

# **Investigation of the Use of Scent in a Medical Service Environment**

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*This paper addresses whether or not the diffusion of scents will positively change evaluations of a service experience in a health service environment. Qualitative data was collected in a pediatric department and quantitative data in a dental office. Conditions of no scent, relaxing and stimulating scents were used. In the pediatric service, both a relaxant and a stimulating odor were found to improve the evaluation of the service experience, and allowed the children to be more positive about their hospital stay. In the dental office, the introduction of a relaxing odor increased approach behavior toward the service for females.*

## **INTRODUCTION**

Odors have long been known to be capable of altering the emotional state of humans through current or retrospective channels (Schifferstein and Blok, 2002). The smell of fresh mown grass, lilacs in the spring air, or the wafting odor of fresh baked bread on a Sunday morning...chances are they all involve memories or associations from the past. The odors are especially powerful reminders of autobiographical experience, an effect which has become known as the Proust phenomenon (Krishna, et.al., 2010; Jönsson, et.al., 2005). Since the middle of the 1990s, many private companies have understood the importance of the integration of an olfactory dimension in their products, particularly at the point of sale.

Specialty stores like bakeries, chocolate shops and florists often carry product lines with inherent ambient scents (Mitchell, et.al., 1995) and these specialty stores rely on scents of their products to influence customers (Ellen and Bone, 1999). Contemporary service providers and managers of stores carrying products not possessing an inherent (or 'expected') scent are adding ambient scents to their retail environments (e.g., an artificially diffused floral scents) to enhance the retail environment (Goldkuhl and Styven, 2007; Spangenberg, et.al., 2006). The altering of the olfactory environment is not limited to the adult market. Crayola markets a pastel Magic Scent pencil releasing a pleasant scent which impregnates the drawing; the manufacturer, Kickers, makes shoes for children that are scented with vanilla and

strawberry; and even dolls are scented, as Polly integrates odors in their models of Lea and Lila with clothes and accessories scented with melon and Kiwi (Guichard, et.al., 1998).

The addition of scent is not limited to products. Consumers are taught to attach more importance to their own olfactory environment through air-fresheners to scent the interior of houses or to remove unpleasant odors. Knowing that bad smells increase the feeling of insecurity for many passengers, Air France diffuses scent by micro-capsules on its aircraft, not only for diffusing passenger anxiety, but also to develop a long-term olfactory signature (Guichard, et.al., 1998). Researchers have investigated the impact of atmospherics as they relate to the customer service experience (Hoffman and Turley, 2002). Atmospherics can impact both employee and consumer behavior and the degree to which a service transaction is successfully conducted (Bitner, 1992). There are a few studies which have introduced sensory factors into health care situations, such as music and temperature manipulation in a dental office (Andrus, 1986) and music in a hospital waiting room (Routhieaux and Tansik, 1999). Because health care service is high in contact, the physical environment and the way in which operations are conducted by staff are essential to create a specific image of the institute and to develop the experience of the patient, whether he or she is a child or an adult.

The purpose of this research is to investigate if introducing ambient scents to health care facilities will enhance patient experience. In order to broaden and develop the focus on previous research, this paper presents two separate but related studies. The first one investigates the impact of the fragrances on children in a public hospital through a qualitative study. Hospitalization is a stressful and painful experience for the child, the family, as well as for the hospital staff. Researchers advocate the humanization of the pediatric service to limit the negative effects of the hospitalization on children (Poutot, 1991). Steps taken in hospitals to improve the child's stay include adjusting the sensory factors by using bright colors in the decoration; diffusing music in corridors; installing televisions in each room; and organizing play activities by staff members.

The second study examines the introduction of a pleasant aroma to a dental service environment. This service experience is often associated with fear and anxiety (Lehrner, et.al., 2000). This dental anxiety may be due to a previous traumatic experience, to the social-learning modeling of fearful behaviors, or to the anesthetic needle and the drill (Berggren, et.al., 1997; Kleinknecht, et.al., 1973). Robin, et.al. (1999) claimed that the odor of the dental office, due to the eugenol, can be another conditioning fearful stimulus. Therefore the dental office is a prime place to address the question of how the introduction of fragrances could lead the individual to perceive positively his or her experience.

## **LITERATURE REVIEW**

### **The Service Encounter**

The heart of a service is the encounter between the server and the customer. Here emotions meet economics in real time and this is when most people judge the quality of service. The American school has developed the concept of "encounter" and the Scandinavian school developed the "moment of truth" (Eiglier, 2004). The encounter, or "moment of truth", plays a crucial role in service quality (Bitner, 1990; Parasuraman, et.al., 1988). Beyond this dyadic interaction between a client and a service company, the encounter is constituted by the interaction between clients and employees, and is influenced by the environment and the behavior of other customers (Kotler, 1973; Bitner, 1992; Bitner, et.al., 2000; Bitner, et.al., 2002).

During a stay in a hospital or even a visit to a dental office, the patient interacts with several different people (e.g., physicians and nurses). Individual patient and various medical and administrative staff encounters form the basic unit of medical care. Therefore the affective or expressive component of the physician's behavior toward the patient is a major factor in the assessment of the instrumental component of the physician's care (Singh, 1990). The concepts of satisfaction and/or perceived quality are attached to identify the evaluation of the service experience by the patient. The different aspects of the service include the technical and the quality of medical care, which are initially determined by the competence of physicians, nurses and other relevant sources.

### **The Role of Atmospherics Within a Service Encounter**

Whether enhanced user satisfaction and image, greater efficiency, increased sales/usage or a combination of these are the desired goals, the designed environment can be tailored to meet these goals (Greenland and McGoldrick, 1994). Atmospherics are composed of both tangible elements (the building, carpeting, fixtures, and point of purchase decoration) and intangible elements (colors, music, temperature, scents) that comprise service experiences (Hoffman and Turley, 2002). The integration of such marketing actions in a health care institution projects a positive image of the hospital to the various users.

Non-verbal signs transmitted by the physical environment may imply welcoming messages and encourage the patients to return into the hospital or the clinic (Wayne, 1984). Thus, various environmental factors must be controlled and manipulated in a health institute in order to attract the users, to encourage them to return, and to speak positively about the establishment. Many dimensions can be controlled in the aim to bring wellness and peace to the different users. These are 1) the esthetic dimension that allows the user to appreciate the physical aspects; 2) the functional dimension is the way in which the objects are organized within the space in an effective manner (a well-organized space facilitates the movements of the users inside the space); and 3) the psychological dimension which procures wellness to the users.

