



ICPA 2010

Peoples & Places

Fremantle
9-12 September 2010



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ICPA 2010

Peoples and Places

9-12 September, 2010

The Esplanade Hotel, Fremantle,
Western Australia

On behalf of the Local Organizing Committee and the Scientific Committee of the International Association of Physiological Anthropology, it is my pleasure and honour to welcome you to the port city of Fremantle and to this 10th Congress of the IAPA, and to acknowledge with gratitude the support provided by our sponsoring bodies.

Thanks to the assistance of international colleagues, and in particular our friends and colleagues in Japan, we have been able to attract an excellent array of papers covering many aspects of human life and health. The 68 papers selected for presentation across the three days of the Congress have been organized into ten Scientific Sessions, with authors drawn from 12 countries. We are particularly fortunate to have as Plenary speakers Professor Cynthia Beall of Case Western Reserve University, USA, and Dr Ken McElreavey from the Institut Pasteur, France. We also look forward to the Younger Researchers' Colloquium on day 1. As with all scientific societies, the future will be the domain of our younger colleagues and it is reassuring that they are prepared to undertake responsibility for an initiative of this welcome nature.

Besides the scientific sessions of the Congress it is of course important that delegates and accompanying persons find time to participate in the planned social activities, and to experience the many pleasures offered by Western Australia in Spring Flower season. We very much hope that your time in Fremantle and Perth will be enjoyable, and look forward both to ongoing scientific collaborations and to your early return to Australia.

Professor Alan Bittles

Congress Convenor for the IAPA

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Congress Programme

03.00 – 03.30 pm	<i>Refreshments</i>
03.30 pm	<p>Session 4 Younger Researchers' Colloquium Coordinator: H Wakabayashi Presenters: H Wakabayashi, Portsmouth & Fukuoka Habituation of shivering T Takahashi, Osaka The realities of fall accidents in Japan T Nishimura, Fukuoka Mitochondrial genome and cold adaptation B Muenstri, Mahidol An exploratory study of physical restraint for Thai elderly patients D Dye, Perth Regeneration in aging and damaged muscle: role of the extracellular matrix M Black, Perth The profile of β-thalassaemia mutations across South Asia</p>
03.30 pm	IAPA General Assembly
05.00 pm	Poster viewing
06.00 pm	Close of session

Saturday, September 11

09.00 am	<p>Session 5 Genetics and human variation Chairs: Prof L Schmitt & Dr Y Tsunetsugu Plenary 2. Dr K McElreavey, Paris Genes, puberty and menopause</p>
09.40 am	<p>O9. Y Tsunetsugu, Y Miyazaki, Chiba Individual variations in baseline levels of salivary biomarkers</p>
10.10 am	<p>O10. S Higuchi, S Aritake, M Enomoto, A Hida, K Mishima, Fukuoka and Tokyo Study of physiological factors related to delay of circadian rhythms in Japanese university students</p>
10.30 – 11.00 am	<i>Refreshments</i>
11.00 am	<p>Session 6 Sleep and human comfort Chairs: Prof K Kotani & Dr E Glasson</p>
11.00 am	<p>011. K Ishibashi, S Arikura, T Kozaki, S Higuchi, A Yasukouchi, Fukuoka & Chiba Relationship between endogenous melatonin and body temperature regulation during sleep in a cold environment</p>
11.20 am	<p>012. K Gransitzki, Kiel Patterns of sleeping behavior as a factor for the ergonomical design of economy class aircraft seats</p>
11.40 pm	<p>013. K Kotani, T Yamada, T Asao, M Kato, N Hara, Kansai Physiological and behavioral effects of windows on occupant comfort</p>
12.00 pm	<p>014. M Ina, H Torigoe, T Kozaki, A Yasukouchi, Fukuoka The effects of bright light in the morning on nocturnal light-induced melatonin suppression and rectal temperature rhythm during sleep</p>

12.20 pm	015. K Edwards, Perth An osteoarchaeological investigation into the functional adaptation of the foot to shoes
12.40 – 01.40 pm	<i>Lunch</i>
01.40 pm	Session 7 Aspects of ageing Chairs: Prof HW Jürgens & Prof Y Tochiwara
01.40 pm	016. RF Brightwell, Perth Paramedic assessment and referral to access medical care at home: providing a cost-effective solution to the unnecessary transport of ageing patients
02.00 pm	017. N Harada, S Okada, Kobe Age-related differences in a serial stepping stability under dual task
02.20 pm	018. Y Tochiwara, T Kumamoto, J-Y Lee, N Hashiguchi, Fukuoka Age-related difference in cutaneous warm sensation thresholds at the air temperatures of 28 and 22°C
02.40 pm	019. EJ Glasson, Perth Ageing and intellectual disability: where to from here?
03.00 – 03.30 pm	<i>Refreshments</i>
03.30 pm	Session 8 Melatonin and responses to light Chairs: Prof T Morita & Dr B Floyd
03.30 pm	020. Y Fukuda, S Tsujimura, S Higuchi, A Yasukouchi, T Morita, Fukuoka & Kagoshima The response of melanopsin-expressing retinal ganglion cells to light stimuli with frequency changes
03.50 pm	021. N Kakitsuba, IB Mekjavic, Y Shimomura, T Katsuura, Meijo, Ljubliana & Chiba Seasonal differences in the core interthreshold zone as related to lighting conditions
04.10 pm	022. T Katsuura, X Liu, L Shi, Y Shimomura, N Kakitsuba, Chiba & Meijo Effects of color temperature and illuminance of lighting on physiological responses under different stress conditions
04.30 pm	023. S Tsujimura, Kagoshima Contribution of human melanopsin ganglion cells to the non-image forming pathway
05.00 pm	Poster viewing
06.00 pm	Close of session
07.00 pm	Congress Barbeque at the Resort Pool

Sunday, September 12

09.00 am	Session 9: The human condition Chairs: Prof C Beall & Prof S Koga
09.00 am	024. DA Coall, JS Chisholm, Perth Developmental stress, reproductive development and adult body size: a life history perspective
09.20 am	025. B Floyd, Auckland Rapid intergenerational change in developmental environments

	in Taiwan, an opportunity to further evaluate maternal epigenetic effects
09.40 am	026. M Walters, P Claes, M Norquay, D Gillett, Perth & Melbourne Defining population facial variations: The Perth Face-Space Project
10.00 am	027. B Muensri, Y Sirapo-ngam, NE Strumpf, P Malathum, Mahidol & Philadelphia An exploratory study of physical restraint use for Thai hospitalized elderly patients
10.30 – 11.00 am	<i>Refreshments</i>
11.00 am	Session 10: Health and health status Chairs: Prof Y Sone & Dr K McElreavey
11.00 am	028. CGN Mascie-Taylor, Cambridge Is there a link between graduation of extreme poor Bangladeshi families out of poverty and improvement in adult and child food security, nutrition and health status?
11.30 am	029. T Nishimura, M Motoi, YK Kim, Y Hoshi, R Kondo, S Watanuki, Fukuoka & Tokai Relationship between mitochondrial haplogroup and psychophysiological responses during cold exposure in Japanese
12.00 pm	030. M Tanaka, S Kanno, S Honda, T Satoh, T Okada, K Satoh, Fukushima Cold water hand immersion test for health examination of forestry workers
12.20 pm	Close of Congress
12.45 – 1.45 pm	<i>Lunch</i>
02.00 – 05.30 pm	Congress Excursion

Abstracts for Oral Presentations

Plenary 1

Updating the human adaptability model: considerations arising from studies of high-altitude hypoxia

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Physiological anthropology focuses on contemporary people in modern society from evolutionary, ecological and bio-cultural perspectives. This ambitious research agenda is based on classic models developed during the 1960s by the founders of the human adaptability branch of physical anthropology including Paul Baker, Geoffrey Harrison, Gabe Lasker, and Jim Tanner. The subsequent exuberant growth of biological knowledge requires new research concepts, models and designs to address fundamental questions about modes and processes of human evolution and adaptation. For instance, the classic migrant model to identify adaptations with genetic or developmental bases has been updated several ways to incorporate new understanding of population genetics, genotype-phenotype relationships and even the concept of a gene. As another instance, developmental influences are now understood to incorporate Baldwin effects and epigenetic modification. Examples from the informative natural laboratories provided by indigenous high-altitude populations illustrate these points. An important question is whether the discipline is prepared to employ new metrics for natural selection or whether differential survival and reproduction will remain as the best measure.

