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It is experientially known that observing 3-dimensional image causes a visual fatigue as comparing with watching 2-dimensional image. However, the tendency of fatigue to observe 3-dimensional image is uncertain. Although there are a few studies to see how observing a image affect the fatigue, it cannot be found a remarkable research about the alteration of fatigue caused by the difference in dominant eye.

This research aims to clarify the tendency of fatigue by stereoscopic 3-dimensional image.

Especially this research discussed the alteration of the tendency of fatigue by the difference in dominant eye. Fatigue was measured by critical frequency of fusion (CFF). In the experiment, eight kinds of images were shown. Six of these images are 3-dimensional images, and the angle of convergence of each 3-dimensional image differs. The measurement result clarified that CFF decreases after observing images and the amount of reduction of CFF is different at every condition. Furthermore, this research clarified that CFF decrease more greatly when dominant eye harmonizes with the angle of convergence.

1-20

1-21 Effects of Worn-out Soles on Lower Extremity Stability, Shock Absorption and Energy Consumption during Prolonged Walking

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This study investigated the effects of worn-out soles on lower leg stability, shock absorption and energy cost during long distance walking. Seven male subjects walked at 4.8 km/h for 60 minutes wearing three different pairs of shoes: two pairs had severely and moderately worn soles and the other pair had no wear. Shock acceleration at the subtalar and knee joints, rearfoot angle during stance phase, oxygen uptake, and heart rate were measured throughout the walking period. Worn-out shoes increased supination of the subtalar joint, extorsion of the lower leg, and oxygen uptake, although walking duration did not influence these changes. However, shock acceleration at the subtalar joint and the heart rate continued to increase with the duration of walking in worn-out shoes. These results suggested that worn-out soles decrease lower leg stability and shock absorption, which consequently increases the energy cost during walking, although the increase in energy cost was not influence by walking duration.

1-22 Comparison of Accelerometer and Condenser Microphone Activities during Upper Arm Isometric Contraction—The Influence of Force Tremor—

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The aim of this study was to compare mechanomyogram (MMG) recorded by a condenser microphone (MMGm) and an accelerometer (MMGa) and to investigate the effects of tremor. Ten volunteers performed isometric submaximal contraction (20, 40, 60, 80%MVC) of elbow flexion and extension. The MMG and EMG were recorded on biceps brachii and triceps brachii. The tremor was measured by accelerometer on elbow and wrist. We analyzed the root mean square (RMS) and the coherence of two MMG and tremor relationship. During all isometric submaximal contractions, the RMS of agonist EMG and MMGm were significantly higher than antagonist ($p < 0.05$). But the RMS of antagonist MMGa was higher. The coherence between two MMG and tremor were highly appeared in MMGa of biceps brachii ($p < 0.05$). The result showed that the MMGa is much affected by noise caused by tremor. In order to evaluate agonist and antagonist muscles of upper arm with MMG, the use of MMGm is recommended because of its air buffer effect to reduce tremor.

1-23 Blood Flow Responses in Upper Arm Veins and Forearm Cutaneous Vessels during Exercise

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Purposes of this study were 1) to investigate the blood flow (BF) response in superficial and deep vein of the upper arm with a rise in internal temperature (T_{in}) during cycling exercise at different exercise intensity, and 2) to compare the response of superficial venous BF of the upper arm with that of forearm skin blood flow (SkBF). Twelve young subjects performed the exercise in supine position at the two intensities of 40 and 60–69% $\dot{V}O_{2\max}$ for 30 min at an ambient temperature of 28°C and a relative humidity of 50%. Though superficial venous BF decreased transiently and then increased during rising T_{in} , deep venous BF was not changed from the baseline. BF and blood velocity in both veins and deep venous vessel diameter (DI) responses didn't show a significant difference between the two exercise intensities, but superficial venous DI had significant difference. Moreover, relative change in forearm SkBF during rising T_{in} in the both exercise intensities did not match totally that in superficial venous BF of the upper arm.

