

There have been many experiments on the deodorant effects of fragrance ingredients. However, those depend mostly on chemical analysis and subjective evaluation. When evaluating stimulation using subjective evaluation, the results must be re-interpreted by recalling them. In addition, different persons assign different meanings to an expression. A physiological indicator that allows objective and continuous evaluation of the status of the body under stimulation has been attracting attention as an important evaluation method for interpreting the status of the body.

In this study, we used physiological indicators and psychological evaluations about the deodorant effect of the fragrance ingredients and tested them. As a physiological indicator, consecutive systolic blood pressures were measured by the Finapres method, a simple method using the fingertips that places less of a burden on subjects. Subjectivity evaluation using the smell strength and the unpleasantness degree were performed to determine changes in psychological impression.

The bad smell of excreta gave subjects unpleasantness, and the systolic blood pressures of the subjects increased. The subjects' unpleasantness disappeared when they mixed the fragrance ingredients (Allyl-heptanoate, Ethyl-vanillin, Methyl-hydroxy jasmonate) with the bad smell of excreta, and the systolic blood pressures became stable. It is suspected that this physiological reaction was caused when the sympathetic nervous system was restrained and the stress from the odors was released. The above demonstrates that these fragrance ingredients had physiological and psychological deodorant effects.

Some fragrance ingredients will be useful for development of fragrance and deodorant products.

PC2-3 The Effects of the Volatile Compound of Japanese Cedar on Physiological Responses

Kyoko TANIGUCHI¹⁾, Sachiko NAGAYOSHI¹⁾, Kuniyoshi SHIMIZU²⁾, Noboru FUJIMOTO²⁾ and Shigeki WATANUKI¹⁾

1) Department of Physiological Anthropology, Faculty of Design, Kyushu University, 2) Department of Forest Products, Faculty of Agriculture, Kyushu University

This study was aimed to investigate the effect of the inhalation of the volatile compound (Sesquiterpene) of Japanese cedar on the physiological responses. Japanese cedar oil was diluted in 5, 30, 120, 240, 480, and 1700fold with propylene glycol. Odorless distilled propylene glycol was used as a control. Twelve students were asked to smell odor while HR, SBP, DBP, EEG, s-IgA,

salivary Cortisol responses and subjective rating were measured. The result was that s-IgA concentrations increased significantly at 480fold compared to other conditions, while salivary Cortisol concentration did not show significant changes in all conditions. It was considered that an increased s-IgA concentration in 480fold was not a reaction by an acute stress. And the findings in cubic regression analysis revealed that s-IgA concentrations have the highest concentrations at around 480fold and the lowest concentrations at around 5fold. These results suggest that Japanese cedar oil diluted in around 480fold may enhance human immune function. Cardiovascular parameters like HR, SBP, DBP and EEG response were not differences in all conditions. All subjects rated pleasure in all smell conditions compared with a control condition. But subjects rated as pleasure were not differences in all conditions. In fact, this indicates that s-IgA concentration may be used as an effective index to evaluate the difference in the volatile compound concentrations.

PC2-4 Contributing Factors in Differences in Cardiovascular and Psychological Responses to Various Natural Moving Images: Relationships among Responses, Impressions, and Physical Components

Jun'ya TAKAKURA¹⁾, Jeong-Mi LEE¹⁾ and Shigeki WATANUKI²⁾

1) Graduate School of Design, Kyushu University, 2) Faculty of Design, Kyushu University

It has been reported that different kind of natural moving images (NMIs) have different effects on cardiovascular and psychological responses. We conducted this study to investigate what contributes such differences. Relationships among cardiovascular and psychological responses, impressions to NMIs, and physical components of NMIs were examined. Fifteen healthy male students participated in the experiment. Eight different NMIs (iceberg, snowscape, drift ice, rain forest, desert, lava, babbling stream, and autumn colour) were used. Each NMI was presented to participants for 10 minutes after 5 minute baseline. Electrocardiogram, impedance cardiogram, continuous blood pressure, and peripheral skin temperature were measured during baselines and presentations. Comfort, thermal sensation, and drowsiness were asked after each presentation. Impressions to NMIs were identified by fifteen dipole adjectives. Physical components of NMIs (e.g. brightness, saturation, difference between frames, etc.) were extracted from their digital bitmap data. Thermal sensation and the change of cardiac output (ΔCO) showed different responses among NMIs. Hot and cold impressions contributed to

thermal sensation significantly, but physical components of NMIs did not. Multiple regression analysis revealed that hot and unpleasant impressions increased ΔCO . However, there were no significant correlations between ΔCO and physical components of NMIs. These results suggest that cardiovascular and psychological responses are sensitive to impressions to NMIs rather than to physical components of NMIs. In addition, pleasant and unpleasant impressions were associated with saturation and difference between frames of NMIs. Therefore, pleasant and unpleasant impressions to NMIs might be improved by editing or processing films.