Plenary 2

Genes, puberty and menopause

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Puberty is the developmental process that culminates in reproductive capability and is the result of a complex series of molecular and physiological events including growth acceleration, weight gain and the appearance of secondary sexual physical features over a 2- to 3-year period. Twin studies estimate that 44–95% of the variance in age at menarche may be heritable. However, specific common genetic variants that influence the timing of puberty have not yet been convincingly demonstrated. Like menarche, the timing of menopause is influenced by both nongenetic factors and genes. There is a wide variation in the age at which the normal menopause begins, varying from 40 to just over 60 years. Several studies have indicated that the variation of the age of onset of normal menopause has a very strong genetic component with several to many genes assumed to make an additive contribution to the variation. Considerable ethnic variations in menopause have also been reported suggesting genetic influences and estimates of heritability range up to 85%. Although family and twin studies indicate that the variation in age at first and last menstruation is inherited, the genes contributing to these traits have not been identified. Understanding the mechanisms that control menarche and menopause is important because variation in the timing of both processes is associated with disease risk. Earlier menarche may be associated with an increased risk of endometrial cancer, menstrual problems, breast cancer and adult obesity. Aside from the obvious fertility problems, early menopause is linked to a higher risk of cardiovascular disease and osteoporosis, whilst a late menopause age has been associated with an increased risk of breast cancer. I will examine the recent genetic studies that have identified loci and candidate genes that may contribute to the timing of puberty and menopause. These discoveries build on epidemiologic studies with detailed data from well-defined source populations and highlight the importance of developing well-characterized biobanks. New genetic data may provide insights into the many established but unexplained associations between menstrual history and risk of adult diseases.

O1

Measuring Suboptimal Health Status in urban Chinese

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Suboptimal health status (SHS) is characterized by ambiguous health complaints, general weakness, and lack of vitality, and it has become a new public health challenge in China. SHS is believed to be a subclinical, reversible stage of chronic disease. As studies of intervention and prognosis for SHS are expected to become increasingly important, a reliable and valid instrument for its assessment is essential. A questionnaire for measuring SHS in urban Chinese was developed based on focus group discussions and a literature review. Questionnaire validity and reliability were evaluated in a small pilot study and then in a cross-sectional study of 3000 individuals. The analyses included tests for reliability and internal consistency, exploratory and confirmatory factor analysis, and tests for discriminative ability and convergent validity. The final questionnaire incorporated 25 items on SHS (SHSQ-25), and encompassed 5 subscales: fatigue, cardiovascular system, digestive tract, immune system, and mental status. Overall, 2799 of 3000 participants (93.3%) completed the questionnaire. Test-retest reliability coefficients for individual items ranged from 0.89 to 0.98. Item-subscale correlations ranged from 0.51 to 0.72, and Cronbach's α was 0.70 or higher for all subscales. Factor analysis established five distinct domains, as conceptualized in our model. One-way ANOVA showed statistically significant differences in scale scores between three occupational groups; including total scores and subscores ($p < 0.01$). The correlation between the SHS scores and experienced stress was statistically significant ($r = 0.57$, $p < 0.001$). The SHSQ-25 has proved to be a reliable and valid instrument for measuring sub-health status in urban Chinese.

O2

The contributions of reductions in skin and deep body temperature to the habituation of shivering

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The metabolic response to cold (shivering) is generated by the thermal input from the skin and deep body regions. The relative contributions of skin and deep body temperature changes in the development of an habituation of shivering remain to be elucidated. The present study tested the hypothesis that short-term cold water exposure, resulting in no decrease in deep body temperature, will not result in a habituation of the shivering response to longer-term immersion. Seven healthy male participants undertook two standard head-out immersions at least a week apart (Pre and Post) in stirred water at 12°C, until either rectal temperature (T_{re}) fell to 35°C or 90 minutes elapsed. In the intervening period, participants undertook five, 5 minute immersions in 12°C water. T_{re} , expired respiratory volume (\dot{V}_E) and oxygen consumption ($\dot{V}O_2$, a surrogate measure of shivering) were measured continuously. There was no difference between the cooling rates of T_{re} observed Pre and Post. The initial 5 minutes responses in \dot{V}_E and $\dot{V}O_2$ were lower in Post than in Pre. No difference was observed in $\dot{V}O_2$ during the period after 20 minutes immersion in Pre and Post. It is concluded that the repeated cooling of skin temperature induces a habituation of the initial cardio-respiratory and metabolic responses but not the longer term shivering response to cold with a decrease of deep body temperature. These findings help elucidate the mechanisms underpinning habituation to cold, and the role of skin temperature in the shivering response.

O3

Subjective skin wetness map to evaluate heat strain

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The purpose of this study was to investigate the validity of the newly developed method for quantifying perceived skin wetness (PSW) as an index to evaluate heat strain. Eight males underwent twelve experimental conditions: activities (rest and exercise) × clothing (Control, Tyvek and Vinyl condition) × air temperatures (25 and 32°C). To quantify the PSW, a body map with 21 demarcated regions was presented. The results showed that 1) at rest in 25°C air, PSW reached 4.4%, 8.3% and 51.6% of body surface area for Control, Tyvek, and Vinyl condition, respectively, while PSW at 32°C increased to 35.8%, 61.4% and 89.8%; 2) the most wetted body regions were the upper back for both rest and exercise conditions, followed by the forehead and front neck. The regions perceived first in the PSW map were the forehead, neck, and upper back; 3) at rest, PSW had significant relationships with rectal temperature, infrared tympanic temperature, heart rate, total sweat rate, thermal comfort, and humidity sensation ($p < 0.05$), but these relationships were dependent on the level of activities and clothing insulation; 4) PSW was compared with the calculated skin wettedness. These results indicated that the PSW map has a distinguishable ability to detect the most wetted and the initially wetted regions during both rest and exercise. In particular, the PSW map is more valid as a heat strain index of workers wearing normal clothing performing static work in heat, rather than wearing vapor impermeable protective clothing during dynamic and strenuous work.

O4

Improvement of thermal physiological and psychological prediction system and its application

Yokoyama S¹⁾, Kato A²⁾, Hirasawa Y³⁾, Kubo T¹⁾, Sugano S¹⁾, Sato H⁴⁾, Takahashi N¹⁾, Yamazaki M¹⁾, Kuramae M¹⁾, Maeda T¹⁾.

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This paper describes several improvements and application of thermal physiological and psychological prediction system. First, we performed examination to evaluate the comprehensive effect of floor heating system on physiological and psychological responses. Secondly, we proposed a new evaluation method to predict thermal sensation vote by using our advanced prediction system. In addition several numerical simulations of whole body temperatures and thermal psychological responses were performed with our system. The results suggested that the present advanced system had high usability. Finally, we applied the system and predicted the optimum floor temperature when using floor heating system.