Andrus (1986) manipulated the temperature and the music in a dental office. He proposed that the atmosphere of a dentist's office is a strategic tool which improves comfort of the patients and their perceived satisfaction with the service. A satisfied patient will repeat visits to the same office, follow the directives of the dentist and speak positively about the service. Thus, the atmosphere of the office must reflect modernity and effectiveness in order to make the patient less anxious. The principal results of this study showed that the patients prefer well organized and well equipped clinic, inspiring confidence especially to anxious patients. The classical music and the temperature did not have a significant effect on satisfaction of the patients. He proposed two reasons for the outcomes: the volume of the classical music was low and the temperature was 20°C. Thus, the patients had not paid special attention to these two factors. However, he concluded, a well-organized cabinet, a comfortable waiting room, a diffusion of a pleasant music and a good room temperature improve satisfaction of the patients (Andrus, 1986).

Routhieaux and Tansik (1999) examined the influence of the music on the relatives of the patients who are in a waiting room of a surgical service. These people are considered as users because they legally authorize the medical care on the patients who undergo surgical operation. Indeed, these people are attentive and are in position to evaluate the services provided by the hospital more than the patients themselves. The authors underline the anxiety experienced by the family members and the relatives of the patient. They showed that the diffusion of a soft music reduced the state of anxiety of the users present in a waiting room. However, the assumption that the evaluation of the quality of the services provided by the hospital would be improved by diffusion of music was not validated, but the researchers recommend that the diffusion of music could improve the evaluation of the service through emotions.

Ambient conditions such as room temperature, air quality, noise, music, odor, as well as the rational organization for room space, signage, cleanliness, and furniture are all aspects used by the patient to assess the quality of service (Brand, et.al., 1997). These physical elements, implemented in a hospital, refer to an environment described as "elaborate" by Bitner (1992). This perceived complexity is due to the number of floors, rooms, sophisticated equipment, and complex variability in functions performed within the physical facility. Researchers advise, therefore, to give special consideration to the physical and sensory environment within health care facilities (Wayne, 1984; Routhieaux and Tansik, 1999).

### **Review of the Relevant Olfactory Literature**

Nearly all objects emit odor molecules that are a unique shape which, when received in the mucous membrane of the nose, attach to a perfectly matching receptor on the cilium. To put this complexity into perspective, there are 10-20 cilia for each of the 12 million nerve cells that can recognize 10,000 scents (Elmar-de Witt, 1991). The receptor then alters the trans membrane electrical potential of the nerve cell it is attached to and subsequently sends a signal to the olfactory bulb at the base of the brain. From there, the various signals are processed and sent to the most primitive system of the brain (and the seat of emotions), the limbic system, to create a mental image (Wilkie, 1995). While the eye relies completely on

the brain to form an image; in olfaction, most of the object identification has been done by the individually shaped receptor cells prior to having reached the brain.

Many factors influence the sense of smell. For example, culture plays an important role in determining how a person reacts to a scent. In France, the aroma of some cheeses (e.g., Munster) is not considered as a repulsive smell, while quite the opposite in Japan. Similarly, in Southeast Asia the durian's smell, a fruit shaped like a rugby ball, is considered nauseating for the French, while for the Vietnamese the smell is well appreciated (Chrea and Valentin, 2007). Additionally, upbringing or life experiences can alter the perception of certain odors. For instance, Hirsch (1995) found that people older than 62 years associate their childhood with smells of nature, such as, sea air, pine, horses and hay while younger people associated artificial smells like plastic and fuel with childhood memories. Those with artificial odor recollections reported a higher degree of unhappy childhood memories (Gutfeld, et.al., 1992). Furthermore the ability to smell, identify and recollect odors declines with age (Köster, 1991).

Gender also affects how people react to aromas. Studies of groups of babies, who had been given toys scented and unscented, showed that the baby girls gave more attention to the scented toys than baby boys (Barbet, et.al., 1999). For adults, Knoblich and Schubert (1989) found that women are more susceptible than men to the smell of shampoo. It is clear that women have a better sense of smell than men and that the smell evokes more memories for them than for men.

Many studies have shown that pleasant odors do improve the perceived store image and increase the behavioral intention to visit the store. Furthermore, they improve product evaluations and increase buying intentions for products that are not (dis)liked (Spangenberg, et.al., 1996). Also, pleasant odors can increase the time spent in a store (Knasko, 1989; Daucé, 2000; Maille, 2005) the number of times products are examined (Spangenberg, et.al., 1996) and the amount of time taken to evaluate products (Kansko, 1995; Morrin and Ratneshwar, 2000). The diffusion of an ambient odor has a positive effect on the cognitive process of individuals (Bone and Jantrania, 1992; Daucé, 2000; Chebat and Michon, 2003) and their affect (Ehrlichman and Bastone, 1992).

The theoretical mechanism underlying most of the published research in this area is the stimulus-organism-response (S-O-R) paradigm (Spangenberg, et.al., 1996). For ambient scents in retail settings, the S-O-R model posits that environmental olfactory stimuli (S) (combined with other cues) affect consumers' internal evaluations (O) (e.g., affective responses), which in turn elicit approach or avoidance responses (R). The scent, whether environmental or intended to scent people or products, may have three types of responses: emotional, cognitive and behavioral (Maille, 2003).

### *Odor and Emotional Responses*

To evaluate the emotional responses to the odors, two types of measurements can be used. First, physiological measurements examine some indicators in the brain to identify the increase or diminution of the level of the stimulation. Among these physiological measures, we find the contingent negative variation (CNV), the alpha waves, and beta waves. A state of relaxation is associated with a predominance of alpha waves, while a state of stimulation is characterized by an increase of beta waves. Similarly, the CNV increases during states of stimulation, while it decreases during relaxing state. Other physiological measures used are systolic blood pressure and electrodermal activity (Daucé, 2000).

From these different measures, some researchers have proposed an inventory of relaxing and stimulating scents (Daucé, 2006). Since 1997, aromatherapy has taken this idea in order to treat patients through the dissemination of anti-stress odors and examples are presented in Table One (Butcher, 1998, Guichard, et.al., 1998). However, researchers do not always agree on the nature of the same essence (Lemoine and Bonnin, 1998).

