A study on city revitalization by local residents: field study in Chiba, Japan

Takumi Iwaasa¹, Naoto Shoji¹ and Motoki Mizuno¹,²
¹ Graduate School of Health and Sports Science, Juntendo University
² School of Health and Sports Science, Juntendo University

City revitalization has become widely popular in Japan, but some of these attempts ended in failure because of lack of cooperation among local residents. Cooperation among residents is essential and fundamental. The purpose of this study was to examine citizens’ degree of interest in measures for city revitalization focusing on tourism resources in a city in Chiba prefecture. A questionnaire survey was conducted three times during local events in the city from October to December in 2014. The number of participants was 1,330 (Male=568, Female=762), the age average was 49.03 (SD=±14.4, range=20-79). We found significant differences across generations in residents’ interest after ANOVA test. Interest in activities related to the community, such as town or historic tours, using flowers in designing city planning, and making a city song was significantly higher for those aged 60 years and over, especially when compared to the young and middle-aged. On the other hand, the young and middle-aged tended to have preferences for hands-on experience or events such as barbecue festivals and agricultural or farming experience. These results suggest that it is necessary to actively promote support measures considering the differences in preference among generations.

Improvement of movement control in snowboarding by using additional equipment for physically-challenged snowboarders

Harutoshi Yukawa¹ and Shiro Nakashima²
¹ Faculty of Regional Policy, Aichi University
² Center for Regional Policy, Aichi University

There are very few physically-challenged snowboarders so far, probably because they may find it hard to keep balance on the board and to control the board movement due to their mobility impairments. In this study, additional equipment for snowboarding was used to improve movement control for a physically-challenged, cerebral palsy (CP) snowboarder. One CP patient with left side hemiplegia participated in a laboratory experiment to examine the effect of additional equipment, a cant-lift plate for alpine race snowboarding, on movement control when snowboarding. The cant-lift plate was installed underneath the left snowboard binding to lift the heel side and fit the subject’s natural posture. Two force platforms were used to measure the vertical force of each foot separately and to compare swing motion variables in the coronal plane (left/right) and in the sagittal plane (front/back) for each case: with a cant-lift plate attached and without one. Using the plate resulted in the correction of uneven left/right loading while standing and also made swinging easier both in the coronal and in the sagittal plane. In addition, the duration of the swing cycle was shorter when a cant-lift plate was used. Experimental data in laboratory showed the advantages of using a cant-lift plate in terms of movement control. Later, the subject actually tried
snowboarding on a ski slope with a cant-lift plate and reported improvement in movement control when snowboarding with a cant-lift plate attached.

Bicycle accidents caused by the aging population

Kazuo Yatagai  
*Bicycle culture center, Bicycling Popularization Association of Japan*

Senior citizens (over 60 years old) show the highest casualties caused by bicycle accidents. In addition, the accident rate due to driving operation mistakes is higher for the elderly than for other age groups. To determine the relationship between senior citizens’ accident experience and their driving skills, we carried out a survey using a questionnaire and a practical investigation. Our results show that accident experience rate is 25.9%; women experience 1.3 times more accidents than men, and falling accidents exceed bicycle-vehicle collisions. Moreover, in the case of people who feel that their physical fitness and bicycle driving skills have lowered compared to their 50’s, men show a higher response rate with age, while women’s response is high regardless of age. Concerning subjects with accident experience, many of the men in their late 60’s who have experienced a bicycle-vehicle collision do not acknowledge any drop in driving skills. Therefore the relationship between the awareness of age-related physical fitness decrease and accident rate cannot be ignored. Practical experiment results: for 25.0%, pedal position at the time of departure was not appropriate; 89.6% did not drive straight, i.e. without staggering. Bicycle sway especially occurred when bicyclists started moving or when they tried to avoid approaching bicycles and pedestrians. In these cases, bicyclists realized a reduction in their bicycle driving skills and physical fitness. We can therefore recommend using a smaller diameter wheel bicycle and respecting the correct pedal position at the time of departure.

Traffic path of bicycles in intersections without traffic lights

Kazuo Yatagai  
*Bicycle Culture Center, Bicycling Popularization Association of Japan*

73.4% of the bicycle accidents which occurred in 2014 in Tokyo took place in or around intersections. In 84.8% of the cases, the accident occurred when crossing and turning left or right. Therefore we investigated 1545 bicycles traffic paths in 10 intersections where traffic lights are not installed. Left-hand traffic rate was as follows: 90.5% go straight; 98.1% turn left; and 26.7% turn right. Because the ratio of right turns was low, we explored the factors that influence the left traffic rate when turning to the right. The following 4 factors were suggested: 1) The number of bicycles that pass on the road before they turn to the right. 2) The left-hand traffic rate of the bicycles that pass on the road before they turn to the right. 3) Traffic amount of bicycles, cars, and pedestrians that pass on the road after turning to the right. 4) Traffic situation of the road after the right turn can be seen in advance. From these results, a method that could help prevent accidents may be raising the left-hand traffic rate before a right turn. Moreover, in the intersections with little bicycle and vehicle traffic, the right-hand traffic rate is high. This is probably because bicyclists ignore the left-hand traffic rule. As an accident prevention measure, utilization of a road surface display may be considered.
A report on the bicycle traffic safety education program group, one of the Groups of KAKENHI B FY2012-2014

Shusa Hashimoto¹ and Kazuo Yatagai²
¹ Musashino University
² Bicycling Popularization Association of Japan

