelsmacker (2009) have shown that fruity and mixed perfumes were significant among the choices of those individuals with high levels of conscientiousness and neuroticism (two dimensions of the "Big Five" personality traits). Therefore, such personality bias should be cautiously taken into account when interpreting the results.

5 Conclusion

The participants in this study were able to associate types of music and tones of the human voice with scent families and components. Indeed, they recognized that these elements are important complements of other information provided in online stores regarding perfume, by giving an immediate idea of whether the perfume is, for instance, fresh or intense or sweet. These auditory cues are particularly important to attract attention to unknown perfumes. Moreover, considering that these e-shoppers frequently use very general scent characteristics in the first phases of their decision process (for instance, some participants mentioned that they only like fresh perfumes, while others stated that they buy floral or sweet perfumes), these sonic cues are important for drawing attention to a new perfume, by indicating the main note or fragrance family of the perfume. In fact, this study shows that e-shoppers decide to pay further attention to an unknown perfume or to ignore it based on the

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scent signals that they perceive, namely from sounds. One aspect that should be stressed is that these findings tend to be similar for both e-shoppers with and those without experience of buying unknown perfumes online, although the interviewees who had who had experience of buying unknown perfumes online tended to create more complex associations (e.g., associating scents with specific music styles), while the ones with no such experience provided more general associations (e.g., soft voice and cool scent).

To return to the research question, and building upon neurological and psychological foundations, the results show that e-shoppers can benefit from the associations between the human senses of olfaction and audition, which may help them with their purchases of perfume online, even if they are going to buy an unknown scent. In fact, this research is rich in providing clues for both e-shoppers and e-sellers who might consider offering perfumes online to be a sophisticated task due the absence of real scents on the online platform. These findings could partially alleviate some of the concerns regarding online purchases of perfumes mentioned earlier by researchers such as Zhang et al. (2018), Kacen et al. (2013), and Claudia (2012), who believe that the internet is not a first priority for perfume e-shoppers. Indeed, the summary of the results in Table 5 illustrates that the subjects in this study were mostly able to associate some scent's characteristics with those of nature sounds, music, and the human voice. This research is also novel in terms of considering a sophisticated mixture of scents, i.e., perfume, which has not been the case in previous research; almost all previous studies, mainly in the field of neuroscince, have studied simple scents, for example orange, clove, fish, peppermint, and cinnamon (Seo et al., 2014), and apricot, blackberry, musk, raspberry, and vanilla (Crisinel & Spence, 2012).

Overall, the congruency between these research findings and experimental suggestions by perfumers such as Piesse and Grojsman, and the psychological and neurological evidence, suggests that the human sense of olfaction could in part receive assistance from the other senses, such as audition, which in turn can help e-shoppers of fragrant products to purchase more confidently, even if access to the real product is impossible over the internet.

6 Managerial Implications

Considering the fast evolution of information and communication technologies and its impact on business strategy and communication, which is something that marks the 21st century, one of the dominant trends is message personalization. Internet communication features allow companies to present the right message to each consumer in a timely manner, and consequently the use of different sounds according to the target profile is not only possible but also a recommended strategy to increase communication effectiveness. This article offers particularly interesting cues on how different sounds communicate scents. Looking at Table 5, we can understand that for each type of scent, there are theoretically three categories of sound media available, i.e., nature sounds, music, and the human voice, through which the characteristics specific to each type of scent can be conveyed to the consumers of fragrant products. For instance, it can be noted that a sea sound is generally associated with cool scents, classical music with bitter scents, and a mature male voice with woody scents. It is, therefore, wise to recommend that advertisers produce audio files presenting nature sounds or playing particular types of music that can properly convey the scent's/perfume's characteristics online to the e-buyers. Creating voiceovers according to the features of specific products while describing the product could be also effective.

