

## **PROCEEDINGS OF THE 42ND ANNUAL CONFERENCE OF THE HUMAN ERGOLOGY SOCIETY**

Hachinohe, June 30 - July 1, 2007

Secretary: Shuji Hisamune  
Takasaki City University of Economics  
Takasaki, Japan

### **Regional reproduction through social entrepreneurship activities**

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With the establishment of laws for providing support for the independence of disabled persons, job assistance has grown in importance. However, finding employment at existing companies is difficult. With that in mind, I thought of solving this problem by developing social entrepreneurs and consortia through local human resources and other available resources. Specifically, with disabled persons as the primary figures, I suggested the creation of a model for community revitalization, through a combination of social entrepreneurship activities (as NPOs) and fair trade businesses. The motive behind these projects is contributing to society and local communities. At the same time, it is important to establish businesses as a sustainable structure. In order to maintain nonprofit activities and to receive support from consumers, it is vital to provide usable services and purchasable merchandise instead of “self-righteous contributions”. It is crucial to gain high customer satisfaction through a two-way, close relationship between the business persons and the consumers. Compared to large cities, countryside areas with no shortage of issues and resources have a bigger chance. Of course, it is necessary to have the spirit of fair trade existing inside and outside of the community to make the adequate use of services and the purchasing of merchandise possible.

### **Investigation on the relationship between actual traffic lights and color vision variation (1: basic problems)**

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Traffic lights used worldwide are constituted by a universal three-color code: red-yellow-green from right or top, in order. Almost all of the lights have circle shapes and are recognized by color vision, therefore color blind people and people with poor color perception might have difficulties recognizing them. As a solution to the problem, I suggest assigning a particular shape to each color (e.g., ○: round-shaped green, □: triangular-shaped yellow, and ×: cross-shaped red) in order to facilitate recognition. As the first step, I aimed to combine the actual problem with the barrier-free approach of traffic lights. The actual usage of traffic lights worldwide must be unified. In reality, in addition to the three-light type, one-light type and two-light type are also used, sometimes with some supplementary light (e.g. green arrow indicating filter-turn). The actual perceptions of color blind people and of people with poor color perception, which are person-dependent, differ according to the actual traffic light conditions (e.g. a color may not be recognized when the light is in a dark area, far from

the viewer, or when the light order is not clear, for example if the light is hidden behind some obstacle). The color hues themselves must be analyzed in order to see whether they are recognized properly or not. It is important to gather concrete examples, including information on the surrounding conditions of the traffic lights and the physical condition of the users.

### **Classification of PET bottle cap opening and closing behavior from the viewpoint of hands usage and observed frequency**

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PET (polyethylene terephthalate) bottle beverages have become popular especially among youth. However, elderly and handicapped persons may have difficulties in opening and closing bottle caps. We investigated the behaviors of opening and closing an empty 500ml PET bottle cap among youth, and classified them, to use them as fundamental data for solving the problem mentioned above. Subjects were 171 male and 87 female Japanese university students. The cap opening and closing behaviors were classified into 4 types, as follows: (A) using the finger tips to screw the cap to open or close, (B) holding the side of cap with the thumb wrapped around it and screwing it, (C) holding the side of cap with the palm and screwing it, and (D) holding the side of cap with the palm reversely and screwing it. The investigation showed the following: (1) 74% held the bottle with the left hand and opened the cap with the right hand; (2) 65% held the bottle from the middle and very few females held the bottle from the bottom; (3) 93% held the bottle inclined in a right-forward direction at 45°; (4) the opening patterns were A: 57%, B: 32%, C: 9%, D: 2%, and closing patterns were A: 67%, B: 27%, C: 5%, D: 0.4%; finally, (5) 77% of right-handed and 41% of left-handed subjects opened the cap with the right hand. The main muscles used and behavior for each opening pattern were as follows. A: thumb abduction by thenar muscles; B: thumb adduction to hold the cap and radio-flexion of the wrist; C: finger and wrist flexion and supination; D: finger flexion and wrist extension. The results show that there are some variations in opening the bottle cap as this is a new behavior that appeared in our modern life.

