The Influence of Ambient Scent and Music on Patients' Anxiety in a Waiting Room of a Plastic Surgeon

Anna Fenko, PhD, and Caroline Loock, MSc

ABSTRACT

OBJECTIVE: This study investigates the influence of ambient scent and music, and their combination, on patients' anxiety in a waiting room of a plastic surgeon.

BACKGROUND: Waiting for an appointment with a plastic surgeon can increase a patient's anxiety. It is important to make the waiting time before an appointment with the surgeon more pleasant and to reduce the patient's anxiety. Ambient environmental stimuli can influence people's mood, cognition, and behavior. This experimental study was performed to test whether ambient scent and music can help to reduce patients' anxiety.

METHODS: Two pre-studies (n = 21) were conducted to measure the subjective pleasantness and arousal of various scents and music styles. Scent and music that scored high on pleasantness and low on arousal were selected for the main study. The field experiment (n = 117) was conducted in the waiting room of a German plastic surgeon. The patients' levels of anxiety were measured in four conditions: (1) without scent and music, (2) with lavender scent; (3) with instrumental music; (4) with both scent and music.

RESULTS: When used separately, each of the environmental factors, music and scent, significantly reduced the level of patient's anxiety compared to the control condition. However, the combination of scent and music was not effective in reducing anxiety.

CONCLUSIONS: Our results suggest that ambient scent and music can help to reduce patients' anxiety, but they should be used with caution. Adding more ambient elements to environment could raise patients' level of arousal and thus increase their anxiety.

KEYWORDS: Healing environments, patient, patient-centered care, quality care, satisfaction

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Introduction

The body of research addressing the effects of the physical environment on the healthcare experience and the well being of patients is steadily growing (Van Rompay & Tanja-Dijkstra, 2010). The waiting environment plays an important role in the healthcare experience of patients, because they often spend a long time waiting for the doctor, sometime more time than the actual appointment lasts. Becker, Sweeney, and Parsons (2008) stress the value of investing in the physical attractiveness of patient areas and indicate the need for further research to identify specific physical elements that contribute to positive attributions related to quality of care. The current study aims to investigate the possibilities of improving the patient experience in the waiting room of a plastic surgeon by using ambient environmental stimuli (scent and music).

A growing number of people are choosing to have plastic surgeries (Grover & Sanders, 1998). Each year plastic and reconstructive surgeons help patients with congenital malformations (such as cleft lip and cleft palate), disfiguring wounds, animal bites, burn injuries, as well as those requiring reconstruction after surgery for malignancy or other chronic conditions. Cosmetic plastic surgery includes procedures that reshape normal structures of the body in order to improve appearance and self-esteem.

Although patients of a cosmetic surgeon are usually able to live a physically healthy life, their concerns should not be underestimated. Aesthetic problems can cause serious psychological pain. Mental health problems might be more frequent in patients that are interested in cosmetic surgery than in the general population (Sarwer et al., 2004). Research into attitudes toward cosmetic surgery has demonstrated that greater bodily dissatisfaction (Henderson-King & Henderson-King, 2005; Sarwer et al., 2005), poorer self-assessed attractiveness (Frederick, Lever, & Peplau, 2007; Swami, Chamorro-Premuzic, Bridges, & Furnham, 2009), and appearance investment (Delinsky, 2005; Sarwer et al., 2005) are associated with more favorable views of cosmetic surgery.

People who are dissatisfied with certain parts of their body often tend to avoid social contact. They have difficulty finding a partner and may become lonely and depressed over time. For these people undergoing a plastic surgery might have a significant impact on their emotional distress (Deaton & Langman, 1986). Socially acceptable appearance can have a positive impact on interpersonal relationships, sense of self-worth, and overall adjustment (Bersheid & Gangestad, 1982; Harris, 1981; MacGregor, 1982). Subjective perceptions of attractiveness after the surgery have been related to feelings of confidence and improved objective outcomes such as job advancement (Edgerton, Langman, Schmidt, & Sheppe, 1982; Pertschuk & Whitaker, 1982). Other findings indicate significant improvements in body image, including more positive evaluations of patients' appearance and easier body exposure during sexual activities (Bolton, Pruzinsky, Cash, & Persing, 2003).

People often feel ashamed to talk openly about their body dissatisfaction and appearance insecurity. Furthermore, the subjective evaluation of attractiveness and bodily dissatisfaction differs greatly from one person to another. For patients

considering cosmetic surgery, it is often hard to discuss their aesthetic concerns with others. That is why people waiting for their appointment with the plastic surgeon may feel even more nervous than other patients awaiting surgery.

Healthcare Experience

This study focuses on three aspects of healthcare experience: (1) the perceived waiting time, (2) the evaluation of the waiting environment, and (3) the anxiety of patients while they are waiting.

The Perceived Waiting Time

The time spent waiting for a service is a pervasive and often unavoidable experience that appears to be a strong determinant of overall satisfaction with the service (Pruyn & Schmidts, 1998). Waiting time has to be differentiated between objective waiting time and the perceived duration, that is, the subjective estimate of the waiting time (Hornik, 1984). It has been suggested that customers' reactions to waiting are more strongly affected by perceived than by objective waiting time (Hornik, 1984; Pruyn & Smidts, 1993).