**TABLE 1**  
**PHYSIOLOGICAL INDICATORS AND BENEFITS OF SCENT**

Lemoine and Bonnin, 1998				
Physiological indicators	Benefit	Lorig (1992)	Sugano (1992)	Schiffman (1992)
Alpha Waves $\alpha$	Relaxant	Spiced apple	Terpenes Lavander Sandalwood	
	Stimulant	Lavander, Eucalyptus		
CNV	Relaxant	Jasmin	Sandalwood, Lavander Musk	
	Stimulant	Lavander	Eucalyptus	Lavander
Blood Pressure	Relaxant		Terpenes Lavander	Nutmeg
	Stimulant	Spiced apple		

In order to measure the pleasure or the stimulation of the individual, researchers often use the PAD scale (Pleasure-arousal-Dominance) developed by Mehrabian and Russel (1974). The use of this tool is simpler than physiological measurements which require complex equipment. Rotton (1983) found individuals exposed to an unpleasant odor in the environment noted a bad mood, a high level of anxiety, tiredness and sadness than those left in an odorless condition. An experiment conducted by Ehrlichman and Halpern (1988) indicated that the mood is better when the odor is pleasant. Similar results were found with Knasko, et.al. (1990) and Kansko (1995). The researchers noted important scores for the pleasure dimension in the condition of the pleasant fragrance. However, other researchers obtained insignificant results for the presence of a pleasant odor (Baron 1994; Mitchell, et.al. 1995).

Warm, et.al. (1990) found no significant differences in performance, stress, drowsiness or irritability in the presence stimulating or relaxing scents (mint versus lily of the valley). The authors concluded that any effects were due to the attractiveness of the smell, and not to the nature of the selected odors. Moreover, Chebat and Michon (2003) found a positive impact of pleasant scents on emotion. Therefore, it may be that the context of the exposure to odors is important, as people preferred light floral fragrances in the morning and more heady oriental fragrances in the evening. Also, some sweet smells were found to cause nausea after meals (Blanc-Mouchet, 1987).

*Impact of Odors on Individual Performance, Evaluation and Perception of Time*

In a series of experiments to identify differences that may exist between a stimulating (mint) and relaxing (lily) fragrance when performing a cognitive task, researchers found better performance in perfumed conditions, but no difference between the two odors used for the experiment (Warm, et.al., 1990; Baron, 1990; 1994). In a second study, they found that cognitive performance was better with the mint condition over the clean air control situation. Performance was best with women in perfumed conditions (no difference between mint and lily), while the men's performance was better in the control condition. Ehrlichman and Bastone (1992) found that the creativity of people is increased in the presence of pleasant vs. unpleasant odor. Over all the cognitive performance of women when they are exposed to a pleasant scent is better than when exposed to a neutral odor.

In memorizing photos, Cann and Ross (1989) found better recognition when the same odor is released during encoding and during storage. Schab (1990) found that individuals exposed to the smell of chocolate, during the two phases of encoding and memorization, memorize more words. Morrin and

Ratneshwar (2000) also found the dissemination of the same odor during the phases of learning and memory of brand names increases the performance of respondents. These different experiments show that the diffusion of the same odor during the phases of learning and memory improves performance (Maille, 2003). This could be due to the ability of odors to recall the context in which they were stored (Cann and Ross, 1989; Schab, 1990; Maille, 2001).

Some studies on the impact of odors on performance during the cognitive tasks give contradictory results. Ludvigson and Rottman (1989) found that solving arithmetic problems was more difficult for people exposed to the smell of lavender. Knasko (1992, 1993) found insignificant results in measuring creativity and performance in various tests following exposure to a pleasant vs. unpleasant odor. The work of Guichard, et.al. (1998), using stimulating and relaxing scents, on memorization and evaluation of advertising led to insignificant results. However, many studies find positive impact of pleasant odors on the atmosphere's evaluation, products or services exposed in the perfumed environment (Spangenberg, et.al., 1996; Chebat and Michon, 2003; Ratneshwar and Morrin, 2000). An experiment conducted by Rotton (1983) concluded that pictures were seen as less professional and poorer, and persons were evaluated in a negative way in the presence of an unpleasant odor. Similarly, Ehrlichman and Bastone (1992) found that photographs were positively evaluated when the smell was pleasant (vs. unpleasant).

Knasko, et.al. (1990) reported that a room is positively evaluated in pleasant odor (vs. control situation) and two experiments conducted by Baron (1994) noted that people exposed to a scented room judged the place warmer, more comfortable, nicer, and cleaner. Daucé (2000) examined the influence of two pleasant odors (tea and lavender) on the behavior of women's customers within a store and found the lavender led to a more positive evaluation of the store. In the presence of certain odors, people tend to spend more time and to underestimate the actual time spent (Teerling, et.al., 1992; Spangenberg, et.al., 1996; Daucé, 2000). This result was found in a jewelry store (Knasko, 1989); museum (Knasko, 1993); and restaurant (Gueguen and Petr, 2006). Kasko (1995) found that individuals exposed to the smell of chocolate and baby powder stayed longer in stores than people in the control situation. When diffusing mint, it was found that the time may be underestimated, while it is overestimated if the respondents were exposed to vanilla (Lorig, 1992). Maille (2005) used five different odors in a post office and found that certain smells increase the time spent into the perfumed space.

### *Odors and Behavioral Responses*

Spangenberg, et.al. (1996) showed that the presence of smell to influence the number of products handled, especially for sports products, and the desire to return to a retail establishment. However, there was no influence of odor on buying intentions for specific products (except for backpacks). These results are also found by others. Hirsch and Gay (1991) showed that floral scent enhanced purchase intentions and Mattila and Wirtz (2001) found a positive effect of stimulating smell on the intention of returning to the store over a relaxing scent. Regarding the amount of purchases and expenses, Hirsh (1995) showed that the amount spent in casinos increases when players are placed in a scented environment.

### **Summary**

In summary, atmospherics are found to influence the behavior of both shoppers and employees. Much of the research has presumed a mediating effect of mood on consumers' cognition and behavior. The manipulation of atmospherics cues can be constructed as an attempt at communicating a particular message to consumers. Transferring this information to the medical context, the quality of the service encounter is affected by the quality of the medical care received from physicians and nurses, the individual patient-physician relationship, and the physical environment. Cues that allow patients to assess the quality of the medical service include: a rational organization of the spaces; an easy orientation to the living arrangement; cleanliness; temperature; noise; and the smell. Among these several cues, this research explores the effect of scent in the environment.

It is found that fragrances are associated with emotionally significant events and past experience as the odors stimulate the limbic system, the part of the brain responsible for emotional responses. However the influence of scent varies and it is suggested that this variation is the result of both individual and

contextual effects. For example, men and women differ in their sensitivity to smells and odor identification performance. Moreover, certain odors have been shown to create relaxed mood states while others evoke stimulated or activated mood. Work in this field has focused in a stimulus-organism-response approach adopted by Mehrabian and Russel (1974). Thus, smells can influence consumers in relation to affective and evaluative responses and this context will now be explored to a medical environment.

