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Do Scents Evoke the Same Feelings Across Cultures?

Exploring the Role of Emotions

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Introduction

Scent has been a part of human civilization since the beginning of time. Throughout history, the possession of scent, in the forms of perfumes and incense, had been the mark of distinction, wealth, and affluence. Among the royal gifts in Ancient Egypt were incense and perfumes, the wealthy Romans were famous for perfumed bathwater, the Chinese had their scented joss sticks and red paper, while the Indians prized their sandalwood incense and jasmine flowers. In the religious circles, scented oils of varying origins are used during rites and for anointing the faithful. As time passed, the methods of dispensing scents have also been refined, and scents of every possible combination have been captured, bottled, and used at various occasions by different cultures.

Culture and Perception

Culture influences individuals in many ways, shaping thoughts, values, and even behaviors, often without conscious realization. The importance and uniqueness of culture, which varies from society to society, is captured in its definition as described by the United Nations Educational, Scientific, and Cultural Organization (UNESCO, 2002): “the set of distinctive spiritual, material, intellectual, and emotional features of society or a social group, and that it encompasses, in addition to art and literature, lifestyles, ways of living together, value systems, traditions and beliefs.”

According to Hall's (1976) culture-context theory, people in different cultures communicate differently, and as a result, see the world differently. For instance, people from the United States are detailed oriented, meaning they need detailed background information when they interact with others, and they look for explicit messages because they value logic and directness (Hall & Hall, 1990). Among Asians, on the other hand, information is transmitted either in the physical context or through implicit means of which very little is imparted explicitly in the message (Hall, 1976). Hall further argues that the whole communication process was affected by the nature of "context," which helped explain the difference in meanings and perceptions from culture to culture.

Cultures not only function as a set of norms and a way of life but also help us make sense of everything that our five senses can recognize—through sight, touch, hear, taste, and smell—by giving meaning to them. In visual communication, for example, culture is an important determinant of how people comprehend and decipher messages. Several past studies have demonstrated that to understand a visual message in an advertisement, the audience must first deconstruct the signs and symbols embedded in the message based on their cultural knowledge (Barthes, 1972; Hall, 1976; Fiske, 1989; Frith & Tsao, 1998). For instance, Hedberg and Brown (2002) showed that in a classroom setting with students from different cultures, educators needed to develop Web site interfaces that matched with the students' cultures in order to maximize their learning process.

Smell, however, is unique because olfactory responses are generally automatic, meaning that it influences humans physiologically before actually influencing cognition. In general, little, if any, cognitive effort is required to experience scents (Ehrlichman & Bastone, 1992), and scents result in emotionally laden memory associations when recalled. Although research in olfaction has emerged extensively in areas like services and retailing (e.g., Chebat & Michon, 2003), few researchers have looked at how cultures shape perceptions through scents. We therefore address this gap in this chapter by exploring how people from different cultures associate scents with emotions and meanings.

Literature Review

The Emotional Role of Olfaction

Humans are exposed to many kinds of scents every day from which individual human responses are formed. Consumers prefer certain perfumes,

room fragrances for the home, or choose to patronize certain service outlets because of the preferred ambient scent. Many of our olfactory preferences are based purely on emotional associations (Fox, 2008). Meaning, how humans feel about a particular scent, depends on how they relate the scent with certain emotions. This primarily has to do with the scent linkages within the limbic system of the brain. When coming into contact with smells, these scents act as inducing agents that stimulate these connections. The limbic system has a role in processing and expressing emotions. Of all the five senses, scent is most closely linked to emotion rather than “facts” (Herz & Cupchik, 1992).

Scents have personal meaning and a very high propensity to be associated with events, surroundings, experiences, objects, and even people (Kirk-Smith & Booth, 1987). Pleasant scents are associated with those that are able to elicit some positive emotions, such as being happy or feeling loved, while unpleasant scents are those which evoke negative emotions, such as being sad or feeling lonely, and this association serves as a requirement for an odor to attract us or warn us (Hummel & Nordin, 2005). Humans are partial to the smell of good food because it provides the cue that the food is delicious. People can receive a feeling of satisfaction just by smelling, and some fragrances are even effective in reducing stress and creating positive moods for those who smell it (Ehrlichman & Bastone, 1992; Parasuraman, 1984; Warrenburg, 2005). On the other hand, we tend to avoid garbage smell because of its negative associations. The stronger the emotional experience when smelling a scent, the greater the potential for the scent in eliciting associations with things (Herz, 1997).

Culture and Scents

Culture also influences our perceptions of scents. Researchers have found that babies learn about smells early but are indifferent to scents until they are about 8 years old. For example, infants like the smell of feces and are equally indifferent to what adults consider to be positive or negative scents (Herz, 2007). There is much evidence for what has been termed odor-associative learning whereby how one feels when first encountering the scent determines one's perception of the scent. Hence, it is the cultural differences in experiences that establish how a particular individual responds to an array of olfactory stimuli.