The waiting time before a surgery might be perceived as even more traumatic than the surgery itself. Patients are usually asked to be at the hospital at least 1 or 2 hours before the surgery. It is during this time that anxiety usually rises because the surgical environment intensifies it (Haun, Mainous, & Looney, 2001). Waiting for an appointment with a plastic surgeon, presenting the body nakedly, and talking openly about personal feelings and desires can also make people feel very uncomfortable. For all these reasons it is important to make the waiting time before an appointment with the surgeon more pleasant. Patients who perceive the waiting time duration as acceptable might evaluate the healthcare environment and the overall healthcare experience more positively and might feel less anxious before meeting the surgeon. In a study that examined the relationship between the attractiveness of the physical environment of healthcare facilities and patient perceptions of quality, service, and waiting time, Becker and Douglass (2008) determined that the more attractive the environment, the higher the perceived quality of medical care and the greater reported reduction of anxiety.

Waiting Environment

The negative effects of waiting can be reduced by improving the attractiveness of the waiting environment (Pruyn & Smidts, 1998). Specific elements in the environment such as lighting, color, and spatial layout have been shown to influence time perception during waiting (Baker & Cameron, 1996). Pruyn and Smidts (1993) found that an attractive waiting environment positively influences satisfaction with the service.

A study on waiting areas of medical units (Arneill & Devlin, 2002) showed that patients perceive a better quality of care when settings are warm, well furnished, well lighted, decorated with artwork, and contain many magazines, health-related pamphlets, and other information. These findings support previ-

ous research that suggested that positive distractions in the physical environment can reduce stress and make positive changes across different physiological systems—for example, by reducing blood pressure (Ulrich, 1991). When patients are able to occupy themselves with stimuli (visual, tactile, auditory, etc.), their stress decreases because they are able to think of something other than the issue for which they are in the waiting room or hospital.

Anxiety

Much research has been done regarding pre-operative anxiety. According to Haun, Mainous, and Looney (2001), patients who are awaiting surgery are generally experience tension and anxiety. Pre-operative anxiety is accompanied by autonomic nervous system (ANS) arousal, which leads to an increase in blood pressure, heart rate, and respiratory rate (Haun Mainous, & Looney, 2001). Anxiety can have negative effects on a person's cognitive abilities and cause mental and physical discomfort (Vaughn, Wichowski, & Bosworth, 2007).

Research has shown that patients do not want excessive medication to reduce their anxiety. They prefer to listen to music or read (Hyde, Bryden, & Asbury, 1998). According to Thorgaard, Ertmann, Hansen, Noerregaard, Hansen, and Spanggaard (2005), music occupies the patients' minds with something soothing and familiar. It allows patients to relax and escape into another world and focus their awareness on the music. Research has shown that music might reduce patients' anxiety (Korhan, Khorshid, & Uyar, 2010), affect their time perception (Spangenberg & Yalch, 2000) and their evaluation of the healthcare environment (Ferguson, Singh, & Cunningham-Snell, 1997). Specific scents might also have relaxing effects on people (Gueguen & Petr, 2006; Field et al., 2004; Lehrner, Eckersberger, Walla, Pötsch, & Deecke, 2000), improve mood and decrease arousal (Knasko, 1992; Lehrner et al., 2000), improve satisfaction (Morrison, Gan, Dubelaar, & Oppewal, 2011) and reduce anxiety (Lehrner et al., 2000).

Physical Environment Features

Research in environmental psychology has demonstrated that physical environment appears to be an important determinant of how people think, feel, and act (see Van Rompay & Tanja-Dijkstra, 2010, for a review). Environmental features can be classified into three groups: (1) ambient conditions such as temperature, air quality, noise, and music; (2) functional features, such as furnishing and equipment; and (3) signs, symbols, and artifacts, such as a style of décor and personal artifacts (Bitner, 1992). Harris, Ross, McBride, and Curtis (2002) distinguish four environmental categories: ambient features, architectural features, interior design features, and maintenance and housekeeping.

In this research we focus on ambient features. Bitner (1992) defines *ambient features* as background conditions of the environment such as temperature, lighting, noise, music, and scent. Even when these factors are imperceptible, they may still have strong effects on people. In the current study we manipulate two ambient features: music and scent. These two variables have received the most research attention in the retail context (Turley & Milliman, 2000), but have

been relatively understudied in healthcare research. In addition, both music and scent are relatively low cost and easily applicable in healthcare facilities.

Music as an Ambient Feature

Research focusing on music as an ambient feature in healthcare environments has long history. In 1906 the study of Foster and Gable indicated that listening to music affected the rapidity and shallowness of breathing, but the regularity of breathing was not affected. More recently, several studies have examined the effectiveness of music on stress and pain reduction in different healthcare settings. Lee, Chao, Yiin, Chiang, & Chao (2011) found that music is effective in reducing patients' anxiety before a surgery. Ikonomidou, Rehnstrom, and Naesh (2004) found that music can reduce patients' anxiety both before and after surgery. There is some evidence from a recent systematic review to suggest that music is effective in reducing dental anxiety (Moola, Pearson, & Hagger, 2011). There are distraction and relaxation components at work when patients listen to music (Good, Anderson, Ahn, Cong, & Stanton-Hicks, 2005).

Several studies have investigated the effects of music on patients' evaluation of a healthcare environment. In a cardiac laboratory study, Thorgaard et al. (2004) showed that patients undergoing coronary procedures evaluated the sound of medical equipment as more pleasant when accompanied by music than without music. A similar study among patients in need of mechanical ventilatory support demonstrated that music reduces blood pressure and other potentially harmful physiological responses arising from anxiety (Korhan, Khorshid, & Uyar, 2010). Ferguson, Singh, and Cunningham-Snell (1997) demonstrated that music may have either detrimental or beneficial effects on environmental appraisals depending on patient characteristics. A study explicitly focusing on relaxing music showed that calm and soothing music is the most appropriate in reducing anxiety (Wong, Lopez-Nahas, & Molassiotis, 2001). Bernardi, Porta, and Sleight (2006) measured cardiovascular and respiratory variables while patients listened to six types of music with differing rhythmic, harmonic, and melodic structures. They found that fast tempo music induced an arousal effect, while slow or meditative music induced a relaxing effect.