## **STUDY 1: DIFFUSING AMBIENT ODOR TO A PEDIATRIC WARD**

The first study aims to provide empirical evidence indicating the effectiveness of using ambient scents in a pediatric ward of a hospital to enhance the experience. Hospitalization is a stressful and painful experience for the child, the family, as well as for the hospital staff. By collecting data for three treatment levels (control, relaxing and stimulating conditions), the differences or similitude among the perception and the assessment of the hospitalization experienced by young patients can be examined. The aim of this study is to understand the experience, interests, behavior and views of the child population researched, through their own expressions and actions (Marshall and Rossman, 1999; Andronikidis and Lambrianidou, 2010)

### **Research Method**

In-depth interviews were conducted in a pediatric department of a public hospital. The qualitative interviews allow for some personal contact between the interviewer and the respondents. They also provide a sensible way to improve our understanding of the children's hospitalization experience. However, the inherent limitations of the interviews lead us to consider observation to supplement our data. This method is particularly relevant to exploratory research as it offers the possibility to understand a new phenomenon and it often acts as a useful complement to other methods of data collection. Observation offers the possibility of understanding the behavioral responses of individuals without the intermediary of a document or testimony. At the hospital, our role was revealed to all involved and thus we were able to freely observe the children in their daily life in hospital. The observation was used to determine the nature of the relationship the child has with the staff and the other patients and the various episodes were recorded in a notebook.

The main research questions were 1) How the child evaluates his/her hospitalization experience; and 2) How the sense of smell impacts the evaluation of that service. The objective is to identify the attributes related to the assessment of the hospitalization experience before and after the release of fragrances. For all the interviews, it was necessary to get the parents' approval before interviewing the children, especially in the cases related to the addition of scent. The environment was scented using electric diffusers for area coverage up to 323 square feet per diffuser. One diffuser was placed in the room of the hospitalized child.

### **The Sample**

Children interviewed in this study were between 8 and 12 years and a convenience sampling method was adopted. A triangulation method was used to try and collect the same facts from the three relevant sources: the hospitalized children, their parents, and the nurses involved in giving care to the patients. In total, 61 interviews with 39 hospitalized children were carried out: 20 interviews with the no scent situation; 20 interviews with the relaxing odor; and 21 interviews with the stimulating odor. The scented treatments each had 10 children and they were interviewed before and after the diffusing of scent. For the second interview in the scented treatment, the same questions were asked but in another manner and order, so the child did not get the feeling that he/she is submitted to repeat questioning. In the case that some changes are noticed in the children's answers, new questions are introduced to look into any modification and to understand the reason of this change.

It is important to mention that children are often emotionally and psychologically vulnerable and that this situation calls for special care and concern on the part of the researcher. When necessary, separate

interviews were conducted with family members who emerged as important individuals. Parents who spend more time with their children can be an important source of information as the children's reaction is largely influenced by the parents. They can also inform us about the changes observed in the child following the release of the scent. Therefore six interviews were done with some parents over each treatment resulting in a total 18 interviews with parents. Finally, interviews were also conducted with professional resources such as health care workers. Thus, ten interviews were conducted with several nurses.

### Data Analysis

Given that the issue concerns a new phenomenon (the evaluation of a perfumed service experience), applied to a particular user (the child) in a specific situation (the hospital), the grounded theory approach was followed for the interpretation of the research data. Once the interviews were completed, they were transcribed verbatim. Following an inductive codification process, a thematic analysis was carried out. To encode the data, we choose the sentence or even the paragraph that we believe are most meaningful and productive units. A label or a short phrase to name the new code, in which the unit of analysis is assigned, was created. The same operation is performed for other units of meaning. Other text segments are integrated into the codes already "tagged" (Blais and Martineau, 2006). In general, the units identified are compared and then grouped into codes according to their similarity. Within each code, sub-codes, including opposing views and new perspectives are created.

The qualitative analysis software NUD \* IST was used to facilitate and to accelerate the coding process. Using this software helps in coding data into larger and conceptually organized units of analysis. This software allows the adjustments of the list of codes, in other words it facilitates the systematic recoding of the interviews once the coding grid is changed. Finally, this software is helpful to structure the data into a hierarchical tree code. Table 2 contains the categories that emerged from all the collected data.

**TABLE 2**  
**CONTENT OF INTERVIEWS**

<b>Categories</b>	<b>Purpose</b>	<b>Type of Question</b>
1-Children's features (Age, during of stay, etc.)	-Install trust between the interviewer and the child -Identify links between the characteristics and the nature of the answers	Hello, what is your name? How old are you? Do you have sisters and brothers? Tell me about yourself? What do you do on the week end? Do you have friends? How do you spend your time? How long have you been here?
2-The hospital (before and after the release of the fragrances)	- Identify dimensions of the evaluation of the hospital -Identify the nature of the judgment	What do you think about the hospital? How do you feel in the hospital? What do you think about the ambiance? How do you feel? why? What should we change in the hospital to please you more? How do you imagine a hospital? give me some details...



3-The stay (before and after the release of the fragrances)	-Identify dimensions of the evaluation of the stay - Describe the journey of the child	What do you think about your stay? Describe your day in the hospital?...What do you do in the morning, in the afternoon, and in the evening?
4-Physical surrounding (before and after the release of the fragrances)	-Identify how the child gauges his or her room -Identify the principal dimensions of the judgment	What do you think about your room? How do you feel in your room?
5-Care staff	-Identify the dimensions of medical staff evaluation - Identify the nature of the evaluation	What do you think about the nurses and the doctors? Do you have any complains?
6-Treatment	Describe the feeling of the children about the care he or she receives	What do you feel when you receive your treatment? What do you think about the care and the treatments?

### Pretest Scent Selection

Seven odors were selected to determine the best scent for the experiment (Sensorys <http://www.sensorys.com> Paris, France). The odors were 1) Citrus fruit; 2) Mix of pineapple and kiwi; 3) Beach and sea (the smell of flower and lightly marine); 4) Smell of the Sea; 5) Exotic fruit; 6) Apple; and 7) Mint. Sixty children were interviewed to determine the preferences of the seven odors in order to select a pleasant stimulating odor and a pleasant relaxing odor.

### *Pleasant Scents*

Three odors chosen from the seven in a random way were presented to each child, who was asked a series of questions: the odor which he/she prefers more, the odor that he/she prefers moderately and lastly the odor that he/she prefers less. Four odors were selected following the first questionnaire: exotic fruit; Pineapple and Kiwi; Sea and Beach and Citrus Fruit.

