

2) *Kyoto Sosei Univ.*, 3) *Graduate School of Engineering, Osaka Electro-Communication Univ.*

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-dimentional 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

Seiji SAITO<sup>1)</sup>, Koji KURODA<sup>1)</sup> and Satoshi MURAKI<sup>2)</sup>

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

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, extortion 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—

Tae Kwang KIM<sup>1)</sup>, Yoshihiro SHIMOMURA<sup>2)</sup>, Koichi IWANAGA<sup>1)</sup> and Tetsuo KATSUURA<sup>2)</sup>

1) *Graduate School of Science and Technology, Chiba University* 2) *Faculty of Engineering, Chiba University*

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

Anna OOUE<sup>1)</sup>, Tomoko ICHINOSE-KUWAHARA<sup>2)</sup>, Yoshimitsu INOUE<sup>3)</sup>, Shunsaku KOGA<sup>4)</sup> and Narihiko KONDO<sup>5)</sup>

1) *Graduate School of Cultural Studies and Human Science, Kobe University*, 2) *JSPS Research Fellow (Osaka International University)*, 3) *Faculty of Human Science, Osaka International University*, 4) *Kobe Design University*, 5) *Faculty of Human Development, Kobe University*

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

Kentaro KOTANI<sup>1)</sup>, Chiho TATEDA<sup>2)</sup> and Ken HORII<sup>1)</sup>

1) *Faculty of Engineering, Kansai University*, 2) *Graduate School of Engineering, Kansai University*.