ORIGINAL ARTICLE

Effects of Scent and Music on Moods and Stress in the Confined Resting Area

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Abstract: Scent and music are acknowledged to generate physiological and psychological changes on people, and the combination of scent and music is exerted in diverse situations. However, effects and utilization of scent and music in confined resting environment have not been examined exhaustively. To investigate the effects of scent and music on people's moods and stress in confined resting areas, towards a better understanding about the olfactory and auditory environment, we tested six combinations of scent and music. The results indicated that music hardly changed people's stress evaluation, but had significant effects on moods. On the other hand, scent dramatically affected both moods and stress assessment. Profound comprehension about scent and music will offer further inspiration for the design of olfactory and auditory environment in confined spaces, and new knowledge and perspectives gained through this exploratory study will serve to the thorough and supplementary research in the future.

Keywords: *Olfactory, Auditory, Cross-modal*

1. INTRODUCTION

Confined resting areas include but are not limited to a resting place for employees in a company's office, a private area divided by curtains in a sharing sickroom, or a private area in a shelter. Furthermore, confined resting areas could also be in transportation vehicles, such as the private area in the business cabin of an airplane or a night bus/train. They are becoming increasingly visible because of the speedily developing world, as well as the issue of a rapidly ageing population [1]. All these "confined resting areas" share some same features, that there is reclining seats or beds for people to rest, providing relatively private but not completely enclosed spaces. Although they are initially designed for relaxing and resting, the confinement of these spaces such as the limited and isolated area, frequently brings about negative affectivity. Studies have shown that a small private area could lead to depressive moods because of the need of more space to adjust moods [2]. Even in a larger area, depressive mood is still a big concern for people who live in confined environment [3]. Taking the first-aid room as another example of confined resting areas, which is often found in hospitals, clinics, schools, company offices and other facilities, it was pointed out that an isolated room in a hospital could lead to stress because of frequent restrictions of activity and the disruption of their daily

routine [4]. Furthermore, people also have a risk of receiving psychological and mental stress due to the lack of normal life atmosphere and too well-organized environment [5]. Therefore, the negativity of confined resting areas is in urgent need to be coped with, to create an upgrade experience to people.

Unlike stimuli of other senses, scent and music are invisible and intangible, not requiring space and attention. Thus, the combination of scent and music is extensively investigated and applied in varied situations. It was revealed that the congruent combination of scent and music in terms of arousal significantly raise consumers' satisfaction of the retail store, and booster impulse buying behaviors [6]. Similarly, arousal congruent combination of scent and music is claimed to enhance the experience of music appreciation [7]. In addition, it was reported that the scent of orange sweet generates positive influence on sound sleep, and refreshed wakeup among aged females [8]. Music reduces pain intensity levels and opioid requirements [9], and music therapy is considered as an attractive and successful method for palliative care [10]. As reviewed above, the main effect of scent or music in the field of wellness has been examined however, the cross-modal effect of them is still waiting to be determined. As a consequence, we were notably interested in refining the environment of confined resting areas, and lead to people's well-being by exploring how scent and music affect people's moods and stress.

2. OBJECTIVES

PAD emotional state model was established to describe and measure emotional states, including Pleasure (enjoyable or annoying), Arousal (stimulating or relaxing), and Dominance (in control or submissive) [11]. Compared with Pleasure and Arousal, Dominance is regarded more ambiguous and was eliminated in some previous studies. It is considered that people benefit from both high arousal stimuli and low arousal ones, but unpleasant stimuli hardly result in positive outcome. Consequently, in this research, the dimension of arousal was focused on. The objective was to explore the effects of scent and music with different levels of arousal on people's moods and stress. We intended to find out what kind of moods and stress related to the experience in the confined resting area were more easily affected by scent and music stimuli.