### *The Nature of the Odor: Relaxing vs Stimulating*

For selecting the odors according to the second attribute, a questionnaire was distributed to 120 students, average age 23 years. Four odors chosen by the children were presented to the adult interviewees and they rated each scent (one to seven) for the stimulating and relaxing characteristics. However, the fact that we asked adults to assess the nature of the odor probably has a methodological bias, because the olfactory responses of individuals vary with age (Köster 1991). It was necessary to solicit the opinion of adults since children were unable to describe the scents as relaxing or stimulating. For the relaxing character, exotic fruits received the highest mark (3.67, sd=1.28) and citrus fruit was selected as a stimulating odor (3.95, sd=1.5).

Before studying the impact of the two scented treatments on the evaluation of the experience by the children, we identified the attributes that the children use to judge their environment using the control group.

### **Control Group: No Scent**

The results indicated the relational and playful dimensions in different facets of the service experience. Several criteria were identified and classified into two categories: 1) the environment and 2)

the results of medical practices. To analyze our case studies, we counted the quotes of the interviewees (children, parents and medical staff).

Sick children perceive their environment through the physical, architectural, social and playful dimensions. The importance of the aesthetic aspect of the physical support is highlighted in the literature (Bitner, 1992; Eiglier, 2004; Bonnin, 2006). The architectural environment, as perceived by the hospitalized child, refers to the functional dimensions such as the surface and the layout of the hospital room and the available material. Third, hospitalized children share common experiences and create groups where they share moments. Group formation is favored firstly by the activities proposed by the staff and courses required by the school of the hospital and, secondly, by the conception of locals that promote the emergence of these interactions.

Interactions among children are not enough: in fact, the young patients insist on the importance of interacting with the staff. Previous research highlights the importance of interpersonal relationships between patients and hospital staff (Castel, 2005; Pourin et al., 2003). Our contribution is the identification of interactions among hospitalized children as an essential attribute of a hospital experience. The environment seems incomplete without incorporating the playful dimension. This dimension refers to the activities proposed within the children's room and television installed in hospital rooms. The children also assess the service experience based on the medical practices, in other words the effectiveness of care and the utility of assistance.

Grönroos (1984, 1999) suggests that service quality consists of two dimensions, technical and functional. The first one refers to *What* the consumer receives or the technical outcome of the process, and the second one refers to *How* the consumer receives the technical outcome, what Grönroos calls the "expressive performance of a service". In the context of services, functional quality is generally perceived to be more important than technical quality, assuming that the service is provided at a technically satisfactory level. Grönroos (1984) also points out that the functional quality dimension can be perceived in a very subjective manner.

In our case, the technical or outcome dimension is related to diagnostics, treatment, medical care, prescriptions and results. The functional aspect or process refers to non-clinical aspects and covers aspects relating to the physical environment (housekeeping aspects), respect of the privacy (Carman, 2000) or aspects referring to interpersonal relationships (Bowers, et.al., 1994). Ware, et.al. (1983) identified several dimensions of the patient satisfaction such as: interpersonal aspects, the technical competence, access to care and the physical environment.

### *Results*

Our study reveals many dimensions identified by the hospitalized children and they are listed in Table 3. The percentage of comments related to each dimension of the service experience whether it was scented or not is presented in table 4. The analyses shows the children evaluate their hospitalization experience focusing on two aspects: 34% of the responses were a technical or clinical aspect directly related to the care, such as the operational dimension, the nature of the care, the pain and the established rules; and 65% of the responses were a functional aspect which referred to the criteria of the peripheral elements of the service (relational, functional and aesthetic dimensions of physical surrounding, playful dimension, and inn-keeping dimensions). What matters to the children, when they evaluate their hospitalization experience, is based on the environment. Thus, the experience is assessed from the peripheral elements of the service as the relational, playful, and social.

**TABLE 3**  
**DIMENSIONS IDENTIFIED BY THE CHILDREN TO EVALUATE**  
**THEIR SERVICE EXPERIENCE**

<b>Dimensions</b>	<b>Definitions</b>	<b>Explored Aspects</b>
Sensorial	Aesthetic feature of the department	Colors and Design
Interpersonal	The quality of the relations between the children and other young patients, and between the children and the care givers.	kindness, respectfulness, and also roughness, disrespect and the authority of the care giver. Observation of children's groups taking place in the department, sharing secrets, sharing lunches, and playing together.
Technical	Technical competence of the caregivers and the result of treatments.	Availability and helpfulness of the care giver, moral and physical assistance.
Playful	Amuse the hospitalized children	Playful activities proposed to the hospitalized children, television
Functional dimension of the physical surrounding	Physical characteristics.	Layout, equipment, sanitary facilities.
Rules	Established rules.	Visits, permits.
Inn-keeping	Quality of the reception	Quality and the quantity of the food and room type, (single or double)

### **Relaxing Ambient Scent**

Two interviews were conducted with the same child before and after releasing the relaxing ambient scent. Before the diffusion of the fragrance, the results obtained are similar to those in the control treatment. Even after releasing the exotic fruit relaxant fragrance, we still find the playful, relational, the physical and functional dimensions of the atmosphere. However, the order of importance of dimensions changed. The physical aspects became more important in judging the evaluation of the scented service experience. Children focused on the sensory aspect of the environment after the scent (40.4%) compared to (11.9%) in the no-scent condition.

The quality of the assessment improved after the diffusion of odors as more emotional responses were generated. According to Herz, et.al. (1999), in olfactory perception, the primary response one has to an odor is an evaluation of how pleasant or unpleasant it smells. Thus, the fundamental reaction one has to an odor is emotional, and personal as not all children felt the same about the odors. Examples of positive responses from the children were positive: *I love it (Ma')* ; *-It scents better, I like it (J'1)*; and negative - *I don't like the odor of chewing gum, it disgusts me a little bit (Lu')*; *-it is the odor of chewing gum and candy and I don't like at all (N')*. Corroborating comments from parents were also found: *-She liked it immediately (PT)*.