Scent as an Ambient Feature

A number of experimental studies have shown that specific scents have a positive impact on human emotions, cognition, and behavior. For example, Ehrlichman and Halpern (1988) found that women exposed to a pleasant scent produced a significantly greater percentage of happy memories than did women in an unpleasant or neutral scent condition. Knasko (1992) found that a pleasant scent positively affected mood and decreased arousal, while unpleasant scent negatively affected mood and increased arousal. Kirk-Smith and Booth (1987) reported that subjects exposed to a pleasant scent rated peoples' attractiveness on photographs higher than they did in a control condition. In a study by Bone and Ellen (1999), scent increased the time that people needed to finish a decision task.

Several studies have investigated the effects of different types of scent. According to Field et al. (2004), the scent of lavender improves mood and makes people feel more relaxed. Peppermint and cinnamon serve as stimulants and may enhance motivation, performance, and alertness (Raudenbush, Grayhem, Sears, & Wilson, 2009). The scent of vanilla has positive effects on shoppers' satisfaction (Morrison, Gan, Dubelaar, & Oppewal, 2011).

Scent as an environmental feature has been studied extensively in the context of consumer behavior. For instance, lavender scent was shown to have a relaxing effect on customers and increased their length of stay in a restaurant.

Research into the effects of scent in healthcare environments is very limited. One example is the study of Lehrner et al. (2000), which showed that women indicated less pre-treatment anxiety, improved mood, and increased calmness when orange scent was diffused in a waiting room of a dental practice.

Scent as an environmental feature has been studied extensively in the context of consumer behavior. For instance, lavender scent, as opposed to lemon scent, was shown to have a relaxing effect on customers and increased their length of stay in a restaurant (Gueguen & Petr, 2006). Hirsch (1995) conducted a study in which a slot machine area was scented during 1 week. The amount of money gambled in this area in this week was greater than the amount of money gambled in the same area before and after it was scented.

Combinations of Environmental Features

A number of studies in the area of consumer psychology have investigated the effects of different environmental features used in combination and identified interaction effects. For instance, a study of Spangenberg, Grohmann, and Sprott (2005) demonstrated the importance of congruency between the scent and music in shopping environment. The evaluation of a Christmas scent in a store was more positive in combination with Christmas music. The combination of a Christmas scent with non-Christmas music in the store led to more negative evaluations. Morrison et al. (2011) found a significant interaction effect of music and vanilla scent on young fashion shoppers' feelings of pleasure and time spent in a store environment. North, Hargreaves, and McKendrick (1999) showed that French music in a supermarket led to French wine outselling German wines, while German music had the opposite effect.

The study of Mattila and Wirtz (2001) investigated the effects of different types of scent and music tempo. They made a distinction between high and low arousal scents and high and low arousal music. The results showed significant main effects of scent and music on shoppers' evaluations and behavior and a significant interaction effect of scent and music on arousal. Customers responded more positively if the arousing qualities of the music and the type of scent were congruent. In another study, Morrin and Chebat (2005) found negative interaction effect of scent and music. They used citrus scent and low-tempo music in a mall and varied these over time. The results showed that the amounts of money spent were the lowest when both scent and music were present in the mall.

Although the majority of the studies on interactions between environmental stimuli have been conducted in the fields of retailing and services marketing, they might be also important for healthcare design (Van Rompay & Tanja-Dijkstra, 2010). The current study aims to contribute to the experimental data in this field.

This study aimed at investigating the effects of scent and music in the waiting room of a plastic surgeon. In particular, we were interested to discover whether specific scents, types of music, or their combinations could be used in a waiting room to reduce the perceived waiting time duration, improve the evaluation of the waiting environment, and reduce patients' anxiety.

The pre-studies were aimed at selecting stimuli (scent and music) for the main study that are perceived as both pleasant and relaxing. Based on the results of the pre-studies, the stimuli that had highest scores on both scales were used in the main study.

Pre-Study 1: Selecting Music

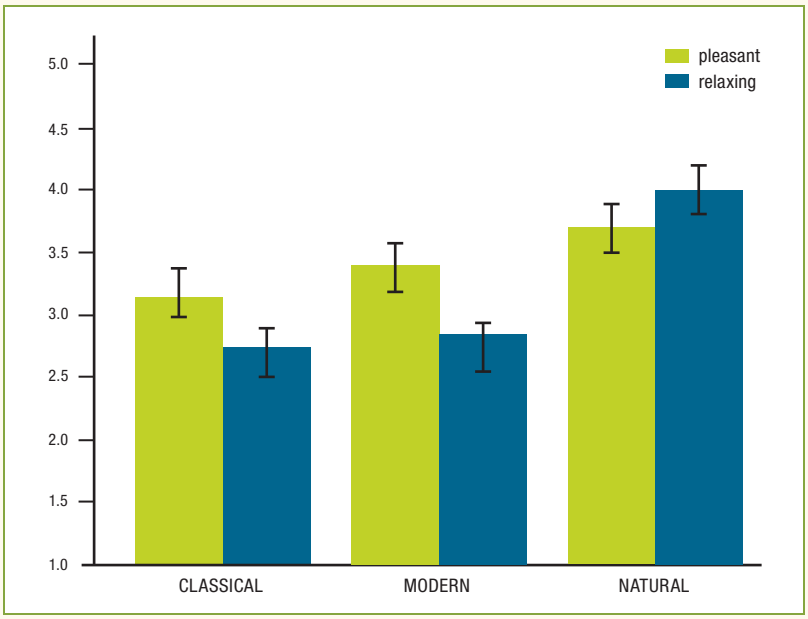
The aim of the first pre-study was to select the type of music that is perceived as both pleasant and relaxing, in order to use it as ambient feature in the main study.

