

It Smells Crowded:  
An Experimental Investigation of Olfactory Influence on Spatial Perception

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## **Abstract**

### **It Smells Crowded: An Experimental Investigation of Olfactory Influence on Spatial Perception**

Tina Poon

Smell is arguably the most impactful of the 5 senses since scent has close ties with emotion and memory. As a result many retailers infuse their stores with scents to alter a consumer's impression of the environment. However, to date very little research has investigated whether scent can alter an individual's perception of crowdedness. Spatial crowding is a huge issue for many stores because a crowded environment can induce anxiety and negative emotions in consumers. Thus, the present study examines whether scent can be used to impact a consumer's perception of spatial crowding, and whether scent and crowdedness interact to influence anxiety levels. Furthermore, the present study examines whether scent influences the spatial size of objects.

This theory was tested in an experimental research study where 120 participants were asked to judge the volume of six containers and the size of room they were in. Participants were randomly placed in the no scent, spacious scent, or intimate scent condition. The test room was either crowded or not crowded. The results show that participants in the crowded condition, versus the not crowded condition, perceived the room as smaller and had lower room evaluations. In addition, participants in the crowded condition had higher levels of anxiety, however an intimate scent enhanced anxiety while a spacious scent reduced anxiety for those in the crowded room. In conclusion, managers should consider using scents in a crowded environment to reduce anxiety levels, but managers should be cautious to use an appropriate scent.

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## **Introduction**

The ambience of a retail environment is crucial to attract consumers and leave a positive impression (Baker, Parasuraman, Grewal & Voss, 2002; Janiszewski, 1998). Kotler (1974) was one of the first to propose that carefully designed retail environments can induce specific emotions in consumers, and enhance purchase probability. Since then, numerous studies have supported the claim that retail atmospherics (the ambience, design and social factors of a store's selling environment; Baker, 1986), can positively influence a consumer's perception of the retail environment (Areni & Kim, 1994; Kotler, 1974).

The majority of studies investigating retail atmospherics apply Mehrabian and Russell's (1974) Stimulus-Organism-Response Model, also known as the S-O-R Model. The model suggests that environmental factors influence consumers' affective responses and behaviour. Such environmental factors include music (Milliman, 1982), colour (Bellizzi, Crowley & Hasty, 1983), lighting (Areni & Kim, 1994), and scent (Chebat & Michon, 2003; Spangenberg et al., 1996). Scent, in particular, has been shown to be a strong influence on store evaluation (Spangenberg, Crowley & Henderson, 1996). For example, Spangenberg, Grohmann and Sprott (2005) found that congruent scent and music increased store evaluations.

Scent is often regarded as one of the most powerful of the human senses (Rodriguez-Gil, 2004) because of its strong links to human emotion (Chebat & Michon, 2003) and long-term memory (Goldman & Seamon, 1992; Laird, 1935). While memory decay for verbal information occurs almost immediately after learning (Peterson & Peterson, 1959), odour recognition decays very little over time (Engen & Ross, 1973). Scent also enhances memory for information associated with a smell (Krishna, Lwin, &

Morrin, 2010). Researchers propose that this link results from the close proximity of the olfactory bulb with the limbic system, a neurological structure responsible for emotions and encoding long-term memory (Swenson, 2006). However, past research has also found a strong relationship between the limbic system and spatial memory; specifically, researchers have found ties between the hypothalamus and spatial memory (Chun & Jiang, 2003; Pearce et al., 2005). In fact, amnesic patients with hippocampal damage demonstrated significant defects in spatial memory tasks, such as a virtual radial arm maze (Goodrich-Hunsaker & Hopkins, 2010).

Since there is evidence that the limbic system influences spatial memory, it is possible that certain scents have the potential to change the spatial perception based on scent associations. For example, scents that are associated with spacious areas, such as an alpine or sea shore environment, may lead consumers to believe that the current room is larger than it appears. In contrast, scents associated with cozy environments, such as burning or woody scents, could decrease the perceived size of a room. Scent may also be used as a means of reducing the anxiety associated with extremely small or large environments.

However, very few studies have investigated the effects of scent on spatial perception, despite the potential managerial implications. Retail environments that are crowded can induce a sense of claustrophobia in customers and generate anxiety (Baxter & Deanovich, 1970). The same is true for spaces that are too large. Agoraphobia—the fear of large, public areas—can also cause anxiety in customers (DSM-IV, 1994). Therefore, retailers need to be strategic about their use of space and the overall impression their store leaves on consumers. Retailers with limited space may be able to

use scents to give consumers the impression of openness and reduce anxiety associated with claustrophobia. On the other hand, retailers with too much space may be able to use scents to create a cozy ambience to reduce anxiety from agoraphobia.

Unfortunately, to date very little research has been done on the effects of scent on spatial perception. Thus, the present paper examines whether scent can be used to alter the anxiety related to perceptions of spatial crowding and, as a result, elicit positive behaviours such as a positive evaluation of the store?

## **Conceptual Framework**

### **Retail Atmospheric**

Overall, there are five broad categories of atmospheric cues: external cues, general interior cues, layout and design cues, point of purchase and decoration displays, and human variables (Turley & Milliman, 2000). The two areas of interest in the present research are general interior cues, which include flooring, lighting, colour schemes, music, and ceiling composition, and layout and design cues, which include interior design and allocation, grouping, traffic flow, racks and cases. It is important to note that when consumers enter a store, they experience these environmental factors holistically. That is, the retail environment is complex and many factors will interact with each other. However, the goal of the present study is to investigate the influence of two specific atmospheric cues, scent and spatial crowding, on consumers' perception. This is accomplished by controlling all other factors and systematically changing the cues one at a time.

### **Ambient Scent**

One of the fastest growing trends in retail marketing is the use of ambient scent. Ambient scent is a general odour present in the environment but does not emanate from a particular product. Retailers can infuse ambient scents into the retail environment with the intention of affecting attitudes and behaviours of consumers in a way that is beneficial for the retailer. Scented stores can enhance brand memory (Krishna, Lwin, & Morrin, 2009), alter emotional states (Cupchik, 2005), and increase store evaluations (Spangenberg, Crowley & Henderson, 1996). However, incorrectly implementing scent can have a detrimental effect on a store's performance. For example, floral scents in a

store tailored towards older individuals can conjure memories of funerals (Bone & Jantrania, 1992).

Scent is a relatively cheap and effective way of making a retail environment more attractive. Companies such as Bloomingdales use difference scents for each department: baby powder in the baby store, suntan lotion in the bathing suit area, and lilacs in the lingerie department (Ravn, 2007). Sony created a custom scent of vanilla and mandarin oranges to put customers, particularly females, at ease in their stores (Vlahos, 2007). To give the impression of cleanliness, Thomas Pink, a high end clothing chain, emits the smell of clean, pressed shirts into its stores (Fetterman & O'Donnell, 2006). Real estate agents often scent new homes with fresh pies to give the impression that the new home is cozy or liveable (Dowdey, 2008). Given the increasing adoption of scents in the retail environment, it is important for researchers to investigate how scents can influence the consumer and how to effectively use scents in the retail environment.

### **Spatial Crowding**

Another important factor to consider in terms of atmospheric cues is layout and design cues, specifically those that relate to crowding. To retailers, crowding is a double-edged sword. On one hand, large crowds typically indicate a high volume of shoppers and generally an increase in profit. However, perceived crowding can decrease levels of satisfaction with the store (Machleit, Eroglu & Mantel, 2000). Crowding as a result of kiosk locations in the mall has been shown to negatively affect shopper patronage and approach intentions (Kim & Runyan, 2011). However, it is important to distinguish between human and spatial crowding (Machleit, Kellaris, & Eroglu, 1994). Human crowding is a result of a high density of shoppers in a retail environment, while spatial

crowding results from a high density of retail products. Li, Kim and Lee (2009) found that crowding as a result of spatial density negatively impacted shoppers' emotions, on the other hand, crowding as a result of human density positively impacted consumer emotions. Crowding can elicit anxiety in consumers who find themselves in crowded environments. The present study seeks to add to the spatial crowding literature by examining whether the use of scents can reduce the perception of spatial crowding and, as a result, elicit positive approach behaviours.

