Effect of Physiological and Psychological Conditions by Aroma and Color on VDT Task

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Abstract. There is research that color and smell improve arousal during VDT task. As the psychological effect of the harmony of colors and aroma, there is research that is being considered from the side of the sympathetic-parasympathetic activity. In this research, we focused on the harmony relationship of aroma and color, these harmonious relationship was examined the physiological and psychological effects of VDT work. From the psychological aspect, aroma has given a good effect, there was a tendency to feel calm by the aroma and color of the investigation. From the physiological aspect, it tends to be stabilized when there is a aroma during task, the effect of the color has been suggested to be susceptible than aroma. If applied to the design to suit its influence on purpose, it is possible to some effective design for the purpose.

Keywords: Aroma · Color · Physiological · Psychological · Design

1 Introduction

It has been made various studies about the relation between the colors and aroma. Koike et al. [1] investigated whether aroma reduce psychological stress and enhance concentration of attention during mental arithmetic. The results indicate that temporal aroma presentation mainly changes brain activity and thus improves concentration of attention. There were researches which had extract dimensions in impressions of colors and fragrances, and had examined their harmonious relationship [2–4].

It is known that the aroma has the effect of changing the concentrate state and stress state. For example, the aroma of mint series is effective to concentrate and lavender is effective to relieve tension. It is a well-known fact that there is such an effect only in the aroma, in addition to this, further effects are expected by stimulating the other senses. Therefore, in this study, we focused on the vision and olfaction. We examined the effect of adding a color to aroma. Specifically, we were focusing on the aroma and color harmony of effect, it was to investigate the physiological and psychological effects in VDT work.

In this research, we focused on the harmony relationship of aroma and color, these harmonious relationship was examined the physiological and psychological effects of VDT work.

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2 Methods

2.1 Participants

Participants were sixteen (eight males and eight females). They were normal in the vision and olfaction in everyday life, and were in good health.

2.2 Aromas

The aromas were Eucalyptus globulus and Citrus sinensis. These are Chemotypes essential oil (Pranarom International). Eucalyptus globulus is effective to concentration and Citrus sinensis is effective to relax condition.

2.3 Colors

The participant selected the colors (on the screen of the PC) each fitting into two types of aroma on experiment description date. Cotton wool that has dropped a few drops of essential oil was in the case. Participants sniffed the aroma by opening the lid, chose the color that fits with its aroma from the Windows color palette. The screen colors which were selected by participants was showed on Fig. 1.

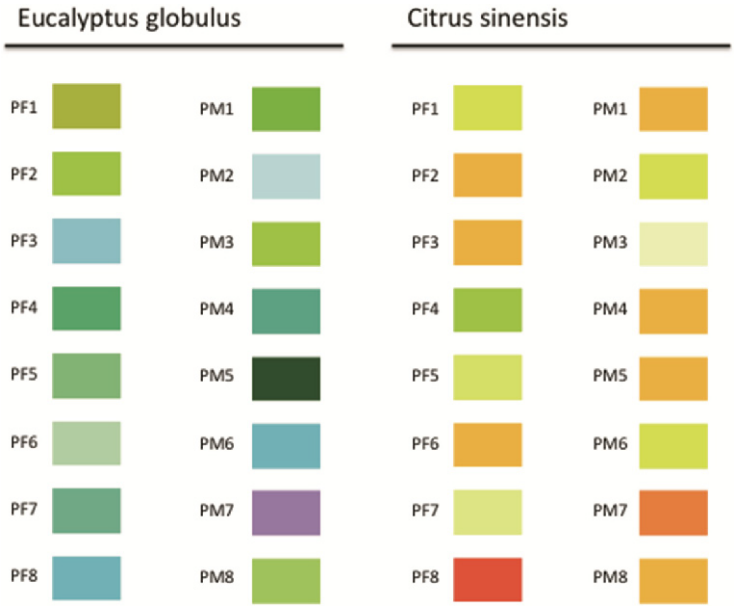


Fig. 1. The screen color (Color figure online)

2.4 Conditions

The conditions were the following six.