O5

Monitoring of chosen vital signs for the evaluation of physical performances

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Working in impermeable protective clothing, possibly wearing a respirator, causes high physical stress. Responsible for this is the higher mechanical work evoked by extra weight and limited flexibility of the protective clothing on the one hand and the extreme microclimatic conditions close to the body on the other. The impermeability of the fabric leads to a drastic increase of relative humidity within a short time and decreases the performances of the user's thermoregulatory system considerably. Reaching the saturation point of the relative humidity within the protective suite depends on the job performance, the surrounding temperature, the thermal insulation attributes of the suite and the intraindividual perspiration grade. Individually customized operating times could be achieved via telemetric monitoring of vital signs. One supervisor is able to monitor several workers with regard to their performance limit from a safe distance and possibly relieve them. The comparative studies dealing with protective clothing we conducted with probands over a long period of time have shown that the scope of possible operating times differs considerably. Operating times could be extended significantly for the majority of the users, enabling a more efficient operation scheduling. Predicting the performance in this special working environment with traditional testing methods in advance is so far not possible due to the extraordinary combination of physical stress characteristics. The choice and standardization of the vital signs suitable for the recognition of performance limits as well as the choice of the technical components and sensor systems allowing telemetric transmission are the goals of our research project.

O6

Proposed non-contact body movement monitor method during sleep using video imaging

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In recent years, it is known that children's abnormal behavior of the day is concerned with sleep disorders. Thus it is important to monitor children's sleep in the early development. For monitoring a sleep, PolySomnoGram (PSG) is generalized inspection method. However, there are some important issues in the case of adopting PSG for children. First, there are few clinics which installs inspection apparatus for PSG because PSG needs great investment in facility and high personnel cost. Next, PSG requires the attachment of many electrical contacts, so children feel heavy constraint. To address these problems, it is strongly desirable to monitoring a sleep quality in a non-restrictive and non-contact way. We paid attention to the relationship between sleep stage and body movements during sleep. We proposed the body movements' measurement method during sleep using difference image processing. And to verify the validity of the proposal method, the body movements data calculated by difference image processing were compared to sleep stages measured by PSG. In twelve children volunteers, it could be confirmed the strong relations between body movements data and sleep stage. This led to the capability to evaluate children's sleep in the non-restrictive and non-contact using our proposal method.

O7

Visualization of surface electromyogram to evaluate coordinated muscular activities on forearm while using hand tools

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However surface electromyography (sEMG) is commonly used as a simple index of physiological muscular load, there are few studies about multi channel sEMG to evaluate inter-muscular coordinated activity. Tenore F. et al. (2007) made the estimation model to predict non-loaded natural finger movements by forearm sEMGs. Yong H. et al. (2010) measured arrayed sEMGs widely in the lumbar region to assess the low back pain with dynamic color topographic images. But the multi channel sEMG is still not a general method for its practical difficulty. We have tried to develop a visualization technique of sEMG in real time to discuss complicated inter-muscular coordination such as using a hand tool like chopsticks. Healthy male volunteers participated in this study. Monopolar electrodes array were attached to subject's forearm to collect whole muscle activities. Gain of amplifier and band pass frequency was set to 350 and from 15 to 500Hz, respectively. LabVIEW 8.0 was used to data acquisition, RMS processing, and to build movie of color topographic images. Subjects were required to have chopsticks, writing implement, toothbrush, and so on with different gripping posture of fingers and thumb. As a result, different distributions of sEMG amplitudes were significantly found at different grip types of these tools. We also found visually the different activity between dominant hands maybe caused by subject's habit or experience. This visualization technique of multi channel sEMG is helpful to study the coordinated activities of skeletal muscles.

O8

Evaluation of aerobic work capacity during a non-steady state following exercise onset

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In daily life, work or sport, the human body is seldom in a steady state and both the intensity and pattern of physical activity vary with time. A non-steady state is the more usual condition in organisms, e.g., the transient state following exercise onset, recovery, and exercise-transitions. In recent years, oxygen uptake ($\dot{V}O_2$) kinetics during exercise have been investigated as a new criterion for the evaluation of aerobic work capacity and exercise tolerance. Through analysis of both steady- and non-steady state $\dot{V}O_2$ responses to exercise, we are able to gain valuable insights into the fundamental mechanisms of regulation of aerobic metabolism. It is of fundamental importance to clarify whether O_2 delivery and/or utilization is the rate-limiting factor(s) in the $\dot{V}O_2$ response following the onset of exercise. Recently, we quantified spatial heterogeneities of the quadriceps microvascular oxygenation dynamics following onset of exercise and to examine whether such heterogeneities are associated with the speed of $\dot{V}O_2$ kinetics. Time-resolved near-infrared spectroscopy systems (TRS-NIRS) were used to measure the spatial heterogeneities of the absolute concentrations deoxygenation (HHb) in the quadriceps muscle. Following exercise onset, the amplitudes (corrected by the subcutaneous fat thickness) and kinetics of the primary component in muscle HHb were spatially heterogeneous. However, the degree of dynamic inter-site heterogeneity in muscle deoxygenation did not correlate significantly with $\dot{V}O_2$ kinetics. These results support the view that multi-channel TRS-NIRS is a powerful noninvasive tool to gain valuable insights into the fundamental mechanisms of regulation of aerobic metabolism.

O9

Individual variations in baseline levels of salivary biomarkers

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Salivary biomarkers, such as cortisol, immunoglobulin A (IgA), and alpha-amylase, have been widely recognized as strong indicators of stress levels and utilized in many studies because of their applicability and noninvasiveness. It has, however, been pointed out that there are large individual differences in the observed values of these indicators, which makes interpretations and comparisons of data difficult. In the present study, we focused on individual variations in the baseline levels of salivary biomarkers and explored factors associated with the variations. Saliva samples of 82-84 male subjects were taken on two consecutive days to analyze the salivary cortisol, IgA, and amylase levels. We also investigated the subjects' personality, i.e., type A behavior pattern and trait anxiety, as a possible factor relating to baseline levels. We found that (i) the baseline level of salivary amylase was linked with type A behavior pattern while salivary cortisol was not, and (ii) the baseline levels of salivary cortisol or salivary IgA were related to the relative responses in these parameters to stimulation. Based on the present study, we concluded that individual differences in baseline levels, which appear to be partly related to personality traits, must be considered when interpreting response data since baseline levels may affect changes brought about by stimulation.

O10

Study on physiological factors related to delay of circadian rhythms in Japanese university students

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Human in modern society is surrounded by many factors disturbing a circadian rhythm and sleep. It has been reported that sleep time in Japanese university students was remarkably short and bed time is also delayed. We investigated the physiological factors related to the delay of circadian rhythms in Japanese university students. Fourteen healthy male university students participated in the study. Sleep habits, amount of exposure to light for 24 hours were measured for one week before the start of the experiment. In the laboratory experiment, we measured the time of dim light (< 15 lx) melatonin onset (DLMO) as a maker of the circadian phase, melatonin suppression by exposure to light (1000 lx) at night as a marker of the sensitivity to light, phase shift of DLMO induced by exposure to light (1000 lx) at night and phase shift of DLMO when the subjects were exposed to only dim light in the morning. The time of DLMO was negatively correlated to the total time of exposure to light over 250 lx in the morning and percentage of melatonin suppression by light at night. Meanwhile, the time of DLMO was positively correlated to the phase shift of DLMO when the subjects were exposed to only dim light in the morning. These results suggest that less exposure to light in the morning and low sensitivity of melatonin to light suppression is related to the delayed circadian rhythm in Japanese university students.