Method

Three different types of music that might be perceived as relaxing and pleasant were included in Pre-Study 1: classical music, calm modern music, and instrumental music with nature sounds. Four different songs were selected for each music type from commercial collections of "calming music" and "music for relaxation." Classical music included Handel's "Water Music," Beethoven's "Für Elise," "A Little Night Music" by Mozart, and "Swan Lake" by Tchaikovsky. Calm modern music included "Set Fire to the Rain" by Adele, "Grenade" by Bruno Mars, "I Can't Help Myself" by Kelly Family, and "Still" by Jupiter Jones. The third music type included four different instrumental songs of unknown artists. The songs included sounds of wind, water, or animals.

Randomly selected participants (n = 21) took part in the Pre-Study 1, including 15 women aged between 20 and 63 years; mean age 31 years. The questionnaire was sent to participants by e-mail. Participants first had to indicate their gender and age. Then participants had to click on a link to listen to a song. For each song two questions were asked: "How pleasant do you find the song?" and "How relaxing do you find the song?" Participants answered on a 5-point Likert-scale from "not at all pleasant" to "very pleasant," and from "not at all relaxing" to "very relaxing." Participants were instructed to listen to a song for at least 50 seconds before evaluating it.

Figure 1. Mean pleasantness and relaxation ratings (with SE) of the three different types of music.



Results

Repeated measures ANOVA was performed to compare the effect of the three different music types on pleasantness. A significant main effect of music type on pleasantness was found ($F(2, 19) = 3.67$; $p < 0.05$). Post-hoc analyses with Bonferroni adjustment were performed to test the significance of the differences between means. Pairwise comparisons indicate a significant difference in pleasantness ($p < 0.05$) for classical music ($M = 3.14$) and instrumental music with nature sounds ($M = 3.69$). Comparisons between modern music ($M = 3.38$) and the two other music types were not significant ($p > 0.05$).

Another repeated measures ANOVA was performed to compare the effect of the three different music types on relaxation. A significant main effect of music type on relaxation was found ($F(2, 19) = 21.72$; $p < 0.001$). Pairwise comparisons indicate a significant difference in relaxation for instrumental music with nature sounds ($M = 4.00$) and classical music ($M = 2.70$), $p < 0.001$; for instrumental music with nature sounds ($M = 4.00$) and calm modern music ($M = 2.77$), $p < 0.001$. No significant difference was found in the scores of relaxation between classical music ($M = 2.70$) and calm modern music ($M = 2.77$).

Based on the results of this pre-study, instrumental music with nature sounds was selected as auditory stimulus for the main study.

Pre-Study 2: Selecting Scent

The aim of the second pre-study was to select the scent that is perceived as both pleasant and relaxing, in order to use it as ambient feature in the main study.

Method

Eight different scents were included in Pre-Study 2: Vanilla, lavender, mint, lemon grass, rose, magnolia, orange, and mango. Some of these scents (e.g., vanilla and lavender) proved to have had relaxing effects in earlier studies. Other scents (e.g., mint) had had opposite effects, and some scents were included to represent different scent categories (e.g., flowery and fruity scents).

Randomly selected participants (n = 21) took part in the pre-study, including 15 women aged between 20 and 80 years; mean age was 41 years.

Participants were asked to smell scent oil from the bottle and to evaluate how pleasant and relaxing they found the smell on a 5-point Likert-scale from "not at all pleasant" to "very pleasant," and from "not at all relaxing" to "very relaxing." Before evaluating the next smell, participants were asked to smell their own skin to neutralize the previous smell. The sequence of the eight stimuli was randomized between participants to control for contrast effect. The names of the scents were provided to the participants after the experiment to make sure that the participants' answers were not based on previous experience.