(1) eucalyptus globulus and color which participant felt to be harmonized with eucalyptus globulus
(2) citrus sinensis and color which participant felt to be harmonized with citrus sinensis
(3) eucalyptus globulus and color of (2)
(4) citrus sinensis and color of (1)
(5) no aroma and color of (1)
(6) no aroma and color of (2)

2.5 Task

The task was two-digit addition mental arithmetic task. The mental arithmetic formula was displayed on screen. The experimental time was 20 min. The color of display screen was selected by each participant. For the screen of display, the area around number formula was white, the number formula was black and the color of the other peripheral area was selected by the participant.

2.6 Questionnaire

The information of participants was age, sex, and likes and dislikes of aroma. The mood assessment before and after the task, the impression evaluation was carried out after the task. The mood assessment items were nineteen. The impression evaluation items were fifteen.

2.7 Physiological Indices

The measured physiological indicators were electroencephalograph, electrocardiograph, and electrodermograph (Fig. 2). The content of alpha wave (8–12 Hz) and beta wave (12–20 Hz) were calculated. The electrocardiograph was analyzed by the frequency analysis and calculated LF/HF. The electrodermograph was calculated the integral value.

Fig. 2. The measurement devices

2.8 Procedure

The experiments were carried out in the following procedure each a condition.

- Facesheet (only on first experiment) + mood assessment
- Physiological indices attached
- Rest of 1 min
- The task start (for twenty minutes)
- Rest of 1 min
- After the task, impression evaluation and mood assessment

The participant was conducted an experiment once for 6 conditions. For a different aroma of the conditions, it was carried out after a period of time more than one week as a general rule.

3 Results and Discussion

The result likes and dislikes of aroma used in the experiment was as Fig. 3. Other than one person was answered that like citrus sinensis. Half of the experimental participants answered that like eucalyptus globulus, was a aroma that favorite divided. Then, the results of mood assessment, impression evaluation, and the physiological indices is stated.

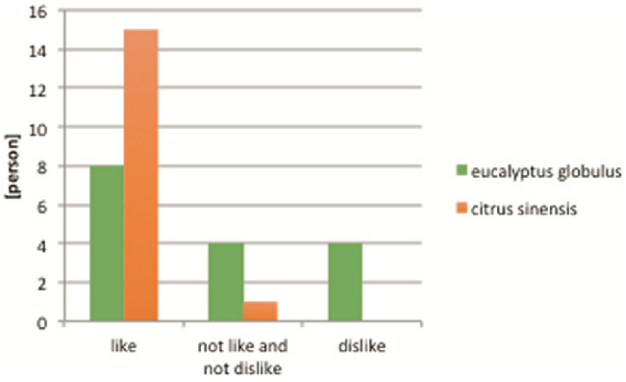
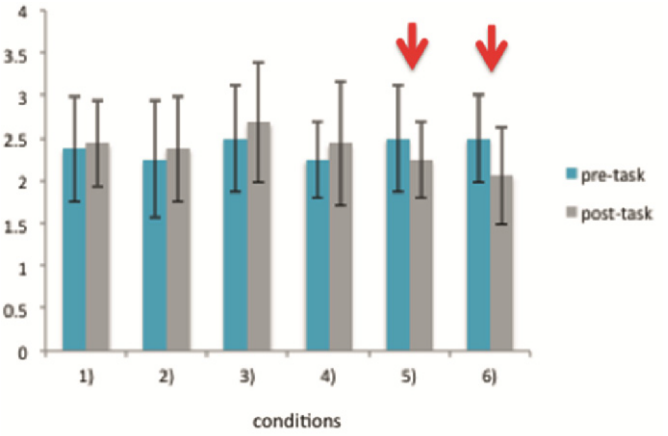


Fig. 3. Preference for aromas (Color figure online)

Mood Assessment. Here, we describe items effect of color and aroma was observed. For the "refreshing" item, the score is low if there is no aroma. It was shown to feel refreshing when there is aroma (Fig. 4). For information about "dark", because it was lower in the citrus sinensis, aroma citrus sinensis soften the dark feelings (Fig. 5). For the "restless", if the color and aroma is correct, restless score is low. In other words, there is a tendency to feel the harmony of color and aroma calm down. In other words, the aroma has a positive impact on mood. In particular, aroma of citrus was to brighten the feeling. In addition, there is a tendency to feel calm by the harmony of aroma and color.



