

**A-25 Study for the relation between attention and physiological tremor**

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Physiological tremor is an invisible mechanical vibration observed on parts of normal subject's body. Intentional tremor is a physiological tremor observed during aiming one's finger at a small target with intentional attention. A quantitative relation between intentional attention and intentional tremor has not been discovered. The objective of this study is to clear the relation between power spectrum of the intentional tremor and dimensions of diameter of the target. In this study, subjects were 10 males, aged 20 to 25 years. An accelerometer with a piezo-electric element to measure the tremor was attached with double adhesive tape on the skin between the distal interphalangeal joint and the distal end of the nail. The palm was put on the board that has a hole below the index finger. A needle was attached with adhesive tape on the nail of the index finger, directing the tip of the needle to the target. Subjects aimed the tip of the needle at a small target as exactly as possible during measurement of the tremor (case 1). The dimension of diameter of the target was either 3.0, 1.0 or 0.5mm. Simultaneously, the tremor was measured while the subjects kept their finger stretched without target (case 2) under their finger (a)invisible, or (b)visible. The tremor signal was subjected to FFT by the signal processor to produce power spectrum; sampling frequency was 250Hz, sampling number was 1024, and additional averaging was calculated for each 10 samples. Total power was defined as the sum of the power for the frequency range between 1.5 and 50 Hz. The total power and the frequency at peak power were employed. Concerning the total power at case 2, there was no difference between (a) and (b). The total power at case 1 was larger than that of case 2. The total power at case 1, especially when the diameter was 3.0mm, was larger than that of case 2(a) with significant level of 5%. On the other hand, the frequency at peak power had no difference among all cases.

**A-26 Analysis of and Testing for Linearity of Stationary Time Series of Physiological Tremor**

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The methods of identification of deterministic, linearly stochastic, and nonlinearly stochastic system are investigated and employed to analysis of stationary time series of physiological tremor, measured by acceleration of the stretched index finger. It turns out that, (1) to 30-th embedding dimension of phase space reconstructed from the one dimensional time series, fractal dimension and Lyapunov exponent, which are calculated using techniques from dynamical system, can not be definitely determined, (2) the third and fourth moment, which characterize the skewness and peakedness of the sampled time series, respectively, are centered around zero in the plots of histogram distribution, and therefore (3) physiological tremor of human finger is recognized as caused by a linear stochastic process. The signal is produced by damped oscillator driven by noise. For such system, we estimate the eigen frequencies,  $\omega_0$ , and damping parameters,  $\beta_0$ , based on 15-th autoregressive model, to characterize the dynamical behavior of physiological finger tremor. The results are consistent with our early hypothesis that physiological finger tremor can be modeled as superposition of two intrinsic resonant modes.

**A-27 Effects of Food Intake on Skin Temperature and Thermal Sensation**

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The purpose of the present study was to observe the food intake effects on the physiological and psychological responses during exposure to the different thermal conditions. Twelve healthy females were divided into two groups. They ate 400 grams curry and rice (group C) or 120 grams crushed ice (group I). The climatic chamber was controlled at 28°C and RH60% (condition N) or 33°C and RH60% (condition H). The physiological and psychological effects were observed from 60 minutes before food intake to 60 minutes after one. The total sweat rate was measured using a weighing machine of 5 grams accuracy. The skin temperatures were measured using a thermograph (JEO, JTG3210). Axillary temperature, heart rate and subjective sensation were recorded also. The axillary temperature did not change, heart rate increased significantly in group C. The skin temperature decreased only around the mouth in group I, and it decreased in the extensive body area in group C. The sweat sensation was remarkable in the face in group C of condition H. The total sweat rate was higher in the condition H than condition N, the values were 112-118 g/hr in the former and 24-28 g/hr in the latter. However there was not seen a significant difference statistically between group C and group I in the condition N and condition H.

**A-28 Changes in Physiological Response According to Differences of Interpersonal Distance (3) - Under Different Conditions of Eye Contact -**

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It has been known empirically that human beings maintain an appropriate interpersonal distance in different situations. However, little information is available on changes in physiological response caused by variation of interpersonal distance. In the previous paper, we elucidated that differences in interpersonal distance caused a change in the coefficient of variation of R-R interval of ECG (CV-RR). This paper focuses on the eye contact. To investigate physiological changes according to different interpersonal distances (60cm, 100cm, 200cm, 400cm) and different conditions of eye contact (gazing at the other's eyes, looking at the other's neck, closing one's eyes, gazing at the other's much blinking eyes), we measured the pulse rate, CV-RR and blood pressure, using 13 healthy male students. The results indicated that 1) the variation of interpersonal distance caused a change in CV-RR and blood pressure, and 2) the change varied with different conditions of eye contact.