### **A method for observation data analysis based on the Grounded Theory**

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Elevator users in Wakayama City Hall were observed in order to grasp their gestures or behaviors structurally and quantitatively. The observation data were analyzed from the viewpoints of property and dimension of the Grounded Theory. The properties were “time”, “sex difference”, “standing position”, “distance from elevator”, etc. The average waiting time to get into the elevator was 25 seconds. 33 users showed gestures after 8 seconds (in average) from their arrival at the elevator. Their gestures were such as “smoothing hair”, “stroking hair”, “touching left thigh”, etc. The relationship between property and dimension was examined using the association rule. A few examples of results are as follows. (1) [right hand: put right hand into pocket]→ male, (2) [standing position: in front of the second elevator from right]→ male. As results, we can analyze the users' gestures or behaviors from the viewpoints of property and dimension of the Grounded Theory. The association rule in particular can show the relationship between the users' gestures and behaviors in a quantitatively more accurate way.

## **The relationship between job stress and depression in nurses: from the viewpoint of career position**

Miyuki Sugiura<sup>1</sup>, Yasuyuki Yamada<sup>1</sup>, Masataka Hirosawa<sup>1,2</sup>, Sumio Tanaka<sup>1,2</sup> and Motoki Mizuno<sup>1,2</sup>

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The purpose of this study was to investigate the relationship between job stress and depression among Japanese nurses. A total of 421 nurses completed questionnaires which included the Nursing Job Stressor Scale (NJSS) and Zung Self-Rating Scale (SDS). We divided the participants into 3 groups according to their years of experience and official position, as follows. Career Position 1 (N= 163) included nurses who had less than 3 years of experience; Career Position 2 (N= 191) included nurses who had 3 or more years of experience and were in the non administrative class; Career Position 3 (N= 67) included nurses in the administrative class. The result of one-way ANOVA showed that the SDS score in Career Position 1 had a higher tendency than in Career Position 3. However, all groups had a SDS score over 40. Additionally, the result of multiple regression analysis showed that none of NJSS had a significant association with depression in Career Position 1. In Career Position 2, conflict with other nursing staff members and patients was associated with depression. In Career Position 3, qualitative work load was associated with depression. These results suggested that nurses in all career position had a slight depression, thus confirming the results of an early research by Lazarus et al. (1984). Therefore, we suggest that measures to prevent the nurses' stress and depression are important to keep their mental health in good condition. Additionally, results showed differences in the relationship between job stress and depression within each Career Position. Therefore, we should consider the stress in each Career Position in order to make more effective prevention steps.

## **A case study on participative education concerning welfare in Hachinohe**

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As a consequence of our aging society, higher education institutions, including universities, have changed greatly, and have been contributing to the local society through a more varied and practical education. In this study, we conducted activities in societal contribution and student participative type education, in the aim to nurture experts in regional contribution, especially in the field of welfare, in the Hachinohe region. The activities were as follows. 1. Establishment and promotion of welfare circles, aiming to make student participation in regional welfare activities easier; 2. Support of student participation in workshops on welfare policy in Hachinohe City; 3. Establishing civic group for barrier-free promotion in Hachinohe City; 4. Support for the promotion of welfare administration through industry-academia cooperation. Owing to the activities mentioned above, students were able to acquire knowledge and experience related to social welfare, and they are expected to become our fighting power in the future. In addition, this is also contributing to the expansion of university activities to the local region.

