

Study on Psychological Effects of Hue And Aroma of Aqueous Solution

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ABSTRACT: Today, there are many products that make use of mental effects are developed. For example, products, such as bath salt, are being used in the life of everyday. It is thought that color can have an effect on relaxation and awakening. The bath salts is high-profile as its distinctive aroma makes people relaxed with fresh and energetic feelings. In this study, we aimed to determine quantitatively how the hue and aroma of aqueous solution can influence the mental effect by the SD method. On the other hand, the SD method is analyzed with the foot bath method in this study and the psychological reactions are discussed and investigated in order to provide basic data for developing the practical products that can make life more comfortable and affluent by quantification for its effect. The result showed that the psychological effect of the combination of hue and aroma is strongly influenced by the impression of aroma. Also, when comparing the results of each combination, sakura and R1 was the more highly evaluability among the combination of optimum hue and aroma both sexes, and chamomile and G0 resulted in the highest degree of refreshingness for males. Then the most highly evaluability was the combination of sakura and R3 for females.

Keywords: SD method, hue, aroma, bath salts

Date of Submission: 17-11-2017

Date of acceptance: 14-12-2017

I. INTRODUCTION

In today's "stressed society," there are many opportunities to feel stress in a variety of situations. Hence, products that provide relaxation have been developed by many and attract a great deal of attention. These products have a refreshing effect by using colors and fragrances effectively. Color (hue) has been determined to have a "relaxation effect," "refreshing effect," and "healing effect". [1] Therefore, by using color effectively, it is thought that the relaxation effect is increased further. When entering the bath, the body temperature rises, capillaries of the skin expand, blood flow improves, and it is a very pleasant feeling. Moreover, the skin's waste products are removed and increasing one's metabolism can mitigate fatigue and pain. Also, because there is pressure on the body's fluids, the blood collected on the limbs is pushed back, the heart becomes more active, and the blood and the lymph can flow better.

Bathing salts are a familiar example that utilize color as part of their effect on people. Red bathing salts would be expected to lift moods and make one more energetic. Pink's softness is considered to be mild and soft which may prolong good feeling after a nice day. Blue, the color of the sea, would feel refreshing and bring calmness. Bath salts with the color yellow of citrus fruits, such as lemons, are thought to have the effect of refreshing or inducing positivity in both males and females. The open feeling of an outdoor bath in the forest or meadow is expressed in the green bath salts, which would also make one feel refreshed and relaxed. Color brown has the same function as well. White bath salts are one of the popular colors. Color white symbolizes milk which is considered to make beautiful skin. Color white is also associated with cleanliness, purity and would probably be the most suitable color for a bath salt when one wants to relax. Therefore, it is possible to influence the mood of a person based on the hue of the bathing salt. [3] The bath salts is high-profile as its distinctive aroma makes people relaxed with fresh and energetic feelings, and it will also be popularized henceforth. It might care most about the aroma among the characteristics of bath salts. [4] And there presumably exists a wonderful sensation if leisurely enjoying in the enamored space with filled aroma. Relaxing the body in favorite aroma will make you fulfilled and open after daily fatigue. [5] Aroma also has the effect of aromatherapy, and relaxing is one of its advantages as well. [6]

The aroma of fruit is actually the scent felt in eating fruit, so this sort of easily imaginary aroma is very easy to be perceived. For example, the fruity aroma of green apple, peach, raspberry, lemon, pomelo and other citrus fruit is widely known. But not just the fruits, there are also more than a few commodities that can spread the similar fruity aroma. The flower with the largest variety of potpourri certainly is rose. Its elegant image and aroma glance the world that differs from normal life. [7] In general, the aroma of jasmine obsesses people infatuated within it and relaxes them. Something will be better than smelling aroma of this flower upon exhaustion. The bath salts is added with the herbal ingredients, thus people can heartily enjoy the aroma with various mingled smells. [8] The chamomile will fire one's desire when it mentions the herbal fragrance, which has a favorable relaxation effect. The most popular aroma among other kinds is the woody fragrance with ligneous sense, which seems to provide people with the enjoyment in a forest bath. In addition, it enables people to remind of the sea and feel at ease as if they are enjoying the sea bathing in the ocean. [9]

The purpose of this study is to provide basic data for the development of practical products to make life richer and more comfortable by quantifying its effect. The SD method is analyzed with the foot bath method in this study and the psychological reactions are discussed and investigated. We aimed to determine quantitatively how the hue and aroma of aqueous solution can influence the mental effect by the SD method.