O11

Relationship between endogenous melatonin and body temperature regulation during sleep in a cold environment

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In the previous study, an increased sensitivity of nocturnal melatonin suppression to light stimulus in winter has been reported. However the biological significance of this phenomenon has not been fully investigated. The physiological function of endogenous melatonin in the thermoregulation in a cold environment was examined in 11 male subjects. The subjects were exposed to two different illumination intensities (30 and 5000 lux) for 4.5 h, and two different ambient temperatures (15 and 27°C) for 2 h before sleep under dark and thermoneutral conditions. Salivary melatonin level was suppressed by bright light ($p < 0.001$), although the ambient temperature condition had no significant effect on melatonin. During sleep, significant effects of pre-sleep exposure to a cold ambient temperature ($p < 0.001$) and bright light ($p < 0.01$) on rectal temperature (T_{re}) were observed. Pre-sleep bright light exposure led to an attenuated fall in T_{re} during sleep. Moreover, T_{re} dropped more precipitously after cold exposure than thermoneutral conditions (cold, $-0.54 \pm 0.07^\circ\text{C}/\text{h}$; thermoneutral, $-0.16 \pm 0.03^\circ\text{C}/\text{h}$; $p < 0.001$). A significant correlation between the nadir temperature of T_{re} and melatonin level ($r = -0.774$, $p < 0.05$) indicated that inter-individual differences with higher melatonin levels lead to a reduction in T_{re} after cold exposure. These results suggest that suppressed endogenous melatonin inhibits the severe down-regulation of body temperature during sleep. The increased sensitivity of nocturnal melatonin suppression to light stimulus in winter may be an advantage in the thermoregulatory adjustment to a cold environment.

O12

Patterns of sleeping behavior as a factor for the ergonomical design of economy class aircraft seats

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Mobility has a high significance in today's society. This fact is also mirrored in the increase of air traffic. The rising amount of long distance flights at falling fares and rising energy expenditures confronts the airlines with the problem of transporting more and more passengers, especially in economy class. This development has led to a dramatic minimization of the space provided for a single passenger, namely seat pitch and seat shape as the true man machine interface. Opposed to the downsizing of personal passenger space caused by economical pressure, space requirements of the user group keep growing due to the secular trend and continuous increase in body circumference measures. The foundation of designing the body-sphere is not only based on surveying and applying human anthropometric and physiological data. Many previous studies performed at our research group have proven the variability of human physical behavior in different environments and situations. A systematic investigation and analysis of movement combinations and behavioral patterns of occupants in the aircraft cabin could pinpoint possibilities for optimizing aircraft body support systems. On the basis of this deliberation, sleeping behavior of economy class passengers was researched on several intercontinental flights. Data collected were occupant positions and position change as well as the use of integrated seat components. The biomechanical and anthropological behavior typology resulting from this research enables conceptions toward a novel cabin interior design.

O13

Physiological and behavioral effects of windows on occupant comfort

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The objective of this study is to investigate the effect of physiological responses to the open-plan feeling varied with the presentation of windows through signals indicating parasympathetic activity. A total of five healthy male subjects participated in the study. The experiment was conducted at a room in our research demonstration house unit. The views from the subject's seat included a cluster of trees and neighboring houses. While performing a set of the assigned task and the following break, the subject faced these conditions: (i) All the windows in the room were uncovered throughout the break; (ii) the windows were covered completely during the period of task performance and started being uncovered when the break started; and (iii) no windows were uncovered throughout the break. In order to fulfill the no-window condition, a curtain was used to hide the windows. CVRR and respiration characteristics were used as an indicator of the changes in the subjects' parasympathetic activities. The highest parasympathetic activity was found in the condition in which windows were present both during the task and subsequent break, followed by the condition in which the windows were present only during the break. The least activity was found in the condition in which no windows were present throughout both the task and subsequent break. Thus, our results showed the possibility of such relationships being observed through physiological indices, which would provide supportive and meaningful evidence for establishing the quantitative regulation of window installation and size requirement of the windows for a certain room size.

O14

The effects of bright light in the morning on nocturnal light-induced melatonin suppression and rectal temperature rhythm during sleep

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The purpose of this study was to examine if bright light in the morning affected light-induced melatonin suppression and circadian rhythms of body temperature at night. Eight males (age 23.9 ± 0.8) served as subjects. The subject exposed to 12000 lx and 150 lx in the morning (0900-1200h) for 3 days in each light condition and also exposed to dim light (<10 lx) at the 2nd night and 500 lx at the 3rd night from 0:00 to 1:30 in each night light condition followed by sleep to 8:00 on a bed under darkness. Rectal temperature was measured during 2300-0800h. Saliva samples were obtained before and after night light exposure both at the 2nd and 3rd nights. There was no significant nocturnal light-induced melatonin suppression under 500 lx after 12000 lx morning-light compared with that after 150 lx morning-light. The minimum rectal temperature observed in early morning tended to decrease under dim light than under 500 lx night-light condition after 150 lx morning-light ($P < 0.1$). The nadir time was significantly delayed under 500 lx night-light than dim light after 150 lx morning-light ($P < 0.05$). The minimum rectal temperature and nadir time were not different between dim and 500 lx night-light conditions after 12000 lx morning-light. 12000 lx morning-light conditions also kept the phase of circadian rhythm of body temperature. In conclusion, it was suggested that the sensitivity to the night light with regard to circadian rhythm of body temperature may be affected by the light intensity in the morning.

O15

An osteoarchaeological investigation into the functional adaptation of the foot to shoes

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The skeleton is a pliable entity which, although structurally strong, is malleable in response to mechanical loading. Activity-related functional adaptation has been successfully identified elsewhere in the post-cranial skeleton, yet the foot is seldom considered a primary source from which to interpret biomechanical history. Studies into the variable morphology of tarsals tend to focus on genetic variation, evolutionary adaptation or palaeopathology and, as such, the quantification of tarsals is an underexploited source of information within osteoarchaeological research. Inherent problems in the investigation of activity-related modification, such as the isolation of genetic characteristics, contribute to a relative dearth of studies into the affects of footwear through skeletal analysis and further exacerbate the basic difficulty in quantifying the complex shape of the human foot. Clinical and medical research has shown that the wearing of heeled shoes in particular alters foot orientation and substantially redistributes mechanical loading. By comparing the morphology of a flat-shoed population with that of a heeled population through linear and angular quantification it has been possible to identify features of the foot that can be considered potential indicators of heeled footwear. While this study reveals some of the potential of the skeletal foot to provide insight into particular forms of biomechanical loading, used in conjunction with the historical written record it also provides a platform from which to access aspects of identity because footwear which lies at a complex junction between functionality and self-expression.

O16

Paramedic assessment and referral to access medical care at home: providing a cost-effective solution to the unnecessary transport of ageing patients

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Besides true medical emergencies, there are many other reasons why people request attendance by an ambulance, including minor injury, health access issues, chronic illness, advice and reassurance, and psychosocial reasons. Patients often seek health care via the ambulance service without necessarily believing or knowing that they need transport to hospital, and some individuals are simply unaware of alternative pathways to health care provision when they are unable to contact a general medical practitioner. Paramedics who are called to a home in countries such as Australia and Japan are governed by duty of care regulations, which legally require them to render assistance until the patient is transferred to another branch of the health service. In practice, this means that Paramedics are compelled to transport patients to a hospital Emergency Department (ED), unless they refuse consent. Lack of alternative resources and pathways to transfer a patient's care, and the associated legal responsibility, can result in significant numbers of unnecessary ambulance transports to EDs, and contribute to long waiting times for patients, both prior to and after admission. Removal from their home surroundings may be especially traumatic for the growing numbers of elderly individuals in developed countries, and any delay in obtaining appropriate health care can exacerbate their level of stress. The option of home treatment, following paramedic assessment and referral to alternative sources of care, can both alleviate pressure on EDs in a cost-effective manner and reduce unnecessary concerns about emergency treatment for aged individuals.

