

### University

The purpose of this study analyzes a deflection characteristic of center of foot pressure (CFP) in center of gravity side direction shift from reference with trunk deflection and muscle force of lower limb, and it is to add reviewing it about posture control of elderly. The subject assumed it totaled 32 of 18 healthy elderly and 14 students. It let a subject do problem movement to let center of gravity move to maximum right direction on a force plate, and, measured deflection (Y-SD) after anticus of working CFP and acromion/anterior superior iliac spine (ASIS) and included muscle force of lower limb (% Body Weight) and demanded a correlation of each. The results recognized a significant negative correlation between CFP Y-SD and turning over muscle force in a group of elderly ( $r = -0.51$ ,  $p < 0.05$ ), and each recognized significant positive correlation between CFP Y-SD and acromion Y-SD and ASIS Y-SD in youth group ( $r = 0.75$ ,  $0.69$ ,  $p < 0.01$ ). From results of a group of elderly, it was thought that muscle force of the tibialis posterior muscle which contributed to dipping of forefoot and anteroposterior homeostasis contributed to control of about CFP deflection of elderly. From these results, it was thought that a control factor of CFP deflection was different from elderly with a young fellow at side direction shift of center of gravity, and that it used different posture strategy with both was suggested.

### 2-9 Physical Strain during Wheelchair Locomotion at Different Gradients

Satoshi MURAKI<sup>1)</sup>, Yusuke MATSUI<sup>2)</sup>, Takashi NOMURA<sup>2)</sup> and Akihiro MIHOSHI<sup>3)</sup>

1) Department of Human Life System Design, Kyushu University, 2) Interdisciplinary Graduate School of Science and Technology, Kinki University, 3) Department of Civil and Environmental Engineering, Kinki University

This study examined the influence of different gradients on physical strain during wheelchair locomotion. Five male and one female wheelchair users with paraplegia (mean age: 36.7 years) performed wheelchair locomotion on a treadmill at seven gradients ( $-5$ ,  $-2.5$ ,  $0$ ,  $2.5$ ,  $5$ ,  $7.5$ ,  $10\%$ ) and the subject's preferred velocity. On an uphill slope, the increased gradient reduced locomotion distance per single stroke, which resulted in decreased locomotion velocity. Oxygen uptake and heart rate significantly increased with slope. Oxygen demand (oxygen uptake during locomotion minus oxygen uptake during rest) against 1-m locomotion increased exponentially with the gradient. The oxygen demand attained 3.7 and 9.3 times at gradients of 5% and 10% against 0%, respectively. Electromyography showed marked elevation of the activity in the upper arm muscles and decreased activity in the deltoid at higher slopes, because of the forward tilt of the upper body to prevent backsliding. In conclusion, these results indicated that increases in the uphill gradients cause an exponential rise in energy demand and emphasis on local muscle strain in the upper arms.

### 2-10 Assessment of Supplemental Equipments in Dishwashing Work

Kazuyuki IWAKIRI, Midori SOTOYAMA, Ippei MORI and Susumu SAITO

National Institute of Industrial Health

The aim of this study was to examine the effects of a standing aid, which we newly developed, and a mat on the muscle activities and the subjective discomfort in the low back and legs. The mat was used to decrease the shock to the legs. Twelve healthy female volunteers performed dishwashing for 30 minutes in each of six conditions with which three standing postures (supporting the shins with the standing aid and the abdomen with the kitchen counter, supporting the abdomen only, and no supporting) and two floor conditions (with and without the mat) were combined. The muscle activities and the subjective discomfort in the low back and legs were smaller in the postures supporting with the standing aid and kitchen counter than the postures without the standing aid. There were no significant differences between use and no-use of mat. The standing aid had effect on decreasing the muscle load and discomfort in the low back and legs during dishwashing, but the mat had no effect.

### 2-11 Effect of Small Vibration on R-R Interval at Writing

Naoto YOSHIHARA<sup>1)</sup>, Toshihiro TAKAMUKU<sup>1)</sup>, Yoshihiro SHIMOMURA<sup>2)</sup>, Koichi IWANAGA<sup>3)</sup> and Tetsuo KATSUURA<sup>2)</sup>

1) Central Research Laboratory, PENTEL CO., LTD., 2) Ergonomics Section, Faculty of Engineering, Chiba University, 3) Division of Design Science, Graduate School of Science and Technology, Chiba University

The purpose of this study was to investigate the effect of small vibration on R-R interval at using writing implement instrumented with eccentric motor. Ten subjects sat on a chair at rest for 5 minutes, and then started writing task with vibration pen for 10 minutes. The vibration intensity was set to 3 levels (acceleration was approximately 0 as free, 1.1,  $1.7 \text{ m} \cdot \text{s}^{-2}$ ). ECG, subjective evaluation, writing pressure and amount of written words were measured. The indices of average R-R intervals (IRRI) were compared between vibration levels. R-R interval decreased in vibration-free condition and IRRI showed low level than at rest. Therefore in two vibration conditions the decreases of R-R interval were suppressed and IRRI neared to the level at rest on chair. IRRI in low or high vibration condition showed significantly high than that of vibration-free condition ( $P < 0.05$ ). There was no significant difference between amounts of written words at all conditions, depicting no difference in writing loads. Our results suggest that writing with small vibration pen suppressed the decrease of R-R interval, and gave a relaxation.