### **Spatial Crowding and Emotions**

It is well documented that interior design manipulations can influence an individual's perception of size and atmosphere. Baum and Davis (1976) found that light-coloured rooms appear larger than dark-coloured rooms. As a result, participants felt less spatially crowded when the room was light compared to dark. Crowding as a result of high spatial density can negatively affect consumers' positive emotions (Li, Kim & Lee, 2009) and can decrease the level of customer satisfaction with the store (Machleit, Eroglu & Mantel, 2000). On the other hand, large minimalistic interior spaces can appear cold and unfriendly, which can also adversely affect store perceptions by making the individual feel isolated. Either way, consumers can become agoraphobic (fearful of open spaces) or claustrophobic (fearful of enclosed spaces), which can manifest itself in negative emotion such as anxiety (DSM-IV, 1994). As such, it is important for retailers to design a retail environment that is comfortable to the consumer and accurately projects the retailer's intended image. Favourable size perceptions should positively influence the level of anxiety for the consumer and increase store evaluation.

## **Scent and Spatial Perception**

Hirsch (1998) was one of the few to investigate the effects of scent on spatial perception. In addition to testing spatial perception, Hirsch (1998) tested the levels of claustrophobia and the levels of anxiety that came with claustrophobia. He found that cucumber scent, seashore scent, and green apple scent were most effective in increasing the perceived size of a room and decreasing anxiety associated with claustrophobia. But, BBQ scent made the room appear smaller and increased anxiety. However, Hirsch's (1998) study has numerous limitations. To begin, Hirsch used only eight participants, lowering the power and generalizability of the results. The profile of the eight participants was also questionable, since one was depressed and four were moderately anxious. One of the participants also smoked, which can lower olfactory abilities (Frye, Schwartz & Doty, 1990).

Furthermore, participants were well aware of the ambient scent since the scent was administered through gas masks. Awareness of a scent can influence a participant's reaction to the scent (Gulas & Bloch, 1995). In addition, gas masks are often associated with illness or war; therefore the gas masks may exaggerate levels of anxiety in participants. The experimenter also exposed participants to several scents, which can over stimulate and overwhelm the olfactory bulb (Kinnealey, Oliver, & Wilbarger, 1995). Finally, Hirsch's (1998) research was not published in a peer-reviewed journal, rather it was submitted as a patent. Therefore, the study was not evaluated on its scientific merits by a group of trained and experienced researchers.

Another limitation of Hirsch's research was the potential placebo effect that may take place. The placebo effect was coined by Henry K. Beecher (1955), and describes

how a medically ineffectual treatment may still improve a patient's condition, simply because of the patient's subjective beliefs about the effects of the treatment. In the context of Hirsch's study, scent is used as a treatment for claustrophobia. However, the purpose of the study was obvious since participants were completely aware of the scent, and the questionnaire clearly asked participants about room dimensions and anxiety levels. Therefore, participants may have believed their anxiety levels were lower, simply because they associated scents with lower anxiety.

In sum, there is a need to replicate Hirsch's (1998) research on the link between scents and spatial perceptions, taking into consideration the need for a larger sample size and an experimental procedure that minimizes participant awareness, sensory satiation, and demand cues. The present research addresses these issues and seeks to also examine the process by which scent affects spatial perception. The proposed process is discussed next.

### **Stimulus-Organism-Response Model**

The majority of retail scent studies are based on Mehrabian and Russell's (1974) stimulus-organism-response model (S-O-R). In general, environmental cues are stimuli (S) that combine to influence an organism's internal affective state (O) to produce an approach/avoidance response (R). In the context of the current study, environmental cues, like ambient scent, elicit an internal emotional response from the organism that influence a consumer's type of behaviour: approach or avoidance. Approach behaviours are behaviours associated with positive attitude towards the environment; some examples include remaining in a store longer and exploring the retailer's selection. On the other hand, avoidance behaviours are characterized by a negative attitude towards the

environment, and include leaving the store and not browsing through the store's wares. Approach behaviours are usually brought about by a positive reaction to the environment (Babin, Darden & Griffin, 1994; Dawson, Bloch, & Ridgeway, 1990; Donovan & Rossiter, 1982), while avoidance behaviours result from negative reactions to the environment (Eroglu & Machleit, 1990).

Affective responses typically studied in the S-O-R model involve pleasure, arousal and dominance (PAD). The PAD model was developed by Mehrabian (1996) and is often used in conjunction with the S-O-R model to describe and measure emotional states. Emotional states are transitory conditions of an organism and these states are important to marketers in order to understand how consumers react to a stimulus or environment. The PAD model consists of three dimensions: pleasure/displeasure, arousal/non-arousal, and dominance/submissiveness.

Pleasure/displeasure is a measure of the pleasantness of an emotion. For example, sadness scores high on displeasure, while happiness scores high on pleasure. Arousal/non-arousal describes the intensity of an emotion. For instance, while gleefulness and ecstasy are emotional states that would score high on pleasure, ecstasy is much more intense than gleefulness. Dominance/submissiveness represents whether an emotional state is controlling or submissive. For example, boredom and anger both score low on the pleasure scale, but boredom would score highly on submissiveness, while anger would score highly on dominance. The present study used the S-O-R model, in conjunction with the PAD model, to measure the emotional reactions of consumers to a retail environment.

## **Effects of Retail Atmospheric on Objects in the Environment**

While ambient scent may influence consumers' reaction to a retail environment, past research shows that scent may also play a role in consumers' perception of products. One of the first studies to demonstrate this effect was by Laird (1932) who presented scented hosiery to housewives. The participants were asked to evaluate the quality of the hosiery, which were scented with a faint narcissus, fruit, sachet, or a natural unpleasant scent. Although Laird did not inform participants about the scent, housewives evaluated the narcissus scented stockings significantly more positive than the hosiery with an unpleasant scent. A further study by Cox (1967) confirmed Laird's results and added that approximately 90% of women selected scented hosiery over non-scented hosiery. Participants also felt the scented stocking were better quality than the unscented ones, even though the hosiery was the same on all aspects except for the scents.

Thus, there is evidence the presence of a scent can impact a consumer's response to a product. Furthermore, researchers have proposed that scent influences a consumer's reaction towards a retail environment the same way that scent can influence a consumer's reaction towards a product (Bone & Ellen, 1999). For example, Bosmans (2006) demonstrates that ambient scent influences a consumer's product evaluations. Bosmans hypothesized that when ambient scent elicits an emotional response, consumers often misattribute the emotional response to the product. Consequently, pleasant scents that elicit positive emotions enhance product evaluations.

## **Congruency Effects Related to Ambient Scents**

Previous literature has found evidence of congruency effects between scent and the environment. For example, Spangenberg et al. (2006) investigated the effects of

congruity between the perceived gender of the ambient scent and the store's gender based products on approach/avoidance behaviours. Using the S-O-R model, Spangenberg et al. (2006) found that ambient scent interacted with the store's gender based products to influence internal consumer's responses to the environment. Spangenberg, Grohmann and Sprott (2005) examined the effects of congruity between scent and music during the Christmas holiday season. Spangenberg and colleagues conducted an experimental 2 (scent vs. Christmas scent)  $\times$  2 (non-Christmas music vs. Christmas music) between-subjects design. They found that consistent music and scent positively influenced behavioural intentions to visit the store.