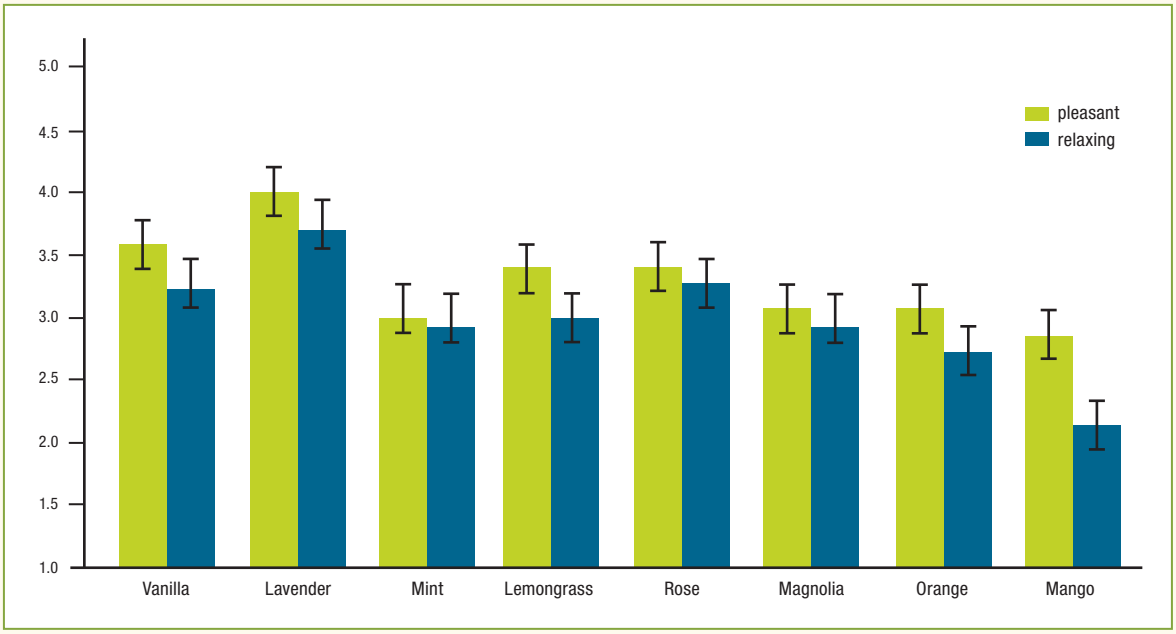
Results

A repeated measures ANOVA was conducted to compare the effect of the eight different scents on pleasantness. No statistically significant effect of type of scent on pleasantness was found (F (7, 14) = 2.47, ns). All scents were approximately the same in pleasantness.

Another repeated measures ANOVA was conducted to compare the effect of the eight different scents on relaxation. A significant effect of scent on relaxation was found (F (7, 14) = 3.90; $p < 0.05$). Post-hoc analyses with Bonferroni adjustment were performed to test the significance of the differences between means. Comparisons of the eight groups indicated a significant difference in the scores of relaxation between vanilla (M = 3.24, SD = 1.30) and mango (M = 2.10, SD = 1.18), $p < 0.05$. Also significant differences in relaxation were found between lavender (M = 3.71, SD = 1.10) and lemon (M = 3.00, SD = 1.00), $p < 0.05$; lavender and magnolia (M = 2.90, SD = 1.38), $p < 0.05$; lavender and orange (M = 2.62, SD = 1.16), $p < 0.05$; and lavender and mango (M = 2.10, SD = 1.18), $p < 0.001$. No significant differences were found between the other pairs (all ps > 0.05).

Figure 2 presents the mean scores of the eight different scent types referring to pleasantness and relaxation. Because lavender scores were significantly higher on relaxation than most of the other scents, it was selected as the olfactory stimulus for the main study.

Figure 2. Mean pleasantness and relaxation ratings of different scents (with SE).



Main Study

The aim of the main study was to investigate the effects of relaxing scent and music used separately and in combination on patients' level of anxiety, evaluation of the waiting environment, and perceived waiting time.

Method

Field experiment was conducted with 2 (scent present vs. absent) by 2 (music present vs. absent) between-subjects design with patients of a plastic surgeon in Germany.

Participants

The patients of plastic surgeon Dr. Abdul Yousef at the Elizabeth Hospital in Recklinghausen (Germany) took part in the experiment. The patients mainly suffered from functional problems with their hands (hand surgery) and aesthetic concerns (breast and face surgery).

Participation in the experiment was absolutely voluntary. All participants gave written permission to use their data, which were treated anonymously. Participants had an opportunity to ask questions and receive information about the purpose and results of the research.

In total 117 patients took part in the experiment; 28 in the No Scent–No Music condition, 28 in the Scent condition, 28 in the Scent–Music condition, and 33 in the Music condition. The sample consists of 28 men (23.9%) and 89 women (76.1%), with a mean age of 47.92 years. The ages ranged from 14 to 88 years. There were 82 first-time visitors (70.1%) and 35 repeat visitors (29.9%). Referring to the type of concern, 49 of the patients had an aesthetic concern (41.9%) and 68 a functional concern (58.1%). Table 1 shows the mean age, gender, familiarity with the environment, the type of concern, and the mean severity of concern among patients in the four experimental conditions. Statistical analyses were performed to test whether the experimental groups differ in any of these characteristics. *T*-tests were used to compare the mean age and the mean severity of concern between the four groups. Chi-square tests were used to compare the differences in gender, familiarity with the environment, and the type of concern. All tests revealed that the sample characteristics did not significantly differ between the four experimental conditions (all *p*s > 0.05).

Stimuli

The experiment included four experimental conditions. In the control condition, neither scent nor music was present in the waiting room. In the second condition lavender scent was present but no music was present in the waiting room. In the third condition lavender scent and instrumental music with nature sounds were both present in the waiting room. In the fourth condition instrumental music with nature sounds was present but no scent was present in the waiting room.

To establish the level of intensity for both stimuli, preliminary tests in the waiting room were performed. For the scent condition, three scent diffusers with lavender oil were initially placed in the center of the waiting room (Figure 3). Patients were asked to evaluate the intensity of the scent. Because a number of patients indicated that the scent was too intense, the experiment continued with two scent diffusers. In this condition there were no complaints about the intensity of the scent. Therefore, it was decided to use two scent diffusers for the experiment.

Table 1. Participant Characteristics per Experimental Conditions

		NO SCENT – NO MUSIC	SCENT + MUSIC	MUSIC	SCENT
N		28	28	33	28
Mean age		47.6	51.2	46.4	46.7
Gender (%)	Male	21.4	28.6	21.2	25.0
	Female	78.6	71.4	78.8	75.0
Type of patient (%)	First-time visitor	60.7	60.7	75.6	82.1
	Repeat visitor	39.3	39.3	24.2	17.8
Type of concern (%)	Aesthetical	39.3	42.8	48.5	35.7
	Functional	60.7	57.2	51.5	64.3
Mean severity of concern		3.39	3.68	3.64	3.69

Figure 3. Scent diffusers placed in the waiting room of plastic surgeon

Figure 4. Auditory equipment placed in the waiting room of a plastic surgeon.