1-24 An Evaluation Technique for Risk-Taking Tendency using Characteristics of Human Steering Behavior

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The objective of the study was to explore the possibility for using an evaluation technique for risk-taking tendency based on characteristics of human switching behavior of steering strategy. Individual Risk-taking Indices can be estimated by the Indices of Difficulty while the subjects switched the strategies from performing the Steering law tasks to the Fitts' law tasks. In this study, a PC-based experiment was conducted where the subjects performed a tube tracing trials in which we expected that switching behaviors were observed. With different tube length and width shown on the display, the trajectories of the mouse cursor were monitored throughout the trials. As a result of the experiment, such switching behaviors were observed from all five subjects. A consistent index over the trials was observed from one subject, whereas the indices obtained from the rest of four subjects showed inconsistent over the trials. Future study included refining the target presentation and the establishment of the protocols for the subjects performing the tasks in order to enhance the validity of the proposed index.

2-1 A Study on the Comfort Evaluation of Cooling Devices while Wearing Firefighting Protective Clothing

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The aim of this study was to investigate comfortability in using two different cooling devices by assessing physiological and psychological responses during exercise on an ergometer while wearing protective clothing. Eight healthy male students rested in a Pre-room for 10 min before entering the Test-room where they rested for another 10 min, followed by 30 min-exercise and 10 min-recovery period. The exercise intensity was set at 55% $\dot{V}O_{2\max}$. Rectal temperature (T_{re}), mean skin temperature (T_{sk}), heart rate (HR), body weight, and clothing weight were measured and monitored during the four test trials: control (CON), ice-pack (ICE), Phase Change Material of 5°C [PCM (5)] and 20°C [PCM (20)]. The cooling devices were worn under the FPC. The physiological responses were similar for the ICE, PCM (5) and PCM (20). However, heat adsorption capacity of PCM (20) was better than other cooling devices. The results of this experiment suggest that PCM (20) fits more comfortably than other cooling devices, and allows freedom of movement and working with ease while wearing firefighting protective clothing.

2-2 Apparatus of Heat and Water-Vapor Transfer of Clothing—In Case of Measurement of Diapers—

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We tried to make an apparatus in which we could evaluate the heat and water vapor transfer in clothing system in case of

diapers. It was clarified that we could measure them in the steady state. In case of sweating condition, the most part of supplied water, which was dummy sweat, was absorbed and trapped by diapers. So water vapor heat transfer was remitted a little. We also measured the clothing microclimate of model diapers. In case of insensible sweat condition, it was below 70%RH, it was rather comfortable for men. In case of urinating condition or sweating condition, it was over 80%RH in the microclimate of diapers, it was uncomfortable. Parents of an infant must understand that an infant feel uncomfortable even though the skin eruption did not occur.

2-3 Fundamental Investigation into Quantification of Respiratory Regularity

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In an analysis of autonomic nervous activities by heart rate variability, the quantitative investigation of respiratory regularity was not examined. This study aimed at establishing a new index of respiratory regularity (IRR). By time-frequency analysis of a given respiratory curve, the IRR is defined as the frequency bandwidth of the respiratory component of power spectral density at the level of -12 dB, where the power spectral density is normalized to the maximum value of the peak. The short-time autoregressive model of order 4 was used for spectral estimation in the moving lag windows that have a width of 5 s. The respiratory curve was measured when a subject breathed with controlled respiration (0.25 Hz) for 300 s and with voluntary respiration for 300 s, and the IRR was calculated in every lag window. The IRR has a stable value from 0.01 to 0.03 with controlled respiration, and an unstable value from 0.02 to 0.3 with voluntary respiration. Thus, the IRR could quantitatively describe respiratory regularity.

2-4 Circadian Changes of Movement-Related Cortical Potentials

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This study investigated circadian changes of movement-related cortical potentials (MRCP) during contraction of the first dorsal interosseous muscle of hand. Seven healthy students, who were neither morningness-type nor eveningness-type, performed a motor task and the odd ball task at 02:00 and 14:00. Motor tasks were designed to exert two levels of target force, expressed as 10%MVC and 50%MVC on a computer screen. However, the real exertion force level was 25%MVC for both tasks, and was not announced to subjects. EEG were measured from C3, Fz, Cz, Pz, then averaged for 30 trials to