The present paper reports on the summary of the research work aiming to establish a bicycle safety education program in the scientific research B (KAKENHI B FY2012-2014) and on future development of these activities. Research was carried out through the investigation of the bicycle traffic circumstances mainly in Mitaka, Nakano and Kichijoji districts and of the effectiveness of bicycle safety education programs based on the local residents’ Group Works. The results showed that the bicycle safety education program is effective. Subsequently, an implementation manual (draft) was formulated. This draft is to be published as a pamphlet in the near future through the Human Ergology Society and is expected to be widely used in bicycle safety training sessions that might be held by various organizations. In addition, such research efforts to the present date will be inherited by the Human Ergology Society. (This work was supported by JSPS KAKENHI Grant Number 24310122)

The relationship between walking motion and muscle mass ratio of the lower limbs in elderly male adults

Hiroki Nakashima¹, Irma Nur Afiah¹, Loh Ping Yeap¹, Kiyotaka Fukumoto², Osamu Fukuda³ and Satoshi Muraki⁴
¹ Graduate School of Design, Kyushu University
² Faculty of Engineering, Shizuoka University
³ Faculty of Science and Engineering, Saga University
⁴ Faculty of Design, Kyushu University

The reduction of muscle mass of the lower limbs in the aging process is one of the factors that cause gait deterioration. Individual aging differences cause variations in the muscle mass decrease among the elderly. Therefore, the walking motion of the elderly could be better understood through the ratio of the lower-extremity muscles. Our objective was to investigate the relationship between walking motion and the ratio of the lower-extremity muscles in the elderly. Fifty-one older male adults (age = 72.5 ± 4.2 years) who can walk independently were recruited. Their walking motion was recorded and analyzed using a 3D motion capture system. The muscle cross-sectional areas (CSA) of the thigh and calf were measured with an ultrasound evaluation system developed by Fukumoto et al. (2010). The muscle mass of the knee extensor (KE) and flexor (KF), and the ankle dorsiflexor and plantarflexor were measured from CSA in the thigh and calf, respectively. Subsequently, the muscle ratios were calculated from the muscle mass results. The subjects were divided into Greater Extensor (GE, KE > KF) and Greater Flexor (GF, KF > KE) groups. Independent t-test indicates the GF has significant higher cadence and shorter stand phase compared with GE. The knee extension in the middle stand phase and the knee flexion in the initial stage of swing phase of the GF were significantly faster than those of the GE. These findings show the relationship between the walking motion and the ratio of the lower extremity muscles. (This work was partly supported by JSPS KAKENHI Grant Numbers 23300255, 26282194)
Relationship between wrist-finger posture and the deformation of median nerve

Ping Yeap Loh¹, Hiroki Nakashima¹ and Satoshi Muraki²
¹ Graduate School of Design, Kyushu University
² Faculty of Design, Kyushu University

Wrist and finger joint synchronization is one of the important hand functions in daily life activities. Wrist and finger movements cause the finger flexor tendons glide and lead to median nerve deformation within the carpal tunnel. The objective of this study was to investigate the effect of different wrist and finger postures on the changes of median nerve cross-sectional area (MNCSA). Ten healthy right-handed male adults (age = 24.0 ± 1.0 years) were recruited. Ultrasound examination was used to examine the median nerve of the dominant wrist at the proximal carpal tunnel level. Combination of three wrist postures, namely wrist 30° flexion, wrist neutral (0°) and wrist 30° extension with three finger postures, namely finger relax, finger straight and full fist, were examined. No significant interaction was found between wrist angle × finger posture in the MNCSA changes (F [1.0, 9.0] = 3.58, p = 0.091). However, both finger posture and wrist angle had a significant effect on the MNCSA. The MNCSA became significantly smaller (p < 0.01) as the finger posture changed from relax to both finger straight and full fist. At each finger posture, the MNCSA at wrist neutral (0°) was significantly larger (p < 0.01) compared to wrist 30° flexion and 30° extension. These results suggest that the changes of wrist, finger and wrist-finger postures could lead to the deformation of MNCSA due to the tendon gliding and to the incursion of lumbrical muscles into the carpal tunnel during posture changes.

Functional morphological analysis of the foot muscles of Japanese macaques

Ryuhei Kojima
Faculty of Health and Medical Care, Saitama Medical University

Functional morphological characteristics of the foot of Japanese macaques were investigated. Muscle weight was measured and muscle fiber type composition was calculated in all the foot and lower leg muscles inserting into toes at right side in a Japanese macaque (Macaca fuscata). Foot actions were recorded with a digital video camera during various behaviours in a zoological garden. Morphological analysis of the lower leg and foot muscles suggested functional characteristics of the muscles as follows. The flexor muscles generated more force and power than the extensor muscles. In the flexor muscles, the lower leg muscles flexed the toes powerfully and the foot muscles controlled them precisely. Most of the lower leg and foot muscles had a large number of fast twitch muscle fibers. During walking on a single pole and on the ground in the zoological garden, abducted big toes were observed. Manipulations of objects with the foot were observed. More observations of foot use in various behaviours and circumstances will be needed.