The release of the fragrance may allow the stimulation of the hospitalized child's imagination and permit the child to develop an experiential context. It allows him/her to escape from reality for few moments and be a part of another experience. Here all the statements are positive: *-We forget that we are at the hospital [...] That has changed, it becomes warm in my room and when a nurse come, she says " it*

*finally feels good”... I think that it feels good; a friend of mine, she came and she said "it does not smell hospital in your room," ... I think it's a good idea to put a smell in my room because I felt good (S')*

*- Before we felt like alcohol I do not know how to say it was a bad smell but now I feel in my room like a flower and I like it, it smells a bit like lavender. I think it makes things prettier. We no longer feel confined, but rather we are out maybe in a garden (L')*

*- It really changed my mood (...)I don't have the impression that I am in the hospital it made me even forget that there are little ones who cry all the time (T')*

The emotional responses produced by diffusion of the smells tend to act as "medium" in the process of evaluating the service experience. We noticed a transmission of these emotional reactions to the evaluation of the unit service and particularly the physical room:

*-Before I didn't like the hospital but now I think it is better...I don't know it smells better...I don't know maybe it is the odor, but now the hospital is better (Ma')*

*- I think that the hospital smells good (A')*

*- It changes because when i visit the other children in their rooms I don't feel anything and even it smells bad like some gas it is not good at all, but here in my room, it is very good...I like to be in my room because it smells good (M')*

*- It smells better, I have the impression that I am not at the hospital...I mean that it is changed because the odor before was not so good (Sa'1)*

Also we noticed that the sensory evocations can be a source of rejection, as well as a source of anchoring in this environment. The rejection by some children was due to a high intensity of odor:

*- I felt better, I like it but then it smelled too much, I requested to stop the diffusion 15 minutes after and even now I do not like it (J'1)*

*- She asked us to unplug the equipment because she said she had a headache. She asked us between 10.30am and 11am, and since she did not want to reconnect the materiel (Nurse)*

For other children the same level of ambient odor tends to encourage them to invest in the experience. Thus, Sa did not want us to remove the machine "it's good but I do not want you to remove it". Wanting to know the reason for her desire to keep the diffuser in the room she says: "Because I feel that it smelled like strawberries and I like it."

## **Stimulating Odor**

Before the diffusion of the citrus, the same criteria determined in the unscented situation are found and. as in the relaxing situation, the order of importance changed after the release of the scent. Before the diffusion of the scents, the hospitalized children assessed their service experience through the functional aspects (relational aspects, aesthetic and functional dimensions of the physical surrounding, playful and inn-keeping aspects), and technical aspects (the operational dimension, the nature of the care, the pain and the established rules).

After the release of the stimulating odor, the social aspect was still the most important criteria, but the physical environment increased in importance. The quotes by the hospitalized children give us an idea about the impact of the diffusion of the stimulating fragrances. The children highlight in their speech the transfer of emotional reactions to the context of the scent. We also note an improvement in the assessment of the physical environment in particular and the experience in general:

*- I think that there is a change, the hospital smells better (Am')*

*-It the same, but with this new smell, i don't feel a musty smell in my room (G')*

*- I don't like the hospital especially with the new smell when we go nearby this material it feels worst then before i don't like it (Ti'1)*

Therefore, to some children, the global evaluation of the surroundings changed due to the positive or negative appreciation of the odor.

The negative or the positive evaluation of the context in particular, and the experience in general, is not only due to the transfer of the emotional response to the smell. We also find the imaginary evocation that the smell might generate and the odor can impact the judgment of the children through the mental image it creates. Thus, some children associate the smell to some familiar situation as the « nature »,

« store », or even a familiar smell. The fragrance involves memories or associations from the past and is considered a powerful reminder of autobiographical experience. Some examples of this are:

- *I have the impression that it scents like flowers or roses something like that...when I pass by the material I feel the odor of the rose [...] (Di')*

- *The hospital scents very weird I don't know how to describe it. But now, sometimes it feels very strong but it is good ...I don't know how to describe it but when we feel it we don't have the impression that we are at the hospital surrounded by the crying of the others (Mr')*

- *It reminds me some stores of candles. When I close my eyes, I don't have the impression that i am at the hospital, I feel that I am in a store (Y')*

- *It really changed... since we are lock in here and you cannot go out, we feel the nature, we feel the smell of the fruits something like that [...] We have the impression that we breathe easier...really I am here in the same room since four days and I find that it smells the nature, the trees, the grass, I have the impression that I am outside rather than in a hospital, even if we are stuck here... [Am'].*

Table 4 illustrates the results of the study and the percentage of comments relating to each group (group control, relaxing and stimulating scents).

**TABLE 4**  
**PERCENTAGE OF COMMENTS RELATING TO EACH DIMENSION OF SERVICE**

Criteria of the service evaluation	% Comments				
	No scent	Relaxing scent		Stimulating scent	
		Before	After	Before	After
Social Dimension	22.3%	22.6%	26%	24%	30.9%
Sensorial dimension	8.8%	11.9%	40.4%	18.3%	30.8%
Design (functional dimension of the environment)	12.2%	11.9%	7.7%	15.5%	8.5%
Playful dimension	14.9%	11.9%	8,7%	15,5%	13,8%
Inn-keeping	7.4%	9.5%	4.8%	7%	6.4%
Technical and competence of the staff	22.3%	21.4%	9.6%	12.7%	4.3%
Pain	10.1%	3,6%		4.2%	
Rules	2%	4.8%	2.9%	2.8%	5.3%
Privacy		2.4%			
<b>Technical aspects</b>	<b>34.4%</b>	<b>29.8%</b>	<b>12.5%</b>	<b>19.7%</b>	<b>9.6%</b>
<b>Functional aspects</b>	<b>65.6%</b>	<b>70.2%</b>	<b>87.5%</b>	<b>80.3%</b>	<b>93.4%</b>

## CONCLUSION

In both the relaxing scent and the stimulating scent environment the children placed a greater emphasis on their physical surroundings. We conclude that this effect is due to the perceived attractiveness of the smell by the child, and not to the specific nature of the selected odors. Similar results were obtained by Warm, et.al. (1990), whom did not find the stimulating effect of mint, nor the relaxing effect of lavender. Given the limitations of qualitative research and a small sample, the changes noted in the experience evaluation may not only be attributed to odors: other criteria such as colors, the relational

dimension or even play activities, are very important in the evaluation process following the dissemination of the odor.

## **STUDY 2: SCENTING THE DENTAL OFFICE**

This study aims to provide empirical evidence indicating the effectiveness of using aroma in a service setting which traditionally is perceived to be highly stressful. The premise is that perceived levels of health, mood and attitude towards the service environment can be altered using scent. A dentist's office is an ideal location due to the highly emotional (and anxious) time spent in the waiting room prior to the appointment (emotions that, incidentally, are experienced with any significant or costly purchase). By collecting data for three treatment levels (control, relaxing and stimulating conditions), this study looks for significant differences among the perceived personal wellness of the patient and the perceptions of the service environment. Four propositions are investigated:

*Proposition 1: The levels of stress and anxiety in the patients would be lower in the relaxing condition vis-a-vis the control (no odor) and stimulating fragrance conditions.*

In the Sloan Kettering Cancer Clinic studies, anxiety levels were reduced dramatically using a relaxant (Green, 1993) while the Shimuzu (1988) studies used stimulants to increase mental arousal levels.