II. EXPERIMENTAL

Semantic Differential (SD) technique is a typical method in performing landscape image evaluation test, was developed by C.E. Osgood. [10] [11] Impression evaluation by SD method, for a given impression measure, is an evaluation method for numerical select the degree to which subjects felt. This method, it is possible to quantify the evaluation value for each evaluation item, and that is also possible to comparative analysis between a plurality of target. The analysis of the evaluation data of the SD method, we used the factor analysis method. This analysis made it possible to grasp the overall impression to the target from the impression words that are similar to adjectives. The evaluation is digitalized for each evaluation item, and comparative analysis becomes possible among multiple object.

Table 1 The judgment standards of adjectives [12][13]

[1]	Not to use adjectives that are used as special meaning by specialists, or adjectives that change the meaning depending on the knowledge of a subject.
[2]	To use a variety of words without concentrating on similar words.
[3]	To add words that are not connected to the sense of value, without leaning to adjectives related to value.
[4]	To avoid words that are easily judged on the purpose of surveying.
[5]	To use soft, sensory and intuitive adjectives.
[6]	To avoid obscure words.
[7]	To make the adjectives can be used in precedent studies as much as possible.

In the questionnaire, based on the after-mentioned judgment standards of Table 1, 22 contrastive adjectives were selected as suitable for evaluation the impression of the combination of hue and aroma among 287 items of written impression words, including two overall indicators of the adjectives were adopted. Also, for the evaluation by a quantification theory, seven-grade system [+3, +2, +1, 0, -1, -2, -3] was used in evaluation sheet of SD method. [14][15] The colors of the bath salts used in the experiment are R (red), Y (yellow), G (green), B (Blue), and P (purple). The turbidity was also changed to four levels in each hue, starting with degree 0 turbidity, where salt was not added. In Colorimetry, the Munsell Color System is a method that specifies colors based on three characteristics: hue, value (lightness), and chroma (color purity). Conceived in the 1890's by the American artist and educator Albert H. Munsell (1858-1918), [16] it was described as a theoretical color model in 1905. The Munsell Color system is set up as a numerical scale with visually uniform steps for each of the three color attributes—in Munsell color notation, each color has a logical and visual relationship to all other colors. [17] Munsell divided colors into five principal hues: Red, Yellow, Green, Blue, and Purple, along with 5 intermediate hues, each halfway between adjacent principal hues. Munsell's system, particularly the later renotations, is based on rigorous measurements of human subjects' visual responses to color, putting it on a firm experimental scientific basis. [18][19] Because of this basis in human visual perception, Munsell's system has outlasted its contemporary color models. It is still in wide use today. [20]

In the previous study, the aromas that induces the higher physiological reactions are pomelo, green apple, sakura, rose, chamomile, peppermint, that has a higher effect for both sexes. And the grapefruit reflects the worst refreshing effect for females. The raspberry reflects the worst refreshing effect for males. Therefore, in this experiment, we choose these eight aromas to complete the experiment.

The dosage of the powder should be adjusted as the occasion demands until the aroma of each aqueous solution is consistent. The measured level value of sensor is controlled within 230~240 using XP-329 III sensor (Figure1). And this level value can fully measure the aroma of aqueous solution. The utilized vessel are provided with the specifications of 60cm length, 40cm width, 38cm height and water depth of 20cm. And of course the container is prepared in color white as a bathtub in real life. The experiment was carried out under the inverter-type white fluorescent lamp and the water temperature was consistently 40°C throughout the experiment. The integrated aqueous solution with various aromas is poured into vessel with seal to make sure of no leakage of aroma. The number of individual subjects participated in the experiment was 40 (20 males, 20 females).



Figure1 XP-329 III sensor

The subject would put both feet into water for an allotted time without seeing the aqueous solution. This is to remove the effect of the aqueous solution’s heat. After the subject acclimated to the water temperature, the subject was allowed to see the hue of the aqueous solution at the same time smell the aroma of the aqueous solution. Subject observed the aqueous solution in one minute, thereafter, evaluates the impression felt the scene sample data sheet using the SD method of psychological techniques(Figure2).