In many cultures scents are clearly defined as having certain qualities, be they desirable or undesirable. This influences the aesthetic experiences

related to the scent. For example, the Dassantch of Ethiopia find the odor of cattle (which connotes fertility and social status) attractive and hence wash their hands with cow urine and smear their bodies with manure (Classen, Howes, & Synnott, 1997). For the Chinese, certain scents have corresponding meanings in a comprehensive system of interrelated sensory codes. For example, the burnt smell is related to the element fire, as well as the bitter taste, the color red, and so on. Other cultures, such as the Suyu Indians of Brazil and the Serer Ndut of Senegal even have their own scent classifications that enable them to distinguish different scents and give meaning to each of them. For example, in Suyu Indians' culture, a bland smell was associated with adult men, small mammals, and birds, while a strong smell was associated with adult women, children, and carnivorous mammals and birds (Seeger, 1981). The Serer Ndut perceived ducks, camels, and pigs as rotten, while donkeys as acidic (Dupire, 1987).

Research Question: Cross-Cultural Responses to Contexts in Sensory Perception

Interestingly, there are certainly many areas whereby various cultures have overlapped the meanings they imbue to certain scents. The concept and the use of scent can be viewed as both universally similar or indigenous and dissimilar. For example, the smell of Mom's home-cooked meal is usually universally viewed as being inviting. However, when it comes to a more specific detail of the meal itself, individual associations of the scent come into play and differ from culture to culture. For example, the smell of salted fish may represent a delicious home-cooked meal for some, while for others it can be unappetizing, depending on associations in that particular culture. This reiterates how emotions influence the meaning given to scents, as the strength of scent associations is related with the emotional experience (Herz, 1997). Furthermore, if scent is indeed influenced by emotional experience, different emotive contexts may therefore elicit different responses.

Would the emotiveness of context influence how culture shapes scent associations? That is, when scent associations are formed within a cultural context, whether those experiences were in the context of strong emotion may create differences in how scent associations occur. We sought to explore scent-attribute association among different cultures and to examine the universality of scent preferences in different contexts. With this study, we attempted to answer this specific research question: Does the emotiveness of contexts play a role in the cultural association of scents?

Method

We conducted eight focus groups, involving 8 to 10 respondents from eight different cultural backgrounds, which were grouped into four sub-groups (Indian subcontinent, Chinese, European, and American). These four groupings were combined to form two main groups of Easterners and Westerners, respectively. The participants were evenly split between males and females and age grouped between 20 to 43 years old, with at least a high school education.

During the focus group discussion, we asked participants to think of situations in two types of experiences: one lower emotive and the other high emotive. For the low-emotive context, we asked two questions that we considered were set in neutral situations that did not evoke a high level of emotions and had commonality across cultures. We felt that a “clean place” was something everyone would have experienced but would be low in emotional intensity. Hence our first set of questions revolved around what was considered a clean or an unclean place. For high-emotive context, we considered situations such as something that was emotive in nature and commonly experienced across cultures. We felt that a joyful celebration was something everyone would have experienced but would be higher in emotional intensity. Hence our second set of questions revolved around what was considered a happy or sad occasion.

Results

In analyzing the results, we were interested in scent associations and the recall of experiences that were related to the scent. Findings will be explained comprehensively in each context and then summarized in [Table 8.1](#).

Low-Emotive Context

What smells would you associate with a clean place?

All groups had a few participants who named citrus scents such as lime being associated with a clean place/house. These participants noted smells like “lime, lemon, grapefruit, orange” as denoting cleanliness. Some of these scents were further associated with brands. A female German participant commented “I know a place is clean when it has the freshly

TABLE 8.1 Cultural Associations of Scents in Low and High Emotive Contexts

Context	Germans/U.K./French	U.S.	Pakistanis and Indians	Chinese Singaporeans, Chinese, Chinese Malaysians
Low emotive: Clean Place	lemon, mint, VIM, freshly washed clean sheets, mountain smell, Alps, ventilated, freshly cooked food, GLADE	pine, chlorides, detergents like TIDE and CHEER, fresh air, lemon, strawberry, orange, grape fruit, mountain breeze, ocean breeze	Citrus, airy, meadows and mountains, lemon and lime; orange; sunny smell, VIM, TIDE detergent, paint, flowers	lemon, lime, lavender, floral, DETTOL, TIDE, sunned, citrus; mint, lime, woody, running water, Alpine mountains, air freshener, fresh paint, fresh paint, detergent, KIWI, GOOD MAID, air fresheners
Low emotive: Not Clean Place	garbage, old food, musty, stale air, dirty clothes	garbage, spoiled food, sewage, stuffy, stale	garbage, stale, spoilt food	garbage, salted fish, smoke, sour, burnt, still, dust, rotten food, stuffy
High emotive: Happy/Celebratory	Christmas smell, forest, candles, beer, wine, cookies, Christmas food, warm, homely, fireplace, sausages	pie, ham, Christmas tree, pine, cake, candles, turkey, chocolate, eggnog, snow, champagne	curry, spices, sweet smell, cake, herbs, oil lamps, incense, whisky	fresh notes, Chinese cookies, barbecue pork, coconut oil, cake, fried chicken, oranges, money smell, liquor, carbonated drinks, fireworks, herbs
High emotive: Sad/Funereal	church smell, flowers, stones	flowers, candle, earth	burning, Bhopal leaves, incense	joss stick, floral, ash, incense, burnt paper, porridge

Note: n = 76, 19, 18, 19, and 20.

scrubbed lemon detergent smell, like Lemon Vim.” In another group, a male Chinese Malaysian commented that it was the “lemon soap smell at my mother’s sink” that he associated with cleanliness.