*Proposition 2: The perceived mood and health of the patients will be enhanced in both scented conditions, but not in the control condition.*

Knasko (1990, 1992, 1995) and Gilbert (1997) showed that pleasant and congruent odors positively increased the perceived levels of health and mood of the respondents.

*Proposition 3: The perceived attitude toward the service environment and the quality of service will be higher in the two scented conditions.*

Increasing approach behavior towards the environment is evident in Knasko (1995), Spangenberg et al. (1996) and Hunter (1995). In those studies, the presence of a scent increased the positive evaluations of the environment and products in that environment.

*Proposition 4: The perceived time spent by the patient in the appointment will be lower in the relaxing conditions, but not in the stimulating or control conditions.*

Knasko (1995) and Spangenberg et al. (1996) give evidence that the presence of an aroma can favorably alter time perceptions.

### **Selection of Scent**

Lavender, Orange, Vetivert, Ylang Ylang and Vanilla are relaxants, stress relievers and anxiety reducing agents. Using a blind pretest with a sample of fifteen subjects, orange and Lavender were the clear favorites. Of the two, Lavender was selected as having the most preferred aroma for the relaxing oil. A stimulating oil was also selected through the same elimination process based prior research and aromatherapy principles. Peppermint, Lemon, Lemongrass, Rosemary, Pepper, Basil, Tuberose and Clary Sage were identified as stimulating fragrances. Rosemary, Pepper, Clary Sage and Basil were eliminated and despite their effectiveness as a stimulant, were almost unanimously rejected by the pretest subjects. Among the remaining oils, the vast majority preferred Peppermint and Lemon. Of these two lemon was selected as the stimulating scent.

### *Procedure*

Sampling was of a convenience nature as it would be inconceivable to rearrange the dental appointment schedule based on a randomized design. However, random assignment of subjects to the experiment and to the scented condition naturally occurred because of how dental appointments are made. In other words, the researcher has no control over how or when the appointments are scheduled due to the nature of a field experiment in a functioning office. Only adults over the age of eighteen were selected for the study as the majority of clients at the dental practice are adults. This was done to remove the variability associated with the comprehension levels of those under the age of eighteen. As well, adult consumers of service are the focus of the study and not youths or children. Retired persons were also not targeted due to the diminishing ability to smell as one ages (Gilbert, 1997).

The environment was scented using two professional, electric diffusers for area coverage up to 1,000 square feet per diffuser. Each diffuser has a controlling mechanism to determine the strength of aroma, which will be set at fifteen milliliters of the oil used per day. A one-day pretest was performed in the dental office in an attempt to identify possible confounding variables and obstacles to the study. Thus, several questions were reworded. The level of diffusion of oil was also changed, as the air conditioning system was stronger than anticipated and carried much of the aroma into the central air system. Finally, the placement of the diffusers was changed for better distribution.

### **The Questionnaire**

The survey contained questions that were designed to gauge the client's perceived wellbeing (health, levels of stress and mood), perceived attitudes toward the environment, and the level of service. Seven point Likert scales were used to measure the dependent variables (1= Strongly disagree to 7= Strongly agree). Subjects were presented three statements relating to their personal wellness (proposition one and two): 1) In general I am feeling healthy today; 2) I am in a happy mood; and 3) I am feeling stressed or anxious. Three questions measured a consumer's attitude to the level service and the office environment and were selected to provide support for proposition three. The fourth question discussed perceived levels of time spent in the appointment and addressed proposition four.

Several extraneous variables were taken into consideration. All respondents were asked if they had a cold or allergies because it was necessary to eliminate those respondents who had an impaired sense of smell. Respondents were also asked if they were having minor work (cleaning) versus major dental work (filling/restorative) to test if there were effects due to the type of visit. The gender (Hirsch, 1991; Knasko, 1992, 1995) of the patients was noted in order to see if males or females significantly differed in the reaction to the scented conditions. Lastly, the question on temperature acted more or less as a "red herring" to draw attention away from the manipulation of only scent. Via the central air system, temperature levels were maintained at 66 degrees Fahrenheit throughout the experiment. The second half of the last of the question was used solely to determine if the levels of aroma were too high and thus readily recognizable.

### **Results**

A total of 99 respondents were interviewed, but 21 responses were not usable due to those who had a cold or allergies or spoke a foreign language and could not fully fill out the questionnaire. There were 78 respondents who provided useable data for the experiment: 31 in the control group; 27 in the lavender; and 20 in the Lemon treatment. There were 46 males and 32 females; 47 came in for minor work and 31 for a major dental procedure. The treatments were balanced among the gender, but more people received major dental work in the lemon treatment ( $p > .05$ ). Although the majority of clients did not recognize a distinguishable odor, several positive comments were made during the scented treatments regarding the aroma. One female said it reminded her of a hair salon and not a dental office, one other said it smelled like his grandmother's house (Lavender) and the staff in general felt it was a great improvement on the regular aroma. One staff member commented that the day seemed shorter in the Lavender condition.

Multiple items on the questionnaire were checked for reliability. Mood and health for proposition two, Cronbach alpha = .76; and for proposition three (perceived attitude), the three items were: office is

pleasant; office provides a high level of service; and office staff are pleasant Cronbach alpha =.75. A one-way ANOVA was used to test the propositions for differences among treatments. The only proposition to achieve significance was the “Noise” construct. Patients perceived less noise in the scented conditions (Lemon 6.55; Lavender 6.15; and control 5.74,  $F=4.71$   $p<.01$ ). No other propositions were supported, as none of the other treatment group comparisons achieved significant differences.

### *Gender Effects*

Further to previous research that suggests that a scented environment affects females more strongly, independent t-tests were run comparing male and female responses in the different scent treatments (table 5). The results indicate that there was a significant difference between males and females when they ranked perceptions of the overall dental service in the Lavender condition. Females rated the service higher (6.7 vs. 6.3); would more likely recommend the service to friends (6.7 vs. 6.4); and thought they spent more time in the dental office (6.5 vs. 5.6). Performing the same tests within the Lemon condition, there were no significant differences between males and females.