In order to prevent accidental filling, etc., it is assumed that fill one by one for one scene sample. In addition, psychological subject, namely in consideration of feeling and physical condition etc., in order to measure and reduce the error as much, experiments were performed while taking a break at fixed intervals.[21]

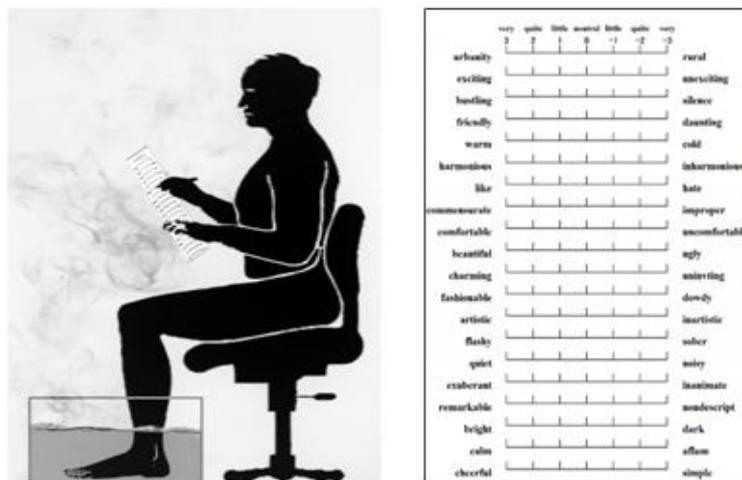
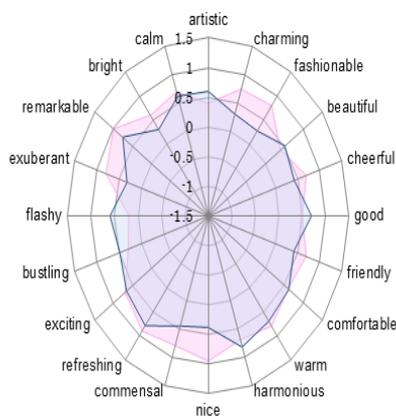


Figure2 Image of experiment

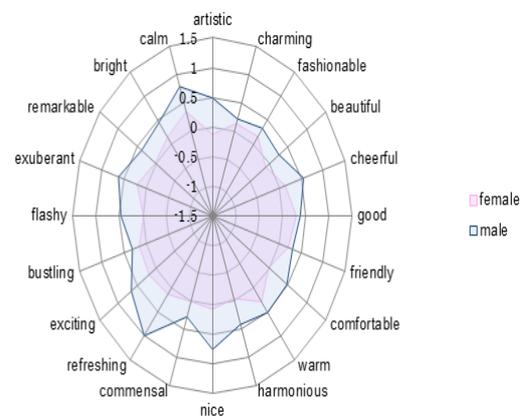
III. RESULTS AND DISCUSSION

In all results, it finds that the various the combination of hue and aromas with the refreshing effect will change in accordance with the gender shift by comparing their results. Therefore, the males and females will be analyzed separately in this experiment. And taking the tendency of the combination of hue and aroma classification into account, the figure of average situation for the refreshing effect of the combination of hue and aroma classification among sexes will be provided and the results will be analyzed.

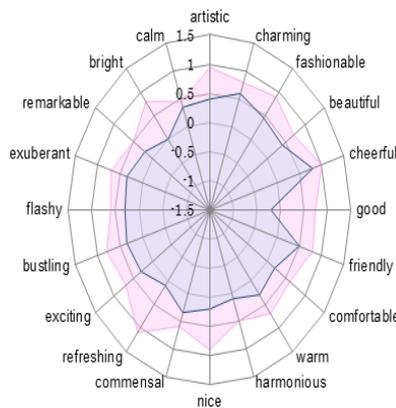
Figure 3 is average results for refreshing effect on SD method's reaction to the combination of hue and aroma both sexes. As shown in the figure, both sexes show similar tendency for the combination of sakura and R1 that has the better refreshing effect. Males love the combination of chamomile and G0, that has the best refreshing effect. While the combination of chamomile and G0 shows poorer refreshing effect for females. In the previous study, the raspberry's aroma reflects the worst refreshing effect for males. The same, the combination of raspberry and P1 shows the worst refreshing effect for males. In the case of female subjects, the combination of sakura and R3 shows the best refreshing effect. While the combination of sakura and R3 shows poorer refreshing effect for males. Besides, the combination of hue and sakura have better effect on females than males in the mass. In the previous study, the grapefruit's aroma reflects the worst refreshing effect for females. The same, the combination of grapefruit and Y2 shows the worst refreshing effect for females. Both sexes show similar tendency for the combination of grapefruit and Y1 reflects the worst refreshing effect. Besides, the combination of hue and grapefruit have worse effect in the mass.