Again for every group, there was a strong cleanliness association with “nature smells,” such as what an Indian male described as the “airy smell” and an American male described as “fresh air.” The Europeans appeared to share a similar association with air/wind, as a British female talked about “clean rooms are well ventilated, or have windows where you can feel (and smell) the breeze.” In particular, participants appeared to conceptualize mountains like the Alps, what a Chinese Malaysian male described as “the smell of the mountains in *Sound of Music*,” and an Indian female described as “beautiful grassy meadows and high mountains.” The concept of nature extended further for participants like a female Chinese Singaporean who said “When you are in a clean place, you can smell natural things like wood and fresh running streams.” Among Europeans and American participants, this concept of air, altitude, and nature was also clearly visualized as they relate cleanliness to “mountain breeze and ocean breeze.”

A number of participants in each group also had associations with synthetic scents. For example, an American male and a few Chinese Singaporeans and Chinese participants offered “detergents,” while another American male associated “chlorides” as being associated with clean. A Malaysian participant mentioned “fresh paint smell” in this regard. Participants from all groups also recounted the scent brands that offered cleaning products as Kiwi and Vim.

In particular, Chinese Malaysian and Chinese Singaporean participants put the smell of Dettol (an antiseptic typically used in high dosage in hospitals) as being an ultimate reflector of cleanliness. As one Chinese Singaporean female commented, “You know it is a clean place when you can smell Dettol.” Similarly, there appeared to be universal agreement that the smell of laundry detergent brands (such as Tide and Cheer) and household cleaning agents (such as Vim) stood for cleanliness. The final set of clean product associations relates to air fresheners. Again all groups had participants who presented the smell of air fresheners in a variety of scent types as connoting a clean place.

What smells would you associate with an unclean place?

When participants were asked about the lack of cleanliness, there were a large number of participants who mentioned “Garbage!” in unison. The concept of smells emitting from undesirable items of discard was foremost in the minds of participants from every group. A Pakistani female

likened “rubbish bins and anything that is thrown away in the rubbish” as being unclean. There was also a unison agreement pertaining to smells from spoiled foods. A Chinese Singaporean felt that “salted fish and other old food stuff” smells did not seem clean, while an American male recalled that “sometimes I forget to put my leftovers in the fridge and the rotten food stinks up my whole kitchen the next day!” In addition, it was the antithesis smells to what was earlier discussed as cleanliness that appeared to contribute to unclean association, namely staleness of air, stuffy rooms, and lack of air movement. Like most, a Dutch participant felt that something that smells like “musty mildewy room” must lack cleanliness.

High-Emotive Context

What smells would you associate with a happy celebration?

When participants were asked about smells associated with celebrations, food appeared to be a primary factor in the scent considerations. However, the food smells evoked were highly culture specific. In the European group, a female German participant thought about “Sausages and beer smells,” while a British male remembered “Christmassy foods and the smells of candles and fireplace.” The American group also had a number of participants who associated Christmas smells like pies and Christmas trees, but many Americans also recalled Thanksgiving smells, “To me, a celebration is when I smell the turkey in the oven!”

In the Chinese group “barbeque pork” (also known in variants like char siew and bak qwa) ranked high on smells associated with celebrations, while Indian/Pakistanis associated “the smells of sweets and spices and curry.” Liquor smells also appeared to figure strongly in evoking the celebratory mood; these range from mentions of beer (Europeans) to champagne (Americans) to hard liquor smells (Asia).

In terms of the nonfood items, for every group, there was a strong festive association with occasion-specific scents like “oil-lamp smell at Deepavali” that an Indian male described. Similarly, the Chinese had occasion-related smells, what many Chinese Malaysians and Chinese Singaporeans called the “joyous smell of money” or “new notes,” referring to “ang-pows” or notes stuffed in red packets that are exchanged at almost every celebration and the Chinese New Year. Some Europeans appeared to have a similar type of association with snow and mistletoe, as a British female talked about “The smell of fresh cut mistletoes makes me think of Christmas parties.”

What smells would you associate with a very sad place or occasion?