### 2-12 Analysis of Subjective Symptoms in VDT Workers

Yosuke KUSANO<sup>1)</sup>, Aoyagi KIYOSHI<sup>1)</sup> and Tai-ichiro

TAKEMOTO<sup>2)</sup>

1) *Department of Public Health, Division of Preventive Health Sciences and Community Health, Nagasaki University Graduate School of Biomedical Sciences*, 2) *Nagasaki International University*

To explore how the VDT work is related to subjective symptoms (10 eye symptoms, 10 musculoskeletal symptoms and 7 general symptoms), we investigated 1057 workers (921 men and 136 women, mean age was 37 years old) using a self-administered questionnaire. Duration of daily VDT use's average was 4.2 hours, and duration of continued VDT use's average was 40.4 minutes. Eye symptoms were most frequent (especially Eye strain, Eye sight falling), musculoskeletal symptoms were secondary frequent (especially Stiff shoulders). Chi-square analysis was used to examine the relation between question items and each symptom. Age most positively related to subjective symptoms (13/27 symptoms). Eye symptom was positively related to each items in 3–5 symptoms evenly, musculoskeletal symptoms was positively related to age specially (7 symptoms) and general symptoms was positive related to each items in 1–3 symptoms. These results suggested that aged workers and female workers had many subjective symptoms, and especially aged workers had many musculoskeletal disorders.

### 2-13 Developing the Inventories to Measure Psychosocial Stress and Stress Tolerance

Kazuhiko YAMAMOTO

*Institute of Health Science, Kyushu University*

It is widely recognized that stress-management is an indispensable factor to stay healthy in modern life. When starting stress-management program, it is preferable to measure stress levels and the level of stress tolerance. However, there is no reliable inventory to measure psychosocial stress. In view of this, the inventories to measure psychosocial stress and stress tolerance (IMPS and IMST, respectively) have been developed. IMPS is a 40 item-questionnaire designed to self assess psychosocial stress by asking physical symptoms and psychological responses caused by psychosocial stress. IMST is a 20 item-questionnaire designed to self assess stress tolerance by asking life style, belief and social support. The validity and reliability of the inventories evaluated with 827 Japanese college students indicate that IMPS and IMST can be used to measure psychosocial stress and stress tolerance.

### 2-14 Study on Psychosocial Stress and Stress Tolerance among the Japanese Students

Kazuhiko YAMAMOTO

*Institute of Health Science, Kyushu University*

Mental health of college students is an issue, which should be dealt with urgently in Japan, as the number of students with psychological problems is increasing. Psychosocial stress is deemed one of the causes of the issue. There are few sources

of information on the status of psychosocial stress and stress tolerance among the Japanese college students. By using the newly developed inventories to measure psychosocial stress (IMPS) and stress tolerance (IMST), it is attempted to clarify the psychosocial stress and stress tolerance among the Japanese college students. 32% of the students are annoyed by psychosocial stress and 44% are tormented by psychosocial stress. It was found that about 50% of the students have lifestyles, which make it difficult to cope with psychosocial stress. The more psychosocial stress the students suffer from, the faultier lifestyle the students have. In view of the results, a stress management program for students should be developed.

### 2-15 Influence of Anxiety and Mood States on Anticipatory Postural Adjustments

Kazuyoshi KITAOKA<sup>1)</sup>, Risa ITO<sup>2)</sup>, Hideo ARAKI<sup>3)</sup>, Hiroyoshi SEI<sup>1)</sup> and Yusuke MORITA<sup>1)</sup>

1) *Department of Integrative Physiology, Graduate School of Medicine, The University of Tokushima*, 2) *Faculty of Human Life Sciences, Tokushima Bunri University*, 3) *Department of Human Sciences, The University of Tokushima*

Previous studies have shown that the anxiety and mood states are related to the static postural control. However, the association between the psychological states and the dynamic postural controls remains ambiguous. In the present study, we have investigated the possibility that the psychological states as anxiety and mood may affect the anticipatory postural adjustments (APAs) caused by the active postural control in sensori-motor task. Fourteen healthy male subjects performed unilateral arm elevation tasks after two psychological questionnaires (STAI, POMS) were performed. Significant negative correlations of the mood states to the APAs amplitude on ventral muscles (rectus femoris and tibialis anterior) and the APAs latency were found. Then, significant positive correlations were shown between the mood states and the APAs amplitudes on soleus and reaction time. However, any significant correlations were not found between state or trait anxiety and physiological data. Our findings suggest that dynamic postural control may be affected by mood states as well as static postural control.

### 2-16 Effect of Temporal and Spatial Changes in Excuted Stimuli on VEP and Reaction Time

Satoko MATSUGANO<sup>1)</sup>, Motohiro YOSHIDA<sup>1)</sup>, Yuki HOSONO<sup>1)</sup> and Hideo ARAKI<sup>2)</sup>

1) *Graduate School of Human and Environment Science, The University of Tokushima*, 2) *Department of Human Sciences, The University of Tokushima*

The purpose of this study is to investigate the effects of sensory information given before performances on Visual Evoked Potentials (VEPs) and Reaction Times (RTs). The LED which linked with 3 positions were used to give the stimuli. Eleven persons were required to response all stimuli and to press a button as possible as fast when the stimuli were given. The conditions were consisted of the combined the