Based on previous research, it is possible that these congruency effects extend to congruency between object size and scent. It is possible that large objects in a room with a spacious scent are perceived more favourable than a large object in a room with an intimate scent. Another possibility that previous research has not touched upon is the possibility that objects will appear larger when the room is scented with a spacious scent, compared to an intimate scent. On purpose of the present research is to explore these possibilities and extend the literature related to scent and spatial perception.

## Hypotheses

Based on the S-O-R model, the environmental cues interact to produce affective responses which influence consumers' behavioural response (Mehrabian & Russell, 1974). The present study proposes that scent and spatial crowding interact to produce either a positive or negative overall evaluation of a room. Specifically, participants smelling a spacious scent in an empty room will perceive the room as too large. The larger room is expected to induce agoraphobia, and decrease overall room evaluations. On the other hand, intimate scents in a crowded room are expected to reduce the perceived size of the room and elicit feelings of anxiety related to claustrophobia (Hirsch, 1998). The anxiety is likely to negatively affect room evaluations. Conversely, spacious scents paired with a small room will increase perceived room size to a comfortable level, while intimate scents in a large room will decrease perceived room size to a comfortable level. The present study defines perceived room size as the actual dimensions of a room. These positive affective responses are likely to produce positive room evaluations (DSM-IV, 1994; Li, Kim & Lee, 2009).

The relationship between the spatial crowding  $\times$  scent interaction on room evaluations is expected to be mediated by affective responses (anxiety, pleasure, arousal, and dominance), and perception of the room size (larger or smaller). This process is illustrated in the conceptual model shown in Figure 1.

In addition, the mechanisms that influence the perceived size of a room are also likely to influence participants' perceptions of object size. Specifically, the type of scent in the atmosphere (spacious or intimate) is expected to interact with the perception of

spatial crowding and either enhance or decrease the perceived size of an object. This in turn will influence affective responses and the evaluation of the object.

This research examines the following hypotheses:

**H1:** Scent will enhance or reduce crowded conditions to influence the perceived size of a room: an intimate scent will decrease the perceived size of the room and a spacious scent will increase the perceived size. However, individuals will perceive the room as significantly smaller (larger) when an intimate (spacious) scent is paired with a crowded (not crowded) room.

**H2:** When participants perceive the room size too small (intimate scent in a crowded environment) or too large (spacious scent in a not crowded environment), this produces negative affective responses (i.e. high anxiety, low pleasure, low arousal and high dominance). When the perceived room size is not too small or too large (intimate scent in a not crowded environment or spacious scent in a crowded environment), participants experience positive affective responses (i.e. low anxiety, high pleasure, high arousal and low dominance).

**H3:** Positive (negative) affective responses elicit positive (negative) overall room evaluations (room feel, attractiveness, ambience, and size).

**H4:** Positive (negative) affective responses elicit larger (small) perceived object size.

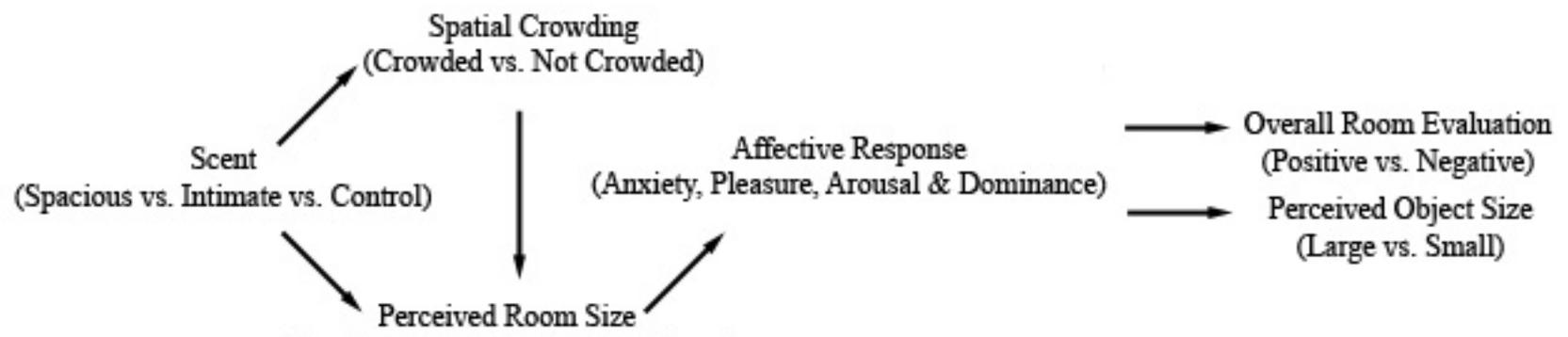


Figure 1. Conceptual Model

## Methodology

### Pre-tests

#### *Scent*

The objective of the first pre-test is to select scents that are strongly associated with spaciousness or intimacy. Due to the lack of previous literature, the scents that were tested included selected scents from Hirsch (1998; smoke, seashore, cucumber and green apple), as well as scents chosen because they are associated with large, spacious areas (for example an alpine scent), or scents associated with small, intimate areas (for example a woody scent). Overall, the pre-test contained a total of five scented oils, including green apple, firewood, cucumber, mountain air, and seashore (Appendix A).

The experimenters presented the scents in opaque, unlabeled bottles containing cotton balls soaked with the fragrant oil. The bottles omitted the same scent intensity to avoid confounds associated with the strength of the scent. All participants ( $n = 19$ ,  $M_{\text{age}} = 25$ , age range: 19 - 36 years ) were independent of the main sample and completed a self-report questionnaire (Appendix B) containing items related to the perceived pleasantness, strength, and spaciousness of the scent. In addition, the pre-test measured a participant's pleasure, arousal and dominance in the PAD scale. See Table 1 for the components of each construct and alpha values. Additional questions determined if external factors, such as sickness or smoking, interfered with the participant's sense of smell.

**Table 1. Pre-test Questionnaire: Variables, Items, and Cronbach's Alpha**

Construct	Item	Cronbach's Alpha
Pleasantness	Unfamiliar – Familiar	.89
	Bad – Good	
	Negative – Positive	
	Unpleasant – Pleasant	
	Unattractive – Attractive	
Strength	Weak – Strong	.84
	Light – Heavy	
	Simple – Complex	
Spaciousness	Expansive – Crowded	.73
	Open – Closed	
	Spacious – Intimate	
Pleasure	Happy – Unhappy	.95
	Pleased – Annoyed	
	Satisfied – Unsatisfied	
	Contented – Melancholic	
	Hopeful – Despairing	
	Relaxed – Bored	
Arousal	Stimulated – Relaxed	.86
	Excited – Calm	
	Frenzied – Sluggish	
	Jittery – Dull	
	Wide Awake – Sleepy	
	Arousal – Unaroused	
Dominance	Controlling – Controlled	.90
	Influential – Influenced	
	In Control – Cared for	
	Important – Awed	
	Dominant – Submissive	
	Autonomous – Guided	

Based on the pre-test findings, there was a significant difference between the scents with regard to spaciousness, ( $F(4,90) = 4.07, p = .004$ ). Tukey's post hoc analysis revealed that firewood ( $M = 4.75, SD = 1.04$ ) and seashore ( $M = 3.49, SD = 1.38$ ) scored significantly different from each other on openness, with participants ranking firewood low on openness and seashore high on openness ( $p < .05$ ). Furthermore, both firewood and seashore align with the present study's hypothesis, since firewood is associated with small areas and the opposite hold true for seashore. Both scents also were similar on strength, arousal and dominance ( $p > .142$ ). There was a significant difference between

scents with regard to pleasantness ( $M_{\text{spacious}} = 3.16$ ,  $M_{\text{intimate}} = 5.15$ ,  $F(4,90) = 8.17$ ,  $p < .05$ ), and pleasure ( $M_{\text{spacious}} = 5.78$ ,  $M_{\text{intimate}} = 3.87$ ,  $F(4,90) = 5.62$ ,  $p < .001$ ).