## **Developing harmonized, multinational work environments**

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Good practices useful for building harmonious, multi-national work environments were collected from a multinational workplace in Thailand, where staff coming from 19 countries worked together. The collected good practices were related to two aspects: (1) organizational structures and (2) individual communication efforts. The former included: using English as a common working language, sharing key information by regular meetings and email communication, considering religious diversity to set workplace holidays, opening plural consultation and grievance systems, and arranging canteens for different food needs. The latter included: promoting informal communication with colleagues from different countries through lunches and home parties, respecting family and privacy issues, helping staff who were not familiar with the Asian region, paying attention to news of colleagues' countries, refraining from talking about politically sensitive issues, and respecting the Thai culture. Both the organizational and individual efforts contributed to creating productive work environments in a cross-cultural setting. In the era of globalization, it is increasingly important to recognize and share existing workplace good practices in order to build harmonized, multinational work environments.

## **Study on the actual situation of bicycle riding on specialized bicycle lanes and on sidewalks where bicycle use is accepted**

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Accidents involving persons and bicycles in traffic have become a serious problem. This type of accidents has rapidly increased about 4.6 times in ten years, from 563 cases in 1995 to 2,576 cases in 2005. When bicycle lanes and pedestrian walkways are set up, it is necessary to separate the pavement so that people should not come in contact with bicycles. We investigated the actual situation of bicycle riding on specialized bicycle lanes and on sidewalks where bicycle use is accepted. We observed a specialized bicycle lane situated at about 300m distance from Fukaya Station in Saitama Prefecture (Point A). We also observed a sidewalk where bicycle use is accepted, in front of Fukaya Station (Point B). The investigation covered 3 days, from 7<sup>th</sup> to 9<sup>th</sup> September 2006, and lasted for 12 hours each day, from 7:00 to 19:00. The investigator observed directly, and recorded the type of traffic violation, the driver's age, sex, and risky behavior. We observed the behavior of 4,360 persons in total over the three days, among which 3,090 persons on the specialized bicycle lane (Point A), and 1,270 persons on the sidewalks where bicycle use is accepted (Point B). Even though these Points are at only 300 m away, differences were observed in the pedestrians' behavior as well as in the actual situation of bicycle riding on the specialized bicycle lane and on the sidewalk where bicycle use is accepted.

## **Three-dimensional kinematic analysis of handwriting**

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This study investigated the movements involved in handwriting in following finger joints: the

metacarpophalangeal (MCP), interphalangeal (IP), proximal interphalangeal (PIP), and distal interphalangeal (DIP) joints. Kinematic data were obtained from three right-handed participants of age ranging from 22 to 42. Participants were instructed to grasp a commercial mechanical pencil with the dominant hand. While a participant was writing hiragana (Japanese script) characters in a space of 1cm<sup>2</sup>, his/her right hand was videotaped using four digital video cameras. The angles of MCP and IP joints in the thumb, of MCP, PIP, and DIP joints in the index and middle fingers, and of the MCP joint in the ring finger were measured. The joint angle amplitude equivalent to the joint angle standard deviation was larger in the IP joint than in the MCP joint in the thumb, and larger in the PIP and DIP joints than in the MCP joints in the index and middle fingers, suggesting that mainly the three kinds of IP joints actively move a pen. Correlation analysis revealed that the MCP joint angles in index and ring fingers coordinately changed, indicating that coordination from joints in the fingers that do not touch a pen, at least the MCP joint in the ring finger, is necessary for efficient handwriting.

### **Reasons why improvement-proposing action checklists are effective**

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As a practical means of participatory workplace improvement programs, action checklists for proposing immediate measures are increasingly used in Japan and Asian countries. The reasons why action checklists are effective in different work settings are discussed by examining their usage patterns. Action checklists used in small enterprises, construction sites, health care, mining, agriculture, fishing and home workplaces are examined. They usually consist of 30-50 improvement actions practicable in local conditions. A clear focus is maintained on low-cost measures covering materials handling, workstation design, physical environment, welfare facilities and work organization. The action checklists are commonly designed to reflect local good practices. Their usage procedures so as to identify “the next step” actions are found suitable. These procedures direct the users towards stepwise improvement actions learned from good practices, rather than towards factor-by-factor analysis of workplace conditions. As reasons for the effectiveness of action checklists, we may suggest (1) the usage procedures aimed at proposing immediate actions, (2) the focus on multiple low-cost measures and (3) the easiness of their horizontal application in similar local conditions. Action checklist can thus be used widely by taking advantage of their usage procedures facilitating immediate improvements in different local situations.

