KEER2014, LINKÖPING | JUNE 11-13 2014
INTERNATIONAL CONFERENCE ON KANSEI ENGINEERING AND EMOTION RESEARCH

The waiting room

Improving space through smell

Alejandra Vilaplana[1], Toshimasa Yamanaka[2]

[1] *University of Tsukuba, Japan, alevila@kansei.tsukuba.ac.jp*

[2] *University of Tsukuba, Japan, tyam@geijutsu.tsukuba.ac.jp*

Abstract: Waiting is an inevitable part of life and the spaces in which we wait can contribute to either improve or worsen the experience. This paper covers the process and results of "The waiting room", analyzing if the presence of specific smells has a significant impact in how the room and the waiting experience are perceived. Two different odorants were selected, lavender (relaxing) and orange (stimulating); 63 participants from 32 different countries were assigned into three groups (between-groups approach): Control (unscented), Orange and Lavender. Results show that both scents affected the room and waiting experience evaluation in different ways and overall increased the surrounding space perception compared to the unscented condition. Participants exposed to lavender scent were inclined to rate as higher the 'psychological' properties of the room such as *pleasantness* and *warmth*; in addition the scent-evoked memories were emotion based. Participants exposed to orange scent tended to rate as higher the 'physical' properties of the room such as *brightness* and *height*; scent-evoked memories were object based. Lavender scent had a stronger influence in space perception than orange, suggesting the relevance of congruency and coherence between scent and physical environment when incorporating scent as a valid design tool in architecture.

Keywords: Kansei Architecture, Space Perception, Smell, Waiting experience.

1. INTRODUCTION

As part of our daily life activities we constantly have to wait and depending on what are we waiting for, this can be either a positive experience or a negative one. In terms of architecture, spaces designated for waiting are a transition space (physical and/or psychological) between the outside and the inside. Architecture influences the way we experience life; design processes focused on *intentions* rather than just *functions* achieve more meaningful projects. From this

perspective, the waiting experience can also be enhanced through adequate design elements.

Design oriented disciplines have been conventionally focused on visual elements as the predominant stimulus. Without disregarding the importance of visual information, it is essential that the design process and its outcome incorporate elements able to reach the user through a multisensory approach.

According to Pallasmaa, “the timeless task of architecture is to create embodied existential metaphors that concretize and structure man’s being in the world”. This initial concept of just *being* in the world is sustained by the mechanisms the senses provide us with, and architecture has the ability to enable them by using the adequate stimuli as design tools. Given the fact that all sensory input is relevant, what makes the sense of smell so special?

There is a traditional hierarchy of the senses, the major ones being sight, hearing and touch; taste and smell are usually referred to as ‘primitive’. Even though throughout history they have played an essential role in both individual and public aspects of daily life, scents have been tacitly disregarded as primary contributors to the sensory experience in architecture because they are invisible; they cannot be reached through tangible means as their ‘major’ counterparts. Nevertheless, their invisibility (usually conceived as a negative trait) gives scents the possibility to blend in with other elements, using them as carriers. Scents have dimensions and presence; they can also *fill* spaces.

Most of the existing research concerning scents is focused on their benefits on the individual’s mood, performance and behavioral aspects. When it comes to their role in space perception, little research has been done. Most studies considering ambient scents are focused on their effects on products and retail experiences; their importance is addressed as a necessary but indirect element that contributes as an enhancer of the global concept of environment.

Henshaw has made remarkable research on the relationship between existing smells in urban spaces and the user’s experience while being in said spaces, stating that odors affect the image of places. According to her book Urban Smellscapes, olfactory perception combines “information collected and mediated by the sense of smell (along with information gained through the other senses) with information gained from memories, odour recognition and association. Olfactory perceptions of place are similarly informed by social and cultural factors, including prior understandings of that place gained from representations made by others” (Henshaw, 2013). A relevant concept portrayed in her research is the role of *smellwalkings* in the analysis of the interaction between user and space through the sense of smell. The smellwalking derives from the concept of *sensewalking*, a method to analyze how people utilize the space through sensorial aspects of the environment, emphasizing non-visual clues. Henshaw has conducted several smellwalkings in different cities with the “primary purpose of exploring the smells that people can detect, what they think about them, how these change between places and how the built environmental form and component parts influence the urban smell experience”.

From an anthropological perspective, Beer has done research on the interrelation between person, place, space, smell and emotional memories. In her article Smell, Person, Space and Memory, Beer states that anthropological research on space perception has emphasized mostly visual, acoustic and recently kinesthetic cues, neglecting smell and its role in said interrelation. However, as she states: “in natural settings there’s no smell-neutral space. Space is always filled with smells produced by components of the environment, influenced by climate and human actions” (Beer, 2007).