3. PRELIMINARY EXPERIMENT

The purpose of preliminary experiment was to decide proper scent and music stimuli. As clarified in previous research [7], peppermint and rose geranium were both perceived pleasant, but high arousal and low arousal respectively. We used these two kinds of scent in this study as well. In the aspect of music, because healing music is favorable in resting areas for its relaxation efficacy, we chose a healing music album called <Aroma>, which is relatively relaxing, soothing, and does not contain any lyrics. This would eliminate the effect of the meaning of words. Two excerpts of music (<Orange – Refresh> and <Rosemary – Concentration>) were selected as high arousal music samples and two excerpts of music (<Sandalwood – Meditation> and <Lavender – Fall asleep>) as low arousal samples to examine. It was expected to determine one high arousal music stimulus, and one low arousal music stimulus by this experiment. Because all the music in this album is comparatively relaxing, to let participants get used to the music atmosphere, another piece of music (<Frankincense – Balance>) was prepared to play at first as baseline. Ten participants (male: 2, female: 8; age: 26.6 ± 4.34) took part in this experiment.

3.1 Procedure

The preliminary experiment was performed in a compact meeting room. Firstly, the participant was asked to listen to the baseline music (<Frankincense – Balance>) for one minute. Then, we randomly played the other four music stimuli for one minute each. After each music

stimulus, the participant was instructed to answer a questionnaire to rate how pleasant and how arousal it was.

The questionnaire was a two-dimension moods scale to measure psychological arousal level and hedonic tone [12], including eight adjectives (energetic, motivated, frustrated, on edge, relaxed, calm, inactive, and sluggish). We also added a question at the beginning to ask if the music stimulus was long. Participants rated each item by a 9-point Likert scale, from “not at all” to “very much”. Because the music <Frankincense – Balance> was reckoned as the baseline, its result was not analyzed or discussed. Therefore, non-parametric Friedman test within subjects was performed on the rest four music stimuli. Then, Wilcoxon pair-wise comparison was carried out to observe Post-hoc results.

3.2 Result

From Figure 1, it was known that <Rosemary – Concentration> was evaluated significantly higher than <Orange – Refresh> ($p=.047$) and <Lavender – Fall asleep> ($p=.047$) on “frustrated”, and it was also considered significantly more “on edge” than <Orange – Refresh> ($p=.041$). In addition, <Orange – Refresh> was shown to be more “energetic” than the other four music ($p<.05$), we chose <Orange – Refresh> as high arousal music stimulus. Further result showed substantial difference between <Sandalwood – Meditation> and <Orange – Refresh> on both “motivated” and “inactive”. Accordingly, <Sandalwood – Meditation> was selected as low arousal music stimulus.

3.3 Summary

As confirmed by the result, we considered to determine <Orange – Refresh> as high arousal music stimulus, and <Sandalwood – Meditation> as low arousal music stimulus in the further experiment. In addition, because respondents reported that listening to the music for just one minute destroyed the sense of unity, we played the entire music (around 8.5 minutes) in the main experiment.

4. MAIN EXPERIMENT

In this experiment, there were three groups of scent (peppermint, rose geranium, and control), and two music stimuli. In control group, alcohol was employed instead of water to avoid drastic change of humidity of the experiment environment. Each scent was presented by essential oil. The essential oil bottle was installed in an aroma diffuser, periodically spreading out scent for 10 seconds, and resting for 50 seconds. Music stimuli was demonstrated by a MacBook (at around 77 dB), in the same way as preliminary experiment.

Figure 1: Result of Preliminary Experiment on Music

4.1 Procedure

This experiment was conducted in a confined resting area shown in Figure 2. Each participant was randomly assigned in one of the six combinations of scent and music. After informing the objectives and instructions, the participant was required to sign the involvement consent. To start with, let the participant sit and relax on the bed. Then, closed the curtain, played the music and turned on the aroma diffuser at the same time. The music lasted around 8.5 minutes. As soon as the music ended, turned off the diffuser, and let the respondent fill in the questionnaire to describe mood state, and stress level within ten minutes. After each participant, the room was ventilated at least two hours until it became scentless. The whole experimental protocol is exhibited by Figure 3.