### **Research Proposal: The relationship between voluntary or involuntary regulation of respiration and motor performance in humans**

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This presentation aims to introduce the research we are conducting. The purpose of our research project is to find the characteristics of voluntary or involuntary regulation of respiration that are related with motor performance in humans. A past preliminary study showed that subjects could respond to a stimulus during expiratory phases more quickly than during inspiratory phases. The present study re-examined this observation. Respiration flow pressure running through a vinyl tube attached to a face mask was measured with a flow pressure transducer. Next, integrated respiration flow pressure (iRP) was presented on a computer display. One respiration cycle was divided into four phases: 1)

inspiration, 2) turning from inspiration to expiration, 3) expiration, and 4) turning from expiration to inspiration. Examiners observed the iRPs waveforms and determined the timing when a red LED should light on. The LED light stimulus was pseudo-randomly presented at four respiration phases. Subjects were asked to press down a button at the moment the LED lit on as quickly as possible while naturally breathing. According to a hypothesis that a particular function or process of the autonomic nervous system for the regulation of respiration rhythm could influence information processing speed in the cerebral cortex to detect a visual stimulus and initiate a motor program, it was expected that a significant difference in reaction time would be found between the four respiration phase conditions.

### **Relationship between *typus melancholicus* and stress coping among Japanese nurses**

Yasuyuki Yamada<sup>1</sup>, Miyuki Sugiura<sup>1</sup>, Motoki Mizuno<sup>1,2</sup>, Sumio Tanaka<sup>1,2</sup>, and Masataka Hirose<sup>1,2</sup>

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This study focused on the *typus melancholicus* (TM) as a personality predictor of job stress among Japanese nurses. Hence, this study aimed to clarify the effects of TM on the adaptation of the stress coping toward a job stressor. The questionnaire investigation was carried out on female Japanese nurses in 2007. The total number of valid respondents was 701. The questionnaire used Kasahara's *Typus Melancholicus* Scale (KS) and the Brief Scale for Coping Profile (BCSP). First, in order to examine the factor structure of TM among nurses, we carried out the factor analysis on KS. The results showed that the two-factor structure comprising "perfection in work (PW)" and "devotion to others (DO)" is the most appropriate. Therefore, we understood TM from the traits of PW and DO. Next, in order to clarify the effects of TM on the coping strategies, we carried out a 3 (three levels of PW) × 3 (three levels of DO) ANOVA on BCSP factors. The results showed that some significant main effects of PW and DO were confirmed in some BCSP factors. Therefore, it was proved that the types of coping strategies effective toward job stressor are different by the degree of TM.

### **Problems concerning bicycles and bicycle drivers' manners**

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Bicycles are popular in the metropolitan areas in Japan, as they provide easy transportation. However, problems concerning bicycles are increasing every year. These problems can be classified into several groups, such as lack of infrastructure, insufficient signs for users, lack of manners in bicycle drivers, poor maintenance of bicycles and insufficient bicycle traffic regulations. This study examined bicycle drivers' manners using a questionnaire survey. The questionnaire was handed directly to the subjects. The subjects ranged from 16 years old to 55 years old, including many university students about 20 years old, 199 men and 74 women in total. The questionnaire items are divided into three sections, namely bicycle usage, manner and actions when riding the bicycle, and experience of accidents involving bicycles. The results indicated that many bicycle users usually lock their bicycles, leave them outside parking lots, and often ride together with friends without any sense of guilt. Also, many people own a bicycle but don't take care of its maintenance. Many users have fallen down with their bicycle and about 2/3 of the users have experienced an accident involving a bicycle.