### ***Spatial Crowding Check***

A check was performed to ensure the testing room was considered crowded or not crowded. In order to make the testing room spatially crowded, the room was filled with empty boxes. In the not crowded condition, the same room was empty and deprived of all objects. Five volunteers were asked to verbally express their reaction to the crowdedness of the room and their emotional reactions to the crowding. These participants were independent of the main study and the pre-test. This is to ensure that the crowded condition induces anxiety as a result of too little space, while the not crowded condition induces anxiety as a result of too much space. See Appendix C for an image of the empty and filled test room.

## **Main Study**

### ***Design***

In order to determine whether scent influences spatial perception, the study used a 3 (scent: spacious [seashore] vs. intimate [firewood] vs. control [no scent])  $\times$  2 (spatial crowding: crowded vs. not crowded) between-subject experimental design. The perceived room size, affective responses, overall room evaluation and perceived object size was measured to test the proposed model in Figure 1.

### ***Participants***

One hundred and twenty participants (70 women, 50 men,  $M_{\text{age}} = 22.26$ , age range: 18 - 47 years) were recruited by approaching every 3<sup>rd</sup> person on local university

campus. Participants were given a \$5 gift card to Starbucks© as a thank you for participating.

### ***Stimuli***

*Scent.* Based on the pre-test results, seashore represented the spacious scent, and firewood represented the intimate scent. In the control condition, no scent was used.

*Spatial Crowding.* Spatial crowding was manipulated with the use of empty boxes. Based on the pre-test, 84 boxes were used to fill the room and they were placed in the same location for each participant to ensure consistency.

*Objects.* Six clear glass objects were used as stimuli for the study. The objects were clear to prevent any bias related to colour, and they were unusual shapes and sizes to make it more challenging for participants. This also prevented any biases from participants that regularly dealt with sizes, because the stimuli were entirely new to them. Furthermore, the objects were labelled with colours and rotated for every participant to prevent biases from the order of the objects. See Appendix D for the image and size of each container, an Appendix E for an image of the overall experimental set-up.

### ***Measures***

*Room Size and Evaluation.* Perceived rooms size was determined by asking participants to estimate, in meters, how long are the length, height, and width of a room. Participants were given the option of answering in metrics if they are not familiar with the empirical system. At the same time, participants were asked how they would rate the overall attractiveness (not at all attractive/extremely attractive), feel (too small/too large), ambiance (cramped/void) and size (tiny/huge) of the room. Finally, the participants answered questions related to spatial crowding derived from Machleit, Kellaris and

Eroglu (1994) as a manipulation check. Scales touching upon room evaluation and perceived room size received Cronbach's Alpha levels of .59 and .47, respectively.

*Pleasure, Arousal & Dominance.* Pleasure, arousal, and dominance were assessed on the 18-item PAD measure developed by Mehrabian and Russell (1974). Items were measured using semantic-differential items assessed on 7-point scales. Either end of the 7-point scale was anchored by two opposite emotional items (e.g. happy vs. unhappy). In the current sample, internal consistency for arousal was  $\alpha = .75$ , and for pleasure was  $\alpha = .83$ . Dominance displayed a Cronbach's Alpha of .80.

*Anxiety.* Anxiety was measured with the State-Trait Anxiety Inventory (Aaker, Stayman, & Hagerty, 1986), which consists of a four-item questionnaire that measures state and trait anxiety. State anxiety is anxiety as a result of a specific situation, whereas trait anxiety is anxiety that results from a general, long-standing personality construct. State and trait anxiety were measured with two items each. Since the present study examines effects of environmental cues (crowding and scent) on anxiety, it focused on the results from the state anxiety questionnaire. The trait anxiety questionnaire was also given in to determine the participant's baseline level of anxiety. In the present study, questions related to state anxiety were significantly correlated ( $r = .23, p < .01$ ) and questions related to trait anxiety were also significantly correlated ( $r = .12, p < .04$ ). Overall, the four-item scale had an acceptable Cronbach's Alpha of .55.

*Object Evaluation.* The study used six objects altogether to determine if scent could influence perceived object size. The objects were all made of glass and contained no special markings, labels or etching. Participants estimated the size of the container by guessing how much liquid each container could hold. The questionnaire mentioned that,

as a point of reference, a regular can of soda is 335ml, 0.335 liters or 12 oz. Participants were allowed to write measurements in either imperial or metric.

### *Experimental Procedure*

The experiment was conducted by research assistants who did not know about the study's hypotheses. These precautions mitigated the possibility of the research assistants unintentionally influencing participants. The research assistants approached every 3<sup>rd</sup> person and asked potential candidates if they would like to participate in a thesis research study where they judge containers based on size. Participants were informed they could withdraw from the study at any time and that responses were kept confidential. If participants agreed to the study, they signed a consent form, and entered the test room. The test room was either spatially crowded (the room was filled with boxes), or spatially not crowded (the room was empty). Experimenters scented the test room with either a spacious scent (seashore), an intimate scent (firewood), or no scent (the control condition). The scent was administered with an Airwick© plug-in scent dispenser filled with a customized scented oil. Before every session, the experimenters made certain the intensity of the scent was consistent and the room was fully aerated for a week between scents to avoid cross-contamination.

In the room, participants filled out the PAD questionnaire and the State-Trait Anxiety Inventory. In addition, participants answered questions regarding their evaluations and perceived size of the room and the objects. Once participants completed the study, they were given a \$5 gift certificate to Starbucks©. The experimenter debriefed participants by explaining the study in greater detail and giving the participants additional contact information. All the participants received the same examination procedures and

questionnaire. Participants obtained an ID number to keep their identities anonymous. Finally, their consent forms and questionnaires were kept separate in order to keep responses anonymous. For a copy of the script used by the research assistants, please refer to Appendix F.

## Analysis and Results

The present study recruited 120 adults (70 women, 50 men,  $M_{\text{age}} = 22.26$ , range: 18 - 47 years old) to participate in the experiment. On average, participants rated their level of English a 6.48 out of 10, which indicates that participants were generally able to comprehend the questionnaire.

### Manipulation Check

An independent samples t-test was conducted to determine whether participants perceived the crowded condition as more crowded. Based on the results, the crowded condition was perceived as significantly more crowded than the not crowded condition ( $M_{\text{boxes}} = 2.40$ ,  $M_{\text{no boxes}} = 2.79$ ;  $t(118) = -3.05$ ,  $p = .003$ ; crowdedness was measured on a Likert Scale out of 5, with higher numbers reflecting more crowded).

Furthermore, the intimate and spacious scent detectability were not significantly different compared to each other ( $M_{\text{intimate}} = 4.50$ ,  $M_{\text{spacious}} = 5.32$ ;  $p = .20$ ). There was a significant difference between scent detectability for the intimate and control condition ( $M_{\text{control}} = 2.75$ ;  $p = .002$ ) and the spacious and control scent ( $p < .001$ ). Therefore, the scent manipulation was correctly implemented and scent intensity was consistent. Scent detectability was not influenced by whether a participant had a cold ( $F(1, 100) = 1.05$ ,  $p = .31$ ), smoked ( $F(1, 100) = 0.14$ ,  $p = .71$ ), or whether there were boxes in the room ( $F(1, 100) = 0.01$ ,  $p = .93$ ).

### Overall Model

According to the S-O-R model, stimuli (S) influence an organism's affective responses (O), which then produced a positive or negative response (R). The present study determined whether scent and spatial crowding interacted to influence participants'

pleasure, arousal, dominance and anxiety levels, and consequently participants' room evaluations and perceived object size. As such, the overall model was tested using a between-subjects ANOVA (Analysis of Variance), where scent and spatial crowding served as the independent variables, and room feel, room attractiveness, and room ambience served as the dependent variables.