1) eucalyptus globulus and color which participant felt to be harmonized with eucalyptus globulus
2) citrus sinensis and color which participant felt to be harmonized with citrus sinensis
3) eucalyptus globulus and color of 2)
4) citrus sinensis and color of 1)
5) no aroma and color of 1)
6) no aroma and color of 2)

Fig. 4. The score of refreshing on mood assessment (Color figure online)

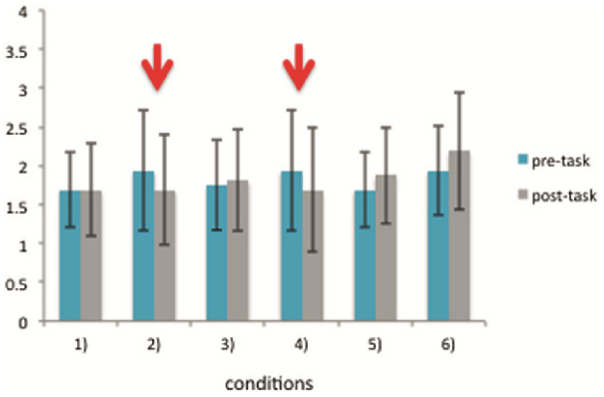


Fig. 5. The score of dark on mood assessment (Color figure online)

Impression Evaluation for Harmony of Color and Aroma. For information about "favorite" and "bright", citrus sinensis also on the screen of the same color was high evaluation (Fig. 6).

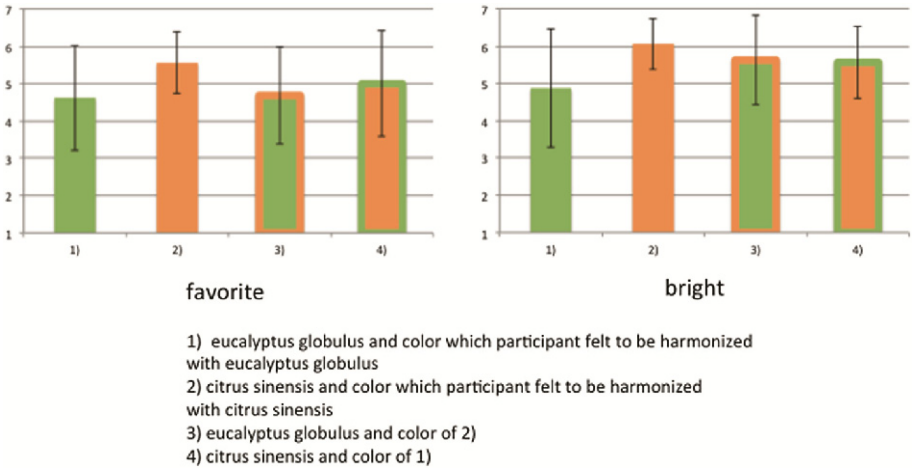


Fig. 6. The score of "favorite" and "bright" on impression evaluation

Physiological Indices. On the integral value on electrodermal activity, in conditions that are watching the screen of the color matches the citrus sinensis, integral value was low trend. It was showed this has been a state of being relaxed (Fig. 7).