Influence of bipedal standing load on foot measurements, first toe angle, foot length and width of different load-distributions

Akihiro Umebara¹, Kyoko Takeuchi¹, Akiyoshi Matsumura² and Morihiko Okada³
¹ Graduate school of Health Science, Teikyo Heisei University
² Department of Biology, National Defense Medical College
³ Tsukuba University

The effect of different load distributions on angle and length are well known in the study of foot measurements. The present study uses a simple foot print method to evaluate the effect of three different load-
distributions on first toe angle, foot length and width. The subjects were 20 healthy adult males. The leg used to kick a ball was established as the dominant leg. The subjects were positioned on a lower extremity load sensor with their feet shoulder-width apart, arms dropped, and with eyes open. By applying three different body weight loads of 10%, 50%, and 90%, a comparative evaluation of the changes in first toe angle, foot length and width was conducted using the footprint data. In almost all cases, first toe angle demonstrated no differences in any of the differing applied load conditions, but a correlation between the dominant and non-dominant leg was observed. There was no difference in leg length or width in any of the differing applied load conditions for the dominant and non-dominant legs, but a trend of 90% > 50% > 10% was indicated. Results indicate that changes in foot length and foot width due to applied load are indicators of changes in the height of the foot arch. However, the fact that no effect was observed on the first toe angle suggests that the toes expand in response to the spreading of the metatarsus.

Joint motion axis changes in time when maintaining a standing posture

Yuzo Takahashi
Graduate School of Information Sciences, Hiroshima City University, Japan

We previously showed that accounting for the degree of freedom in hip movement during standing posture is required for high-quality micro-part assembly work. However, it remains unclear what body segment requires physical support to maintain standing posture for several minutes. Therefore, in this study we focused on the time related changes of the joint motion axis required to maintain standing posture. To assess the influence of joint motion axis on standing posture, we used three experimental conditions (10 min. each) as follows: (a) eyes open with a gaze target in front of participants, (b) eyes open without a gaze target and (c) eyes closed. We showed the axis of joint motion in the 8th thoracic spine (T8) diverged from the axis centre of gravity movement with time. Furthermore, the average error of the joint motion axis at 1st lumbar spine (L1) around the axis centre of gravity movement was constant for all experimental conditions. In addition, the average error of the joint motion axis on both sides of the shoulder became larger during the experimental condition c. From the above results, it is believed that the upper parts of the trunk become gradually unstable with time in all experimental conditions. Therefore, it can be considered that the joint motion axis at L1 is independently controlled against the stable head motion during standing posture. (This work was partly supported by JSPS KAKENHI Grant Number 25350025)

Reduction of burden of planting task by motion analysis for private farmers

Yoshie Shimodaira¹ and Macky Kato²
¹ Nagano Prefectural College
² Waseda University

Recently the number of farmers is decreasing in Japan. Many elderly farmers have no choice but to retire and abandon their field in spite of the fact that they want to continue their job. Farm tasks are too hard for the elderly people. One of the hardest tasks in farm work is planting, because farmers have to squat down for a long time. In a previous study, a social system to call the young people together was suggested. However, many of the volunteers are novices and their work is not efficient. In this study, a motion analysis of the planting task was carried out in order to improve work on this task. It was revealed that an experienced farmer living in the rural area of Nagano city could plant onions significantly faster than the novices, who are college female students. On the other hand, the novices became able to plant as fast as the experienced farmer by using a small chair and a pole to dig the holes. It can be said that conventional industrial engineering improvement methods are effective for private farmers.
Study of watching system and evaluation system for the elderly in nursing facility

Kazuyoshi Sakamoto¹, Tiejun Miao² and Kenzou Ozaki¹
¹ The University of Electro-Communications
² TAOS Institute

Japanese population over 65 years old reached 21% of the total population in 2007, so that Japan is becoming a super aging society. Many elderly persons live in nursing facilities. But the actual situation of the elderly during sleep was not clearly known yet. Recently, a new sensor that detects body vibration has been developed. Various physiological factors like respiration, heartbeat, and sleep level can be analytically detected based on body vibration. In our study, the body vibration of elderly persons living in a nursing facility was detected and recorded during night sleep in bed. The sleep stages were evaluated. The results in sleep condition for persons in a nursing facility were obtained and compared with the results of persons not in facility (namely living at home) as follows: (1) Detection of long awake periods and of getting out of bed indicated unusual states. (2) Sleep hours were 1.5 times longer than for those living at home. (3) Deep sleep hours (i.e., levels 3 and 4 in non-REM sleep) had an extremely low percentage (less than 5 %). (4) Hours of REM sleep were two times longer (i.e., about 40%) than for those living at home. These results show that persons staying in a nursing facility could not get brain rest due to a very low amount of deep sleep, but they could get body rest due to double time REM sleep. It was found that sleep health in facilities should be improved following investigation of sleep circumstances in nursing facilities.

The role of constraint conditions and logical thinking in product and design development process

Toshiki Yamaoka
Kyoto women’s University

We examined how constraint conditions and logical thinking could be used in a product or design development process. The constraint conditions guide us or navigate our activities, while they also influence the product and design development process, because the product or design solutions are narrowed down according to the constraint conditions in the process. The logical reasoning which is the basis of logical thinking includes deduction, induction and abduction. These can be used in the product and design development process and are useful for constructing products and design. The role of the constraint conditions and logical thinking in generic system design process is as follows:

1. Defining system outline: The purpose is narrowed down by 5W/1H/1F (function) and expectation examined for system. The goal and other system outline are narrowed down by the purpose.
2. Defining detailed system including four elements: i. Positioning; ii. Gathering user requirements, i.e., user requirements that are the basis of structured design concept are collected by the induction method; iii. Clarifying users and systems, i.e., the specifications of users and systems are clarified by the constraint conditions produced by the system outline and user requirements; iv. Formulating structured design concepts, i.e., the structured design concept is decided by the constraint conditions such as user requirements and the system outline.
3. Visualizing: Usually designers visualize their image based on ambiguous design concepts using abduction. However, the classical method depends on the designer’s attribution and so the method is not available for everybody. A proposed method based on the constraint conditions can be visualized logically based on the structured design concept.
4. Evaluating the design: Evaluation methods include verification and validation. The verification is done by the constraint conditions such as design specifications. The validation is done by the constraint conditions such as usability.
An analysis of action patterns of convenience store customers

Etsumi Matsunami, Yukari Senda, Saori Nishino, Yui Fujita and Toshiki Yamaoka
Faculty of Home Economics, Kyoto Women's University

The convenience store industries plan various strategies to attract customers to their stores because competition has become very tough. Two investigations were done to disclose the relations between customers and facilities and the store layouts. First, as results, the number of employees was related to the number of customers. Secondly, customers were observed and the characteristics of their actions were identified. The observation data were analyzed using mathematical quantification theory class II. The results show as follows: Customers who go along the window side in Lawson had a bag and stayed more than three minutes until they lined up at the cash register. Customers who brought a bag at the convenience store seemed not to have a clear purpose. They seemed to stay in the convenience store more than three minutes. Most customers carrying a basket in two Seven-Eleven stores were ladies and took more than three minutes until they paid at the cash register.

An analysis of subjective data on product comparison and evaluation

Saori Nishino, Yu Fujita and Toshiki Yamaoka
Kyoto Women’s University

Two questionnaire surveys were performed to understand the package design factors which are decisive in product purchase. The products for the test were sold at Seven-Eleven and Lawson. The investigation participants were 23 students from Kyoto Women's University. The methods are as follows:
1. Questionnaire
   About the following questionnaire item, the participants were asked to choose from the products sold in Seven-Eleven and Lawson.
   i. It looks delicious. ii. It stands out. iii. It is easy to imagine the taste. iv. It looks expensive. v. I want to buy it.
2. Questionnaire
   Participants were asked to evaluate the impressions of six products.

The results were analyzed regarding the effectiveness of package design. The sponge cake of Seven-Eleven was evaluated highly. It was the packaging material that made the difference from other products. Materials such as Japanese paper make products look high-quality. In addition, consumers were interested in the product because they could not see the contents. The following effective design factors were identified:
   i. Package materials such as Japanese paper are important.
   ii. The letter font used was elegant Ming-style.
   iii. Photographs on the package are more effective than see-through packaging in some cases.
   iv. Displaying important information like expiry date on the package front.

The approach for designing products and services based on understanding invisible needs through User Centered Design Thinking

Yuichi Inobori
Director/UX Strategist, INFOBAHN Inc.

The VALUES for consumers have been changing as the economic environment changes. Formerly,
the weight of VALUES for consumers was based on Goods, but now it is based on Experiences. So my suggestion is that we should design based on the approach of understanding not only the visible needs, but also the "invisible needs" of users (User Centered Design Thinking). This approach needs rich INSIGHT brought by drastic qualitative research and field research. Examples of such qualitative research methods are: (1) Contextual inquiry; (2) KA method; (3) Persona design method; (4) User journey mapping method; (5) Scenario method. It is important to use all these methods in understanding user context and not only verbalized needs, but also non-verbalized needs. When we, designers and developers, think about the making concept of products, we should think beyond our point of view, based on the user's invisible needs (that maybe users themselves still cannot realize). This approach may bring us the opportunity and ideas so that we can make a concept about designing products and services users really need.

Development and application of a markerless three-dimensional motion analysis system

Akio Ishimoto¹, Nobuo Honda¹ and Kazutaka Adachi²
¹ Human And Life Design Laboratory
² University of Tsukuba

In conventional optical three-dimensional movement measuring systems, it is necessary to attach many markers to certain measuring points of the body as landmarks. The system introduced here, called “Anakin SystemTM”, makes it possible to measure human movement without attaching these markers. This system is constructed with three KinectTM cameras, a WindowsTM-based personal computer and software for operation and calculation. Three-dimensional location of 24 points of the body, such as vertex, 6 points on the vertebral column, right and left shoulder joints, elbow joints, wrist joints, center points of each hand, hip joints, knee joints, ankle joints and center points of each foot are calculated every 1/30 seconds by applying a human body model in the software. In order to unify the coordinate system of the three KinectTM cameras, we used a unique but easy method of calibration. It is enough to move circularly a sphere of 20 cm diameter attached to a rod ca. 1.5 m long in the measuring area. It takes 10 seconds at most. There is no special condition for subject’s clothing except for avoiding long skirts or loose sleeves. This system allows us to measure the movements of several subjects separately in the same measuring area at the same time. Its accuracy is almost the same as that of the traditional marker-type measuring systems. Anakin SystemTM can be applied for measuring human movement in versatile ergonomic scenes.