Overall, there was a significant main effect of crowdedness on perceived room feel (too small vs. too large;  $F(1, 114) = 3.70, p = .05$ ), room attractiveness (not attractive vs. very attractive;  $F(1, 114) = 6.40, p = .01$ ), and room ambience (cramped vs. void;  $F(1, 114) = 31.16, p < .001$ ). The only main effect that was not significant was on overall room size (tiny vs. huge;  $F(1, 114) = 0.23, p = .64$ ). See Table 2 for means and standard deviations. Specifically, participants rated the overall room more positively when it was not crowded compared to the crowded condition. This reinforces the idea that crowding is a serious issue that can significantly harm a consumer's impression of an environment's room size, attractiveness and ambience.

There was no significant interaction between scent and crowdedness on room evaluations, nor a significant main effect of scent on room evaluations. In addition, there were no significant effects of an interaction between scent and crowdedness on the estimated room size. Although there was no significant interaction between scent and crowdedness of room size, or any significant main effects of scent on room size, the results show that crowding is still a major issue for retailers and can leave a negative impression of the retail environment on consumers.

To determine whether scent and spatial crowding influenced perceived object size, a between-subjects ANOVA was conducted with scent and spatial crowding as the

independent variables, and perceived object size as the dependent variable. There was no significant difference between spacious or intimate scents on the perceived size of an object. Therefore, we conclude that scent and spatial crowding did not interact to enhance or reduce the perceived size of an object.

**Table 2. Summary for Scent and Spatial Crowding (IV) on Room Evaluations (DV)**

<b>Item (Room)</b>	<b>Anchors (5-point scale)</b>	<i>M</i> <sub>Crowded</sub>	<i>SD</i> <sub>Crowded</sub>	<i>M</i> <sub>Not Crowded</sub>	<i>SD</i> <sub>Not Crowded</sub>	<i>F</i>	<i>p</i>
<b>Attractiveness</b>	Not Attractive – Extremely Attractive	1.53	0.97	1.98	0.95	395.79	.013
<b>Feel</b>	Too Small – Too Large	2.15	0.61	2.37	0.64	3.70	.057
<b>Ambience</b>	Cramped - Void	1.63	0.66	2.68	1.27	31.16	<.001
<b>Size</b>	Tiny - Huge	2.07	0.55	2.12	0.59	0.23	.635

## Hypothesis Testing

*H1: Scent will enhance or reduce crowded conditions to influence the perceived size of a room: an intimate scent will decrease the perceived size of the room and a spacious scent will increase the perceived size. However, individuals will perceive the room as significantly smaller (larger) when an intimate (spacious) scent is paired with a crowded (not crowded) room.*

The hypothesis was tested using ANOVA (Analysis of Variance), where scent and spatial crowding served as the independent variables, and perceived room height, width, length and volume were the dependent variables. Overall, there were no significant interactions between scent and spatial crowding on room measurements for height, width, length and volume, nor were there any significant main effects of scent or spatial crowding on room size. However, as mentioned earlier, there was a significant main effect of crowdedness on perceived room feel (too small vs. too large;  $F(1, 114) = 3.70, p = .05$ ). Therefore, H1 was not supported. While participants' estimates of room measurements were not influenced by scent and spatial crowding, there seems to be relationship between perceived room size and spatial crowding.

*H2: When participants perceive the room size too small (intimate scent in a crowded environment) or too large (spacious scent in a not crowded environment), this produces negative affective responses (i.e. high anxiety, low pleasure, low arousal and high dominance). When the perceived room size is not too small or too large (intimate scent in a not crowded environment or spacious scent in a crowded environment), participants experience positive affective responses (i.e. low anxiety, high pleasure, high arousal and low dominance).*

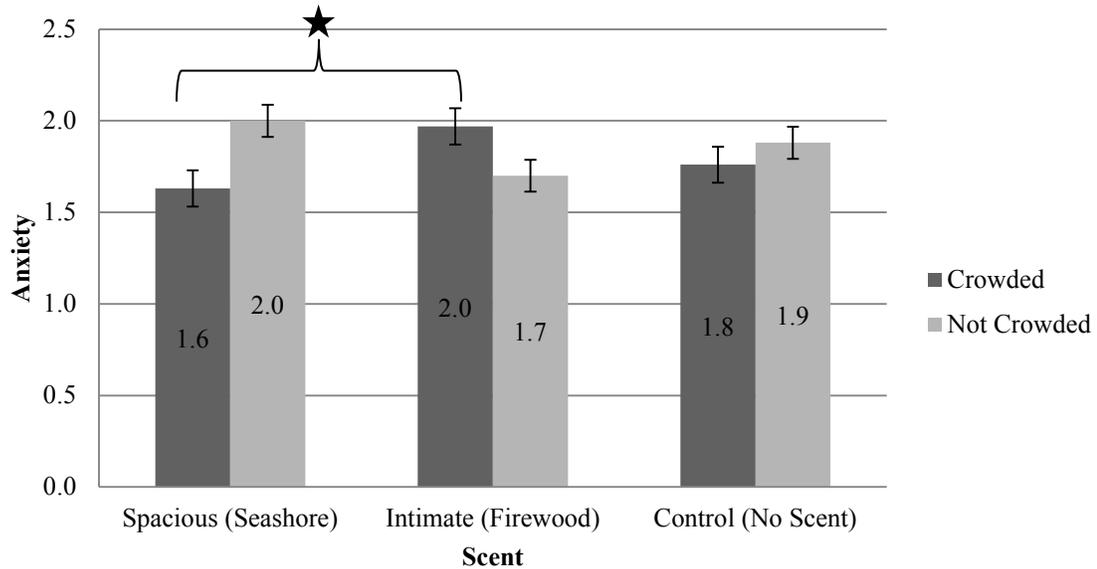
A linear regression was conducted, with perceived room size and room feel as the independent variable, and anxiety level as the dependent variable. In general, there was a significant negative relationship between perceived room size and anxiety ( $b = .15$ ;  $SE = .08$ ;  $t(119) = 2.00$ ,  $p < .05$ ). The smaller the participant perceives the room size, the higher their anxiety level, and vice versa. This once again speaks to the influence of crowding on anxiety levels. In addition, a between-subjects ANOVA was conducted to test the interaction between scent and crowding condition (the independent variables) on anxiety levels (the dependent variable). The results indicated there was a significant interaction between scent and crowdedness on anxiety ( $F(2, 114) = 4.18$ ,  $p = .02$ ). A post-hoc analysis stated that in the crowded condition, anxiety levels were higher when participants smelt the intimate scent compared to the spacious scent, ( $t(27) = -2.37$ ,  $p = .03$ ). As a result, the intimate scent reinforces anxiety to crowding, while the spacious scent reduces anxiety to crowding.

Another regression analysis examined the influence of pleasure, arousal and dominance on anxiety levels, with pleasure, arousal and dominance serving as independent variables, and anxiety as the dependent variable. Pleasure significantly accounted for variations in anxiety ( $b = -.12$ ;  $SE = .05$ ;  $t(119) = -2.20$ ,  $p = .03$ ), whereas arousal or dominance did not. Therefore, as pleasure levels increase, anxiety scores decrease. Overall, H2 is partially supported. See Figure 2 for a graph depicting the significant interaction between scent and crowdedness, and see Table 3 for the mean and standard error values. Note that high levels of anxiety correspond to lower values of the scale.