Both Henshaw and Beer point out the relevance of smell in the way users perceive surrounding space, but they emphasize the relationship between *existing smells* and how users *experience* the space under those existing smells.

The present study intends to establish an initial approach on what specific aspects and elements of the space are affected by the deliberate use of precise scents. The main purpose is to determine whether based on context scents can be used as tangible design tools to increase space perception and therefore its quality.

1.1. Objective and hypothesis

The main objective was to analyze the possible differences in terms of space perception, in the evaluation of a room and the experience of waiting when participants were exposed to orange and lavender odorants, compared to a control condition when no odorant was applied. A secondary objective was to determine the role of odor awareness in terms of space perception: establishing if preconceived notions concerning scents affect the participants' room and experience evaluation. The hypothesis stated that scented condition will increase the space perception of the room and that lavender and orange scent will affect perception in different ways, considering the relaxing and stimulating connotations of each odorant.

2. METHODS

2.1. Participants and experiment concept

63 participants from 32 different countries were invited to take part in an experiment concerning space perception; the experiment took place in the Laboratory for Advanced Research in the University of Tsukuba. Participants were randomly distributed in three different groups (n = 21 each), and each participant belonged exclusively to one of them. Groups division: Control, Orange and Lavender. They were not informed about the presence/absence of scent in the room to avoid biased impressions and were told they only had to 'rate some architectural images while some physiological conditions were going to be measured'; therefore, they had to wait while machine preparations were made in the 'real experiment room'. But in reality the true experiment took place during the waiting period.

A room was set as a fake *waiting room* in which participants were asked to sit and wait by themselves for five minutes. Any possible distractors (e.g., digital devices, watch, books) were collected before entrance with the intention to make the participant aware of the room. After five minutes we entered the room and gave them the evaluation questionnaires in order to 'save time while the room was still being prepared'. As soon as they completed the questionnaires, participants were told the real purpose of the experiment and were informed about the presence of smell in the room. All procedures before, during and after the experiment were performed according to the guidelines established by the ethical committee of the University of Tsukuba.

2.2. Materials

The room itself was the main stimulus in the experiment. The selected space had a 'negative' connotation in terms of *atmosphere*: lack of aesthetic elements, cold and unwelcoming environment and furniture, reduced size and irregular shape (Figure 1).

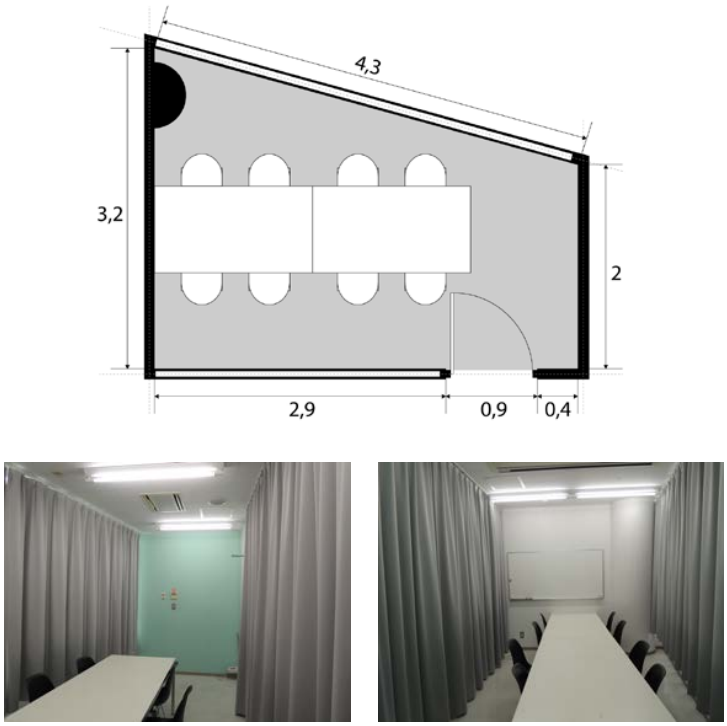

Figure 1: Room top plan and views

Orange and lavender essential oils were selected as the scent stimuli and were distributed in the room through an ultrasonic diffuser placed in the room for 15 minutes before each session. In order to avoid smell contamination, an odorant remover and natural ventilation were used as air cleaners before and after all sessions. A different device was used for each scent and same proportion of water/essential oil was used according to manufacturer directions. Scents did not represent any health harm for the participants.