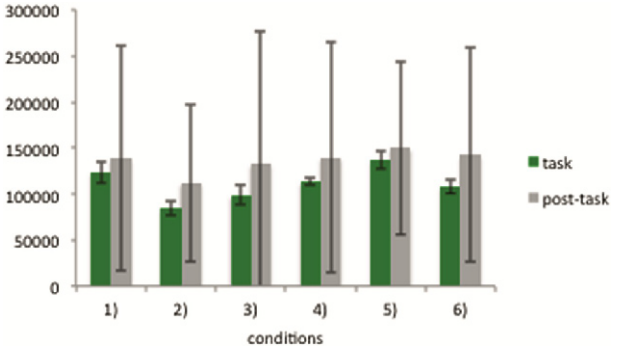


Fig. 7. The integral value of electrodermal activity on task and post-task (Color figure online)

LF/HF of ECG was slightly lower value of eucalyptus globulus than citrus sinensis during task. Relaxing effect by the aroma of eucalyptus globulus appeared. Moreover, the value after work at the time of the E screen there was a high tendency. After the task was over, it was shown to stress state is getting stronger (Fig. 8).

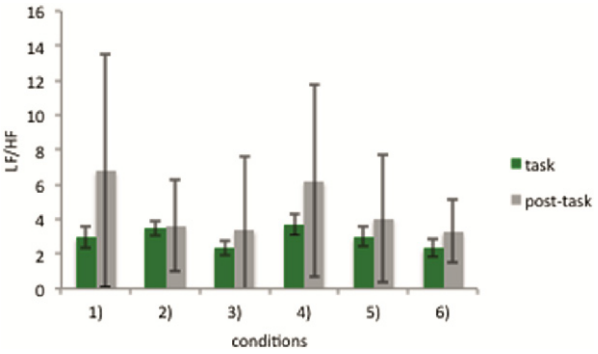


Fig. 8. LF/HF on task and post-task (Color figure online)

For alpha wave content of brain waves, the value after task under the conditions of citrus sinensis of aroma were elevated. That is enough to feel relieved after the task is stronger than the other conditions (Fig. 9).

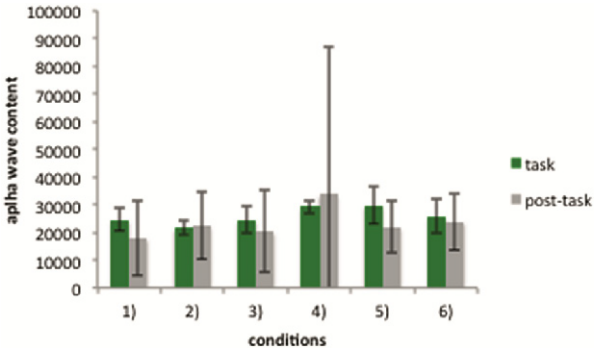


Fig. 9. Alpha wave content on task and post-task (Color figure online)

It was recognized that if there was a harmony of color and aroma in the VDT work, there was a physiological and psychological effects. This can be said to be evidence to support the implicit knowledge that is felt experientially. Some designers have been empirically acquire such a capability and knowledge and have applied to conventionally products and space. Not only designers, by design in cooperation with researchers, such as ergonomics expert, taking advantage of the evidence in the upstream process of the design process has an important role. Based on this evidence, to develop a design methodology that applies such design thinking is effective to propose products and spaces with a new value. In the future, we will be working on a new development of evidence-based design methodology as one of the design approach.

4 Conclusion

The harmonious relationships between colors and aromas were examined the physiological and psychological effects of VDT work.

There is a possibility that the aroma has a positive impact on mood after task. In particular aroma of citrus sinensis soften the dark feelings after task. In addition, there was a tendency to calm down when the color and aroma are matched. Electrodermal activity tended to stable if there was a aroma in the task. LF/HF was observed relaxing effect by eucalyptus globulus than citrus sinensis during the task.

From the psychological aspect, aroma has given a good effect, there was a tendency to feel calm by the aroma and color of the investigation. From the physiological aspect, it tends to be stabilized when there is a aroma during task, the effect of the color has been suggested to be susceptible than aroma. In other words, aroma and color affects even if they are not noticed by yourself. If applied to the design to suit its influence on purpose, it is possible to some effective design for the purpose. In this study, we will aim to develop the design process to take advantage of evidence data for corporate with designer and researcher in the future.

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