**Table 3. Summary for Scent and Spatial Crowding (IV) on Anxiety (DV)**

<b>Scent</b>	<b>Spatial Crowding</b>	$M_{\text{Anxiety}}$	<b><i>SD</i></b>
<b>Seashore</b>	Crowded	1.63	.46
	Not Crowded	2.00	.60
<b>Firewood</b>	Crowded	1.97	.65
	Not Crowded	1.70	.38
<b>Control</b>	Crowded	1.76	.41
	Not Crowded	1.88	.46

**Figure 2. Interaction between Scent and Spatial Crowding (IV) for Anxiety (DV)**



*Note:* Star indicates 95% significance between variables.

**H3:** *Positive (negative) affective responses elicit positive (negative) overall room evaluations (room feel, attractiveness, ambience, and size).*

A regression analysis was conducted between affective responses and overall room evaluations (attractiveness and ambience). There were no significant correlations between affective responses and overall room evaluations. Therefore, we fail to support H3 and conclude that affective responses do not influence overall room evaluations.

**H4:** *Positive (negative) affective responses elicit larger (small) perceived object size.*

A between-subjects ANOVA was conducted with affective responses as the independent variable, and object size as the dependent variable. There were no significant main effects or interactions, despite the present study's manipulations there was not influence on perceived object size. Therefore, we fail to support H4 and conclude that object size is not influenced by affective responses.

## Discussion

Researchers and laymen often cite the powerful ability of scent to elicit emotional responses and memories from as far back as childhood (Engen & Ross, 1973).

Neuroscientists often attribute the relationship between memory, emotion and smells to the close proximity of the olfactory bulb, the scent processing organ of the brain, to the limbic system, the neurological hub for emotions (Swenson, 2006). While the limbic system has been associated with emotions and memory, it is also responsible for spatial perception. Therefore, the present study sought to investigate whether scent and spatial perception would interact to influence a consumer's perception of the retail environment within the S-O-R model.

Overall, there was a significant relationship between crowdedness and overall room size and evaluations. Specifically, participants in the crowded condition rated the room smaller, more cramped and less attractive compared to the participants in the not crowded condition. This supports previous literature that spatial crowding significantly lowers the overall evaluations of an environment and individuals will view crowded rooms unfavourably (Li, Kim & Lee, 2009; Machleit, Eroglu & Mantel, 2000). Furthermore, there was a significant correlation between perceived room size and anxiety levels. Participants who perceived a larger room tended to be associated with lower anxiety levels, and vice versa. Once again, the results reinforce the notion that smaller, crowded spaces can increase anxiety levels, while larger areas can put individuals at ease and lessen anxiety. As a result, our findings support previous literature and emphasize the detrimental effect of crowding in the retail environment.

In addition, the present study found a significant interaction between scent and crowdedness on level of anxiety. Specifically, in a crowded condition, the intimate scent (firewood) tended to enhance anxiety and the spacious scent (seashore) decreased anxiety levels. These results are fascinating because they speak to the effect of the environment on an individual's affective state. As mentioned earlier, extremely small areas can trigger higher levels of anxiety in people via claustrophobia (DSM-IV, 1994). The findings suggest that scent can enhance a sense of claustrophobia in an already too small room. If a manager does choose to implement scent into their marketing plan, it is vital to choose the correct scent to suit the environment. The present study's findings complement the findings from Bone and Ellen (1999), who suggest that picking the right scent is of utmost importance. For example, scents that are not congruent with the product offering or elicit an unpleasant emotion can negatively influence a consumer's perceptions and behaviour. The interaction also suggests that scents can reduce anxiety levels when placed in the appropriate context. Anxiety levels were lower when participants smelled the spacious scent in the crowded environment. These findings support the previous results by Hirsch (1998). Hirsch found that certain scents, such as cucumber, green apple and seashore, reduce anxiety caused by claustrophobia and increase the perceptual size of a room. While in the present study, scent did not necessarily change the size perception of the room, scent did interact with the environment to alter anxiety levels. Therefore, with the appropriate scent, managers can alter a consumer's perception of their crowded or spacious retail environment by simply choosing the right scent. However, scent can increase or decrease anxiety levels based on the context, therefore managers should carefully choose their scent.

Unfortunately, while scent and crowding were found to influence affective responses, there were no findings to suggest that scent and spatial crowding influence room evaluations, room size, or perceived object size. While the present study failed to link scent and crowdedness with perceived room size, room ambience, attraction, feel and object size, the evidence is still inconclusive. There are a number of factors that could have contributed to the present results; these are outlined in the limitations and recommendations section. Overall, the findings suggested that scent and crowding influence affective responses, such as anxiety, but there is limited evidence that scent and crowding influence the size perception of a room. However, given the possible limitations, we recommend further research to resolve the issue.

## **Limitations and Recommendations**

The present study has limitations that should be acknowledged. The present study used an experimental approach. While experimental research tends to control potential confounds, it is less generalizable to the real world. Every research design has fundamental flaws and benefits, and an experimental design was chosen to measure the relationship between scent and spatial crowding in a systematic and controlled setting. Future research could complement the current study's results by duplicating the results in with a field study. For example, the study could be conducted in an actual retail environment rather than a simulated lab environment; this would allow the results to be more generalizable to retail environments.

Furthermore, there are limitations with the stimuli that need to be addressed. While the pre-test determined that the intimate and spacious scents were significantly different on openness, individuals react to scent in different ways (Bensafi & Rouby, 2007). As mentioned earlier, scents are often associated very closely with memory. Individuals can remember scents months after the first exposure (Engen & Ross, 1973), and it's not uncommon for individuals to remember scents from their childhood (Hirsch, 1992). As a result, participants may associate the scents with different emotions and knowledge based on their own experience. For example, not everyone may associate seashore with wide open spaces; perhaps the scent of seashore is associated with their family beach house, which was smaller. Firewood could be associated with intimacy or with fire, which can trigger anxiety. By randomly sampling participants, the current research mitigated these issues; however, it is difficult to completely control for individual differences. The current study did not ask participants about their previous

experience with firewood or with beaches because of time constraints, but future studies may wish to include these control questions.

Furthermore, while many participants associated the intimate scent with firewood, participants had a more difficult time associating the spacious scent with seashore. The present study continued to use the scent because it scored significantly higher on the openness scale, compared to firewood, and participants associated with other pleasant spacious concept, such as “freshness” and “floral”. However, future research could duplicate the study using various types of scent that are identified more easily.

The experimenters used boxes to mimic a crowded scenario; however to some participants the boxes appeared fake and deliberate. While some participants guessed that the boxes were deliberately placed there, none of the participants actually guessed the hypothesis or the true intention of the experiment. Furthermore, while 100% of the participants in the crowded condition noted the boxes, only 10% of them actually pointed out the boxes looked deliberate. The majority of the participants thought the room was used as storage. The present study used boxes because boxes can easily crowd a space and they are neutral objects. In order to make the experiment more realistic, future studies could conduct a use more realistic stimuli (e.g., shelves, products, bins).

Furthermore, the present study found that for the crowded condition, an intimate scent increased anxiety while a spacious scent decreased anxiety. But, the scent did not influence anxiety levels for the not crowded condition. While the present study did check to make sure the experimental room appeared “empty”, it’s possible the room was not large enough to induce agoraphobia in participants. Future studies should use an excessively large room that is tested and shown to induce agoraphobia.

Finally, when participants guessed the volume of certain containers, the questionnaire gave a can of soda as a reference point (a regular can of soda is 335mL, 0.335 liters, or 12 oz). Despite the reference point, some participants were very inaccurate with their estimations. The present study eliminated estimations that were greater than two standard deviations from the mean, and also calculated the volume as a ratio to the anchor container (the container labelled “Red”). Despite these measures, one still has to question the overall ability for participants to estimate volume in general. In the future, the study might be more insightful to ask participants to describe the objects with adjectives, and measure subjective perceptions in terms of the number of “spacious” adjectives versus “intimate” adjectives.