Decreasing the visual search and spatial working memory function through long-term consecutive visual search

Kazuma Oki¹, Akio Mori², Ryo Koshizawa³, Masaki Takayose⁴, Yuzo Koyama⁵, Akira Jujo¹, Masaki Morinaga¹ and Ryosuke Takahashi¹
¹ College of Science and Technology, Nihon University
² College of Humanities and Sciences, Nihon University
³ College of Commerce, Nihon University
⁴ College of Industrial Technology, Nihon University
⁵ University Research Center, Nihon University

We investigated the influence of a long-term consecutive visual search (LCVS) on visual search and spatial working memory (VWM) function. 11 subjects performed the VWM tasks before and after a LCSV. As for the LCSV and VWM, the Advanced Trail Making Test Random Task (ATMT Task R) and the Advanced Trail Making Test Fixed Task (ATMT Task F) was introduced respectively, in which a subject, using a computer mouse, clicked a black circle with the numbers from 11 to 40 in consecutive order. Once a numbered target was clicked, it disappeared and another circle with the clicked number plus 30 showed up
at the same time. In ATMT Task R all the circles were rearranged at random, while the circles were not re-
arranged in Task F; 30 circles were on the screen at any time in both tasks. Each subject performed Task
R 40 times and Task F 10 times. In this study, we mainly focused on the recorded data of ATMT Task F
and calculated the power values of the 13-30 Hz (beta power) to compare the values before and after the
LCVS. It was clarified that the beta power of F3 and T 6 electrodes more significantly decreased after the
search than before the search. As the beta power reflects the activities of cerebral cortex and F3 and T6
record the activities of the frontal and posterior temporal cortex, the LCVS impaired the activities of those
areas.

The correspondence between extended muscle region and subjective muscle tension during static-
stretching exercise

Ryosuke Takahashi1, Yuzo Koyama2, Akira Jujo1, Masaki Morinaga1 and Kazuma Oki1
1 College of Science and Technology, Nihon University
2 University Research Center, Nihon University

The purpose of this study was to investigate the correspondence between the extended muscle region
and the subjective muscle tension during static-stretching exercise. The participants consisted of 115 male
college students. Six kinds of static-stretching exercises (hip, quadriceps, hamstrings, shoulder and upper
arm, triceps and top of shoulder, and gastrocnemius) were performed, and the extended muscle region and
the subjective muscle tension were reported. The lengthened region was correctly perceived in the case of
quadriceps, shoulder and upper arm, and triceps and top of shoulder. The ratio of correct estimation of ex-
tended muscle region for hip was lower than for other static-stretching exercises. Subjective muscle tension
of the hip was lower than that of the quadriceps, hamstring, shoulder and upper arm, and gastrocnemius.
On the other hand, subjective muscle tension of the hamstrings and gastrocnemius were higher than that
of the shoulder and upper arm, and triceps and top of shoulder. Confirming the extended muscle region
and the correct procedure for static-stretching is very important for college students when performing static-
stretching exercise. Further research is needed to determine the effectiveness of static-stretching in main-
taining a good physical condition, in the prevention of sport related injuries, and in sports performance.

A design analysis and proposal for shampoo bottle design based on subjective evaluations (1)

Rika Kato, Miho Takechi, Sakiko Namba and Toshiki Yamaoka
Faculty of Home Economics, Kyoto Women’s University

The purpose of this study is to determine the image that the design of a shampoo bottle gives a cus-
tomer by carrying out a design analysis based on subjective evaluation. We also want to find which shampoo
bottle design is most attractive for women in their twenties. As a method we showed seven kinds of com-
mercial shampoo to 26 female college students and performed a questionnaire survey using 15 sets of ad-
jective pairs for each design. We analyzed the results using the SD method, Correspondence Analysis and
Formal Concept Analysis. From the results we could make the following considerations. At first, using the
SD method, the designs of seven kinds of shampoo were classified into three groups: unique image, high-
performance image and friendly image. Next, using Correspondence Analysis, the relationship between
the design and the adjective image was clarified. Furthermore, by Formal Concept Analysis, we understood
that when purchasing shampoo, the preferred design is related to the image of "refined", "novel" and "in-
dividual". This study suggests that we can decide the concept of new shampoo bottle design by utilizing
the results of the SD method, Correspondence Analysis and Formal Concept Analysis.
A design analysis and proposal for shampoo bottle design based on subjective evaluations (2)

Sakiko Namba, Kato Rika, Miho Takechi and Toshiki Yamaoka

Faculty of Home Economics, Kyoto women’s University

In our previous study 1, the requirements for attractive shampoo design were explained. In study 2, a new shampoo design based on the results of study 1 is proposed. A structured design concept was used to define the concept more clearly. It is based on the requirements identified in our previous study 1. The concept of Design I is "a novel and adult-like shampoo bottle that blends harmoniously with space design and that also lets the user imagine its contents". The concept of Design II is "a cute shampoo bottle that offers the user a simulated experience and also lets the user imagine its contents." Based on the structured design concepts, the concepts of Design I and II were visualized. Design I resulted as a shampoo bottle that becomes a lighting fixture. By combining shampoo bottle and lighting, we get a product that is harmonious with the surrounding space. Design II was modeled on fruits. Users are able to enjoy the simulated experience of squeezing fruits. The new designs were proposed as explained above. The authors would like to evaluate these designs and improve them in the near future.

A design analysis and proposal for shampoo bottle design based on subjective evaluations (3)

Miho Takechi, Sakiko Namba, Rika Kato and Toshiki Yamaoka

Faculty of Home Economics, Kyoto Women’s University

Many people use online shopping and can get information about products from user reviews in the Consumer Generated Media (CGM). An analysis of the factors of User-Generated Contents (UGC) by using text mining may help us find out more about a product’s commercial value. The purpose of this analysis is to help product planers. This study is based on the results of study 1. We analyzed 112 UGC comments by text mining and calculated scores for three shampoo types to clarify their value from the point of view of women in their teens and early twenties. KHcoder, a software program for text mining, was used and then the results of co-occurrence network were analyzed. The results showed that the most frequently appearing words referred to fragrance and usability. Contrary to our expectations, only 15 comments on the bottle design were found. However, these comments highly evaluated the bottle design. Based on this study, the evaluation factors of shampoo products for women in their teens and early twenties were fragrance and usability, and it was found that the design of the shampoo bottle was not evaluated as much. However, it is important that users who took into account bottle design highly evaluated the products. This study shows that product design should be done based on a concept.