O17

Age-related differences in a serial stepping stability under dual task

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Older individuals, especially those with a history of falls, could recover balance by taking a several steps when they loose their balance, while young adults could take a single step at most. It presumably indicates that older adults have difficulty in keeping their stability for a period from dynamic balance to static condition. This study was to investigate the characteristic of postural sway in older and younger adults in order to clarify posture adjustment for a period from a serial voluntary stepping to a standing position under dual task. Fourteen healthy older (66-79 yr) and eleven younger adults (21-23 yr) volunteered to participate for this study. There were two conditions: following three serial steps, they keep static position for a while with and without concurrent cognitive activity. According to the center of foot pressure (COP) data, displacement and velocity in mediolateral (ML) and anterior-posterior (AP) directions, and total trajectory length in three one-leg standing phases, which were identified as the phases of the first acceleration, the second acceleration and the deceleration, were measured. The results showed that the velocity in AP direction in the phase of the first acceleration was slower in dual task for older adults, whereas no differences for younger adults. This result suggested that older adults made the velocity in AP direction slower when they start to accelerate in order to stabilize their posture.

O18

Age-related difference in cutaneous warm sensation thresholds at the air temperatures of 28 and 22°C

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The purpose of this study was to investigate age-related differences in cutaneous warmth thresholds in neutral and cool environments. A total of 12 young and 13 elderly males were exposed to the air temperatures of 28°C and 22°C. The results showed that: 1) Mean skin temperature did not show differences by age in both environments. 2) The hand, calf, and foot temperatures at cutaneous warmth thresholds were significantly higher for the elderly than for the young in both environments ($p < 0.01$), whereas the rest body parts showed no age difference. 3) Young males detected the increase of 1.3 ± 1.0 , 3.7 ± 2.6 , and 3.4 ± 2.6 °C as initial warmth on the hand, calf, and foot, respectively, while elderly males perceived the increase of 3.5 ± 2.6 , 7.9 ± 2.7 , and 6.8 ± 3.3 °C at T_{air} of 28°C ($p < 0.01$ for age difference on three regions). 4) The most insensitive region for elderly males was the calf and foot for both environments, while any region was not statistically classified in T_{air} of 28°C for young males. 5) The foot of the elderly was five and eight times less sensitive to warmth when compared to those of the cheek at T_{air} of 28 and 22°C, respectively. 6) Warmth thresholds were 3–4°C greater in T_{air} of 22°C than in 28°C, only on the elderly males' calf and foot ($p < 0.05$). In conclusion, these results indicate that age-related differences in cutaneous warmth perception appear to be non-uniform over the body; and the bluntness of warm sensitivity in the cool environment was more profound for elderly males.

O19

Ageing and intellectual disability: where to from here?

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Over the past century the process of deinstitutionalization and the introduction of improved general health care for people with intellectual and developmental disabilities have resulted in positive health outcomes. In many cases this has included projecting median life expectancies towards that of the general population. However, it is now recognized that the period of extended life expectancy is associated with considerable age-related morbidity and new mortality risks. Specific disease patterns that develop in people with intellectual and developmental disabilities with advancing age are exacerbated by factors like exposure to long-term medications, impaired communication, sedentary lifestyles and reduced access to regular and specialist health care. To understand the antecedents of developing comorbidities and ensure appropriate and timely treatments are administered, greater attention needs to be focused on the influence of particular genetic syndromes, the role of gender and the impact of type of residence on age-related patterns. The importance of considering such issues is illustrated by the characteristic patterns of ageing for people with Down syndrome, for whom health and life expectancy is dependent on early surgical intervention for heart defects, gender, lifestyle, and presence of comorbidities. Appropriate planning and continuity of health care are particularly important for individuals with Down syndrome, as they commonly experience premature ageing from 40 years of age, accompanied by the development of Alzheimer's type dementia, and therefore require intensive care for the remainder of their lifespans, which currently approximate to 60 years of age.

O20

The response of melanopsin-expressing retinal ganglion cells to light stimuli with frequency changes

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The mechanisms by which melanopsin-expressing retinal ganglion cells (mRGCs) regulate circadian rhythms in humans have not been established. To understand mRGC characteristics and their role independent of effects due to the rods and cones, mRGC responses should be induced or measured independent of cone and rod responses. We have reported results from light stimuli which differentially induce only the mRGC response according to the stimulus levels, contrast changes of the light amplitude, by using a receptor-silent substitution technique (Tsujimura, 2010). In this study, we designed experimental conditions in order to investigate the mRGC characteristic to light stimuli with frequency changes of 0.5, 1.0, 2.0, 5.0, 8.0, 12.0 and 30.0 Hz with 50% contrast. In the results, the mRGC response varied according to the frequency. The data of the mRGC response were homoscedastically distributed, and there were significant differences in mRGC responses with frequency (one-way ANOVA, $p < 0.01$). The mRGCs showed complicated responses with regard to the latency of response time. There were no significant differences between the frequencies. However, the variance in low-frequency range between 0.5 and 2 Hz was significantly higher than that in high-frequency range between 5 and 30 Hz (Brown-Forsythe test, $p < 0.01$). Absolute deviations from medians in the latencies were 283.7 msec in the low-frequency range and 19.6 msec in the high-frequency range. These results suggest that mRGC behavior is not a simple response to the various frequencies found in solar light but may be related to intrinsic neural circuits with feedback connections in the mRGC pathway.

O21

Seasonal differences in the core interthreshold zone as related to lighting conditions

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The hypothesis tested in the present study is a seasonal difference in the core interthreshold zone (CIZ) since we suggested that individual awareness of heat may change the CIZ due to thermoregulatory behaviour. A series of human experiments were carried out on January and August in 2009 and January in 2010. Air temperature in the climatic chamber was controlled at 20-24°C. Subjects wore a water perfusing suit which was perfused with 25°C water at a rate of 600cc/min. They exercised on the ergometer at 50% of their maximum work rate for 10-15 min. until sweating rate increased, and continuously remained seated without exercise until oxygen uptake increased. Rectal temperature and skin temperatures at four sites were monitored by thermistors. Sweating rate was measured at the forehead with a sweat rate monitor (SKD 4000, Skinos Co.). Oxygen uptake was monitored with a gas analyser (Respiromonitor RM-300i, Minato Med. Science, Co.). In a 2009 winter experiment, 5 male subjects were exposed to a brightness level of 36cd/m² whereas 10 male subjects were exposed to a brightness level of 18cd/m² in the 2009 summer and 2010 winter experiments. The results showed that the CIZ of 0.69±0.29°C (n=22, data from 2005-2007 experiments) at 36cd/m² and of 0.37±0.17°C (n=10) at 18cd/m² in summer were greater than the CIZ of 0.37±0.13°C (n=5) at 36cd/m² and of 0.18±0.17°C (n=10) at 18cd/m² in winter, and therefore demonstrated a seasonal difference in the CIZ as well as the effect of a brightness level on the CIZ.

O22

Effects of color temperature and illuminance of lighting on physiological responses under different stress conditions

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We examined the effects of color temperature (3000 K, light bulb color; 7500 K, daylight color) and illuminance (200 lx, 1500 lx) on the autonomic nervous and central nervous responses under two different stress conditions. Healthy young male volunteers participated in this study. They performed a 20-min arithmetic addition task and a 20-min white noise exposure (80 dBA) as the stress conditions under each of the four lighting conditions. The four lighting experiments were conducted at the same time of day on four different days. We found the change of systolic blood pressure (Δ SBP) from the baseline measurement and the change of mean arterial pressure (Δ MAP) were significantly higher under the 1500-lx condition of 3000 K than under the 200-lx condition during the arithmetic addition task. At 200 lx, the change of total peripheral resistance (Δ TPR) during the arithmetic task was significantly higher under 3000 K than under 7500 K. On the contrary, no effect of lighting on blood pressure was found during the noise exposure. At 200 lx the change of heart rate (Δ HR) during noise exposure was significantly higher under 7500 K than under 3000 K. The latency of P300 event-related potentials during the arithmetic addition task was significantly longer under 7500 K than 3000 K. We also found a significant relation between the personality traits of the subjects and the blood pressure responses during the arithmetic addition task.

