and the performance of a subject during a dual task (2 back task and stick control task) with a malfunction of alarm sound. In stick control task, to assist monitoring of the stick movement, the alarm sound was presented every time when the stick deviates from a prescribed district. The alarm sound offered 100% accurate in the first half of the tasks. The 50% of alarms were lacked or false in the second half of the tasks. The influence of alarm malfunction on the performance of task was examined. The influence on EEG and HRV, etc. as the index of the mental workload were also examined. As the results, a lack and a false of alarm sound brought the decrease in the performance and the increase in the mental workload. Especially, the performance was worse and the sympathetic nerve activity was higher in a false of alarm sound condition than in a lack of alarm sound condition.

2-07 Effect of Local Linear Trend on the Fractal Analysis of Biological Variability

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We found that there was an example which normal distributed white noise data with local trend was detected to be stationary and a fractal by computer simulation. We made 1000 normal distributed data set whose data length was 1024, mean value was 1000, and standard deviation was 50. The linear trend whose value was 0.1 was added at the last 128 of the original data set. The null hypothesis which data with local linear trend had a uniroot was rejected by Augmented Dicker-Fuller test at the level of 5%. Scaling exponents of data sets were calculated by using the general spectral analysis. Means and standard deviations of scaling exponents on the original data and the data with local trend were -0.002 ± 0.061 and 0.130 ± 0.050, respectively ($p<0.05$). Data with local trend was detected to be a fractal by using the surrogate data method. These results suggested that time series data was not necessarily a fractal when their scaling exponent was smaller than 0.3.

2-08 Test-retest Reproducibility of Circulatory Responses to Mental Work

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We investigated the cardiovascular responses to mental works in our previous studies, and we found the individual difference was large and the response patterns can be divided into three different types. The purpose of this study is to identify the test-retest reproducibility of circulatory responses to mental work. We presented the same mental work (mental arithmetic task) to nine adults (8 men and 1 woman) for three times at different days, and systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), stroke volume (SV), heart rate (HR), cardiac output (CO), and total peripheral resistance (TPR) were measured for 5-minute baseline, 5-minute task and 10-minute recovery for each day. The results of the two-way ANOVA showed that the main effect of subject for MAP, CO, and TPR were significant, but that of experiment day were not significant. The significant correlations were obtained between experiment days for MAP and CO, but not for TPR. In conclusion, the test-retest reproducibility of MAP and CO during mental task were identified.

2-09 The Effects of Psychosocial Stress and Stress Tolerance on Menstrual Problems among Japanese College Students

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There have been few studies done to explicitly demonstrate the relationship between stress and menstrual problems. We attempt to address this issue in this study. The newly developed inventories to measure psychosocial stress (IMPS) and stress tolerance (IMST) were used. A total of 295 female students at the national college in Fukuoka were asked to answer a questionnaire and 194 responded. The mean age of the students was 21.1 ± 2.0 years. We found that the stress score of the students who had experienced menstrual irregularity was higher than that of the students who had not experienced it. The higher the stress score of the students, the more likely the students had experienced menstrual irregularity. The students who did their favorite pastime once a week were less likely to have menstrual irregularity. The stress score of the students with premenstrual syndrome was higher than that of the students without premenstrual syndrome. The higher the stress score of the students, the more likely the students had experienced premenstrual syndrome. The students who could express their feelings openly when angry or worried were more likely to have premenstrual syndrome. No difference in stress score was found between the students with and without dysmenorrhea. The results suggest that both psychosocial stress and stress tolerance have effects on women's menstrual cycle and the prevalence of premenstrual syndrome.