Scent selection was based on a previous study concerning lavender and orange scents as anxiety reducers and mood boosters in a waiting room in a dental office (Lehrner et al., 2005). Moreover, according to Warrenburg, citrus scents (orange) tend to be more stimulating while floral scents (lavender) tend to be more relaxing. The purpose was to measure whether it was a significant different in perception when using a stimulating and a relaxing scent, both of them eliciting a positive reaction in the participant's mood (Warrenburg, personal communication, August 10, 2013).

2.3. Questionnaires and evaluation

Four points were measured while participants where in the room exposed to one of the three smell conditions: room evaluation, experience evaluation, odor awareness and memories and associations. All questionnaires were prepared in both English and Japanese.

Concerning room evaluation, nine properties (divided into physical and psychological properties) were measured through Semantic Differential method (SD) and Visual Analogue Scale (VAS): width, brightness, fun, pleasantness, color, warmth, relaxation, height and identity. In terms of experience evaluation, level of comfort and perception of waiting time were measured also through SD and VAS (from 0 'Not at all' to 5 'Very much'). In the case of scented conditions, the scent liking and perceived strength were also measured. Participants were also asked to state whether they felt the scent and to define it through selecting one or more categories according to what they

thought the smell was (Categories: floral, fruits, spices, wood, musk and fresh).

As a conjoint project with the Department of Psychology from the University of Tsukuba, an existing Odor Awareness Scale (OAS) was administered to establish the olfactory background of the participant in terms of the importance of smell in daily life activities and situations. The questionnaire contains 32 items considering smell in different categories. At the end of the questionnaires participants were asked if the smell triggered specific memories or associations, this was a free-answer question.

3. RESULTS

Data was processed using analysis of variance (ANOVA) and principal component analysis (PCA) in SPSS software.

3.1. Room evaluation

In general terms all properties in the room were rated as higher under the presence of scent in the room, as stated by the individual room score evaluation, which is the average evaluation score per participant (Figure 2). Participants rated the room as wider, warmer, more fun, relaxing, pleasant and with more identity when exposed to lavender scent. On the other hand, the room was rated as brighter and with a higher ceiling when orange scent was present (Table 1). However, a statistically significant difference was only found between Control and Lavender groups concerning pleasantness and warmth levels (Table 2).

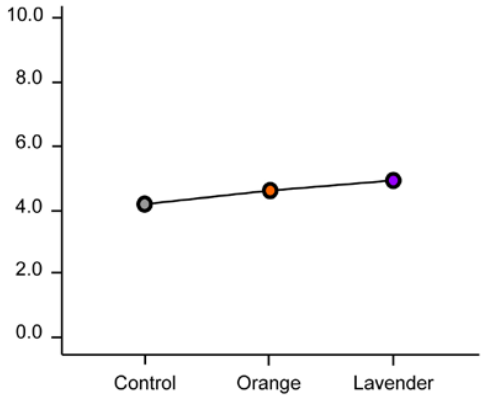

Figure 2: Individual room score

Table 1: Descriptive data for room evaluation

Scent		Width	Fun	Brightness	Pleasantness	Color	Warmth	Relaxation	Height	Identity
Control	Mean	2,98	2,71	6,53	5,10	2,99	3,54	5,22	5,14	3,13
	SD	1,29	1,69	2,01	2,03	1,66	1,24	1,95	1,71	1,94
Orange	Mean	2,87	3,17	7,15	5,07	3,37	4,09	5,62	5,88	4,30
	SD	1,53	2,05	1,55	1,65	1,91	1,88	2,36	1,47	2,64
Lavender	Mean	3,46	3,83	6,20	6,26	3,66	4,73	6,14	5,54	4,45
	SD	1,89	2,01	1,65	1,66	2,08	1,44	2,14	1,55	2,15
Total	Mean	3,10	3,24	6,63	5,48	3,34	4,12	5,66	5,52	3,96

	SD	1,58	1,95	1,76	1,85	1,88	1,59	2,15	1,58	2,30

Table 2: ANOVA for room evaluation

		Sum of Squares	df	Mean Square	F	Sig.
Width	Between Groups	4.09	2	2.04	.81	.45
	Within Groups	151.45	60	2.52		
Fun	Between Groups	13.40	2	6.70	1.81	.17
	Within Groups	221.98	60	3.70		
Brightness	Between Groups	9.74	2	4.87	1.59	.21
	Within Groups	183.10	60	3.05		
Pleasantness	Between Groups	19.38	2	9.69	3.02	.05
	Within Groups	191.94	60	3.19		
Color	Between Groups	4.76	2	2.38	.66	.51
	Within Groups	214.03	60	3.56		
Warmth	Between Groups	14.90	2	7.45	3.13	.05
	Within Groups	142.57	60	2.37		
Relaxation	Between Groups	8.91	2	4.45	.96	.38
	Within Groups	278.34	60	4.63		
Height	Between Groups	5.80	2	2.90	1.16	.31
	Within Groups	149.41	60	2.49		
Identity	Between Groups	21.77	2	10.88	2.12	.12
	Within Groups	306.99	60	5.11		

3.2. Experience evaluation

As expected the room was rated as more comfortable under the presence of both scents. The perceived waiting time decreased from Control to Orange and Lavender, in that order (Figure 3). Statistically significant difference was only found between Control and Lavender in terms of comfort levels (Table 3). Concerning scent evaluation, there was no difference between scents in terms of liking. Lavender scent was rated higher in strength.