Behaviour of pedestrian and bicycle sidewalk users in Kyoto city

Shun Imai and Akira Okada

Graduate School of Human Life Science, Osaka City University

There are few public roads in Japan designated specifically for bicycles, and even where such routes exist they are usually not completely separated from motor vehicle lanes or pedestrian sidewalks. Consequently, many traffic accidents involve bicycles. Recently, sidewalks with a marked bicycle lane beside a pedestrian lane have been increasingly used to promote user safety and reduce accidents. To examine the appropriate design elements of such a sidewalk for pedestrians and bicycles, the present study investigated the behaviour of both types of users on Gojo-dori Street in Kyoto city, where such sidewalks have been installed. The users’ behaviour was studied in relation to the width of the sidewalk and to the three different methods of distinguishing the pedestrian and bicycle lanes (curbs, fences, colours painted on the lane).
Where the divider was a curb, bicyclists were more likely to properly use the bicycle lane when the sidewalk was narrower rather than wider, apparently because it is too easy for bicyclists to ride on a wide pedestrian lane. Furthermore, bicyclists’ and pedestrians’ observance rates were lower when the sidewalk was divided by fences rather than curbs, because some pedestrians shifted into the bicycle lane on the wrong side of the fence, thereby affecting bicycle traffic. The results suggest that lower observance rates among bicyclists are not only due to their own behaviour but may also represent their response to pedestrians’ behaviour. (This work was supported by JSPS KAKENHI Grant Number 24310122.)

Effects of standing posture on the psychological and physiological conditions of office workers

Yuhki Miyata¹, Akira Okada¹ and Kuniko Yamashita²
¹ Graduate School of Human Life Science, Osaka City University
² Research Support Department, Osaka City University

It is important for office workers to improve their static working posture, from the perspective of low back pain, mental health, and physical health. Therefore, a working style that incorporates standing postures into sitting work has recently been suggested. Although significant effects of such changes in working posture have been shown in previous studies, suitable conditions under which office workers utilize a personal computer (PC) while standing have not been investigated. In this study, psychological and physiological measurements were evaluated to examine the most suitable conditions under which workers may use a PC while standing. Eight male students participated in the experiment. Desk heights to achieve a standing posture were established at elbow height (eh), eh+10 cm, and eh-10 cm for each participant. A notebook PC was placed at 10, 20, and 30 cm from the desk’s front edge. In addition, a condition in which the participants leaned against the desk was also added. Participants were asked to perform typing tasks for 3 minutes in each desk and PC condition. The evaluation score tended to be lowest when the PC was placed 30 cm from the desk’s front edge and under leaning conditions, regardless of desk height. These results are thought to be due to an increase of pressure on the participant’s elbows. The suitable condition for typing tasks in a standing posture may be influenced not only by the standing posture itself but also by the elbows’ position and pressure thereupon.

Effect of fragrance inhalation on awakening - Application to fragrance products for cars -

Hiroshi Yoshii¹, Kuniko Yamashita² and Akira Okada³
¹ SOFT99 Corporation
² Research Support Department, Osaka City University
³ Graduate School of Human Life Science, Osaka City University

Inhaling certain fragrances may contribute to an increase in the alertness level of the brain; this may in turn result in safer car driving. We used psychological and physiological methods to assess whether fragrance inhalation relates to safe car driving. A total of 10 students participated in parts of two separate experiments. Experiment one (n = 10) was a randomized cross-over design consisting of seven repetitive sets of 30 reaction-time tasks performed wearing a mask that had a fragrance (soaked lemon and ginger constituents, experimental) or no fragrance (control). Each participant wore the mask that had no fragrance during all sets for control condition, and changed to a mask with a fragrance in set six and set seven (the last set) for experimental condition. During all reaction-time task performances, continuous electroencephalogram (EEG) was recorded. In addition, critical fusion frequency (CFF) and subjective assessment of psychological states were recorded prior to onset of task performance, after set three and following the last set. Six participants from experiment one participated in experiment two, which was conducted to test for a potential habituation effect of the fragrance condition. Consistently in experiments one and two, the
contingent negative variation (CNV) value obtained from EEG analysis during task performances was significantly greater in experimental conditions than in control conditions. Furthermore, during reaction-time tasks in experiments one and two, shorter reaction times and higher levels of alertness through subjective ratings were observed in the fragrance condition than in the control condition. These data objectively suggest the effect of fragrance inhalation on awakening, and a fragrance product developed based on our observations is expected to be effective for safer car driving.