The loudness of music was also tested before the actual experiment. The instrumental music with nature sounds was played in the waiting room with a CD player (Figure 4). Patients were asked about the preferred loudness of music. Based on this feedback, a preferred level of loudness was used for the experiment. The CD collection used in the experiment provided three hours of instrumental music with nature sounds. Patients did not have to listen to the same songs several times while waiting, which might have been annoying.

Measurements

The level of anxiety, evaluation of the waiting environment, and perceived waiting time duration were measured with a questionnaire (in German). Demographic questions, the type of concern ("rather functional" or "rather aesthetical") and the severity of concern were also included in the questionnaire. The severity of concern was measured on a 5-point Likert scale from "not at all serious" to "very serious." Participants were also asked whether they were first time or repeat visitors. We suggested that the type and the severity of patients' concern and their familiarity with the healthcare environment might affect the anxiety level of participants prior to the experiment.

To measure anxiety, eight statements were selected from *Clinical Anxiety Scale* (Snaith, Baugh, Clayden, Husain, & Sipple, 1982) and the German version of the *State-Trait Anxiety Inventory* (Laux, Glanzmann, Schaffner, & Spielberger, 1981). Furthermore, an existing German version of the *Hospital Anxiety and Depression Scale* (Ketterer, 2008), which was originally developed by Zigmond and Snaith (1983), was also used. Participants indicated on a 5-point Likert scale whether they agreed to statements such as "I am nervous" or "I am calm." The reliability of the scale was appropriate (Chronbach's $\alpha = 0.80$).

The type and the severity of patients' concern and their familiarity with the healthcare environment might affect the anxiety level of participants prior to the experiment.

For the evaluation of the waiting environment the four-item *Physical Environment Quality Scale* was used (Voorhees, Baker, Bourdeau, Brocato, & Cronin, 2009). Patients had to indicate on a 5-point Likert scale to what extent they found the waiting room "pleasant," "attractive," "clean," and "comfortable." The reliability of the scale was high (Chronbach's $\alpha = 0.94$).

The perceived waiting time was measured with three items (short or long, unacceptable or acceptable, and reasonable or unreasonable) assessed on a 5-point Likert scale (Voorhees et al., 2009). The reliability of the scale was appropriate (Chronbach's $\alpha = 0.82$).

Patients also were asked to indicate the number of minutes that they approximately had waited (objective waiting time).

When scent and/or music were present in the waiting room, participants were also asked if they perceived scent and/or music. If they answered "yes," they were

further asked to assess how pleasant and relaxing they perceived the scent and/or music on a 5-point Likert scale.

Participants were also asked to give their written permission to use their data anonymously. Finally, the researcher thanked the patients for participation and provided a telephone number and e-mail address for questions and comments.

Procedure

When a patient registered at the front desk, he or she was asked by the receptionist to fill in a questionnaire about patient satisfaction while waiting for the appointment with the doctor. Patients that were willing to fill in the questionnaire received it together with a pen and verbal instructions. Patients were instructed to fill in the first part of the questionnaire (the demographic questions, evaluation of anxiety, and waiting environment) while they were sitting in the waiting room before their appointment. The questions about the objective and perceived waiting time and manipulation check questions about perceived scent and music were answered after the appointment when patients were checking out at the front desk.

The data collection took place during consultation hours (3 days a week). After at least 25 questionnaires had been gathered for one experimental condition, the new condition started on the next day. The whole experiment took about 7 weeks in spring and summer 2012.

Data Analysis

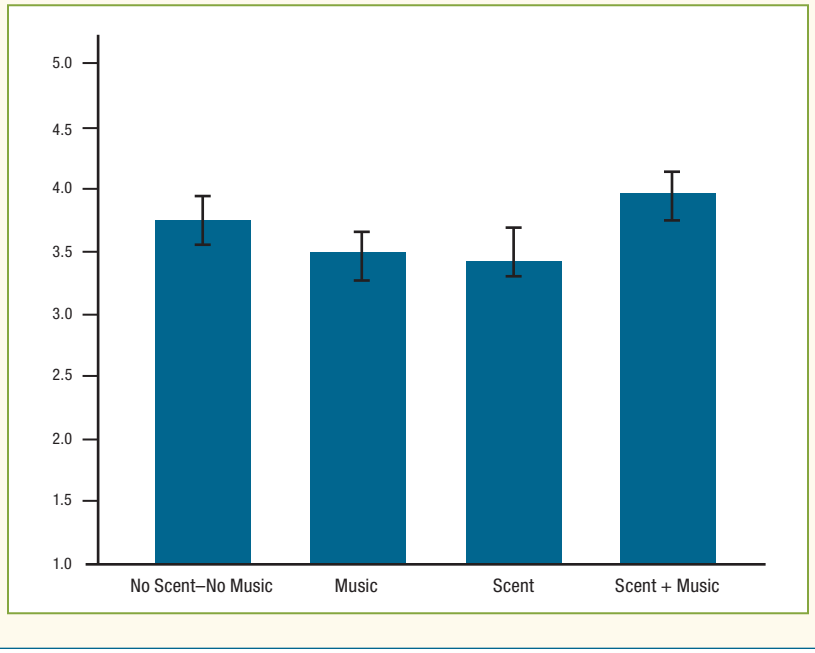
Two-way ANOVAs with Scent and Music as independent factors and Anxiety, Evaluation of Healthcare Environment, and Perceived Waiting Time as dependent variables were performed. Individual characteristics of respondents (age, gender, familiarity with environment, type of concern, and severity of concern) were considered as possible moderators. Post-hoc analyses with Bonferroni adjustment were performed to test the significance of the differences between the means.