When this question was asked, most of the participants were reminded of funerals and such occasions of farewell. For the Indian participants, burning smells were foremost in their mental imagery of a sad occasion. An Indian female likened “the smell of burning wood and burning cloth and burning flesh” to be the most painful and sad smell she could remember. In this regard, many of the associations were related to funerals, and once that smell was experienced in this highly emotionally charged context, it seemed that the participants remembered it vividly. A Chinese Singaporean female remembered that “My grandmother’s funeral, her body lay in my house for the wake for three days, and the smell of the flowers from the wreaths was strong. ... I don’t know how to describe it but when I smell that in a market or anywhere, I start tearing.” For the Asians, there was a general consensus of the smells of burning, certain types of flowers and culture-specific items like joss stick and Bhopal leaves as smells associated with sadness.

For both Europeans and Americans, the smell experiences lie more in church and cemetery environments. Churches were related to “church smell” that evoked sad feelings. An American male recalled that “I said goodbye to my friend at a soggy cemetery which smelled of the earth and rain, and when it rains and I smell the earth I feel sad.” Many participants agreed that if one attended a funeral of someone close in that church, the smells experienced on that sad occasion remained a haunting reminder.

Discussion

Our objective was to explore how higher or lower contexts of emotion relate with scent perceptions across cultures. The focus group discussions yielded some interesting findings of how strong scent associations prevail in different cultures. First, in line with past studies on olfaction, we found that scents evoke a host of past experiences, regardless of the cultures. There appeared to be greater descriptions from all participants with “positive” or “happy” contexts and lesser types of scents being evoked for the negative situations.

Second, our focus group responses showed that for low emotive context, scent linkages tend to be rather universal. When asked about scent associations to a clean room, three similar items emerged: (a) citrus smells, (b) detergent/synthetic air fresheners, and (c) mountain/nature scents. Almost all groups connected the scent of a clean room with smells

of nature, specifically lemon and lime, and synthetic smell from various brands of cleaning products, antiseptics, or synthetic air freshener scents. What was also striking was that almost all groups talked about nature smells, like the smell of the Alps, the mountains, the rivers, even if they had not themselves experienced smelling those in real life.

In Kaiser's (2006) examination of the world geography in relation to scents, most were classified as tropical, savanna, or desert, and only a very small percentage of habitats were really considered "high mountain area" and few habitats in the world would thus be exposed to such smells. The fact that the city dwellers from Calcutta, Singapore, Kuala Lumpur, and Bangkok mentioned this universal ideal of the clean room implies that perhaps advertising and media images have successfully influenced scent associations internationally. When queried, we found that none of the participants from Asia had visited the Alps or lived in a mountainous place. Few had been to any mountain above 1,000 feet. This seems to imply that the concepts of citrus scents or Alpine mountains being associated with cleanliness were gained from exposures to mass media rather than cultural experiences, which typically use these themes to market their household products.

For the unclean house, garbage was mentioned unanimously in all groups. Although many types of negative scents exist in different cultures (for example, the smell of pork, which is disliked by Muslims; the smell of tobacco, disliked by Singaporeans; the smell of rancid cheese, disliked by the Chinese; the smell of durian, a spiky fruit native to Southeast Asia that has a distinctive and very strong odor, which is disliked by Westerners), the universal commonality of "garbage" or "rubbish" smells appears to be evoked rather than these culture-specific smells. The finding again seems to suggest that in low emotive context, people need not depend much on their cultural knowledge to give meaning to the pleasant or unpleasant scents, but rather through common meaning associated with the context. Perhaps participants tend to agree with these universal associations of certain scents, or with what is being communicated in the media, because of the less involved nature of the context.

On the other hand, our findings clearly showed that highly culture-specific scent associations are evoked in high emotive contexts, emphasizing the importance of cultures in making sense of these scents. Our participants were clearly brought back to the joyous or the sad experiences they themselves experienced in the past together with friends and family. Scents that are associated with happy occasions came mostly from memories of culturally bound celebrations, such as Christmas and Chinese New

Year. This is in agreement with Roubin's (2006) argument that fragrances can take on the role of messenger to herald a festive time and communicate the festiveness of the season. On the other hand, unhappy occasions are associated with different rituals in funerals (i.e., flowers for Westerners, joss stick and Bhopal leaves for Easterners), and these smells were strongly evoked for our participants. Several studies have recognized that people from different cultures do associate the smell of a sad occasion with funerals. For example, the Kuswar of Nepal believe that certain fragrant plants can open up communication between the villagers and the world of the deceased and the divinities (Roubin, 2006). Because the smell of these fragrant plants is ubiquitous during the funeral rites, unpleasant feelings are evoked for the Kuswarese whenever the smell is present. The same cultural associative explanation goes for the smell of porridge, which is typically served at the Chinese funeral wakes. The smell of burnt paper may not be meaningful to Westerners, but to Easterners, especially Chinese, the smell can evoke a sad feeling when it is reminiscent of (a) the Hungry Ghost Festival, where souls are believed to revisit the earth and (b) All Souls Day, when the Chinese visit their ancestral grave sites. For the Indians, the burning smells connote the sadness of funeral pyres. These are all highly culture specific.