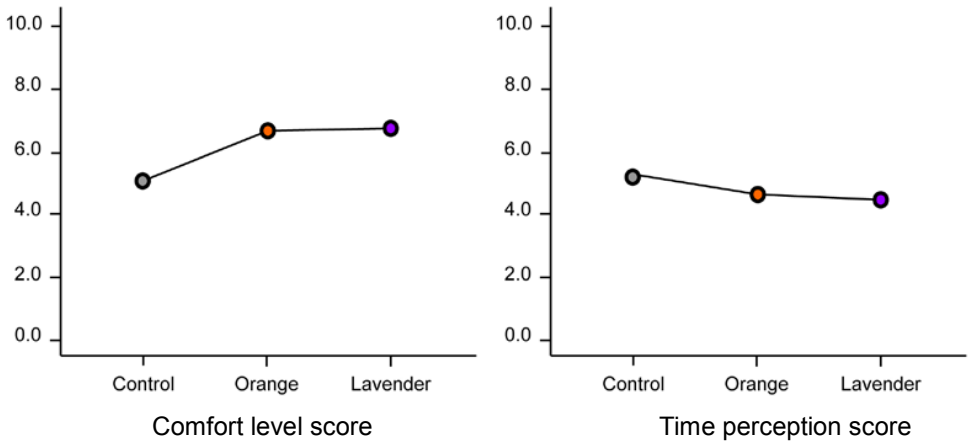

Figure 3: Experience evaluation (comfort and time) average scores

Table 3: ANOVA for experience evaluation

		Sum of Squares	df	Mean Square	F	Sig.
Comfort	Between Groups	36.591	2	18.295	4.531	.015
	Within Groups	242.267	60	4.038		
Time	Between Groups	5.405	2	2.703	.733	.485
	Within Groups	221.316	60	3.689		

3.3. Correlations

A correlation analysis was performed for all room properties and experience evaluation variables. Expected positive correlations were found in the three groups between these properties: pleasantness-relaxation, pleasantness-comfort and relaxation-comfort. In the case of scented groups an expected positive correlation was found between relaxation-liking. However, analyzing each group, different correlations between properties were found, suggesting that perception worked differently under the three conditions.

Control group: positive correlations were found between fun-color, pleasantness-height, relaxation-height and comfort-height (Table 4).

Table 4: Control group correlations (Pearson's *r*)

	Width	Fun	Brightness	Pleasantness	Color	Warmth	Relaxation	Height	Identity	Comfort	Time
Width	1,00	.454*	0,30	0,19	-0,05	0,28	0,19	0,39	.572**	0,05	0,03
Fun	.454*	1,00	0,09	0,43	.492*	0,37	0,06	0,40	0,26	0,03	0,20
Brightness	0,30	0,09	1,00	0,26	0,10	0,30	0,18	0,27	0,06	0,38	-0,20
Pleasantness	0,19	0,43	0,26	1,00	0,34	0,13	.674**	.698**	-0,18	.810**	0,11
Color	-0,05	.492*	0,10	0,34	1,00	0,29	0,04	0,22	-0,01	0,09	0,22
Warmth	0,28	0,37	0,30	0,13	0,29	1,00	-0,07	-0,04	0,15	0,03	0,32
Relaxation	0,19	0,06	0,18	.674**	0,04	-0,07	1,00	.643**	0,04	.643**	0,12
Height	0,39	0,40	0,27	.698**	0,22	-0,04	.643**	1,00	0,35	.578**	0,03
Identity	.572**	0,26	0,06	-0,18	-0,01	0,15	0,04	0,35	1,00	-0,30	0,03
Comfort	0,05	0,03	0,38	.810**	0,09	0,03	.643**	.578**	-0,30	1,00	-0,12
Time	0,03	0,20	-0,20	0,11	0,22	0,32	0,12	0,03	0,03	-0,12	1,00

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Orange group: positive correlations were found between width-time and liking-strength. Negative connotations were found between pleasantness-time and relaxation-identity (Table 5).