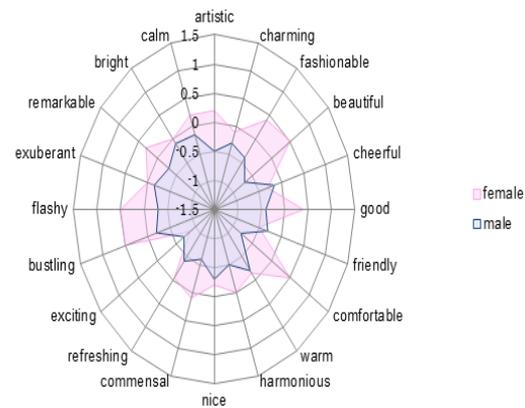
sakura and R1



chamomile and G0



sakura and R3



raspberry and P1

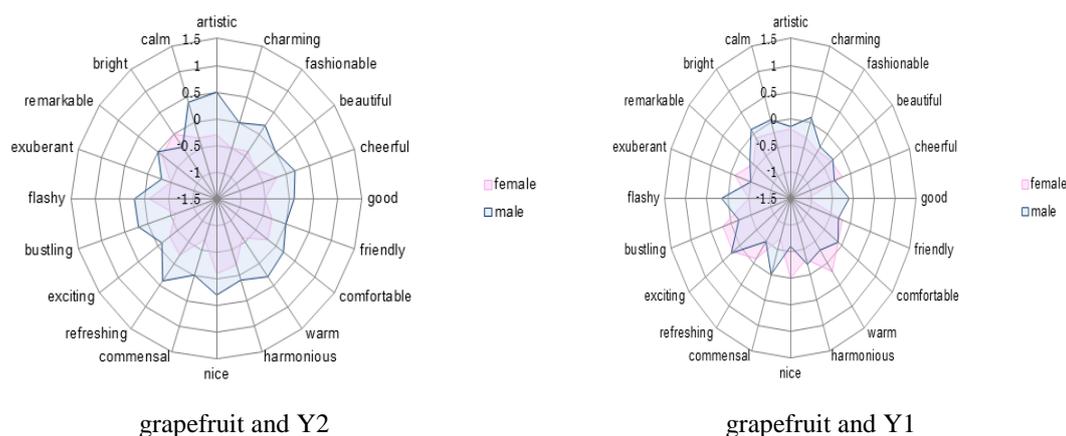


Figure3 Average results for refreshing effect on SD method's reaction to the combination of hue and aroma

This experiment revealed what the impression received by the combination of hue and aroma of the bath agent is clear. From the results of this experiment it can be seen that the psychological effect of hue and aroma, especially the psychological effect of aroma greatly affects its evaluation. Therefore, when combining hue and aroma, it is better psychological effects can be obtained by matching with the image of the aroma. In this paper demonstrates that the psychological reaction was analyzed what generated by bath salts of hue and aroma is composed in the SD method. The existing psychological effect and the caused psychological reaction of the hue and aroma of aqueous solution are investigated. And, it can be anticipated that the effect will vary as the intensity of the aroma. Therefore, it believes that dividing the the combination of hue and aroma into several classes to conduct the experiments can obtain more accurate data.

IV. CONCLUSION

As all results, sakura and R1 was the more highly evaluability among the combination of optimum hue and aroma both sexes, and the combination of chamomile and G0 resulted in the highest degree of refreshingness for males. Then the most highly evaluability was the combination of sakura and R3 for females. From this experiment, it also can be seen that the psychological effect of the combination of hue and aroma, especially the psychological effect of aroma, has a great influence on the evaluation. Various the combination of hue and aroma with the refreshing effect will change as gender. The situation of both sexes will be compare for a more detailed analysis on the results. This experiment showed the significance of the subjective evaluation by the SD method. The hue with a high degree of cloudiness has the comfort and the refreshing effect. And, it became clear that the hue of the cloudiness degree 0 which was light exhilaration by the psychological reaction also gives the person a refreshing effect.

In addition, the combination of hue and aroma will also change with different ages of subjects. Thus the experiment conducted on this basis is of profound significance. In other words, it is possible to quantify the psychological reaction by hue and aroma, it is considered to be useful in the future of product development. It's of extreme significance to investigate the refreshing effect of the combination of hue and aroma while analyzing the SD method. That is to say, this experiment can quantify the psychological reaction of aroma, which has positive effects on developing the commodities. It hopes to obtain practical applications for more effective products and develop the data with positive effects via the combination of hue and aroma.