To conclude, our findings suggest that culture does play an important role in shaping scent perception, especially in highly emotive contexts. In the high-emotive contexts, people do associate their past experiences strongly with the scents involved in them. In the low-emotive contexts, the meanings of the scent are more universal and appear to be adopted not just from experiences but from what has been communicated in the mass media. We note that there is much to be explored in examining culture and scent. Future research can examine when and how the acculturation process actually takes place. According to Hirsch (2006), scent preferences shift from generation to generation even within the same culture. For example, people born in the 1920s felt that the smell of flowers, grass, and roses could evoke the feelings of nostalgia, while those born in 1960s named baby powder, mother's perfume, and window cleaner as evoking similar emotions. However, there is a lack of longitudinal data that examine this phenomenon across cultures. Second, it will be useful to examine whether scent associations are additive as people get exposed to other cultural experiences, or if early emotive linkages remain most dominant throughout one's life. Third, research can examine how marketers can create scent attribute associations for their brands or products much like house cleaning products have done for mountain smells.

Finally, there is scope for research to examine how overall the cultural lens can shape mental approaches to scents. Cognitive psychologists have argued that Asians tend to view the world through wide-angle lens, or pay more attention to the environment, and to be more holistic by understating the context of the problem, whereas Westerners have tunnel vision and tend to focus on solving specific problems (Nisbett, 2003). Would differences in the two cultures result in differences in the way they perceive scents, such as Easterners paying attention to “holistic” scents and Westerners paying more attention to “individual” scents? More interesting avenues lie ahead to study smell cultural universes, smell consumption classifications, and smell-sensory associations within cultures.

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9

The Impact of Scent and Music on Consumer Perceptions of Time Duration

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What impact do ambient scent and background music have on shoppers' perceptions of how much time has elapsed or how much distance was traveled during a shopping episode? Retail managers are interested in the effects of store atmospherics on such perceptions because they can be an important determinant of customer satisfaction levels.

If a particular customer activity is a pleasant one, for example, if enjoyment is derived from the act of shopping (Guiry, Magi, & Lutz, 2006), a retailer may want to increase shoppers' duration perceptions in order to enhance satisfaction levels. Alternatively, if a customer activity is an unpleasant one, such as having to wait in line for service, a retailer may instead want to decrease shoppers' perceived durations to avoid causing dissatisfaction (Katz, Larson, & Larson, 1991). Thus, a clearer understanding of how specific store atmospherics influence perceived time durations is of critical importance to retailers.

Store atmospherics refer to the various background elements found in retail settings, such as lighting, scent, music, color, and crowding, all of which can influence shopper perceptions and behaviors (Baker & Cameron, 1996; Donovan & Rossiter, 1982; Kotler, 1973; Turley & Milliman, 2000). Theoretical frameworks for understanding the effects of store atmospherics are usually based on formulations of Mehrabian and Russell's (1974) approach/avoidance model of environmental psychology. This model suggests that affective reactions such as mood or arousal, which are created by store atmospherics, result in either approach or avoidance behaviors on the part of consumers. Approach behaviors include lingering longer and exploring items in the environment, whereas avoidance behaviors include attempts to exit the environment more rapidly.

In the current research, we are interested in how the atmospheric elements of ambient scent and background music influence consumers' perceptions of time duration and distance traveled in a retail setting. There are several streams of research that help to explain the effects of environmental variables on duration and distance perceptions. The two areas most relevant to the current research are a chronobiological approach known as the internal clock model (e.g., Treisman, 1963), and a memory-based approach known as the storage-size model (e.g., Ornstein, 1969). We discuss these streams of research in more detail below and build our hypotheses for the expected effects of scent and music on duration perceptions.

Music and the Internal Clock Model

Kellaris and Kent (1992) examined the effect of music on consumers' perceptions of the duration of a time period. They found that perceived duration was longest (shortest) for those exposed to positively (negatively) valenced music. Thus, in the presence of more liked music, perceived time durations increased. These researchers employed a retrospective approach to duration estimates, that is, one in which the participants were not told ahead of time that they would be asked to estimate how much time passed during the task, as in the present research. Based on these results, the authors concluded that time does not necessarily fly when having fun. Similarly, Hui, Dubè, and Chebat (1997) found that positively valenced music triggers both a positive emotional response as well as longer perceived wait durations. These results are in accord with chronobiological models of perceived duration, such as the internal clock model.

The internal clock model of perceived duration (Treisman, 1963) suggests that feelings of stress, anxiety, or physiological arousal can speed up the "ticking" of an individual's internal clock and thus make more time seem to pass during a given interval. Thus, colors that induce feelings of relaxation would be expected to slow down the internal clock and reduce perceived time durations (Gorn, Chattopadhyay, Sengupta, & Tripathi, 2004). This is indeed what Gorn et al. (2004) found when they manipulated background colors of Web sites (e.g., blue vs. yellow or red) during downloads.