## **Managerial Implications**

In general scent is an underused marketing tool in the retail environment, particularly when you consider scent is arguably the most powerful sense. While many of the initial hypotheses were not significant in the present study, the results still hold relevant to retailers. The findings suggest that scents and crowdedness interact to reduce or increase anxiety levels. Specifically, spacious scents can reduce anxiety levels in crowded environments, while intimate scents in the same environment can increase anxiety levels. These findings can help managers improve the retail atmospherics.

First of all, retail stores with limited amounts of space or excessive amounts of inventory can reduce the levels of anxiety by consumers through the use of pleasant, spacious scents. Furthermore, certain industries tend to have more inventory than others. For example, antique stores and dollar stores tend to be in small locations with large amounts of inventory. Macheit, Kellaris, and Eroglu (1994) demonstrated that consumers can feel anxiety as a result of spatial crowding, but the present research shows these effects can be mitigated through the use of scents.

On the other hand, the present study also found that intimate scents can increase anxiety caused by spatial crowding. Therefore, it's very important for those retailers with spatially crowded stores to choose an appropriate scent for their environment Bone and Jantrania (1992) further emphasizes the importance of choosing an appropriate scent through their findings that certain scents can cause an environment to leave a negative or undesired impression to consumers. Overall, managers with spatially crowded stores can use pleasant, spacious scents to reduce the levels of anxiety created by crowdedness, however managers must be cautious because certain scents can heighten anxiety instead.

## **Conclusions**

In conclusion, the findings of the present study are mixed and inconclusive. The original intent of the study was to determine whether scent would interact with environmental cues to alter a consumer's spatial perception. The present study did find that crowding negatively impacted a participant's impression of the environment, which supported previous findings from past literature. This only emphasizes the importance of the retail atmosphere for managers. Overall, the present study supports the findings of previous literature, but future research is needed to fully understand the influence of scent and crowding on spatial perception.

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## Appendix A – Scents used in pre-test

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Scent Name
Green Apple
Firewood
Cucumber
Mountain Air
Exotic Seabreeze (Seashore)

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*Note:* All scents were purchased through [SaveOnScent.com](http://SaveOnScent.com). Save On Scents SOS fragrance oils are designed at strengths for formulations most commonly used in crafting.

## Appendix B – Pre-test Scent Questionnaire

Open the scent bottle, hold it about 6 inches away from your nose, and inhale briefly and lightly. Try the scent as long or as many times as you need to form an opinion about it. Then use the following scales to evaluate the scent by circling the numbers that best represent your opinion.

***This scent is ...***

unfamiliar	1	2	3	4	5	6	7	familiar
bad	1	2	3	4	5	6	7	good
negative	1	2	3	4	5	6	7	positive
unpleasant	1	2	3	4	5	6	7	pleasant
unattractive	1	2	3	4	5	6	7	attractive
weak	1	2	3	4	5	6	7	strong
light	1	2	3	4	5	6	7	heavy
simple	1	2	3	4	5	6	7	complex
expansive	1	2	3	4	5	6	7	crowded
open	1	2	3	4	5	6	7	closed
spacious	1	2	3	4	5	6	7	intimate

Think about your perception of the scent you just experienced. For each pair below, put a check mark closer to the adjective which you believe describes your feelings about the sample better. The more appropriate an adjective seems, the closer you should put your mark to it.

Colorful	___:___:___:___:___:___:___	Drab
Negative	___:___:___:___:___:___:___	Positive
Stimulating	___:___:___:___:___:___:___	Boring
Attractive	___:___:___:___:___:___:___	Unattractive
Tense	___:___:___:___:___:___:___	Relaxed
Comfortable	___:___:___:___:___:___:___	Uncomfortable
Depressing	___:___:___:___:___:___:___	Cheerful
Good	___:___:___:___:___:___:___	Bad
Unlively	___:___:___:___:___:___:___	Lively
Bright	___:___:___:___:___:___:___	Dull
Unmotivating	___:___:___:___:___:___:___	Motivating
Pleasant	___:___:___:___:___:___:___	Unpleasant
Uninteresting	___:___:___:___:___:___:___	Interesting
Unfavorable	___:___:___:___:___:___:___	Favorable

**Identify this scent: What is it?** \_\_\_\_\_

**How difficult is it to identify this scent?**

very easy    1    2    3    4    5    6    7    very difficult

**How does this scent make you feel?**

Each pair of words below describes a feeling dimension. Some of the pairs might seem unusual, but you may generally feel more one way than the other. For each pair, circle the number to show how you feel.

Happy	1	2	3	4	5	6	7	8	9	Unhappy
Pleased	1	2	3	4	5	6	7	8	9	Annoyed
Satisfied	1	2	3	4	5	6	7	8	9	Unsatisfied
Contented	1	2	3	4	5	6	7	8	9	Melancholic
Hopeful	1	2	3	4	5	6	7	8	9	Despairing
Relaxed	1	2	3	4	5	6	7	8	9	Bored
Stimulated	1	2	3	4	5	6	7	8	9	Relaxed
Excited	1	2	3	4	5	6	7	8	9	Calm
Frenzied	1	2	3	4	5	6	7	8	9	Sluggish
Jittery	1	2	3	4	5	6	7	8	9	Dull
Wide awake	1	2	3	4	5	6	7	8	9	Sleepy
Aroused	1	2	3	4	5	6	7	8	9	Unaroused
Controlling	1	2	3	4	5	6	7	8	9	Controlled
Influential	1	2	3	4	5	6	7	8	9	Influenced
In control	1	2	3	4	5	6	7	8	9	Cared for
Important	1	2	3	4	5	6	7	8	9	Awed
Dominant	1	2	3	4	5	6	7	8	9	Submissive
Autonomous	1	2	3	4	5	6	7	8	9	Guided

### Additional Questions

Please answer the following questions about yourself.

Do you have a cold or flu today?

yes       no

Do you smoke?

yes       no

Are you male or female?

male       female

How old are you?

\_\_\_\_\_ years

How would you rate your knowledge of English?

Just learning    1      2      3      4      5      6      7      Totally fluent

**Appendix C – Test Room (Crowded vs. Not Crowded Condition)**



Not Crowded Condition



Crowded Condition

## Appendix D – Test Containers

Container	Colour Label	Actual Size (mL)
	Blue	1600mL
	Green	750 mL
	Orange	1300mL
	Pink	1100 mL
	Brown	600mL
	Red	1250 mL

## Appendix E – Containers in the experimental set-up



## Appendix F – Procedural Script

Hello, my name is \_\_\_\_\_ and I'm a research assistant working under Dr. Bianca Grohmann and Tina Poon. I'm conducting a thesis research study where you judge containers based on their size. I know you are busy, but it's a very simple study that takes 10 minutes to do. As a thank you, we'll give you a \$5 gift certificate to Starbucks when you have completed the study.

### **\*Response\***

Yes – Okay, thank you very much, the study is held on the 13<sup>th</sup> floor and signs will be there to greet you.

No – Thank you for your time, we'll have signs posted up in case you change your mind.

### **Study:**

Hello, my name is \_\_\_\_\_. Thank you very much for participating in our study. Today, we'll be asking you to judge the size of several containers and answering a few questions. In total this study should really only take 10 minutes and at the end we're giving away \$5 gift certificates for Starbucks as a thank you. This study is completely voluntary and you are free to drop out at any time. Even if you decide to leave halfway through, you'll still receive the \$5 gift certificate. It's important to note that all of your information will be kept confidential and your responses will only be read by people who are directly related to the study. Do you have any questions?

### **\*Give consent form\***

Okay, please read and sign this consent form. This way please.