Table 5: Orange group correlations (Pearson's *r*)

	Width	Fun	Brig.	Pleas.	Color	Warm.	Relax.	Height	Ident.	Liking	Stren.	Comf.	Time
Width	1,00	0,27	0,21	0,19	0,13	0,36	0,32	-0,12	-0,26	0,40	0,34	0,12	.445*
Fun	0,27	1,00	-0,24	0,09	0,24	0,30	-0,21	0,00	0,13	-0,08	-0,02	-0,33	0,13
Brig.	0,21	-0,24	1,00	0,20	0,17	0,11	0,24	0,33	0,04	0,29	0,17	0,00	-0,10

Pleas.	0,19	0,09	0,20	1,00	0,10	-0,06	.475*	-0,03	-0,04	0,07	0,05	.562**	-.531*
Color	0,13	0,24	0,17	0,10	1,00	0,36	0,01	0,26	0,29	0,07	0,32	-0,26	0,00
Warmth	0,36	0,30	0,11	-0,06	0,36	1,00	0,12	0,25	0,13	-0,27	-0,22	-0,13	0,02
Relax.	0,32	-0,21	0,24	.475*	0,01	0,12	1,00	0,25	-.569**	.505*	0,00	.516*	-0,15
Height	-0,12	0,00	0,33	-0,03	0,26	0,25	0,25	1,00	0,32	0,23	0,31	-0,40	-0,30
Identity	-0,26	0,13	0,04	-0,04	0,29	0,13	-.569**	0,32	1,00	-0,31	0,13	-0,39	-0,16
Liking	0,40	-0,08	0,29	0,07	0,07	-0,27	.505*	0,23	-0,31	1,00	.569**	0,08	0,35
Strength	0,34	-0,02	0,17	0,05	0,32	-0,22	0,00	0,31	0,13	.569**	1,00	-0,30	0,17
Comfort	0,12	-0,33	0,00	.562**	-0,26	-0,13	.516*	-0,40	-0,39	0,08	-0,30	1,00	-0,12
Time	.445*	0,13	-0,10	-.531*	0,00	0,02	-0,15	-0,30	-0,16	0,35	0,17	-0,12	1,00

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Lavender group: positive connotations were found between: pleasantness-liking, warmth-comfort and liking-comfort. A negative connotation was found between liking-strength (Table 6).

Table 6: Lavender group correlations (Pearson's *r*)

	Width	**Fun**	**Brig.**	**Pleas.**	**Color**	**Warm.**	**Relax.**	**Height**	**Ident.**	**Liking**	**Stren.**	**Comf.**	**Time**
Width	1,00	0,43	0,04	0,38	-0,18	0,38	0,22	-0,07	0,24	0,08	-0,05	0,41	0,14
Fun	0,43	1,00	-0,06	0,42	0,02	-0,03	0,29	-0,10	0,29	0,18	-0,16	0,12	-0,33
Brig.	0,04	-0,06	1,00	0,08	0,14	-0,19	0,17	0,01	-0,08	-0,19	0,26	-0,22	0,09
Pleas.	0,38	0,42	0,08	1,00	0,12	0,25	.806**	-0,25	0,12	.514*	-0,32	.562**	-0,25
Color	-0,18	0,02	0,14	0,12	1,00	-0,07	0,18	0,03	-0,10	0,16	0,13	-0,12	-0,32
Warmth	0,38	-0,03	-0,19	0,25	-0,07	1,00	0,25	0,13	0,07	0,19	0,38	.545*	-0,24
Relax.	0,22	0,29	0,17	.806**	0,18	0,25	1,00	-0,01	0,00	.613**	-0,29	.593**	-0,37
Height	-0,07	-0,10	0,01	-0,25	0,03	0,13	-0,01	1,00	-0,06	0,33	0,01	0,21	-0,28
Identity	0,24	0,29	-0,08	0,12	-0,10	0,07	0,00	-0,06	1,00	-0,29	0,12	-0,12	-0,18
Liking	0,08	0,18	-0,19	.514*	0,16	0,19	.613**	0,33	-0,29	1,00	-.459*	.592**	-0,20
Strength	-0,05	-0,16	0,26	-0,32	0,13	0,38	-0,29	0,01	0,12	-.459*	1,00	-0,07	0,14
Comfort	0,41	0,12	-0,22	.562**	-0,12	.545*	.593**	0,21	-0,12	.592**	-0,07	1,00	-0,08
Time	0,14	-0,33	0,09	-0,25	-0,32	-0,24	-0,37	-0,28	-0,18	-0,20	0,14	-0,08	1,00

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

3.4. Odor awareness

General odor awareness score was higher in scented groups compared to Control group (Figure 4). From the 31 total items on the scale, eight items concerning scents and space perception were isolated and analyzed: distraction by scents in environment, noticing scents when visiting new places, happiness when picking pleasant scents in environment, annoying feeling for unfamiliar scents in environment, anxiety produced by unpleasant scents remaining in the environment, memories revived by scents and bad smells as a reason to choose not to return to a place. From

the mentioned items two main factors were extracted through principal component analysis: the first factor involves influence of scents in environmental perception with a positive connotation and the second one with a negative connotation (Figure 5).