Behavioral sensor-based organizational design and management in Japan: From the perspective of communication channel in nursing organization

Motoki Mizuno\textsuperscript{1,2}, Yasuyuki Yamada\textsuperscript{1,2}, Yasuyuki Hachi\textsuperscript{1}, Riyako Honda\textsuperscript{4}, Hideko Takahashi\textsuperscript{1}, Naoto Shoji\textsuperscript{1}, Hideko Aida\textsuperscript{5}, Aya Okada\textsuperscript{6} and Yuki Mizuno\textsuperscript{7}

\textsuperscript{1} Graduate School of Health and Sports Science, Juntendo University
\textsuperscript{2} School of Health and Sports Science, Juntendo University
\textsuperscript{3} Faculty of Health and Welfare Human Service, St. Catherine University
\textsuperscript{4} Business Consultants, Inc.
\textsuperscript{5} Koshigaya Hospital, Juntendo University
\textsuperscript{6} Nerima Hospital, Juntendo University
\textsuperscript{7} Center of Liberal Arts, Toyo Gakuen University

The purpose of this study is to clarify the communication channel and social signaling behavior in the nursing organization of a university hospital from the perspective of interpersonal influence by using electronic sensors. Participants in this study were 33 nurses (male=16, female=17) working in the psychiatric ward. All subjects gave their informed consent. They included 6 administrative nurses (male=2, female=4). The subjects’ communication time and social communication network pattern in the ward were recorded using electric badges. As a result, communication networks got tighter and more individualized with time, when observed in time intervals of 30 minutes, 90 minutes and 180 minutes. In addition, the longer the time interval, the clearer interpersonal connections became. The key person in the nursing organization could be most clearly identified at the end of the 180 minute interval. It was also shown that administrative nurses have great influence over employees, including staff nurses. Above all, the importance of communication in and around top management and middle management nurses was suggested, just as the existence and the role of the senior nursing officers proved important in the nursing organization. It was also suggested that male nurses had significant influence on both administrative and staff nurses in the psychiatric ward. (This work was supported by JSPS KAKENHI Grant Number 26285089)

Intervention using the guideline for enhancing resilience in fitness clubs: Research design for cluster randomized trial

Naoto Shoji\textsuperscript{1}, Hiromitsu Moriguchi\textsuperscript{2}, Yo Kono\textsuperscript{1}, Takumi Iwaasa\textsuperscript{1}, Hideko Takahashi\textsuperscript{1} and Motoki Mizuno\textsuperscript{1,2}

\textsuperscript{1} Graduate School of Health and Sports Science, Juntendo University
\textsuperscript{2} School of Health and Sports Science, Juntendo University

Recently, resilience is considered important both as a process and as a skill in the adjustment to occupational stress. This is no exception for fitness clubs. A guideline for supporting the enhancement of psychological resilience through daily operations as organizational level challenge was developed (Shoji, 2014). The purpose of this study was to present a research design for a cluster-randomized trial to verify the effectiveness of the guideline. Research methods are shown as follows. In parallel with trial design, pair-matching was carried out. Eligibility criteria for trial participants included employment in a branch of
a major fitness club, and all forms of employment were targeted. The intervention was carried out at organizational level. The sample size was 455, that was pre-set using G*Power 3.1.7 and considered design effect of cluster-randomization (analysis: t-test, effect size: 0.3, p-value: 5%, statistical power: 0.8, allocation ratio: 1:1, cluster size: 30). While the major outcome of this research was resilience, the alternate index was hardiness. Measurements were BSR (Hirano, 2010) and hardiness scale (Tada & Hamano, 2003). Quantitative data of intervention group and control group were compared using a t-test. Additionally, multilevel analysis was used to verify interactive effects including manager’s facilitation skill, number of employees, and attitude towards challenge.

Relationship between multiple roles and mental health conditions among Japanese nurses: Cross-sectional study using Multiple-role Map Questionnaire for Nurses (MMQ-N)

Yasuyuki Yamada¹², Takeshi Ebara³ and Motoki Mizuno¹²
¹ Graduate School of Health and Sports Science, Juntendo University
² School of Health and Sports Science, Juntendo University
³ Graduate School of Medical Sciences, Nagoya City University

This study aimed to examine a possibility of using the Multiple-role Map Questionnaire for Nurses (MMQ-N) as an assessment tool of the mental health condition among Japanese nurses. The MMQ-N was designed to evaluate the degree of positive spillover effects (PSP), negative spillover effects (NSP), compensation effects (COM) and segmentation state (SEG) caused by the interactions between the roles of nurse, manager, friend, partner, parent and daughter. Additionally, this scale also measures the effects of private time (role-free time). For this purpose, we conducted an online survey in 2015 and collected a total of 792 valid data from working female nurses. In the analysis, the GHQ-12 scores were replaced by the dichotomous (0-1 points: good mental health condition category, 2-12 points: normal to poor category). According to the logistic regression analysis, the PSP and COM scores associated with good mental health condition (PSP: Adjusted OR=1.53 to 2.22, COM: Adjusted OR=1.53 to 2.49). On the other hand, the NSP and SEG scores didn’t relate to the health outcome. These results indicate that the PSP and COM items in the MMQ-N were useful to assess the good mental health condition among Japanese nurses. (This work was supported by JSPS KAKENHI Grant Number 24700779)

One side dominance in humans: Examination of errors using questionnaire method in locomotive behaviour studies

Akiyoshi Matsumura¹, Takahiro Nakamura², Kyoko Takeuchi³, Kazuo Maie⁴, Katsura Higuchi⁵ and Morihiko Okada⁶
¹ Department of Biology, National Defense Medical College
² Department of Mathematics, National Defense Medical College
³ Graduate School of Health Science, Teikyo Heisei University
⁴ Otsuma Women’s University Museum
⁵ Faculty of Health Science Technology, Bunkyo Gakuin University
⁶ Tsukuba University