The questionnaire included assessment on moods and stress level. The moods assessment scale was developed to examine patients' moods condition on clinical occasion [13]. However, it was suggested that undergraduates and common adults are also suitable to apply this scale. 40 items of this scale were divided into five categories to describe moods state, which are "tension and excitement", "refreshing moods", "fatigue, depressive moods", and "anxious moods". Participants measured their moods by a 4-point Likert scale, from "1" means "not at all" to "4" means "very much". Then, participants rated their stress

Figure 2: Experimental Setting

Figure 3: Experimental Protocol

level under 13 stress events which often occur in confined resting areas. Seldom stress scale has been established for the circumstances of confined environment. Since the sickroom is a typical example of confined resting areas, we referred to this scale which was originally aimed at observing the stress experienced by hospital patients revised by Kawaguchi et al. [5] based on another prior research [14]. However, in this experiment, only the stress events universally applicable in all other confined environment were picked up. Participants reported their stress level in the same way as mood assessment, from “1” means “not at all” to “4” means “very much”.

Five respondents took part in each combination of scent and music, except three people were in the group of low arousal scent and low arousal music. In all, there were 28 participants (male: 11, female: 17; age: 25.2 ± 4.14), and all of them were students from University of Tsukuba. For confirmation, we asked the participants in control group after the experiment if they felt any scent, and none of them recognized the smell of alcohol.

To analyze the data, rank transformation was performed to the original nonparametric data to achieve parametric analysis method [15]. Then, we conducted Multiple ANOVA on moods assessment, and stress evaluation individually.

4.2 Result

According to the result of Multivariate tests, there was a statistically significant difference in moods assessment based on scent, $F(42,4)=12.03$, $p=.013$; Wilks' $\Lambda=.00$. As shown by Table 1, low arousal scent significantly raised up the feeling of “too filled with emotions to stand still” than high arousal scent and control group (both $p=.033$). Moreover, low arousal scent also had significant impact on “painful” ($F(2,22)=6.81$, $p=.005$), compared with high arousal scent ($p=.026$). In the aspect of music, low arousal music evoked stronger moods on “troublesome” ($F(1,22)=5.02$, $p=.036$), “painful” ($F(1,22)=8.85$, $p=.007$), and “lots of (negative) memories come across my mind” ($F(1,22)=9.81$, $p=.005$) than high arousal music. However, high arousal music was verified to trigger the moods of “lonely” more easily than low arousal music ($F(1,22)=5.08$, $p=.034$). Furthermore, the significant effect of the interaction between music and scent was demonstrated by Multivariate tests ($F(42,4)=8.42$, $p=.025$; Wilks' $\Lambda=.00$). In addition to the moods which was mostly influenced by scent or music, such as “troublesome” ($F(5,22)=2.76$, $p=.044$), “painful” ($F(5,22)=6.38$, $p=.001$), and “lonely” ($F(5,22)=3.14$, $p=.028$), specific combinations of scent and music caused significant effects on the

moods of “apathetic” ($F(2,22)=13.06$, $p=.000$), “vain” ($F(2,22)=12.18$, $p=.000$), and “depressed” ($F(2,22)=6.54$, $p=.006$). As demonstrated by Post hoc tests, on “apathetic”, the combination of L+L (low arousal music and low arousal scent) received significantly higher score than H+L (high arousal scent and low arousal, $p=.006$), L+H (low arousal scent and high arousal, $p=.029$), and C+H (control and high arousal music, $p=.029$).

Similarly, the combination of L+L was higher scored on “vain” than H+L ($p=.007$), C+L (control and low arousal, $p=.036$), and L+H ($p=.007$), and it also definitely generated the feeling of “depressed” compared with H+L ($p=.019$).

On the other hand, the result of Multivariate tests revealed that music did not demonstrate significant effect on stress. In the aspect of scent, although the main effect of scent on stress was not statistically significant ($F(26,20)=.600$, $p>.05$; Wilks' $\Lambda=.316$), Post-hoc test yielded that high arousal scent, peppermint, significantly eased the stress of “having restriction of bathing”, compared with control group ($p=.045$).