### **Avoiding collision with obstacles while riding a bicycle**

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Bicycles are an effective transportation means. Unfortunately, the number of accidents involving bicycles is increasing every year. An unexpected movement of the bicycle running behind can be a great danger factor for car drivers. In this study, we examined to what extent a bicycle deviates from its running course when the bicycle driver avoids a utility pole, a sign, or a pedestrian on the road. Subjects were university students who used bicycles daily. An experimental bicycle course and a sidewalk 100 cm wide were set on the ground, and a temporary utility pole was set on the experimental sidewalk. There were two experimental driving conditions, namely riding normally and riding with an umbrella. The utility pole and a pedestrian were chosen as obstacles. The results of the experiment showed that different subjects have very different ways to avoid obstacles. The result common to many subjects suggests that a bicycle driver would be running a longer distance for a longer time on the road when avoiding a pedestrian walking on the sidewalk, and that the situation would deteriorate when the driver is also using an umbrella.

### **Research on the relationship of preferable work and workload in care workers using SDM**

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The preference of care work and the degree of volition were evaluated in care workers, and ranked by the investigation method named SDM (Sensitive Differentiation Method). The investigation showed that factors such as communication with the care user, user's weight, cooperation with other care workers and user's family, potential of improvement through a device, necessity of advanced skills, and the feeling of burden towards the user are involved in the care worker's work preference and volition to work. Moreover, although there was an individual difference in the order of work elements, neither a high degree of required care nor the existence of senile dementia in users were recognized as main factors concerning the work preference. In addition, when a certain amount of years of experience were accumulated, a shift towards the desire to find out fulfillment in comparatively serious work, and towards a positive concernment with work was also suggested.

### **Changes in the Ainu population of the Western Ainu Territory in Hokkaido before the Meiji Restoration**

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Changes in the Ainu population in 26 Regions ("Basho") of the Western Ainu Territory before the Meiji Restoration were observed. Between 1798-1822 (Period A), the population was decreasing in most Regions, but increasing in several others. It is possible that the increase is misleading due to the underestimate of the population in 1798. Between 1822~1854 (Period B), the population was

decreasing in 22 Regions (over 50% in 10 Regions, 40~50% in 8 Regions.), but the population did not change in 4 Regions. In Period A, the decrease rate in the Western Territory was of only 8%. In Period B, however, the decrease rate was over 40%. The main causes of the decrease were diseases (mainly smallpox), malnutrition and stern labor. In addition, the forced migrations and disintegration of communities (“kotan”) were also considered. The stern labor demanded by merchants (the “Basho-Ukeoinin”) were recorded in several documents by the visiting inspectors of the Shogunate (such as “Ezo Jinbutu-Si” (The Profile of famous Ainu ) by Takesirou Matuura). The stern labor seems to be the main cause of population decrease in Period B.

### **The condition of the test contraction for the assessment of muscle strain with surface EMG**

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The condition of test contractions (TC) was studied to assess muscle strain with surface EMG. Whether lengthening the duration of TCs improves stability and sensitivity of the assessment was investigated. The improvement was compared with that by averaging repeated TCs. Nine female subjects simulated mushroom picking work. The experiment consisted of a series of a 60-min rest, three works (W1-W3), a 30-min rest, a work (W4), a 30-min rest and a work (W5). The duration of each work was of about 20min. A shoulder abduction and a stooping posture were performed for one minute respectively as a set of TC. The set of TC was performed between the works and at every 10 minutes in the rest periods. EMGs were recorded from trapezius, infraspinatus, deltoid, and erector spinae. Amplitude of EMG (AEMG) and mean power frequency (MPF) of EMG were calculated. Each TC was divided into three parts equally. The results of each part and the whole of TC were compared. The analysis parts of TC affected the results little. AEMG and MPF were fluctuated before W1. Averaging of repeated TC was concluded to be more effective to improve the assessment by EMG during TC than lengthening TC.