In the present experimental context, we expect that pleasant background music will increase consumers' affective response to the environment. Considerable evidence exists to suggest that background music can positively impact consumers' moods and physiological arousal levels as well as their overall affective response to the environment (Bruner, 1990).

If background music does indeed impact consumers' affective responses in this way, it could serve to speed up their internal clocks and make it seem as if more time has passed. Such a result would be in accord with the results obtained by Kellaris and Kent (1992), as well as with the internal clock model of perceived duration. The foregoing leads us to expect that the presence of pleasant background music will increase consumers' affective responses as well as their perceptions of perceived time duration:

H1: Background music will increase perceptions of time duration and distance traveled.

H2: Background music will enhance consumers' environmental affective response.

Scent and the Storage-Size Model

One study that specifically measures the effects of ambient scent on perceived time durations is that of Spangenberg, Crowley, and Henderson (1996). These authors found that while the presence of pleasant ambient scents did not affect the actual time spent in a simulated shopping environment, it did reduce the perception of how much time had passed, from 11.0 minutes when no scent was present to 9.6 minutes when there was a scent present. Based on this prior research, we expect to observe a similar effect of ambient scent in the present research, namely, we expect scent to reduce perceptions of time duration. Furthermore, we explore whether such a result can be explained using an alternative model of duration estimation: the storage-size model.

Although prior research has found that pleasant music influences consumers' affective responses, as discussed above, research does not suggest the same is true of ambient scent (Chebat & Michon, 2003). Instead, ambient scents have been found to impact responses such as lingering (Knasko, 1995), attention (Morrin & Ratneshwar, 2000, 2003), variety seeking (Mitchell, Kahn, & Knasko, 1995), and memory (Herz, 2004). The evidence is considerably weaker regarding the effects of scent on mood, arousal, and other types of affective response. Thus, we might not expect scent to alter consumers' internal clocks. Chronobiological models of time duration may be less helpful in understanding the effects of scent on consumer response in this domain because of the limited evidence that it impacts consumers' moods and arousal levels. Instead, a more cognitively based model such as the storage-size model, which is based on memory processes, may be more appropriate.

The storage-size model (Ornstein, 1969) focuses on the amount of information that is stored and later recalled from an elapsed time period. When asked how long an episode lasted, individuals may try to recall information from memory related to the episode and use the amount of information retrieved as a cue for how long the episode lasted. Therefore, if more information is processed, stored, and later retrieved, longer duration estimates will result. If less information is processed, stored, and retrieved, shorter duration estimates will result. In accord with this line of thought, Mantel and Kellaris (2003) found that perceived durations of radio ads depended, in part, on the amount of information recalled. The limited evidence available regarding the effect of scent on perceived durations suggests that the presence of ambient scent tends to reduce such perceptions (Spangenberg et al., 1996). However, no process evidence has been offered to support the underlying drivers of such a result. Thus, we explore whether scent does indeed reduce duration and distance estimates. We also explore whether scent reduces the amount of cognitive processing engaged in by consumers, which could explain reduced duration and distance estimates, if they are observed. We thus hypothesize:

H3: Pleasant ambient scent will reduce perceptions of time duration and distance traveled.

H4: Pleasant ambient scent will reduce the depth of cognitive processing.

To summarize, we expect that background music will create an affective response in consumers such that consumers' internal clocks will be sped up, resulting in longer perceived time durations, in accord with the internal clock model of perceived duration. Ambient scent, on the other hand, may reduce consumers' cognitive processing efforts, resulting in shorter perceived time durations, in accord with the storage-size model of perceived duration.

A study designed to test these hypotheses is discussed next.

Method

Sample

One hundred sixty graduate students of a major business school volunteered to participate in the study in return for course credit. Ages ranged from 18 to 39 years (mean = 22.5), 46.5% were male.

Design

The study was a 2 (ambient scent, no ambient scent) \times 2 (background music, no background music) full factorial design. Participants were randomly assigned to one of four treatment groups. For those in the scented conditions, the scent of geranium was emitted into the room's atmosphere with an electric diffuser into which several drops of geranium essential oil had been placed. This scent has been pretested and successfully used in prior consumer research (Morris & Ratneshwar, 2000). The diffuser itself was hidden from view to minimize the salience of the scent manipulation. For those in the background music conditions, the music consisted of a piece of classical music (Mozart's Allegro for Horn Concerto No. 3 in E Flat Major), which was played on a music player, also hidden from view.

Procedure

Participants entered the laboratory and were informed that they would be viewing a videotaped "walk" through a shopping center. They were informed, "While you are watching this video, we would like you to imagine that you are actually walking around this shopping mall, experiencing your surroundings, as you normally would, while visiting a real shopping mall. When the video is finished, we are going to ask you some questions."