Results

The majority of patients noticed the experimental manipulations. In the scent condition, 71.4% of the patients indicated that they noticed the scent while waiting. In the music condition, 68.9% of patients noticed the music in the waiting room. We can conclude that the intensity levels of scent and music were not too penetrative, but were high enough to be consciously perceived by the majority of the patients.

The patients who had noticed scent and/or music were asked to rate how pleasant and relaxing the scent and music were on a 5-point Likert scale (from 1 = totally not pleasant/relaxing to 5 = totally pleasant/relaxing). Lavender scent was perceived as rather pleasant (M = 3.83, SD = 1.20) and relaxing (M = 3.78; SD = 1.26). The instrumental music with nature sound was also perceived as rather

Figure 5. Mean anxiety rates (with SE) in four experimental conditions.



pleasant (M = 3.57, SD = 1.23) and relaxing (M = 3.55, SD = 1.33). These results were in line with the results of the pre-studies and showed that both music and scent were perceived as intended.

Effects of Scent and Music on Anxiety

Two-way ANOVA was conducted with Music and Scent as the main factors and Anxiety as the dependent variable. Results showed no significant main effect of either scent ($F(1, 117) = 0.07$; $p > 0.05$) or music on the level of anxiety ($F(1, 117) = 0.14$; $p > 0.05$). However, the interaction effect of scent and music was significant ($F(1, 117) = 6.62$; $p < 0.05$).

Pairwise comparisons with Bonferroni adjustment showed that in the condition without scent, anxiety was significantly lower when there was music present (M = 3.43, SE = 0.14) than when there was no music (M = 3.95, SE = 0.16; $p < 0.05$). In the scent condition, the presence of music did not significantly change the anxiety level (M = 3.77, SE = 0.16; $p > 0.05$). In the condition without music, the presence of scent significantly reduced the level of anxiety (M = 3.51, SE = 0.16) compared to the condition without scent (M = 3.95, SE = 0.16; $p < 0.05$). In the presence of music, the scent did not significantly change the level of anxiety ($p > 0.05$) (see Figure 5).

We also tested whether patients' familiarity with the environment, the type of concern (functional or aesthetic), the severity of concern and demographic variables (age and gender) had any effects on anxiety. The severity of concern was found to have a significant main effect on anxiety ($F(1, 117) = 13.10$; $p < 0.001$).

Patients with the more severe concern experienced higher levels of anxiety (β = 0.67, $t(115) = 10.4$; $p < 0.0001$). Therefore, the severity of patients' concern could serve as an indicator of patients' stress level prior to the experiment. However, there was no interaction effect between the severity of concern and both environmental factors (scent and music). Therefore, the severity of concern did not moderate the effects of scent and music on anxiety. Familiarity with the environment, the type of concern, and demographic characteristics (age and gender) did not have effects on the level of patient's anxiety (all ps > 0.05).

Effects of Scent and Music on Evaluation of Waiting Environment

Two-way ANOVA was conducted with Scent and Music as independent factors and Evaluation of the Waiting Environment as the dependent variable. Results showed no significant main effect of scent (F (1, 117) = 0.01; $p > 0.05$) or music on evaluation of waiting environment (F (1, 117) = 0.11; $p > 0.05$). The interaction effect of scent and music on evaluation of waiting environment was also not significant (F (1, 117) = 1.55; $p > 0.05$).

We also checked whether age, gender, familiarity with the environment, objective waiting time duration, the type of concern, or the severity of concern had any effects on the evaluation of waiting environment. No significant effects of the individual differences were found (all ps > 0.05).

Effects of Scent and Music on Perceived Waiting Time

Two-way ANOVA was conducted with Scent and Music as independent factors and the Perceived Waiting Time duration as the dependent variable. Objective waiting time duration was used as the covariate. The results showed no significant main effect of scent (F (1, 117) = 1.05; $p > 0.05$) and music on perceived waiting time duration (F (1, 117) = 0.03; $p > 0.05$). No significant interaction effect of scent and music on perceived waiting time duration was found (F (1, 117)= 0.06; $p > 0.05$). Objective waiting time duration was found to have a significant effect on the perceived waiting time (F(1, 117) = 54.24; $p < 0.001$). Patients had to wait for the appointment from 5 minutes to 3 hours; the mean waiting time was 50 minutes. Participants who waited up to 30 minutes were more likely to evaluate their waiting time as "short" compared to the rest of the patients ($p < 0.01$). Participants who waited up to 60 minutes more often evaluated their waiting time as "appropriate" compared to those who waited longer than 60 minutes ($p < 0.05$). Participants who waited more than 1 hour were more likely to evaluate their waiting time as "long" and "unreasonable" compared to patients who waited less than 60 minutes ($p < 0.01$).

We also tested weather age, gender, the familiarity with the environment, the type of concern, and the severity of concern had any effects on the perceived waiting time duration. No significant main or interaction effects of any of these variables on perceived waiting time duration were found (all ps > 0.05).

Discussion

The aim of this research was to find out whether scent and music could be used to reduce patients' anxiety in the waiting room of a plastic surgeon. We found that both of the environmental features, music and scent, could significantly reduce anxiety, but only when used separately. The combination of scent and music in the waiting room did not have any positive effect compared to the absence of these ambient features.