### **\*Lead to the room\***

Please fill out the questionnaire. There may be certain questions that may seem strange, but try to answer them to the best of your ability. As you can see, there are several containers lined up with an associated colour. When you reach the page where you guess the amount each the container holds, please judge the containers from left to right and do not touch them. Do you have any questions? If you do have questions, please knock on the door and I'll be glad to answer anything. Once you're finished, you can just exit and I'll pick up the questionnaire from you.

### **\*Pick up questionnaire\***

Thank you for your participation, here is a \$5 gift certificate to Starbucks. We'll be here from \_\_\_\_\_, so if you have any friends you'd like to recommend they are more than welcome to join.

This study investigated the effects of scent on your perception of the environment. We also wanted to see how scent would influence your judgement of the size of various products. If you are interested in the results of the study, we can email you the final thesis. Finally, please do not talk about the study, especially to friends that could potentially participate in the study.

## Appendix G – Informed Consent Statement

### CONSENT TO PARTICIPATE IN PRODUCT EVALUATION STUDY

This is to state that I agree to participate in a program of research being conducted by Bianca Grohmann, Ph.D., Associate Professor of Marketing of Concordia University. You can contact the researcher by phone at 514.828.2424 extension 4845, or e-mail at bgrohmann@jmsb.concordia.ca.

#### A. PURPOSE

I have been informed that the purpose of the research is to better understand how consumers evaluate products that differ in product characteristics.

#### B. PROCEDURES

This research takes place in the research lab at the Molson Building at Concordia University. You will consider a number of common consumer products in this study, and answer a few questions about each product. You will also answer questions about your age and gender. These questions are of general nature. All answers will be combined before they are published, so your answers will not be known to anyone. You don't have to answer any questions you are not comfortable with. This research will take about 10 minutes of your time. If you would like to have a copy of the study report, please contact Dr. Grohmann at the e-mail address listed above.

#### C. RISKS AND BENEFITS

There are no risks to participating in this study, but if you feel uncomfortable with the study environment, the process, or the questions asked in the study, you are free to discontinue participation at any time. Just tell the administrator that you would like to stop. Although this study does not have any direct benefits to you, it will help us better understand how consumers go about evaluating various products from different product categories.

#### D. CONDITIONS OF PARTICIPATION

- I understand that I am free to withdraw my consent and discontinue my participation at anytime without negative consequences.
- I understand that my participation in this study is CONFIDENTIAL (i.e., the researcher knows who participated, but results are anonymous)
- I understand that the data from this study may be published.

I HAVE CAREFULLY STUDIED THE ABOVE AND UNDERSTAND THIS AGREEMENT. I FREELY CONSENT AND VOLUNTARILY AGREE TO PARTICIPATE IN THIS STUDY.

NAME (please print) \_\_\_\_\_

SIGNATURE \_\_\_\_\_

If at any time you have questions about the proposed research, please contact the study's Principal Investigator B. Grohmann, Department of Marketing, 514.848.2424 extension 4845 or bgrohmann@jmsb.concordia.ca. If at any time you have questions about your rights as a research participant, please contact the Research Ethics and Compliance Advisor, Concordia University, at (514) 848-2424 x7481 or by email at ethics@alcor.concordia.ca.

## Appendix H – Questionnaire

### SECTION 1

*Please estimate the height, width and length of the room you are currently in (meters).*

Height \_\_\_\_\_m                      Width \_\_\_\_\_m                      Length \_\_\_\_\_m

*Note: Width is perpendicular to the table, length is parallel to the table.*

*Please circle the number that best represents your opinion.*

	<b>Not Attractive</b>	<b>Somewhat Attractive</b>	<b>Average</b>	<b>Very Attractive</b>	<b>Extremely Attractive</b>
	1	2	3	4	5
How would you rate the attractiveness of room you are in?					
	<b>Too Small</b>	<b>Small</b>	<b>Average</b>	<b>Large</b>	<b>Too Large</b>
	1	2	3	4	5
How would you rate the overall feel of the room you are in?					
	<b>Cramped</b>	<b>Intimate</b>	<b>Average</b>	<b>Spacious</b>	<b>Void</b>
	1	2	3	4	5
How would you rate the overall ambiance of the room you are in?					
	<b>Tiny</b>	<b>Little</b>	<b>Average</b>	<b>Big</b>	<b>Huge</b>
	1	2	3	4	5
How would you rate the overall size of the room you are in?					

*Please circle the number that best represents your level of agreement with the statements.*

	<b>Totally Disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Agree</b>	<b>Totally Agree</b>
	1	2	3	4	5
The room seemed very spacious					
I felt cramped in this room					
The room had an open feeling to it					
This room felt confining to me					

**SECTION 2**

In front of you are 5 objects. Please estimate the volume of liquid each container holds. You may choose the unit of measurement (liters, ml, oz etc.), but please indicate the chosen measurement unit. As a point of reference, a regular can of soda is 335ml, 0.335 liters, or 12 oz.

**Please review the containers from LEFT TO RIGHT. Do not forget to indicate the unit of measurement.**

**Colour \_\_\_\_\_ would hold \_\_\_\_\_ of liquid**

**SECTION 3**

*Please circle the response that best reflects how you feel.*

	<b>Almost Never</b>	<b>Sometimes</b>	<b>Often</b>	<b>Almost Always</b>
I feel at ease	1	2	3	4
I feel upset	1	2	3	4
I am a steady person	1	2	3	4
I lack self-confidence	1	2	3	4

***How do you feel?***

Each pair of words below describes a feeling dimension. Some of the pairs might seem unusual, but you may generally feel more one way than the other. For each pair, circle the number that best shows how you feel right now.

Happy	1	2	3	4	5	6	7	Unhappy
Pleased	1	2	3	4	5	6	7	Annoyed
Satisfied	1	2	3	4	5	6	7	Unsatisfied
Contented	1	2	3	4	5	6	7	Melancholic
Hopeful	1	2	3	4	5	6	7	Despairing
Relaxed	1	2	3	4	5	6	7	Bored
Stimulated	1	2	3	4	5	6	7	Relaxed
Excited	1	2	3	4	5	6	7	Calm
Frenzied	1	2	3	4	5	6	7	Sluggish
Jittery	1	2	3	4	5	6	7	Dull
Wide awake	1	2	3	4	5	6	7	Sleepy
Aroused	1	2	3	4	5	6	7	Unaroused
Controlling	1	2	3	4	5	6	7	Controlled
Influential	1	2	3	4	5	6	7	Influenced
In control	1	2	3	4	5	6	7	Cared for
Important	1	2	3	4	5	6	7	Awed
Dominant	1	2	3	4	5	6	7	Submissive
Autonomous	1	2	3	4	5	6	7	Guided

**SECTION 4**

*Please answer the following questions about yourself.*

Are you male or female?

male       female

How old are you?

\_\_\_\_\_ years

Do you have a cold or flu today?

yes       no

Do you smoke?

yes       no

How would you rate your knowledge of English?

Just learning      1      2      3      4      5      6      7      Totally fluent

## **SECTION 5**

*Please circle the number that best represents your level of agreement with the statements.*

For the majority of the questionnaire, I...

---

	<b>Totally Disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Agree</b>	<b>Totally Agree</b>
Paid attention to my environment	1	2	3	4	5
Concentrated on my environment	1	2	3	4	5
Thought about my environment	1	2	3	4	5
Focused on my environment	1	2	3	4	5
Spent effort looking at my environment	1	2	3	4	5

---

**SECTION 6**

Did you notice anything particular about this room today?       yes       no

If yes, please elaborate...

Did you perceive any scent while you were writing this survey?       yes       no

How noticeable was the scent, if there was any?

Undetectable      1      2      3      4      5      6      7      Obvious

If you noticed a scent, what do you think it smelled like? \_\_\_\_\_