REFERENCES

- [1]. Z. W. Yin, M. Takamatsu, Physiological and Psychological Reactions to the Hue of Aqueous Solution, American Journal of Engineering Research, 6(7), 2017, 168-172.
- [2]. M. Takamatsu, Y. Nakashima, S. Fujii, Y. Saeki, H. Miyamoto and T. Mikami, The Study of Mental Effect by the Color of Bath Salts, IEEJ Transactions on Fundamentals and Materials, 25(2), 2005, 187-188.
- [3]. M. Takamatsu, Y. Nakashima, L. Qian and Z. Katoh, Study on Quantification of Mental Effect by Hue of Solution, Journal of Japan Society of Kansei Engineering, 8(3), 2009, 799-804.

- [4]. Y. Sugawara, M. Kawasaki, C. Hara, N. Sugimoto, Y. Yamanishi, M. Miyauchi, T. Masujima, T. Aoki, Alteration of perceived fragrance of essential oils in relation to type of work: a simple screening test for efficacy of aroma, *Chem Senses*, 24(4), 1999, 415–421.
- [5]. S. Wilkinson, J. Aldridge, I. Salmon, E. Cain, B. Wilson, An evaluation of aromatherapy massage in palliative care, *Palliat Med*, 13(5), 1999, 409–417.
- [6]. G. Bu-inflammatorischer and chbauer, L. Jirovetz, W. Jager, C. Plank, H. Dietrich, Fragrance compounds and essential oils with sedative effects upon inhalation, *J. Pharm. Sci.*, 82, 1993, 660-664.
- [7]. K. Yamada, Y. Mimaki, Y. Sashida, Anticonvulsive effects of inhaling lavender oil vapour, *Biol. Pharm. Bull.*, 17, 1994, 359-360.
- [8]. I.J. Romine, A. Bush, C.R. Geist, Lavender aromatherapy in recovery from exercise, *Percept Mot Skills*, 88(3 Pt 1), 1999, 756–758.
- [9]. M.A. Diego, N.A. Jones, T. Field, et al., Aroma-therapy positively affects mood, EEG patterns of alertness and math computations, *Int J Neurosci* 96, 1998, 217-224.
- [10]. C. E. Osgood, Semantic differential technique in comparative study of cultures, *American Anthropologist*, 66(3), 1964, 171-200.
- [11]. C. E. Osgood, Study on the generality of affective meaning systems, *Amer. Psychology*, 17, 1964, 10-28
- [12]. Y. Nakamura, Impression of the urban landscape, *Journal of the Illuminating Engineering Society*, 74(3), 1999, 143-148.
- [13]. T. Kumamoto, K. Ohta, Selection of impression word for Impression-based retrieval, *Transaction of Information Processing Society of Japan*, 44(7), 2003, 1808-1811.
- [14]. M. Zhang, Y. Nakashima and M. Takamatsu, Research on illumination of historical buildings by the color temperature, *International Journal of Computer Science and Network Security*, 10(8), 2010, 27-33.
- [15]. L. Ma, Y. Nakashima and M. Takamatsu, Study on the optimum color temperature for the illumination of Japanese style garden, *The Institute of Electrical Engineering of Japan*, A133(11), 2013, 558-564.
- [16]. A. H. Munsell, A Pigment Color System and Notation, *The American Journal of Psychology*. University of Illinois Press. 23 (2), 1912, 236–244.
- [17]. D. Nickerson, History of the Munsell color system, company, and foundation, *Color Research and Application*. 1 (1), 1976, 7–10.
- [18]. R. G. Kuehni, The early development of the Munsell System. *Color Research and Application*, 27(1), 2002, 20-27.
- [19]. M. E. Bond, and D. Nickerson, Color-order systems, Munsell and Ostwald, *Journal of the Optical Society of America*, 32(12), 1942, 709-719.
- [20]. T. Izumi, T. Hattori, S. Sugimono, and T. Takashima, Color Image Arrangement Using Elastic Transform on Principal Component Axis (in Japanese), *Journal of Japan Society of Kansei Engineering*, 8(3), 2009, 667-674.
- [21]. J. C. M. Takamatsu, The Evaluation of Urban Landscape upon Japanese Representative LRT Cities Using Visual Engineering, *American Journal of Engineering Research*, 5(2), 2016, 136-144.

*Zhiwei Yin. “Study on Psychological Effects of Hue And Aroma of Aqueous Solution.”
American Journal of Engineering Research (AJER), vol. 06, no. 12, 2017, pp. 136-141.