O23

Contribution of human melanopsin ganglion cells to the non-image forming pathway

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The recent discovery of melanopsin-containing retinal ganglion cells (mRGCs) led to a fundamental reassessment of non-image forming processing, such as circadian photoentrainment and pupillary light reflex. In the conventional view of retinal physiology, the rod and cone were assumed to be the only photoreceptors in the eye. Therefore, they were considered responsible for photoentrainment. However, the signals from the mRGCs contribute to this non-image forming processing along with cone-mediated luminance signals. Although both signals contribute to such processing, it is difficult to investigate how these signals are summed. The challenge stems primarily from the need for selective stimulation of each photoreceptor type. We designed and built a novel multi-primary stimulation system to stimulate mRGCs independently of other photoreceptors using a silent-substitution technique within a bright steady background. Here, we observed a large change in pupil diameter when we varied the excitation of mRGC alone, with no change in luminance and color. Furthermore, the change in pupil diameter by mRGCs was ~3-times larger than that when we varied luminance alone. These results suggest that the signals from the human mRGCs contribute more to the non-image forming processing than the cone-mediated luminance signals. They lead us to suggest that circadian rhythms, for instance, could be entrained by independent stimulation of mRGCs.

O24

Developmental stress, reproductive development and adult body size: a life history perspective

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Across human populations, women who reach sexual maturity at a younger age are consistently shorter, heavier and thus have a higher body mass index (BMI) than later maturing women. Higher levels of childhood psychosocial stress have been shown to accelerate age at sexual maturity in humans. To our knowledge, however, it has not been established whether the early psychosocial environment also has consequences for a woman's adult body size. We test the hypothesis that for women who experienced higher levels of childhood psychosocial stress, an earlier menarche will be associated with being shorter, heavier and having a higher BMI in adulthood than women who experienced no childhood stressors. The data for this study came from 580 pregnant women who completed self-report questionnaires. The childhood psychosocial environment was measured via 10 stressful life events experienced before 15 years of age. In the full sample, earlier maturing women were significantly heavier ($r = -.124$), shorter ($r = .137$) and had a higher BMI ($r = -.209$). These associations were not consistent across sub-groups however. As predicted, early menarche was only associated with being heavier and having a higher BMI in women who experienced higher levels of childhood psychosocial stress. Conversely, in women who experienced no childhood stressors, there was no association between menarche and weight or BMI. Interestingly, the positive association between menarche and height was consistent across both groups. These findings suggest a woman's developmental environment moderates the negative association between her age at sexual maturity and her weight and BMI.

O25

Rapid intergenerational change in developmental environments in Taiwan, an opportunity to further evaluate maternal epigenetic effects.

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In this study I evaluate a hypothesis that a mother's accrued physical condition at the time of pregnancy and lactation partially represents an evolved time-averaged indicator of the environment that her offspring may experience. A potentially related hypothesis, that female growth is more canalised than male growth to changing circumstances, was also considered. The influence of 107 Taiwanese mothers' heights on variation in father-offspring knee height differences were evaluated in a model that also included a proxy for her husband's childhood environment and the sex of their first offspring. The influence of variation in fathers' heights on mother-offspring differences were evaluated as well using a similar model. Because mothers' heights were hypothesised to represent both genetic and developmental contributions, while fathers' heights only indicate genetic contributions, the slope coefficient of mothers' heights was anticipated to be stronger than that for fathers' heights. Mothers' heights were also anticipated to be more strongly associated with father-son than father-daughter differences in knee height. Results indicated that mothers' heights were highly significantly positively associated with the extent of father-offspring knee height differences ($\beta = 0.110 \pm 0.038$, $t = 2.90$, $p = 0.005$) with markers of fathers' childhood environments significantly inversely associated with intergenerational gains ($\beta = 0.598 \pm 0.232$, $t = -2.58$, $p = 0.011$). However, while fathers' height slope coefficient was lower ($\beta = 0.088 \pm 0.038$, $t = 2.31$, $p = 0.023$) the difference was not statistically significant. Intergenerational gains in knee height were substantial and similar among daughters and sons.

O26

Defining population facial variations: The Perth Face-Space Project

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The Western Australian population (WA) is a migrant population of different population affinities. The availability of three-dimensional (3D) capture of facial form with 3D scanners, computing power and geometric morphometrics facilitates a high definition statistical analysis of the spatial relationships of faces. To achieve a high definition geometric morphometric a dense set of corresponding anatomical landmarks is required. This was achieved with an Anthropometric Mask (AM) in combination with robust superimposition into a defined coordinate space whereby variances and co-variances can be described. The AM is the equivalent to landmark definitions as used in traditional anthropometrics but described in a more spatially dense way using quasi-landmarks (~10.000 points) that can be mapped to 3D facial images. This large set of corresponding landmarks can be used to define a statistical face space using a principle component analysis (PCA). This statistical face-space describes variations and co-variation of typical faces within a population. A total of 843 male and female subjects aged between five and 25 years were recruited. Each participant had their face scanned with a 3D camera (3dMD) to retrieve high dimensional data of facial form to contribute to the face-space. A set of meta-data was concurrently collected on population affinity, gender, age and BMI. The meta-data was used to define property pathways within the face-space to systematically explore patterns of facial variance in this Perth population. Here we report on patterns of age, gender, and population affinity related facial differences found in 5-25 year old Western Australian population.

O27

An exploratory study of physical restraint use for Thai hospitalized elderly patients

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The purpose of this study was to explore physical restraint use (PRU) for Thai hospitalized elderly patients. The purposive samples were 429 elderly patients aged 60 and older, 27 healthcare staff who restrained elderly patients, and 27 family members of restrained elderly patients from nine wards of a teaching hospital in Songkhla. Elderly patients were observed using a Physical Restraint Use Observation Tool twice a day until discharge. For restrained patient, the primary nurse and family member were asked to answer the physical restraint use questionnaire. Descriptive, chi-square, and independent t-test was used to analyze data. The prevalence of PRU, including side rails was 65.7%. The use of side rails only was 59.4%, whereas both the use of side rails and additional physical restraint devices were 6.3%. The most frequently types of PRU were bilateral wrist restraint. The rationale was protecting medical devices and preventing falls. Statistically significant differences in restrained and unrestrained elderly patients were found based on age and cognitive status. Statistically significant differences also occurred in attitudes toward PRU between family members of restrained elderly patients and healthcare staff who restrained elderly patients. Findings from this study will lead to the development of an appropriate educational intervention and guideline suitable for practice in Thailand.

028

Is there a link between graduation of extreme poor Bangladeshi families out of poverty and improvement in adult and child food security, nutrition and health status?

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The Department for International Development (DFID) is the UK government Department promoting international development and poverty reduction. DFID is funding two projects in Bangladesh which hope to enable up to 1 million people to lift themselves out of extreme poverty over the next 5-8 years, through an asset transfer programme. Asset transfer programmes are a new approach to poverty reduction. Rather than providing one-off resources, or even a regular support programme, they give ultra-poor households (defined as having a household income of less than £30/month and no micro-credit) with an asset which can provide an income, for example, a cow or a sewing machine. This paper reviews these projects and discusses the inter-relationships between poverty, nutrition and health and shows: (a) that there is a relationship between food expenditure and Body Mass Index, (b) a cash-for-work programme in the hungry season improves nutritional status and food diversity, and (c) a randomised trial providing daily micronutrients and deworming improves nutritional status more than deworming alone.