**TABLE 5**  
**DIFFERENCES BETWEEN MALE AND FEMALE PERCEPTIONS**  
**IN THE SCENTED DENTAL OFFICE**

	Lavender		Lemon	
	Male n=16	Female n=11	Male n=12	Female n=8
P1: Overall stress level	3.5 (1.75)	3.18 (1.83)	2.92 (1.56)	2.88 (1.73)
P2: Overall mood and health	5.97 (.81)	6.31 (.56)	6.17(.49)	6.31 (.75)
P3: Attitude to service	6.3 (.42)	6.66 (.38)*	6.6 (.39)	6.47(.45)
P4: perceived noise level	6 (.89)	6.36 (.92)	6.42 (.67)	6.75 (.46)
Would recommend service to friends	6.38 (.50)	6.73 (.47)*	6.75 (.45)	6.25(1/04)
Perception of time	5.62 (1.15)	6.45 (.93)*	5.75(1.22)	6(1.31)

\*indicates significant difference between males and females ( $p<.1$ ) in the lavender condition

### **Other Results**

As indicated by tourism research, the weather seems to affect levels of mood and health (Niemira, 1997). During the testing period, two days were not sunny. A new variable, WEATHER was created to compare the two cloudy days with the sunny days over both scented treatments. There were no significant differences. The weather was then investigated within each treatment and there was a significant difference between the perceived stress (3.58 vs. 1.88  $p<.01$ ) and the perceived personal wellness (6 vs. 6.56  $p<.05$ ) of the patients. Respondents were considerably less stressed (1.88) and experienced higher levels of personal wellness (6.56) on the sunny days in the Lemon condition. An independent sample t-test was also run to study the effects of the purpose of the appointment (major dental work or minor dental work). Contrary to what would be expected, respondents having major dental work (filling/restorative) were not more stressed or anxious than those having minor work done over both scented conditions.



## Discussion and Conclusions

The results of this research indicate that, contrary to the propositions, the introduction of a pleasant aroma to a dental service environment did not cause the consumers' overall "experience" to be perceived as 'better'. Comparing gender, the results did show that females rated the service levels higher than males in the scented condition. This is congruent with the previous gender research (Gilbert 1987; Knasko 1992) that suggests that females are more influenced by the introduction of odors. Somewhat contrary to prior research was the finding that males perceived the length of the appointment to be shorter than expected in the Lavender scented condition, compared to females. Lavender seems well suited to females as they ranked the service environment and service better and were more likely to recommend the office to friends. Similar to previous weather research (Cawthorn, 1998; Niemira, 1997) there was a significant difference in the level of perceived wellness and stress between sunny and cloudy days in the lemon condition.

Taken as a whole, one of the main limitations to this project was the ceiling effect encountered with the positive evaluation of the dental service in the control condition. The majority of the time, the clients rated the staff, environment and service provided at the dental office extremely high. Except for *I am feeling stressed* and *My experience was better than I expected* the means of all dependent variables either approach six or seven on the scale and have distributions that are highly skewed to the upper part of the scale. The problem with this ceiling is that regardless of the variable manipulated, it is hard to improve on a service that is already excelling. The dental office used for the research has invested a lot of energy on providing positive aesthetics, making the customer feel comfortable (e.g., handing out flowers to each customer) and a professional atmosphere. Perhaps different results could be obtained in an office that has no spent so much effort refining its service levels.

## IMPLICATIONS AND FURTHER RESEARCH

The contribution of this research is the investigation of the use of scents within the context of medical services to determine if perception of service can be enhanced. Hence, recommendations are provided to medical institutions in the aim to improve the service experience both to children and adult patients, through the manipulation of atmospheric cues. For example, hospitals can transfer this research to enhance a patient's satisfaction. Moreover, companies specializing in olfactory marketing will be able to provide place of medical services pleasant fragrances to enhance user satisfaction and image and to create a better atmosphere, thereby increasing goodwill to both users and employees.

The first study shows that ambient scent can play an important role in the formation of emotional reactions of children, and subsequently impact their evaluation toward the service experience. Thus, diffusion of a pleasant and low intense odor helps to humanize the hospital by evoking emotional reactions and positively impacting the service experience of young patients. However, we should highlight the subjective responses to odors given the individual differences of children. As we have seen through various interviews, the reactions to the scents were varied by the patient. It may be important to personalize the scent of the hospital room. Samples of smell may be available upon the admission of the child, he or she chooses the smell that he or she prefers the most. To conclude, the hospital atmosphere and the olfaction dimension particularly can be used as a marketing tool to consider the health care establishment as a space where original and unusual experiences can be lived. The consultant firms working in the sensorial field must take into consideration the atmosphere of the pediatric service.

This study, although relatively small sample, supports and further develops other research into young people and their behavior in a scented space. It would be interesting to expand investigations in other pediatric services to confirm the validity of our findings.

It would be also interesting to conduct a quantitative study through an experimental procedure to operationalize the impact of odors on behavior of young patients, despite the great difficulties of achieving such an approach. This research provides the hospital several attributes identified by the sick children to evaluate their service experience. Taking into consideration these factors and their implementation will have only one purpose: improve the living conditions of children in hospitals and

increase their satisfaction. The implications of this research are also based on the fact that the environment of a pediatric service must be considered by designers as a tool to humanize the hospital. Thus, they can create an atmosphere by acting positively on several dimensions (physical dimensions, architectural, social and play activities) allowing the hospitalized children to live a positive experience.

The second study will be of interest first and foremost to owners or managers in the service industry. Based on the evidence that scent can be used to reduce anxiety levels, health care professionals can use the results to create a better atmosphere for their clients, thereby increasing customer goodwill. As well, based on the premise that perceptions of service quality can be enhanced using ambient odor, other service providers can create a competitive advantage over competitors. For example, private medical clinic can readily transfer this research to generate better client appointments, which means higher client satisfaction. Not only can service providers benefit from this research but marketers of high stress purchases (usually due to high costs), such as car dealers or jewelry stores can also benefit from a better-perceived environment.

Due to high competition, dental practitioners are focusing on marketing their service in order to gain and retain clients. The dental office where the second study was conducted spends a lot of time and energy in this respect (as evidenced in their willingness to participate in such a study). Due to the various limitations and the inconclusive evidence, how scent affects a service environment remains a worthy area for future research. One unexpected finding was the perceived level of noise in the office was significantly lower in the Lemon scented environment. Although unlikely, this could possibly be a result of a noisier than normal environment on the control treatment days, however, the findings do suggest future research might be worthwhile. Does the sense of smell impact other senses like hearing?

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