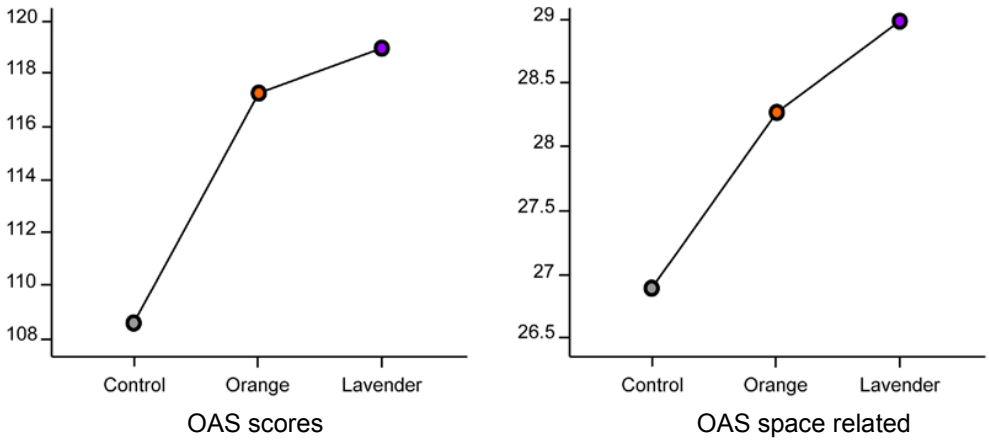

Figure 4: Odor awareness evaluation mean scores per group

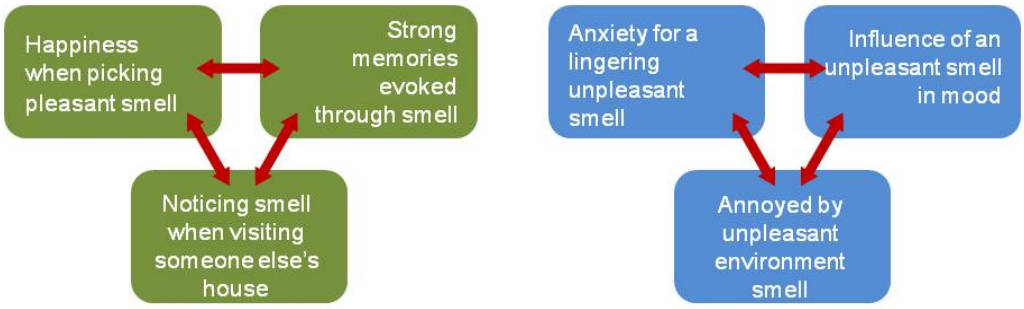

Figure 5: Positive and negative connotation factors in odor awareness in space

3.5. Memories and associations

For Orange and Lavender groups participants were asked whether they could associate the scent with any specific memories. For Orange group (n = 21) 15 participants reported memories, for Lavender (n = 21) 14 participants reported memories. All free answers were assigned into six different categories (Figure 5). Orange scent evoked more memories overall. Most of the memories evoked by lavender are related to personal experiences. Memories evoked by orange scent are more related to specific places and artificial products instead.

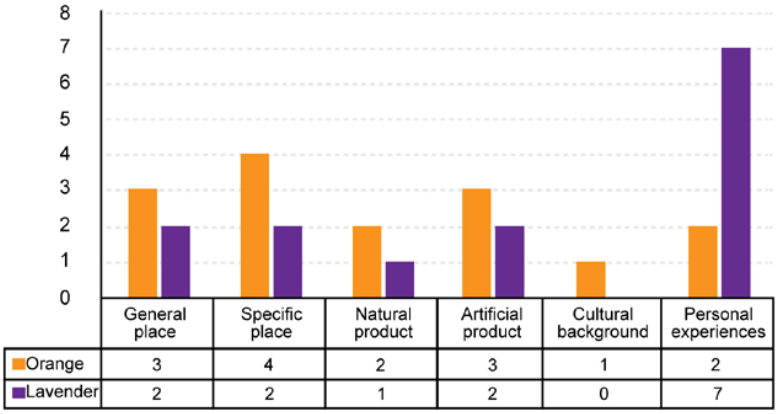

Figure 6: Memories categorization

4. DISCUSION

The main objective of the experiment was to compare both the room and experience evaluation to establish if there was an improvement due to the use of two different scents compared to an unscented condition. In addition, by analyzing general odor awareness and associations triggered by scents it was possible to define the relevant aspects for the users in terms of scent when associated to space.