O29

Relationship between mitochondrial haplogroup and psychophysiological responses during cold exposure in Japanese

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Cold adaptation is one of the most important functions of human. In this study we focused on its relationship to mitochondria. Mitochondrion itself exists in human cells and it has vital function in generating ATP and heat. Mitochondria have their own genome which enable modern humans to classify the mitochondria haplogroup. Recent studies suggested that these haplogroups were shaped by climatic change and mitochondrial genome influence balance between ATP and heat generation. In this study we hypothesized that human cold adaptability is influenced by the mitochondrial haplogroup. Our purpose was to investigate the association between mitochondrial haplogroup and psychophysiological responses during cold exposure. We focus on haplogroup D, the biggest group in Japan and also a major group in northern Asia including Siberia. Subjects were 18 young Japanese university students and divided in two groups : D and non-D group. There was no significant difference of height, weight, BMI and BSA between them. Cold exposure was induced for 90 minutes in climatic chamber; for the first 30 minutes air temperature was decreased from 27°C to 10 °C and for the last 60 minutes the temperature was maintained at 10 °C. Rectal and skin temperatures, oxygen consumption ($\dot{V}O_2$), blood pressure, thermal comfortability were measured during the experiment. The result showed that D group had significantly higher T_{re} during cold exposure ($p < 0.001$) with no significant difference in $\dot{V}O_2$ and mean skin temperature. It suggests that mitochondrial haplogroup D is associated with cold resistance and haplogroup.

O30

Cold water hand immersion test for health examination of forestry workers

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Forestry workers work using vibrating tools such as chain saw, glass cutter etc. and are exposed to hand-transmitted vibration. They are familiar with natural conditions and are exposed to severe weather condition, that is, rain, windy, snow, cold conditions. Severe weather condition influences health obstruction. Specific health examination for forestry workers is carried out under the recommendation of the Ministry of Welfare and Labour to protect the health hazard of the workers in Japan. We did specific health examination for forestry workers with a questionnaire in Fukushima area, north-east parts of Japan. Cold water hand immersion test (for 10 minutes at water temperature 10 C), finger skin temperatures, blood pressures, muscular strength, vibration & pain sensations, and so on. Measurements of muscular strength, vibration & pain sensations were performed before, and after the cold water immersion. Measurements of finger skin temperature and blood pressure were performed before, during and after the cold water immersion. When the hand was immersed in the cold water, the finger skin temperature reduced markedly. After removal of the hand from the cold water, the finger skin temperature increased faster or slower according to disorders in the peripheral circulation of the hand. Workers who had usually blood pressures on the high side, showed higher blood pressure during immersion in cold water. Vibration syndrome occurs easily under cold condition. Prolonged and intensive exposures of the tools represent an effective risk for workers. Cold water hand immersion test is useful to check the disorder of forestry workers.

Abstracts for Poster Presentations

P1

Increased spinal inclination is associated with decreased physical performance

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Changes in spinal alignment due to spinal deformities would cause changes in spinal posture. However, the association between changes in posture and physical performance is unclear. We explored the association of spinal inclination with physical performance measures among 107 Japanese women ages 40 to 84 years. Spinal posture was assessed as inclination to a perpendicular line by using computer-assisted device (Spinalmouse®). Greater inclination value means forward inclination of the spine. Physical performance was measured by using the following methods: grip strength, chair stand time, functional reach, usual walking speed, and timed-up-and-go test. Mean age of the women was 66 and mean inclination was 4.6 degrees. Inclination significantly increased with age. Pearson correlation analysis showed significant associations between inclination and all the physical performance measures. Pearson partial correlation analysis adjusted for age showed significant associations of inclination with poor physical functioning in chair stand time, functional reach, usual walking speed, and timed up and go test. However, there was no significant association between inclination and grip strength when adjusted for age. In conclusion, spinal posture in forward inclination was associated with impairment in various physical performance measures. It would be important to consider spinal posture when establishing public health strategies to maintain physical functioning.

P2

Polytypism of the daily physical activity in healthy older females based on their physical and mental characteristics

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This study is aimed to classify healthy older females (over 65 years) by daily physical activity (PA) level according to polytypism based on their physical and mental characteristics, because sufficient PA is important for the health promotion in the elderly. The total 400 elderly women were evaluated their daily PA level by the average oxygen intake and the metabolic equivalent obtained by an accelerometer measurement for 24 hours except sleeping in three usual days at Tokyo and Sapporo. In addition, measurements of physical characteristics, common tests of physical strength, and examinations of quality of life (QOL) were performed before PA measurements. These parameters were used as a background to construct the polytypism. The polytypism of PA level was acquired by using a cluster analysis on physical strength and QOL examination on the elderly women. The classification of elderly women by the polytypism based on mental score of QOL indicated a difference in the mean of PA level, however classification by the polytypism based on physical strength did not. In conclusion, mental condition of healthy elderly women may influences on the daily PA level.

P3

Comparison of the body water turnover of elderly people with 3 different levels of physical activity

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In humans, significant loss of body water can be a limiting factor when performing physical activity. Therefore, water homeostasis is very important for healthy living. Renal blood flow increases from childhood and peaks in young adults; thereafter, it dramatically decreases with age. Moreover, thirst response declines with age. Elderly people thus have greater difficulty correcting the disturbance in water balance. In this study, body water turnover was compared between 3 different elderly groups divided according to their level of physical activity. Twenty five elderly subjects (65.7 ± 6.5 yr) participated in this study. The 3 groups were as follows: (1) the exercise group comprised those who exercised regularly (Group E; $n = 9$); (2) the normal group comprised those who led a sedentary life-style (Group N; $n = 9$); and (3) the hospitalized group comprised those who performed barely any physical activity (Group H; $n = 7$). Total body water and body water turnover were measured using the deuterium dilution technique. Each subject ingested 1 g of D_2O per kilogram of body mass. Urine samples were obtained every day for 10 days after the measurement of total body water. According to the results of ANOVA, Group E had the highest body water turnover. However, the body water turnover was not different between Group N and Group H. The results of this study show that although physically active subjects may have a higher body water turnover, the fluid intake circumstantial seemed to be influenced below the subnormal physical-activity quantity.

P4

Preventing falls during walking of Japanese elderly: relationship between walking speed and wobbling of the body trunk

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The purpose of this study was to reduce the incidence of fall accidents, which contribute to a lowering of the health expectancy of the elderly in Japan. Walking speed is thought to be one of the causes of fall accidents among the elderly, due to a slower walking speed, brought on by a decline in muscular strength in the lower limbs following a reduction in daily physical activity. From this angle, this study defines “walking steps” as the amount of physical activity in daily life. The experiment was conducted in a laboratory as step-width was changed to 10cm, 20cm and 40cm in walking activity. Two groups were created, divided into a larger walking amounts and smaller walking amounts. It analyzed walking speed and measured wobbling to the left and right side (rolling index) that it is thought to induce fall accidents, using a three-dimensional motion analysis system on the 2 groups. We further examined the relationships of these. The subjects of the analysis were thirteen elderly people (large walking steps group; 6 persons, small walking steps group; 7 persons). The results showed that, as for the walking speed, the small group was slower 33m/min than the large group. The small group demonstrated a relationship between “rolling index” to “walking speed”. When the “walking speed” was decreased the “rolling index” was shown to increase. Therefore, as daily physical activity decreases so the walking speed decreases, causing an increase in side-to-side wobble. This suggests that the increase in falling accidents among the elderly in Japan is correlated to a general decrease in muscular strength.

P5

Physiological and psychological responses during a mild-heat exposure in young Japanese women being sensitive to the heat

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The purpose of this study was to clarify the physiological and psychological responses to the mild-heat exposures in young Japanese women being sensitive to the heat. The subjects were 21 young Japanese women (20 to 22 years) and divided into two groups, an HS group (self-judged being sensitive to the heat, n=12) and an NS group (non-sensitive to the heat, n=9). Skin temperatures, oral temperature, humidity between skin and clothes, thermal sensation and thermal comfort were measured. The experiments were conducted three times for each subject: 60-min exposure at 28°C, 30°C, 32°C (50±10%RH) after 20-min baseline at 26±1°C (60±10%RH). The mean skin temperatures after 60-min exposure at 28°C were 33.6°C for the HS group and 33.2°C for the NS group, showing a significant difference at p<0.05. There were no significant differences between two groups in oral temperature. HS group tended to produce more sweat and begin to sweat earlier than NS group, but showing no significant differences. There were significant relationships between mean skin temperatures and thermal sensation, mean skin temperatures and comfort sensation in both groups. The regression coefficients of HS group's regression lines were bigger than those of NS group's significantly at p<0.01. HS group tended to complain of thermal discomfort with increase in skin temperature compared with NS group.