5. DISCUSSION

Our findings emphasized low arousal scent and music tend to provoke negative moods sometimes. Also, high arousal music was reported to increase “lonely” feeling rather than low arousal music.

The significant results of moods assessment belong to four categories (Table 1) of the five, determined by Sakano Yuji et al. [13]. There was no mood showing significant effect by either scent or music on “refreshing mood”, which is the only positive mood within the five categories. This suggested that basically, staying in the confined resting area, scent or music only affected the experience of negative moods. Therefore, in this circumstance, the role of scent and music might not be enhancing positive moods, but to diminish negative moods. From Table 1, we were convinced that low arousal stimuli increased negative moods in most cases. Terms similar to “fatigue and depressive moods” in previous research were perceived as low potency and low activity, which are close to low arousal [16]. Low arousal moods were strengthened by low arousal scent or music based on the indication of this literature and the observation shown in Table 1 (except for “lonely”). Therefore, it was considered that depressive moods in the confined resting area are low arousal moods, and when participants listened to low arousal music or were in the environment with low arousal scent, the depressive moods might be increased.

Table 1: Result of Self Moods Assessment (L: low arousal, H: high arousal, C: control, ↑: increase, ↓: decrease)

Category	Mood	Scent			Music		Combination (Scent+Music)					
		L	H	C	L	H	L+L	H+L	C+L	L+H	H+H	C+H
①Tension and Excitement	Too filled with emotions to stand still	↑	↓	↓								
③Fatigue	Apathetic						↑	↓		↓		↓
③Fatigue	Troublesome				↑	↓	↑			↓		
④Depressive Mood	Painful	↑	↓		↑	↓	↑	↓	↓	↓	↓	↓
④Depressive Mood	Lonely				↓	↑		↓			↑	↑
④Depressive Mood	Vain						↑	↓	↓	↓		
④Depressive Mood	Depressed						↑	↓				
⑤Anxious Mood	Lots of (negative) memories come across my mind				↑	↓						

However, “lonely” was an exception, as it was magnified when people listened to high arousal music.

It is unclear in the literature about why “lonely” is different from other depressive moods. Loneliness is always an important topic in healthcare research. A study states that loneliness is a risk to health, and people who are lonely are more likely to use Emergency Department and it is independent to chronic illness [17]. Studies on music therapy also targeted on “loneliness”. For example, they revealed that music therapy could significantly decrease the feeling of loneliness in old people [18]. Nevertheless, none of them explained why loneliness is different from other depressive moods, and how it could be declined by low arousal music. Fortunately, Heinrich and Gullone provided us with a research about loneliness and its significance in general and clinical situations [19]. As a conclusion, they pointed out that:

“While loneliness shares features with other psychological problems, such as depression and anxiety, it is nonetheless a distinct phenomenon worthy of attention in its own right.”

To define a resting, healing space, pleasant aromatherapy and relaxing music are usually regarded as relaxation techniques to calm down, alleviating the stress [20]. Unexpectedly, the results of this study implied that low arousal stimuli intensified despondent and worried moods in contrast with our intuition. As substantiated in a prior study, scent modifies people’s perception of music, and low arousal scent has potential impact on lowering the arousal of music [7]. Therefore, a conceivable interpretation might be low arousal scent (rose geranium) considerably diminished the arousal of music, so that the low arousal combination might lead to too low arousal state, such as melancholic and gloomy, far beyond relaxing and calm. Therefore, we considered that overall, low arousal scent and music stimuli might have negative

impact on people’s moods in confined environment. Still, the reason for high arousal music boosted “lonely” feeling is undetermined on the authority of existing studies, further observations are needed to explore the effect of high arousal music.