The participants were not informed that the experiment concerned perceptions of time duration or distance traveled, and thus the study consists of an examination of retrospective estimations of duration. After viewing the video, participants were first asked to provide duration estimates, described in more detail below, and then list their thoughts, completing the 7-item Fisher (1974) scale for environmental quality, the 5-item pleasure and 4-item arousal dimensions of the PAD (Pleasure Arousal Dominance) Emotion Scale (Mehrabian & Russell, 1974), as well as manipulation checks and demographic questions such as age and gender.

Measures

Two questions were used to assess perceived time duration. The first question asked was, "How long do you think you were 'walking around' in this mall? That is, how long were you watching this video? Please be as precise as possible, even if you are not certain." The open-ended answer

stated, "I estimate that I was walking around in this mall for _____ minutes and _____ seconds." This question was modeled on prior research (Kellaris, Mantel, & Altsech, 1996).

The second measure used to estimate duration was, "How much distance did you cover, while 'walking around' in this mall? Please estimate how many meters you walked while in this simulated mall experience." The open-ended answer stated, "I estimate that I walked _____ meters." We included this item as a measure of perceived pace, or "how rapidly the succession of events within a time interval seems to take place" (Kellaris et al., 1996). The sequence of events or changes within a time period may be perceived to take place at a more rapid pace than that at which they actually happen. Perceived pace will generally be positively correlated with perceived duration and either may be used as an inference for the other (Kellaris et al., 1996). Then participants were asked to "Recall all of the thoughts that were going through your head while the video was playing." After completing the closed-ended questions, participants were debriefed and thanked for their participation.

Results

A series of analyses of variance (ANOVAs) were conducted on the measures as a function of the two manipulated factors (scent and music) with covariates for age, gender, liking of the music, and liking of the scent included for control. Prior research suggests that both age (Yalch & Spangenberg, 1990) and gender (Kellaris & Mantel, 1994) can influence perceived duration.

Perceived Time Duration

On average, participants estimated that 504 seconds, or about 8.4 minutes, had elapsed while watching the video (range = 150 to 2,718 seconds, standard deviation = 386). The true video duration was 320 seconds, or about 5.3 minutes. Because the seconds' measure exhibited a long right-tailed distribution, we transformed this measure via the natural log function. We conducted an ANOVA on the natural log of perceived time elapsed as a function of the music and scent conditions, plus the covariates. The covariate for age ($F(1, 151) = 4.61, p < .05$) was significant, with older participants providing longer time estimates. The only other significant effect

was that of music ($F(1, 151) = 4.33, p < .05$). When there was no music present, participants estimated that 396 seconds, or about 6.6 minutes, had elapsed. When music was present, their time estimates increased to 475 seconds, or about 7.9 minutes, about a 20% increase in estimated duration. This result supports H1.

Perceived Distance Traveled

On average, participants estimated that they had traveled 502 meters while watching the video (range = 20 to 20,000 meters, standard deviation = 407). Again, because the meters measure exhibited a long right-tailed distribution, we transformed this measure with the natural log function. We conducted an ANOVA on the natural log of the estimated number of meters traveled in the mall as a function of scent, music, and the covariates.

The covariates of age ($F(1, 151) = 4.16, p < .05$) and liking of the scent ($F(1, 151) = 5.35, p < .05$) were significant. Older participants tended to provide longer distance estimates. Also, those who did not like the scent tended to provide longer distance estimates. Two main effects were also significant: both music ($F(1, 151) = 4.69, p < .05$) and scent ($F(1, 151) = 5.38, p < .05$). The presence of music increased the perception of distance traveled, from 300 (no music) to 413 (music) meters, in support of H1. The presence of scent, on the other hand, decreased the perception of meters traveled, from 418 (no scent) to 296 (scent) meters, in support of H3.

Affective Responses

Affective response to the environment was measured using Fisher's (1974) 7-item scale, which measures the degree to which the environment is perceived to be relaxing, comfortable, cheerful, colorful, stimulating, lively, and bright (coefficient alpha = .88). We conducted an ANOVA on affective response to the environment as a function of scent and music plus the covariates. Two of the covariates were significant: the degree to which the scent was liked ($F(1, 151) = 8.35, p < .01$) and the degree to which the music was liked ($F(1,151) = 9.32, p < .01$). Not surprisingly, the environmental quality of the mall was rated more positively if either the scent or music was liked. The only other effect that was significant was music condition ($F(1, 151) = 5.09, p < .05$). Affective response to the environment was greater when there was music present ($M = 4.10$) versus absent ($M = 3.64$).

This result supports H2. We also measured respondents' levels of happiness and arousal using dimensions of the PAD scale, but neither analysis was significant.

Cognitive Responses

Number of Words

We first simply counted the number of words written in the cognitive response section as an overall measure of amount of cognitive processing. We conducted an ANOVA on the number of words as a function of scent, music, and the covariates. The covariate of age was significant ($F(1, 151) = 17.49, p < .0001$), with older participants listing more words. Scent also had a significant effect ($F(1, 151) = 8.57, p < .005$), with the number of words falling from 30.5 to 24.4 when scent was present. This result supports H4. This effect is qualified, however, by a significant interaction between scent and music ($F(1, 151) = 15.55, p < .0001$). Inspection of the means shows that the presence of scent reduces the number of words (from 34.0 in the no scent/no music condition to 19.7 in the scent only condition), unless there is also music present ($M = 27.2$ music only condition, $M = 29.1$ in scent and music condition).