7 Limitations and Avenues for Future Research

Although this study is rich in novel findings, its limitations should be taken into account before any interpretations are made. Findings based on interviews with only 27 subjects are hardly generalizable; therefore, replication of the same interviews in other cultures might yield more dependable results. Despite the authors' efforts, some level of bias might not have been avoided, namely by the use of prompts and by structuring the interview in three main sound categories (i.e., music, sounds of nature, and the human voice). Consequently, future research should also consider additional procedures in order to focus on spontaneous associations between sounds and scent. Moreover, quantitative measures should be employed in order to assess some subjective concepts such as light, warmth, calmness, intensity etc., as

Table 5.
Summary of findings – the scents of sounds

Scent	Sounds of nature	Music	Human Voice
Sweet scent	N/A	-Ballad music (BR8) -Pop music (IR7) -Classical music (IR3)	N/A
Bitter scent	N/A	-Classical music (IR5) -Heavy metal (IR7)	N/A
Warm scent	-Sound of birds (IR9)	-Spanish flamenco (IR5) -Intimate music (BR1)	-Warm, sensual voice (BR4, BR8, BR9, PT2, PT4, PT6) -Strong voice (PT2, PT8)
Cool scent	-Sound of forest (breeze) (IR9) -Sound of sea (PT4) -Sound of wind (IR8) -Sound of sea waves (IR8, IR4) -Sound of rain (IR8)	N/A	-Soft voice (BR9, IR4, PT8, PT9)
Soft/light scent	-Sound of sea (BR8) -Sound of rain (BR8)	-Calm music (PT1) -Soft music (BR1) -Pop music (BR3)	-Soft voice (BR7, PT5)
Intense/strong scent	N/A	-Intense music (PT1) -Rock music (BR8) -Romantic music (BR7)	-Male voice (PT1) -Mature voice (BR3) -Mature male voice (BR3)
Fresh scent	-Sound of sea (BR7) -Sound of rain (BR7)	N/A	-Young voice (BR3) -Soft voice (BR7)
Floral scent	-Sound of breeze (BR4)	-Soft music (BR5) -Folk music (IR5)	-Soft voice (BR4)
Fruity scent	-Sounds of nature in general (BR4, BR6, BR9)	-Pop music (IR7)	-Soft voice (BR4, BR7)
Woody scent	N/A	-Romantic music (BR4) -Blues music (IR5) -Intimate music (PT4)	-Mature male voice (BR3)
Oriental scent	N/A	-Rock music (IR4) -Intimate music (PT4) -Heavy metal music (IR7)	-Intense voice (PT6)

individuals' definitions might vary. In the present study, the participants were asked to state their assessments while no real scent, sound, voice, or music was present at the time of the interviews; thus, a future study could obtain the self-assessments in the presence of some cues, that is, giving the participants the opportunity to smell a certain type of perfume, while concurrently playing a piece of music or a voiceover, describing a specific perfume. This would perhaps mitigate the level of bias mentioned above.

Also, implementing neuroimaging might reveal more reliable facts regarding all the associations mentioned above. We recommend exploring consumers' personality traits in the associations between consumers' choice of perfumes, scent types, and their preferred type of music. Furthermore, we suggest recruiting professional musicians or voice actors and asking them to play a piece of music or talk about a product's characteristics according to the type of ambient odor they are provided with and then comparing their genres, instrument selection, and characteristics of their voice.

Interviewees such as IR7 were able to talk professionally about top, middle, and base notes, which was rarely seen among the other subjects. So, another suggestion would be to recruit more professional users in order to discover more details about notes. It could be hypothesized that a professional musician could even change the pitch, intensity, and other characteristics of

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the music according the top, middle, and base notes, as a scent's notes change with the passage of time. People from countries which are known to be major manufacturers in the perfume industry should be scrutinized in order to understand if they can reveal different results from those of this research.

Finally, we also suggest that future research further explores the consumption behavior of e-shoppers that only buy perfume that they already know online. This particular topic lay beyond the scope of this study, but we do stress that participants from this segment were also able to make general associations between sounds and perfume scent. Recognizing that scent cues may be essential tools to communicate a new perfume, we expect studies using this segment of consumers to provide valuable contributions for both academics and practitioners.

References

Ackerman, D. (1990). *A natural history of the senses*. New York, NY: Random House.

Belkin, K., Martin, R., Kemp, S. E., & Gilbert, A. N. (1997). Auditory pitch as a perceptual analogue to odor quality. *Psychological Science*, *8*(4), 340-342.

Calvert, G. A., Spence, C., & Stein, B. E. (Eds.). (2004). *The handbook of multisensory processes*. Cambridge, MA: MIT Press.

Chiang, K.-P., & Dholokia, R. R. (2003). Factors driving consumer intention to shop online: An empirical investigation. *Journal of Consumer Psychology*, *13*(1-2), 177-183.