In the aspect of stress evaluation, the most obvious observation was that only scent affected the stress level in the confined resting area, no effect of music was claimed. High arousal scent could be applied to alleviate the stress of “having restriction of bathing”. To understand the reasoning behind this, we could have a look at our daily experience. For instance, bath additives are scented products that are extensively used for bathing. Their scent is reckoned the most important, even more than their function [21]. In another Internet survey administrated on 20826 respondents in 2013 [22], we were also convinced with the same result. 5593 people replied that scent was the most decisive factor (26%), then exhaustion recovery (21%), circulation simulation (16%), moisturizing effect (13%), and so on. Therefore, the indispensable role of scent during bathing was understood. According to the literature on the history of bath additives scent, sparkling type of bath additives has taken the place of hot bath type ever since “Babu” (by Kao Corporation) was released [21]. The majority of sparkling type of bath additives on the market is mainly divided into two categories by the effect of scent: relaxing, and refreshing [23]. In daily life, floral scent is widespread and popular in different types of bath additives, while menthol is usually only compounded in cooling type. However, when “having restriction of bathing” in the circumstances of confined resting area, the priority aim of bath becomes hygiene rather than relaxation or enjoyment. In coincidence with the evidence that peppermint bath has antibacterial, clean [24], and refreshing efficacy [25], it makes sense that peppermint was perceived preferable by participants, and declined the stress of “having restriction of bathing”.

In summary, our work revealed the impressive impact of scent on altering people's moods and stress staying in the confined resting area. Music exhibited remarkable efficacy on self-mood evaluation but hardly affected stress. We were enlightened that other than applying low arousal scent or music to create a relaxing, peaceful healing environment, using high arousal scent properly such as peppermint is further beneficial, because the upsurge of tension brings about cheer and refreshment to people, which would be absolutely advantageous to mental well-being.

6. CONCLUSION

This study was aimed at understanding the role of scent and music in the user experience in confined resting environment. The results showed that both scent and music could affect moods. In general, high arousal scent or music tend to reduce negative moods. However, in the most affected category "depressive moods", it was revealed that "loneliness" was very unique and different from others, as it was alleviated by low arousal music. It is recommended that scent or music with different arousal levels should be used depending on specific negative moods.

Results also exhibited that, scent was much more effective than music in influencing participants' stress level in the confined resting area. It was believed that high arousal scent definitely reduced the stress of "having restriction of bathing", possibly because it offers the impression of clean and refreshing.

7. LIMITATION & FUTURE STUDY

The fundamental knowledge generated from this research will contribute to novel confined environment design. These new findings and perspectives will also provide designers with critical information to execute needed design techniques, ultimately upgrading the well-being for people.

Aside from the unexpected findings which could be explained with the support of existing literature, there are still some results which need to be further investigated. For instance, in contrast to our observations, rose geranium was reputed to help people to relax [26], therefore, it may be necessary to explore the reason why rose geranium, the low arousal scent, raised the perception of "too filled with emotions to stand still", which belongs to the factor "tension and excitement".

In addition, a specific healing music album was

selected and investigated. However, in order to apply the result to a wider range of different types of music, further experiments using music stimuli from diverse music CDs should be conducted in future study.

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REFERENCES

1. Ejiri, M., Kawai, H., Fujiwara, Y., Ihara, K., Hirano, H., Kojima, M., and Obuchi, S.; Predictors of social isolation among older people living in urban area: a prospective study, *Japanese Journal of Public Health*, 65(3), pp.125-133, 2018.
2. Tomari, S., and Yoshida, F.; The relationship between affect, use of place, and the functions of private space, *Japanese Journal of Social Psychology*, 15(2), pp.77-89, 1999. (in Japanese)
3. Palinkas, L. A., Johnson, J. C., and Boster J. S.; Social Support and depressed mood in isolated and confined environments, *Acta Astronautica*, 54(9), pp.639-647, 2004.
4. Brodsky, W.; Music therapy as an intervention for children with cancer in isolation rooms, *Music Therapy*, 8(1), pp.17-34, 1989.
5. Kawaguchi, T., Sakaguchi, S., Tajiri, K., Sato, E., and Watanabe, H.; Study on factors of inpatient stress, *Journal of Japan Society of Nursing Research*, 17(2), pp.21-29, 1994. (in Japanese)
6. Mattila, A. S., and Wirtz, J.; Congruency of scent and music as a driver of in-store evaluations and behavior, *Journal of Retailing*, 77(2), pp.273-289, 2001.
7. Zhou, C., and Yamanaka, T.; How does congruence of scent and music affect people's emotions, *International Journal of Affective Engineering*, 17(2), pp.127-136, 2018.
8. Matsunaga, K., Lee, J., Park, B., and Miyazaki, Y.; The physiological effects of sweet orange odor on anxiety in elderly women requiring care before sleeping, *Japan Journal of Aromatherapy*, 13(1), pp.47-54, 2013. (in Japanese)
9. Cepeda, M. S., Carr, D. B., Lau, J., and Alvarez, H.; Music for pain relief, *Cochrane Database of Systematic Reviews*, 2013(10), Art. No.: CD004843, 2013.