2-10 Influence of VDT to Health among Administrative Officers

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Visual display terminal (VDT) is standard equipment for many workers in industrialized societies, and its use can influence the psychological and physiological reactions. VDT users may be at increased risk of developing adverse conditions related to vision, musculoskeletal system and mental. We carried out a survey to assess the relationship between duration of daily VDT use and eyestrain, neck or upper extremity pain, back pain and mental health among 3070

administrative officers. The Japanese version of GHQ-12 was used to identify potential mental stress. Subjects scoring 4 or more were classified as GHQ-12 cases. The frequencies of eyestrain, neck or upper extremity pain and back pain were 16.5%, 19.1% and 11.5%, respectively. Seventeen percent of subjects were classified to be GHQ-12 case. Logistic regression analysis showed that VDT use was significantly associated with eyestrain, neck or upper extremity pain, back pain and GHQ-12 case. Longer VDT use (=5 hours) was also associated with these physical and mental problems. To alleviate these harmful influences, improvement of the adaptability to VDT use is needed.

2-11 The Mattress Elasticity and the Subjective Evaluation of Sleep

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We studied the relationship between the mattress elasticity and the subjective evaluation of sleep. Twenty normal subjects (4 males, 16 females), aged 53–71, were investigated, sleeping in their homes for 15 consecutive nights from Friday. Subjects were randomly assigned to one of two groups. Group 1 slept for 7 consecutive nights (4 adaptation nights and 3 nights for analysis) on a viscoelastic mattress first and then for 8 consecutive nights (4 adaptation nights, 3 nights for analysis and last night for Last Night Effect) on a more elastic mattress. The other group slept in reverse order. The subjective evaluation of sleep was estimated by OSA sleep inventory MA version, a standardized rating scale to estimate sleep quality, and original questionnaires. The results showed the subjective evaluation of sleep was significantly better on a more elastic mattress. Our study reveals the need to consider the mattress elasticity for better sleep, and indicates that ease of roll over is important factor of the mattress for better sleep.

2-12 Assessment of Sleep Used by Wrist Watch Type Optical Pulse Wave Sensor

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The purpose of the study is to propose the easily and continuously evaluation method of sleep quality and amounts. Polysomnography (PSG) is the golden standard for the evaluation of sleep, but this method is so troublesome then can't use for long-term recording, and actigraphy is only able to estimate the sleep-wake state. The autonomic nervous activity during sleep fluctuates with the sleep stage changes and the mental and physical condition. We developed an ambulatory wristwatch type pulse wave sensor analyzed the autonomic nervous activity using pulse rate variability. The pulse rate variability correlates closely with the heart rate variability. We studied 21 subjects, young group (YG; 7 males and 3 females, age range 20–22 years) and middle-aged women group (MG; 11 females, age range 54–64 years), evaluated the heart rate, sympathetic-parasympathetic nerve activities analyzed pulse rate variability and the actigram during night in the home. Sleep length and WASO estimated by actigram were no different between two groups. The transition of autonomic nervous activity is different between two groups, the average HF during sleep is lower MG than YG ($p<0.01$). These results suggest that the evaluation of the autonomic nervous activity during sleep analyzed by pulse wave sensor may be useful new method to assessment of long-term objective sleep quality.

2-13 Relationship between Pupilary Response and Melatonin Suppression to the Light Stimuli

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We found that Individual difference of pupil response was large at low illuminance levels in the previous study. In the present study, we examined the relationship between papillary response and melatonin suppression to the light stimuli. Twelve young males (24.2±1.6) were participated in this study. LED was used as light stimuli (Peak: 530 nm, half band width: 30 nm). We found correlation between pupil diameter to 30 lux and melatonin suppression to 30 lux ($p<0.05$), ant the melatonin suppression was large in subject with a large pupil diameter. Moreover, we found correlation between pupil diameter to 5 lux and melatonin suppression to 600 lux ($p<0.1$). This correlation indicates the possibility that the sensitivity of papillary response reflects the sensitivity of melatonin suppression.

2-14 Effect of Color Temperature of Illumination during Exercise on Physiological Functions and Subjective Preference

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The present study was designed to examine the effect of color temperature of illumination during exercise on physiological functions and subjective preference.The lighting conditions consisted of three levels of color temperature (3000 K, 5000 K, and 7000 K) at 1000 lx of illuminance. Ten healthy male subjects performed a 2-step (50 W and 100 W) incremental exercise test for 14 minutes. Physiological parameters and subjective preference were recorded before, during and after exercise under each color temperature condition. The results showed that heart rate, diastolic blood