Chinn, P. L., & Kramer, M. K. (1999). *Theory and nursing: A systematic approach*. St Louis: Mosby Year Book.

Choi, S. Y., Choi, B., & Lee, H. (2006). Categorizing commercial products for customer oriented online retailing. *Computers & Industrial Engineering*, *51*(1), 90-101.

Claudia, I. (2012). Perceived risk when buying online: Evidence from a semi-structured interview. *Economics Series*, *22*(2), 63-73.

Cohen, L., Rothschild, G., & Mizrahi, A. (2011). Multisensory integration of natural odors and sounds in the auditory cortex. *Neuron*, *72*(2), 357-369.

Cole, F. L. (1988). Content analysis: Process and application. *Clinical Nurse Specialist*, *2*(1), 53-57.

Cooke, E., & Myin, E. (2011). Is trilled smell possible? How the structure of olfaction determines the phenomenology of smell. *Journal of Consciousness Studies*, *18*(11-12), 59–95.

Crisinel, A.-S., & Spence, C. (2010). A sweet sound? Food names reveal implicit associations between taste and pitch. *Perception*, *39*(3), 417–425.

Crisinel, A.-S., & Spence, C. (2012). A fruity note: Crossmodal associations between odors and musical notes. *Chemical Senses*, *37*(2), 151–158.

Crisinel, A.-S., Jacquier, C., Deroy, O., & Spence, C. (2013). Composing with cross-modal correspondences: Music and odors in concert. *Chemosensory Perception*, *6*(1), 42–52.

Deroy, O., Crisinel, A.-S., & Spence, C. (2013). Crossmodal correspondences between odors and contingent features: Odors, musical notes, and geometrical shapes. *Psychonomic Bulletin & Review*, *20*(5), 878–896.

Gelinas-Chebat, C., & Chebat, J.-C. (1992). Effects of two voice characteristics on the attitudes toward advertising messages. *Journal of Social Psychology*, *132*(4), 447-459.

Janssens, W., & De Pelsmacker, P. (2009). Smells like me: Personality and perfume choice. *International Journal of Market Research*, *51*(4), 1-13.

Kacen, J. J., Hess, J. D., & Chiang, D. (2013). Bricks or clicks? Consumer attitudes toward traditional stores and online Stores. *Global Economics and Management Review*, *18*(1), 12-21.

Klein, L. R. (1998). Evaluating the potential of interactive media through a new lens: Search versus experience goods. *Journal of Business Research*, *41*(3), 195-203.

Korgaonkar, P., Silverblatt, R., & Girard, T. (2006). Online retailing, product classifications, and consumer preferences. *Internet Research*, *16*(3), 267-288.

Levin, A., Levin, I., & Heath, C. (2003). Product category dependent consumer preferences for online and offline shopping features and their influence on multi-channel retail alliances. *Journal of Electronic Commerce Research*, *4*(3), 85-93.

Levitan, C. A., Charney, S. A., Schloss, K. B., & Palmer, S. E. (2015). The smell of jazz: Crossmodal correspondences between music, odor, and emotion. Annual Conference of the Cognitive Science Society, Pasadena, CA, USA, 37. Retrieved from https://cogsci.mindmodeling.org/2015/papers/0233/paper0233.pdf

Lian, J.-W., & Yen, D. C. (2013). To buy or not to buy experience goods online: Perspective of innovation adoption barriers. *Computers in Human Behavior*, *29*(3), 665- 672.

Marks, L. E. (1978). *The Unity of the Senses*. New York, NY: Academic Press.

Mayring, P. (2000). Qualitative content analysis. *Forum: Qualitative social Research, 1*(2), Art. 20. Retrieved from http://nbn-resolving.de/urn:nbn:de:0114-fqs0002204

Millot, J.-L., & Brand, G. (2001). Effects of pleasant and unpleasant ambient odors on human voice pitch. *Neuroscience Letters*, *297*(1), 61-63.

Nehmé, L., Barbar, R., Maric, Y., & Jacquot, M. (2016). Influence of odor function and color symbolism in odor-color associations: A French - Lebanese - Taiwanese cross-cultural study. *Food Quality and Preference*, 49, 33- 41.

Neuendorf, K. A. (2002). *The content analysis guidebook*. Thousand Oaks, CA: Sage.

