2-2 Skin and Forearm Blood Flow Responses to Breathing Oxygen Gas during Normothermia and Heat Stress
Kazuaki YAMASHITA\(^1\), Juntaro MATSUO\(^2\) and Yutaka TOCHIHARA\(^1\)
\(^1\) Faculty of Design, Kyushu University; \(^2\) Department of Ergonomics, Kyushu Institute of Design

This study was examined skin and forearm blood flow responses to breathing oxygen gas during normothermia and heat stress. Six healthy male students were explained the procedure and possible risks of the experiments, and participated voluntarily in this study. They breathed air (control) or oxygen gas (100%\(\text{O}_2\)) for 20 minutes at rest under thermoneutral condition (Experiment I: 27\(^\circ\)C, 50%RH) and during heat stress (Experiment II: feet-bathing (42\(^\circ\)C) under 25\(^\circ\)C, 50%RH) on separate days. Forearm blood flow (FBF), mean skin temperature (Tsk), and laser Doppler flowmeter (LDF) on the back, forearm, fingertip, and thigh and local sweat rate (Msw) on the back and forearm were measured continuously during the experiments. In Experiment I, Tsk and LDF barely changed, but FBF decreased during breathing oxygen gas. In Experiment II, most measurements showed obvious decrease during breathing oxygen gas, although there were no marked difference in Msws between control and 100% \(\text{O}_2\). These results indicated that hyperoxia may not bring about marked effects on skin blood flow during normothermia, but inhibited skin vasodilatation during heat stress.

2-3 Diurnal and Seasonal Variation of Responses to Different Wavelength Lights in Cardiac Autonomic Nervous System
Satoshi ARIKURA\(^1\), Kazuhiko HORNOUCHI\(^2\), Tomoaki KOZAKI\(^1\), Tadaaki HAZAMA\(^1\) and Akira YASUKOUCHI\(^\text{a}\)
\(^1\) Department of Ergonomics, Kyushu University; \(^2\) Department of Ergonomics, Kyushu Institute of Design

The purpose of this study was to examine the diurnal and seasonal variations of response to different colored lights in cardiac autonomic nervous system. The experiments were performed in the morning and evening in summer, in summer, and in winter. The subjects were 7 male students (age: 22.7±0.7), and reported normal color sensation. Colored lights were made by three kinds of fluorescent lamps that had peak wavelength at 435 nm (blue), 545 nm (green) and 610 nm (red) respectively. In first procedure, subjects stayed in darkroom for 15 minutes to adapt to darkness. To this end, they were exposed to colored lights for 15 minutes. In the winter morning, heart rate during blue light was inclined to be lower (p<0.06) than that in darkroom, and in the winter evening, heart rate during red light was significantly lower (p<0.05) than that in darkroom. However, there were no significantly differences in heart rate in summer. The results indicate that there are the diurnal and seasonal variations of response to different colored lights in cardiac autonomic nervous system.

2-4 Comparison of Circulatory Responses in Different Types of Mental Work
Xinxin LIU\(^3\), Yoshihiro SHIMOMURA\(^2\), Koichi IWANAGA\(^1\) and Ietsum KATSURA\(^2\)
\(^1\) Graduate School of Science and Technology, Chiba University, Chiba, Japan; \(^2\) Faculty of Engineering, Chiba University, Chiba, Japan

We compared the circulatory responses to different types of mental work to declare physiological types of adaptability to mental stresses. Three kinds of tasks were used; mental arithmetic addition task, subtraction task, and color-word task. Changes in systolic blood pressure (\(\Delta\text{SBP}\)), diastolic blood pressure (\(\Delta\text{DBP}\)), mean arterial pressure (\(\Delta\text{MAP}\)), stroke volume (\(\Delta\text{SV}\)), heart rate (\(\Delta\text{HR}\)), cardiac output (\(\Delta\text{CO}\)), and total peripheral resistance (\(\Delta\text{TPR}\)) were evaluated in 10 young healthy men. Subjective evaluation to each task was also investigated. On subjective evaluations, a degree of difficulty and a degree of mental confusion during subtraction task were significantly higher than those of the others. \(\Delta\text{SBP}\), \(\Delta\text{DBP}\), and \(\Delta\text{MAP}\) significantly rose in all three kinds of tasks. Significant correlation were found between addition and subtraction tasks for \(\Delta\text{SBP}\), \(\Delta\text{DBP}\), \(\Delta\text{MAP}\) and \(\Delta\text{TPR}\). During subtraction task, \(\Delta\text{TPR}\) rose in five subjects and fell in the others. In conclusion, the circulatory responses to mental stresses were reproducible between different types of mental task. The possibility that there were two types of \(\Delta\text{TPR}\) responses, raising and falling to mental stresses, was suggested.

2-5 Changes in Sweating Response with Age in Healthy Older Men: 10-yr Follow-Up
Yoshimitsu INOUE\(^1\), Tomoko KUWAHARA\(^3\) and Hiroyuki UEDA\(^1\)
\(^1\) Osaka International University; \(^2\) Kobe University; \(^3\) Osaka Shin-ai College

Four healthy older men were retested after 5 (Test-2) and 10 years (Test-3: mean age 72–81 years) of the initial 60-min passive heating test (Test-1: by placing the lower legs and feet in a 42°C water bath while sitting in an air condition of 35°C and 45%rh). The longitudinal changes of local sweating rate, active sweat gland density and sweat gland output per gland on the 5 body sites in the Test-1, Test-2 and Test-3, support longitudinally our previous findings that 1) the age-related decrements in heat loss effector function may involve sweat output per gland and active sweat gland density in that order, 2) the successive decrements may proceed from lower limbs to the back of the upper body and then to the front of the upper body, upper limbs and finally to the head, and 3) exercise habits may slow the age-related declines even in older men of 70 years.