4.1. Did scent improve room and waiting experience evaluation?

Overall the answer is affirmative, compared to Control group, when exposed to both odorants participants rated as higher all properties. However statistical difference was found only in comfort, warmth and pleasantness level, suggesting that the most relevant differences between scented and unscented conditions involve psychologically oriented aspects rather than physical. It was noticeable that highest evaluation scores were found in Lavender for most of the properties. In the case of Orange, the highest scores correspond to brightness and height levels in the room. This is relevant because it sets different effect mechanisms for two odorants which are known to have a positive influence on individuals. Knowing what aspects of a space are affected by certain odorants will establish guidelines and patterns on how to use scents congruently to improve space design. In terms of the waiting experience, as expected comfort levels increased and perceived waiting time decreased under the presence of both scents.

Moreover, the correlations found between room and experience properties show that all properties relate to each other in a different way for each group: orange scent had a strong effect in correlations involving perceived time, width and identity of the room; in the case of lavender, its strongest effect was on correlations involving pleasantness, warmth and comfort (sustained by statistical difference). An important aspect was also the evaluation of scent itself, a positive correlation between scent liking and scent strength was found in Orange group while a negative one was found in Lavender group, showing that intensity of scent works differently for each scent, therefore the amount of odorant necessary to trigger good responses happens on a case-by-case approach. This means that using specific scents can trigger particular properties associations

within space.

4.2. Awareness and memories

From an initial perspective, it might seem logical that odor awareness scored higher in scented groups compared to the unscented condition. The isolated space related items in the scale also report a higher score in scented groups; this indicates that scents have a powerful influence in the users' awareness concerning the surrounding environment at an unconscious level. Results suggest that odor awareness is context-based rather than a fixed evaluation statement and subsequently can be used to modify space properties by altering perception.

Memories and associations were also different according to the scent, orange tended to triggered more physical related memories while lavender evoked emotional related memories, a noticeable aspect was the lack of specific cultural associations in both groups (with one exception in Orange group) regardless of the multicultural background of the participants. This suggests that memories evoked by scent are context-based as well as awareness. Even though culture plays an essential role in sensory appreciation, individual experience could be more relevant when it comes to define the extent of scent in space perception.

4.3. Present study limitations

Measuring effects caused by scents is a difficult task mainly due to their multidimensional nature; conventionally scents are not presented on a physical continuum (unlike wavelength of light) (Laurent, 2002), therefore they can vary from small molecules to long-chained hydrocarbons, making them vulnerable to change as a result of environmental variations. This adds up to their abstract and subjective character, especially when attempting to establish perceptual differences. It was an essential point to perform all experiment sessions under the same conditions, however, the uncontrolled effect of environmental conditions cannot be dismissed from any possible variation in the scent composition.

Considering the subjectivity of the topic, one of the main purposes of this research was to focus on the individual responses towards scents, based on the immediate context rather than on cultural constructs; nevertheless, analyzing each of the room evaluation variables into detail, the graphs show heterogeneity amongst responses and the remaining question would be whether that difference is due to individual and subjective opinion or the indirect influence of cultural associations.

The purpose of the experiment was to isolate olfactory stimulus as possible from other elements that could interfere as distractors, therefore a neutral room was selected for the experiment. However, *congruency* between scent and other physical stimuli in the room was not considered as an influential factor in space and experience perception. Schifferstein states that olfactory information needs to compete against other stimuli to gain attention (Schifferstein et al., 2011); yet if the scent is not paired with other congruent environmental cues, it might turn into ambiguous stimuli.

Michon et al found that ambient odors are more likely to affect users' cognitive levels (perception of the environment) rather than emotions (Michon et al., 2005), based on that mood was not considered as a mediator for perception in the current research.

REFERENCES

Barbara A., & Perliss, A. (2006). Invisible Architecture: Experiencing Places through the Sense of Smell. Italy: Skira Editore S.p.A

Beer, B. (2007). Smell, Person, Space and Memory. In Wassmann, J. and Stockhaus, K. (Eds.), *Experiencing new worlds* (pp. 187-200). New York: Berghahn.

Classen, C., Howes, D., & Synnot, A. (2003). Aroma: the cultural history of smell. New York: Routledge.

Chebet, J. & Michon, R. (2003). Impact of ambient odors on mall shoppers' emotion, cognition and spending: A test of competitive causal theories. Journal of Business Research, 56, 529-539.