10. Ichie, M.; Ongaku to ningen to no atarashii kakawari –Ongaku ryōhō to sono shūhen–, Journal of the Society of Biomechanisms, 30(1), pp.26-30, 2006. (in Japanese)
11. Mehrabian, A., and Russell, J.A.; An approach to environmental psychology (1st ed.), MIT Press, Cambridge, MA, 1974.
12. Sakairi, Y., Tokuda, H., Kawahara, M., Yagi, T., and Soya, H.; Development of the two dimension moods scale for measuring psychological arousal level and hedonic, Bulletin of Institute of Health and Sports Sciences, University of Tsukuba, 26, pp.27-36, 2003. (in Japanese)
13. Sakano, Y., Fukui, T., Kumano, H., Horie, H., Kawahara, K., Yamamoto, H., Nomura, S., and Suematsu, H.; Development and validation of a new moods inventory, Japanese Journal of Psychosomatic Medicine, 34(8), pp.629-636, 1994. (in Japanese)
14. Volicer, B.J., and Bohannon, M.W.; A Hospital stress rating scale, Nursing Research, 24(5), pp.352-359, 1975.
15. Conover, W.J., and Iman, R.L.; Rank transformations as a bridge between parametric and nonparametric statistics, The American Statistician, 35(3), pp.124-129, 1981.
16. Morgan, R.L., and Heise, D.; Structure of emotions, Social Psychology Quarterly, 51(1), pp.19-31, 1988.
17. Geller, J., Janson, P., McGovern, E., and Valdini, A.; Loneliness as a predictor of hospital emergency department use, The Journal of Family Practice, 48(10), pp.801-804, 1999.
18. Tazraji, F.S., Pakdaman, S., Dadkhah, A., and Tavakoli, M.R.H.; The Effect of music therapy on depression and loneliness in old people, Salmand Iranian Journal of Ageing, 5(2), 2010. (in Arabian)
19. Heinrich, L.M., and Gullone, E.; The clinical significance of loneliness: a literature Review, Clinical Psychology Review, 26(6), pp.695-718, 2006.
20. Yamada, F., Ooi, K., Yano, J., Sugihara, T., Todo, N., Kishi, Y., Fujiwara, M., Araki, K., and Tajima, N.; Development of the stress management education program for the patients with an intractable disease in order to increase QOL, Bulletin of Osaka Prefectural College of Nursing, 9(1), pp.25-37, 2003. (in Japanese)
21. Shoji, H.; Changes in preference of bath additives scents, Journal of Japan Association on Odor Environment, 46(6), pp.390-397, 2015.
22. Summary of Nice Smell Bath Additives; <https://www.cosme.net/matome/I0000639> (accessed 06.15.2019). (in Japanese)
23. Series Lineup of Babu (Kao Corporation); <https://www.kao.co.jp/bub/lineup/teiban/> (accessed 06.15.2019). (in Japanese)
24. Home Page of Herbs; <https://www.myherb.jp/main/contents/rilax/bus.html> (accessed 06.15.2019). (in Japanese)
25. Information of Bath Additives; <https://bath-time.biz/peparmint.html> (accessed 06.15.2019). (in Japanese)
26. Worwood, V.A.; The complete book of essential oils and aromatherapy, New World Library, California, p.21, 2012.

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