Number of Thoughts

We then conducted a more rigorous analysis of the thoughts listed. We relied on MacInnis and Jaworski's (1989) typology for categorizing cognitive responses to advertisements according to the attention and processing capacity allocated to the information, as determinants of the depth of information processing. Six levels of processing are involved:

1. feature analysis,
2. basic categorization,
3. meaning analysis,
4. information integration,
5. role-taking,
6. constructive processes.

In the MacInnis and Jaworski (1989) framework, level 1 typically occurs when motivation, ability, or opportunity to process is very low. In such a situation, attention will be focused primarily on feature analysis or encoding salient features of the environment. At a slightly higher level

of motivation, ability or opportunity to process, basic categorization will occur, such as that involving assigning a semantic label to an element of the environment. Meaning analysis involves interpreting salient cues to derive some basic understanding; information integration involves synthesizing meanings assigned to several stimuli; and constructive processes and role-taking involve relating the information to the self (MacInnis & Jaworski, 1989). The types of responses linked to these processing operations are then classified as message related (1, 2), execution related (3, 4), or context related (5, 6).

For the present research, which concerned processing of retail environments rather than of ads, we interpreted these categories from a linguistic point of view as follows. According to the respondent's written cognitive responses, the individual reached one of the six levels of information processing when he or she (a) recalled contextual elements, (b) evaluated contextual elements, (c) made explicit inferences, (c) made implicit inferences, (d) made statements of personalization or identification, and (d) exhibited imaginative constructs. Thus, levels 1 and 2 refer to context, levels 3 and 4 refer to content, and levels 5 and 6 refer to the actor. After categorizing the thoughts into one of the six categories, we summed across the first three categories and the second three categories to differentiate between lower order and higher order thoughts. We conducted an ANOVA on the number of lower order thoughts (categories 1 to 3) as a function of scent, music, and the covariates, but none of the effects were significant, except for age, which indicated that older participants listed more lower order thoughts.

Then we conducted an ANOVA on the number of higher order thoughts (categories 4 to 6) and found that the covariate of age was significant ($F(1, 151) = 4.76, p < .05$), with older participants listing more higher level thoughts. In addition, scent was significant ($F(1, 151) = 4.25, p < .04$). The presence of scent reduced the number of higher order thoughts listed by participants, from 1.74 (no scent) to 1.27 (scent). This result supports H4.

Discussion

In this study we find that music improves shoppers' affective response to the environment and increases their perceptions of both elapsed time as well as distance traveled in the mall. This result is in accord with the findings of Kellaris and Kent (1992) as well as with the affectively based internal clock model of duration estimation.

The presence of ambient scent, on the other hand, had an opposite effect on perceptions of distance traveled in the mall. When a scent was present, participants perceived that they had traveled a shorter distance. The presence of scent also reduced the level of cognitive processing, as evidenced by fewer words and fewer higher-level thoughts listed. The perceived distance results are consistent with the duration estimation results reported by Spangenberg et al. (1996). The results regarding the reduced processing efforts suggest the cognitively based storage-size model of duration estimation may be a more appropriate framework for understanding the effects of scent on perceived durations or distances traveled. It should be noted, however, that the presence of a pleasant ambient scent did not alter perceptions of time duration, only of distance traveled in the mall. Thus, the effects of scent on duration and distance perceptions as well as on the level of cognitive processing require further testing, as the evidence is more tentative in this regard.

Overall the results indicate that it cannot be concluded that simply adding pleasant atmospheric elements to a retail environment will necessarily result in shorter perceived time durations. That is, retailers should not simply assume that making their environments more pleasant will make shoppers perceive they have spent less time in the store or mall. Instead, the type of effect that a particular atmospheric element will have on consumers' perceptions of time duration or distance traveled may be a function of whether it elicits primarily affective or cognitive responses. When a pleasant atmospheric element elicits a positive affective response, such as positive environmental affect, physiological arousal, or pleasant mood, then it may tend to speed up the consumer's internal clock and make it seem as if more time has passed and more distance has been traveled. This may be a desirable effect in instances where the shopping activity is considered pleasant.

If, on the other hand, a pleasant atmospheric element elicits a cognitive type of response, such as shallower processing, then it may impact the amount of information that can be recalled about the elapsed time period and result in the perception that less time has passed. This would be a desirable effect in instances where the shopping activity is considered unpleasant, such as waiting for service. Future research is needed not only to document the effects of other types of atmospheric elements on perceived time durations (e.g., noise, crowding, lighting, humidity, etc.) but also on whether the element tends to have a greater impact on affective or cognitive responses of the consumer.

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