Chu, S. (2008). Olfactory Conditioning of Positive Performance in Humans. Chemical Senses, 33, 65-71.

Damhuis, C. (2006). There is more than meets the nose: multidimensionality of odor preferences. Monell Chemical Senses Center, the Sense of Smell Institute, the Research & Education Division of the Fragrance Foundation.

Doucé, L. & Janssens, W. (2013). The Presence of a Pleasant Ambient Scent in a Fashion Store: The Moderating Role of Shopping Motivation and Affect Intensity. Environment and Behavior, 45(2), 215-238.

Fiore, A., Yah, X., & Yoh, E. (2000). Effects of a Product Display and Environmental Fragrancing on Approach Responses and Pleasurable Experiences. Psychology & Marketing, 17(1), 27-54.

Fox, K. The smell report: an overview of facts and findings. Social Issues Research Centre. Retrieved from: http://www.sirc.org/publik/smell.html

Gilbert, Avery N. (2008). What the nose knows: the science of scent in everyday life. New York: Crown Publishers.

Herz, R. (2007). The scent of desire: Discovering our enigmatic sense of smell. New York: HarperCollins Publishers.

Henshaw, V. (2013). Urban Smellscapes. Understanding and Designing City Smell Environments. Oxford: Routledge, Taylor & Francis Group.

Holl, S., Pallasmaa, J., & Pérez-Gómez, A. (2006). Questions of Perception: Phenomenology of Architecture. Japan: A+U Publishing Co., Ltd.

Johnson, R. (2013). Lovely lavender: the many applications and uses of lavender essential oil. United States of America: Michael Anderson.

Kaneki, N., Kurosawa, T., Yamada, H., Mitsubayashi, H., Shimada, K., &Kamimura, H. (2005). Effect of aroma on event-related potential in cognitive workload. Kansei Engineering International, 5, No. 33, 51-56

Knasko, S. (1992). Ambient odor's effect on creativity, mood and perceived health. Chemical Senses, 17, 27-35.

Laurent G (2002) Olfactory network dynamics and the coding of multidimensional signals. Nature Reviews Neuroscience 3: 884–895.

Lehrner, J., Marwinski, G., Lehr, S., Johren, P., & Deecke, L. (2005). Ambient odors of orange and lavender reduce anxiety and improve mood in a dental office. Physiology & Behavior, 86, 92-95.

Mattila, A. & Wirtz, J. (2001). Congruency of scent and music as a driver of in-store evaluations and behavior. Journal of retailing, 77, 273-289.

Michon, R & Chebet, J. (2005).Mall atmospherics: the interaction effects of the mall environment on shopping behavior. Journal of Business Research, 58, 576-583.

Peltier, M. Healthcare environments using environmental aroma technology. The Olfactory Research Fund: The Aroma-Chology Review, Vol. III, No. 2.

Philpott, C., Bennet, A., & Murty, G. (2008). A brief history of olfaction and olfactometry. The Journal of Laryngology & Otology, 122, 657-662.

Purves, D., Augustine G., & Fitzpatrick, D. (2001). Neuroscience. Sunderland: Sinauer Associates.

Spangerber, E., Sprott, D., Grohmann, B. & Tracy, D. (2006). Gender-congruent ambient scent influences on approach and avoidance behaviors in a retail store. Journal of Business Research, 59, 1281-1287.

Smeets, M., Schifferstein, H., Boelema, S., & Lensvelt-Mulders, G. (2008). The Odor Awareness Scale: A New Scale for Measuring Positive and Negative Odor Awareness. The Chemical Senses, 33, 725-734

Schifferstein, H., Talke, K. & Oudshoorn, D. (2011). Can Ambient Scent Enhance the Nightlife Experience? Chemosensory Perception, 4, 55-64.

Styles, KG. (2011). Healing powers of sweet orange oil. Oregon: Health Mastery Systems.

Warrenburg, S. The consumer fragrance thesaurus: putting consumer insight into the perfumer's hands. The Olfactory Research Fund: The Aroma-Chology Review, Vol. III, No. 2.

Warrenburg, S. (2005). Effects of Fragrance on Emotions: Moods and Physiology. The Chemical Senses, 30 (suppl. 1) i248-i249.

Wrzesniewski, A. McCauley, C., & Rozin, P. (1999). Odor and Affect: Individual Differences in the Impact of Odor on Liking for Places, Things and People. The Chemical Senses, 24, 713- 721.

Zarzo, M,. & Stanton, D. (2009). Understanding the underlying dimensions in perfumers' odor perception space as a basis for developing meaningful odor maps. Attention, Perception, & Psychophysics, 71 (2), 225-247.