O'Mahony, M. (1978). Smell illusions and suggestion: Reports of smells contingent on tones played on television and radio. *Chemical Senses and Flavour*, *3*(2), 183-189.

Pan, M. C., Kuo, C. Y., Pan, C. T., & Tu, W. (2013). Antecedent of purchase intention: Online seller reputation, product category and surcharge. *Internet Research*, *23*(4), 507-522.

Peterson, R. A., Balasubramanian, S., & Bronnenberg, B. J. (1997). Exploring the implications of the Internet for consumer marketing. *Journal of the Academy of Marketing Science*, *25*(4), 329-346.

Phau, I., & Poon, S. M. (2000). Factors influencing the types of products and services purchased over the Internet. *Internet Research: Electronic Networking Applications and Policy*, *10*(2), 102-113.

Piesse, G. W. (1867). *The art of perfumery and the methods of obtaining odors of plants*. Philadelphia: Lindsay and Blackiston.

Schifferstein, H. N., & Howell, B. F. (2015). Using color–odor correspondences for fragrance packaging design. *Food Quality and Preference*, *46*, 17-25.

Seo, H.-S., & Hummel, T. (2011). Auditory–olfactory integration: Congruent or pleasant sounds amplify odor pleasantness. *Chemical Senses*, *36*(3), 301–309.

Seo, H.-S., Lohse, F., Luckett, C. R., & Hummel, T. (2014). Congruent sound can modulate odor pleasantness. *Chemical Senses*, *39*(3), 215–228.

Shams, L., & Seitz, A. R. (2008). Benefits of multisensory learning. *Trends in Cognitive Sciences*, *12*(11), 411- 417.

Spector, F., & Maurer, D. (2012). Making sense of scents: The colour and texture of odours. *Seeing and Perceiving*, *25*(6), 655-677.

Spence, C. (2011). Crossmodal correspondences: A tutorial review. *Attention, Perception, & Psychophysics*, *73*(4), 971-995.

Stein, B. E. (2012). *The new handbook of multisensory processing*. Cambridge, MA: MIT Press.

Stevenson, R. J., Rich, A., & Russell, A. (2012). The nature and origin of cross-modal associations to odours. *Perception*, *41*, 606 – 619.

Velasco, C., Balboa, D., Marmolejo-Ramos, F., & Spence, C. (2014). Crossmodal effect of music and odor pleasantness on olfactory quality perception. *Frontiers in Psychology*, *5*, 1352. doi:10.3389/fpsyg.2014.01352

Verhagen, T., & Bloemers, D. (2018). Exploring the cognitive and affective bases of online purchase intentions: A hierarchical test across product types. *Electronic Commerce Research*, *18*, 537–561.

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Weathers, D., Sharma, S., & Wood, S. L. (2007). Effects of online communication practices on consumer perceptions of performance uncertainty for search and experience goods. *Journal of Retailing*, *83*(4), 393-401.

Wesson, D. W., & Wilson, D. A. (2010). Smelling sounds: Olfactory–auditory sensory convergence in the olfactory tubercle. *Journal of Neuroscience*, *30*(8), 3013-3021.

Whipple, T. W., & McManamon, M. K. (2002). Implications of using male and female voices in commercials: An exploratory study. *Journal of Advertising*, *31*(2), 79-91.

Zhang, T., Ge, L., Gou, Q., & Chen, L. (2018). Consumer showrooming: The sunk cost effect and online-offline competition. *Journal of Electronic Commerce Research*, *19*(1), 55-74.

Zhou, G., Lane, G., Noto, T., Arabkheradmand, G., Gottfried, J. A., Schuele, S. U., . . . Zelano, C. (2019). Human olfactory-auditory integration requires phase synchrony between sensory cortices. *Nature Communications*, *10*, 1-12. doi:10.1038/s41467-019-09091-3

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2. Development of hypotheses or research questions (empirical studies)				
3. Development of theoretical propositions (theoretical work)				
4. Theoretical foundation/ literature review	√			
5. Definition of methodological procedures	√	√	√	√
6. Data collection	√		√	√
7. Statistical analysis				
8. Analysis and interpretation of data		√		
9. Critical revision of the manuscript	√	√		√
10. Manuscript writing	√	√		
11. Other				

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