PC2-5 Physiological Effects of Basking in Different Forested Environments

Tomoaki KOZAKI¹⁾, Kana HASHITOMI²⁾, Yusuke GOKA³⁾ and Akira YASUKOUCHI⁴⁾

1) *User Science Institute, Kyushu University, 2) Graduate School of Design, Kyushu University, 3) Department of Design, Kyushu Institute of Design, 4) Faculty of Design, Kyushu University*

In this study, the physiological responses were compared in forested and urban environments. A total of 12 young males (age range: 21 - 28 years) participated in the present study. The experiments were executed in selected environments; viz., an urban site (Fukuoka-city, Fukuoka, Japan); two types of forested site-grown one with Japanese cedar, and another with sawtooth oak; and a wooden bungalow flanked with Japanese cedar forest (Oguni-town, Kumamoto, Japan). Subjects were required to sit on a chair for 20 min in each environment. They were also instructed to have a view of the Japanese cedar forest through the window in the wooden bungalow. The heart rate (HR), systolic (SBP) and diastolic (DBP) blood pressures (BP) of the subjects were measured before and after the sitting. For biochemical analyses of cortisol and immunoglobulin-A (IgA), saliva samples were collected after the sitting in each environment. Higher cardiac vagal index (CVI) of heart rate variability (HRV) and lower HR were obtained in the forested site grown with Japanese cedar compared to the urban site. Lower HR was also obtained in the forested site grown with sawtooth oak compared to the urban site. However, there were no significant differences on physiological parameters between the wooden bungalow and the urban site. These findings suggest that basking in the forest may attenuate autonomic nervous tone, whereas viewing of the forest may not yield similar considerable physiological effect.

PC2-6 The Impact of Plants on the Reduction of Volatile Organic Compounds in Small Space

Jeong-Eun SONG¹⁾, Seung-ki PANG²⁾, Yong-Kyu BAIK³⁾, Yong-Shik KIM⁴⁾ and Jang-Yeul SOHN⁵⁾

1) *Department of Architectural Engineering, Graduate School, Hanyang University, Korea, 2) Division of Architectural Engineering, Incheon University, Korea, 3) Department of Architectural Environment Engineering, Seoil College, Korea, 4) Division of Architecture, College of Architecture, Hanyang University, Korea*

This study aims at examining the reduction of indoor air contaminants by the plants placed indoor space. Field measurements were performed using *Aglaonema brevispathum*, *Pachira aquatica*, and *Ficus benjamiana* which were verified as air-purifying plants by NASA. Three conditions for the amount of plants and positions were used in two separate rooms whose dimensions are identical. The concentration of Volatile organic compounds (VOCs) was monitored three hours after the plants were placed and three days after the plants were placed. The variations of concentration of Benzene, Toluene, Ethylbenzene and Xylene(BTEX) and Formaldehyde which were known as major elements of Volatile organic compounds were monitored. The amount of reduction in concentration of Toluene and Formaldehyde were monitored 3 hours and 3 days after the plants were placed in the space. The reduction in the concentration of Benzene, Toluene, Ethylbenzene, Xylene and Formaldehyde was significantly greater when plants were placed. When plants were placed near window, the reduction of concentration was greater. The more plants were used the more reduction of indoor air contaminants occurred. The effect of reducing the concentration of air contaminants increased when the amount of plants increased, and when the plants were placed in sunny area. The concentration of Toluene was reduced by 75.6% when 10 percent of the model space was occupied by *Aglaonema brevispathum*.

PC2-7 Randomized Controlled Crossover Trial (RCT) of Relaxative Effect in Seawater Floating on Human Physiological Responses

Masashi ARAKAWA¹⁾, Jun MOTOMURA²⁾, Takao YOKOTA²⁾ and Kazuhiko TAIRA¹⁾

1) *Health Informatics in Japan Circulation System (JCS), Course of Wellness Tourism, Department of Tourism Sciences (DTS), University of the Ryukyus, 2) Psychiatric Nursing, School of Health Sciences, Faculty of Medicine, University of the Ryukyus*

Though it is widely mentioned that sea-related elements has a potential power at human health promotion, these benefits have not been well