The purpose of this study is to examine whether results of locomotive behaviour studies by questionnaire method appropriately reflect function differentiation in the left and right side. Results of questionnaire surveys were evaluated in 11 degrees on 30 items about one side dominance in arms, legs and head (more than 1000 subjects). The result of this analysis and those of the past studies on one side dominance were comprehensively examined and compared. The questionnaire method has a merit of providing more individual data compared with kinematic or physiological analysis of behaviour. On the other
hand, questionnaire surveys related to locomotion, movement and somaesthesia provide information that cannot be obtained by measurement equipment, and there is a possibility of subjective validity. Mistakes in deciding the pivot leg might be an example of error factor, but explaining the definition of the pivot leg and using common understanding can be appropriately reflected when interpreting the result. The results indicate similar tendencies in multiple data sets in a series of investigations, and show that a high stability of results can be attained by using a questionnaire method in locomotion, movement and somaesthesia studies. When judging the dominant hand, asking about several different movements enables a comparison of one side dominance between detailed finger work, rough arm work and culturally influenced hand work. Our research results empirically show that around 50 subjects provided us with stable information on movement behaviour.

The effect of rest on fatigue patterns among students in university correspondence courses

Fumiko Matsuda¹,² and Hiroshi Ugajin²
¹ Institute for Science of Labour
² Musashino University

A long-term fatigue awareness survey was carried out with students taking university correspondence courses. Over ten years, the survey accumulated 628 samples of fatigue awareness data regarding 'a person on a particular day'. Conventional fatigue awareness studies usually identify and compare the degree of tiredness across sample groups defined by occupation, workplace, age or other attributes. However, the sample group in this study had no such shared attributes. Therefore, attempts were made to identify some tendency by changing the way the data was examined. One of these attempts was to identify the difference in tiredness by the proportions of the length of lunch break in the working hours of a day. Considering that the total working hours per day of an individual would affect the degree of tiredness, those who worked less than 8 hours or more than 12 hours a day were excluded from the analysis and 301 samples were examined. This analysis shows that, regardless of industry or occupation, those whose lunch break time ranged between 15% to 20% of their total daily working hours are comparatively less tired. The study suggests that a certain kind of pattern can be identified even within a group without shared attributes.

A study on work improvement and health management system for job creation

Yuki Mizuno¹, Yasuyuki Houchi² and Nobuyuki Motegi³
¹ Toyo Gakuen University, Center for Liberal Arts
² St.Catherine University, Faculty of Health and Welfare Human Service
³ Institute for Science of Labour

The purpose of this study was the creation of a healthy and safe work environment that enhances new job creation. We identified the workplace problems and implemented "work improvement" and "construction of health management system". The company in this survey is a cast iron manufacturer. In the weight carrying part of the processing operation, there is a high load on the arm, shoulder, and low back. Therefore, the creation of a machine-aided operation that can be used by the elderly has been demanded. In addition, elderly workers had expressed anxiety about their health and safety during heavy weight operations. As an improvement measure for load reduction, a support device was introduced. It helped reduce the lifting load on human power and enabled workers to easily perform high precision operations. This device also had the effects of reducing the load on the upper limbs and low back, and thus ensuring safety. In particular, the reduction of the physical load helped remove the "health anxiety" during work and the "mental
anxiety" of performing tasks continuously for a long time. These work environment improvement measures resulted in the expansion of job categories. In addition, as a health management system, an original health check test was introduced, designed to take into account the characteristics of the work. "Medical records" were created for each worker, and a healthcare administration system was built, listing the health conditions required for each work operation. With the introduction of the healthcare administration system, the company decided to extend their employment age limit to 70 years of age.

**Application of the Workplace Dock programme for improving mental health**

Yuriko Takeuchi¹, Kazuhiro Sakai¹, Kazutaka Kogi¹, Toru Ikegami¹, Fumiko Matsuda¹, Etsuko Yoshikawa², Chihiro Takezawa³, Yumi Sano⁴ and Toru Yoshikawa⁵

¹ The Ohara Memorial Institute Science of Labour
² Tokyo Ariake University of Medical and Health Sciences
³ Japanese Red Crosse Hokkaido College of Nursing
⁴ Teikyo University Graduate School of Public Health
⁵ National Institute of Occupational Safety and Health, Japan

Awareness is growing of the need to advance participatory work improvement programmes as a means of promoting mental health of workers. By the amendment of the Industrial Safety and Health Law, employers are obliged from December 2015 to comprehend the stress situations of their workers through the stress check system. It is important for each workplace to establish a coherent mechanism to improve working conditions and mental health of workers by taking into account the stress check results. As a practical means of primary prevention of work stress and overwork, the “Workplace Dock” programme is applied in different sectors relying on groupwork steps for identifying existing good practices and planning immediate improvement actions addressing multifaceted work-related risks. The use of participatory action-oriented tools including action checklists focusing on low-cost improvements can facilitate this process. The Workplace Dock programme can be conducted within the year-round schedule of the workplace. Following workplace-level review meetings, each workplace plans and implements readily feasible improvements. Experiences in workplaces of healthcare and local government workers demonstrate the effectiveness of participatory steps leading to multifaceted improvements reducing work-related risks. Since the steps taken in the programme correspond to the Plan-Do-Check-Act cycle of risk management, sustained activities can be assured by following the yearly steps. It is suggested to organize in various workplaces action-oriented mental health activities represented by the Workplace Dock programme that can facilitate workplace risk management covering broad-ranging risks at work.