**A-29 Change in the Course of Time of Physiological Response to Colored Light**

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Light is one of the important environmental factors in life space. This research was to attempt to grasp this effect of light in the change with time. Red or blue colored light was irradiated to ten subjects for 20 minutes, and the change of physiological response during the period was grasped at intervals of 5 minutes. The results are as follows; As a whole, in the case of blue light, the physiological response areas somewhat later as compared with red light, and the increase of heart rate and the increase of CV-RR were observed. In the case of red light, the rise of blood pressure was observed as compared with the case of blue light. The diastolic blood pressure after 6 minutes rose by 5% as compared with the reference case, and the statistically significant difference was observed ( $p < 0.01$ ). It is considered that these results are supported the results of psychological assessment carried out simultaneously and the tendency of "tension-anxiety" and "anger-hostility" obtained as the results of the profile of mood states test.

**A-30 EEG activity associated with scenic imagery**

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EEG activity over the whole scalp was investigated, during imagining several scenes ('forest', 'flower fields', 'crossroads', 'sea', 'lake', 'comfortable places', 'Mt. Fuji'). The subjects were 11 adult males with no neurological disorders. EEGs were recorded from 12 electrodes (F3, F4, C3, C4, P3, P4, O1, O2, F7, F8, T5, T6) with reference to linked earlobes. Power spectral densities for  $\theta$  (4-8Hz),  $\alpha 1$  (8-10Hz) and  $\alpha 2$  (10Hz-13Hz) were estimated using FFT. Changes of the absolute EEG power on each scalp location, and topographical changes as t-maps were evaluated, as compared with those in rest states. Powers of  $\alpha 2$ -band were augmented over almost all the measured points in the task of 'crossroads', which made all the subjects highly irritated. The results agreed with previous results<sup>1)</sup> relating  $\alpha 2$ -augmentation over the whole scalp to 'tense'. According to the results using t-maps,  $\alpha 1$  over the occipital was significantly attenuated for each task. This might be caused by some visual information processing associated with imagination.  $\alpha 1$  over the parietal was suppressed except for 'crossroads', showing all the tasks except 'crossroads' to be comfortable<sup>1)</sup>.  $\theta$  over the anterotemporal, which are related to vigor<sup>1)</sup>, showed increase except for 'comfortable places'. The results provided usefulness of EEG measures for estimating some aspects of emotions. (1) KIKUCHI & MIYAZAKI: Jpn Soc. Res. on Emotions 1994.

**A-31 The Effect of Color of Lighting Sources on Contingent Negative variation**

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The present study was designed to investigate the effect of color of lighting sources on contingent negative variation (CNV). Seven male students (mean age 21.3) volunteered as subjects. The CNV was recorded under two different color temperature conditions (3000K and 7500K) and two different color conditions (red and blue). The lighting sources of the color temperature conditions were used to a fluorescent light of three wavelength form and that of the color conditions were used to a fluorescent light of a wavelength form. The color temperature of 3000K looked like reddish color and that of 7500K looked like bluish color. The CNV between 500msec to 900msec after the warning stimulus (S1) at Fz (early CNV) was related with an orienting response to S1. In the color temperature conditions, the early CNV under 7500K was significantly larger than that under 3000K. In the color conditions, the early CNV under blue was significantly smaller than that under red. The result suggested that bluish color (7500K) raised the tension and reddish color (3000K) relaxed the tension in the color temperature conditions, whereas blue relaxed the tension and red raised the tension in the color conditions.

**A-32 Compound Effects of Hue and Luminance on Visual Task on CRT Display**

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The purpose of this study was to examine interaction between hue and luminance on visibility. Subjects were six male students (22.2  $\pm$  1.5 years old). This experiment had nine conditions of the combination of three kinds of hue (cyan, green, yellow) and three levels of luminance (10, 20, 30 cd/m<sup>2</sup>). Visual Task was to search number on 14 inch CRT color display. Search time, percent of error and subjective report were measured during this experiment. In search time, cyan and yellow conditions were shorter than green condition ( $p < 0.01$ ). 20(cd/m<sup>2</sup>) condition was shorter than 10(cd/m<sup>2</sup>) condition ( $p < 0.05$ ). Interaction between hue and luminance on search time was significant differences ( $p < 0.05$ ). The condition of cyan 20(cd/m<sup>2</sup>) was shorter than the other cyan conditions and all green conditions. There was no significant difference in percent of error. The result of subjective report were similar to that of search time.