One of the possible explanations of these results can be found in Berlyne's (1960) optimum arousal theory. Berlyne suggested that the relationships between the level of arousal and an individual's affective state could be represented as a bell-curved function. Individuals usually prefer medium levels of arousal. If stimuli cause a too high or too low level of arousal, it results in a negative affect. In the current experiment, the initial level participants' arousal (anxiety) was rather high due to the upcoming appointment with the plastic surgeon. Therefore, stimuli with a low arousal potential were needed to reduce the level of arousal (anxiety). The results of our study suggest that lavender scent and instrumental music with nature sounds both had an appropriate arousal potential to reduce patients' level of anxiety. However, when scent and music were combined, the level of patient's arousal increased. This might be the reason why the combination of two stimuli (scent and music) did not reduce the patients' level of anxiety.

Very low arousal can be pleasant (relaxation) or unpleasant (boredom), while very high arousal can be pleasant (excitement) or unpleasant (anxiety).

An alternative explanation of our results can be found in Apter's (1982) reversal theory. This theory suggests that two different mechanisms account for the affective reactions to arousing and relaxing stimuli. Very low arousal can be pleasant (relaxation) or unpleasant (boredom), while very high arousal can be pleasant (excitement) or unpleasant (anxiety). These two opposite ways of interpreting arousal can be reversed depending on a specific situation (serious or playful) or individual goals. "At one moment a person may crave excitement and at another avoid exactly those arousing situations which he was so keen to experience a short time before" (Apter, 1984, p. 274). In several studies, Walters, Apter, and Svebak (1982) showed that in different situations the same participants preferred either arousing "warm" colors (red and yellow) or relaxing "cool" colors (blue and indigo), while the neutral color (green) was chosen extremely rarely. In our study, the participants were clearly in a situation where they interpreted arousal as anxiety rather than as excitement. This may explain why the increase in the amount of external stimulation in the combined scent and music condition was perceived more negatively than the conditions with either olfactory or auditory stimulation.

Reversal theory may also explain why the results of this study seem to contradict previous findings of positive influence of congruent scent and music in retail environment (e.g., Mattila & Wirtz, 2001; Spangenberg, Grohmann, & Sprott, 2005). In a shopping situation people may feel more relaxed and playful, and they might experience increased arousal positively, as increased excitement. Hence, the effects of the chosen music and scent might be different in other situations. When people are bored and crave excitement, the chosen stimuli might not have any positive effects separately, but be successful in combination. When

people are positively aroused (excited), the effects of pleasant and relaxing scent and/or music and their combination might also be different.

Limitations of the Current Study and Suggestions for Future Research

In our Pre-Study 1, participants listened to the music for approximately 1 minute, while in the main study patients often had to listen to the music for a longer period. Although the music was evaluated positively both times, a small number of participants in the main study indicated that the music was annoying. Some studies suggest that music might become annoying when listening to it for a long period (Witvliet & Vrana, 2007).

The effects of music might also change over time due to sensory habituation (Brentar, Neuendorf, & Armstrong, 1994). Some studies have found that exposure increases the enjoyment of music (e.g., Bradley, 1971; Brickman & D'Amato, 1975), while others have found that affective responses to music follow an inverted-U pattern, with increased exposures to music (e.g., Brentar Neuendorf, & Armstrong, 1994; Hargreaves, 1984; Heyduk, 1975). Bernardi, Porta, & Sleight (2006) found no habituation effect, while Witvliet & Vrana (2007) found a polarization effect of exposure on music liking: with exposure, negative music was liked even less, whereas positive music was liked even more. Because different studies of habituation effects of music have yielded contradictory results, more research is clearly needed into the dynamic effects of exposure to music.

Another interesting question that needs further exploration is whether the effects of music and scent on anxiety found in our study occur automatically or require patients' attention. Literature suggests that ambient environmental features might affect people's affective and cognitive reactions without their full awareness (Krishna, 2012; Herz, 2010). In our study, the level of olfactory and auditory stimulation was calibrated in such a way that the presence of scent and music would not be too obtrusive. The post-exposure questions showed that about 30% of participants did not notice music and scent in the waiting room. Our results demonstrate a significant anxiety reduction in the music only and scent only conditions compared to the control condition. However, our study does not provide enough data to conclude whether conscious awareness or attention moderated the effects of ambient stimuli. The question of whether these effects require awareness or attention needs further research.

Many of the participants in our study were 70 years and older. Because sensory perception decreases as we age, these patients might have perceived the scent and music differently than younger patients. The perception of the stimuli in our study was also influenced by the fact that the door and the windows of the waiting room were always open. When used in closed spaces, scent and music might be perceived differently. Future research needs to take this into account while investigating psychological effects of the environmental stimuli.

In future studies, it also would be interesting to investigate the effects of scent, music, and other ambient features (such as lighting and temperature) in differ-

ent healthcare or other waiting environments (a waiting room of a dentist or a pediatrician, a hotel lobby, an airport terminal, etc.). By manipulating the initial level of a patient's anxiety or boredom, it might be possible to find an optimal level of sensory stimulation that can ensure the desired effects of relaxation or excitement for specific groups of customers.

Implications for Practice

- This study demonstrates that scent and music can be used in healthcare environments for reducing anxiety of the patients.
- A relaxing scent (such as lavender) and relaxing music (such as instrumental music with nature sounds) can be used separately in a doctor's waiting room in order to reduce patients' level of anxiety.
- Ambient stimuli like relaxing scent and music might be effective in other healthcare environments where patients wait for their appointment and are likely to experience anxiety (such as a dentist's waiting room). They could also be used to reduce people's anxiety in other waiting situations, such as airports or examination facilities.
- Our study also demonstrates that using relaxing scent or music in combination may be less efficient in reducing people's level of anxiety than using these ambient features separately. The combination of two or more ambient features should be considered with caution, especially in situations where the initial level of arousal is high. It might be more effective to use two or more ambient environmental features in situations where people feel bored (but not physically threatened), such as waiting for a train or in a bank.

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