P6

Effects of the timing of thermal stimulation on human sleep

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Many Japanese workers take a bath after they come home at night. The bath-time varies according to the lifestyle, and it might affect quality of sleep. To investigate the effect of bath time to nocturnal sleep, we gave thermal stimulation (mist sauna bathing) to subjects at different time of day. Ten healthy young adult males participated in this study. They stayed in a laboratory for four days and three nights, and thermal stimulation was given only on the third night. The subjects carried out this session twice. The stimulation time was 20:00 (condition 20), in one of these sessions, and the stimulation time was 23:00 (condition 23) in the other session. The bed time was 0:30, and the wake time was 7:30. The measurement of the first night was done for the subject's adaptation to the experiment. The data taken in the second night was used as the control condition data, and the data taken in the third night was used as the stimulation condition data. The measurement items were polysomnogram, rectal temperature, skin temperatures and so on. Rectal temperature was increased approximately 0.4°C by the thermal stimulation. Skin temperature on foot was higher in condition 23 than control condition at the bed time. Slow wave sleep was longer in condition 20 than condition 23. From these results, we thought that thermal stimulation at different time of day would provide different effects on body temperature and sleep.

P7

Skipping breakfast affects the diurnal rhythm of the salivary IgA and cortisol secretions

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Recently more youths have irregular lifestyle and dietary habits with skipping or not eating breakfast. The purpose of this study was to examine whether skipping breakfast affects diurnal rhythm of salivary IgA (SIgA) and cortisol (CS) secretion. Saliva samples from 22 healthy female volunteers were collected 7 times between 6:00 and 23:00, including immediately after rising at the first day. The participants were divided into 2 groups, one which eats breakfast regularly (n=12) and the other which do not eat breakfast (n=10). Saliva samples from the regular breakfast eaters were collected again after the three consecutive no-breakfast-days. Saliva samples from the no-breakfast eaters were collected after the 7 consecutive breakfast-days. SIgA and CS concentrations were determined by ELISA. For measuring psychological traits, Profile of Mood States (POMS) was used. For the regular breakfast eaters, SIgA and CS levels showed a diurnal pattern being the highest before breakfast and the trough level within 2 h after breakfast, and this diurnal pattern persisted after the three no-breakfast days. However, the POMS values were significantly higher after the 3 no-breakfast days than before. No such a diurnal variation was observed for the no-breakfast eaters, and even after the 7 breakfast-days no regular alteration in SIgA and CS levels were observed. The persistence of the diurnal rhythm in SIgA and CS secretion, together with fatigue values in POMS, suggest that skipping breakfast may have negative consequences such as increasing fatigue, decline in immune functions.

P8

Disappearance of seasonal variation in the basal metabolic rate in Japanese males.

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It was reported the disappearance of seasonal variation in the basal metabolic rate of Japanese people, although basal metabolic rate in winter was higher than that in summer. Changing dietary habit and decline in seasonal variation in room temperature were cited as the main cause of the disappearance of seasonal variation in basal metabolic rate. However, the factors affecting the disappearance of seasonal variation in the basal metabolic rate have not been well studied. So, the purpose of the present study was to clarify the influencing factors on the disappearance of seasonal variation in basal metabolic rate. Seven healthy male subjects voluntarily participated in this study. Basal metabolic rate, dietary intake including total energy, protein, fat, and carbohydrate intake, daily activity, and air temperature surrounding the subject were measured in each subject. No seasonal difference in basal metabolic rate and total energy intake was observed. Energy expenditure of activity and air temperature surrounding the subject in summer were higher than those in winter. In winter, air temperature surrounding the subject was negatively correlated with basal metabolic rate. In conclusion, the results of the present study suggests that the influencing factors of the disappearance of seasonal variation in basal metabolic rate include the decline in daily activity in winter, the increase in room temperature in winter, and no seasonal difference in energy intake.

P9

Comparison of seasonality in respiratory quotient after an overnight fast between Japanese, Polish and Thai female university students

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Previously, using the breath hydrogen test, we investigated the seasonal variation in the amount of unabsorbed dietary carbohydrates from the intestine after breakfast in Japanese, Polish and Thai female university students and found that there was significant seasonality in Japanese and Polish subjects but no significant seasonality in Thai subjects. Seasonal variations in the amount of unabsorbed dietary carbohydrates found in Japan and Poland are consistent with the circannual rhythms of insulin response in US residents. These facts prompted us to examine the seasonal variations in the respiratory quotient (RQ) after an overnight fast, an indicator of carbohydrates and fats being oxidized in the subjects' resting metabolic state, in Osaka (Japan, n=30), Poznan (Poland, n=33) and Chiang Mai (Thailand, n=32). We also investigated seasonal variation in food intake and body fat percentage. The results are summarized as follows: (1) there was a significant seasonal variation in RQ values in Japanese subjects and they were the lowest in summer and the highest in winter; (2) there was no significant seasonal variation in RQ values in Polish and Thai subjects. We also present the results of seasonal variation in food intake and body fat percentage in the three subjects' groups.

P10

Seasonal differences in physical activity and length of time spent indoors in Japanese female students

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Seasonal changes in physical activities and lengths of time spent indoors were studied in 29 female students in summer, autumn and winter in 2009. The subjects were asked to full activities and places in on a chart of 24-hour time-study. The activities and places were classified into 7 activities (sleep, meal, commute, study, sports, others) and 2 places (outdoor, indoor). Their physical activities were measured using an Actiwatch (Mini-Mitter) on a non-dominant hand. The survey was made for 5 days (3 weekdays and 2 no-business days) in each season. The means (SD) of length of time spent indoors on weekdays were 1373(39), 1384(35) and 1389(24) minutes in summer, autumn and winter, respectively. On the other hand, those on no-business days were 1349(76), 1376(67) and 1385(40) minutes in each season which were slightly shorter than those on weekdays. In all cases, the subjects spent indoors about 95 % of time a day. On no-business days, the length of time spent indoors in summer was significantly longer than that in winter ($P<0.05$). There were no significant differences in the mean physical activities per day among the seasons. On no-business days in summer, there was a significant relationship between the length of time spent indoors and the mean physical activities per day. The subjects spent indoors shorter had a tendency to have higher physical activities in summer.

P11

The change in cortisol awakening response after two weeks of sleep instruction

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Recently there is growing evidence suggesting that the magnitude of cortisol awakening response (CAR), which is indicated by profound increment of salivary cortisol after awakening, is relevant to the level of a mental stress. In this study, such awakening responses of salivary cortisol and Immunoglobulin A (IgA) in the subjects who went through a two weeks of instruction for taking a good sleep was investigated; by which we anticipated that the instruction would bring forth a positive affection with better sleep management, and also a result in an altered CAR, with illustrating the difference in such awakening response between endocrine and immune system. Eleven healthy students aged from 20 to 21 voluntarily participated in this study. They were instructed to individually go through our original-developed sleep instruction for taking a good sleep just before going to bed for two weeks. At the start and at the end of the two weeks of experimental period, salivary cortisol and IgA were assessed at just before going to bed, at the time of awakening, and 30 and 45 minute after awakening, for estimating the awaking response of these biomarkers. In result, subjects did not change their daily sleep, diet, and the other behaviors as anticipated. However, CAR in cortisol significantly increased ($p < .01$) whilst that of IgA did not change. Finally, it was assumed that the going-through instruction every day for two weeks would unexpectedly bother subjects before sleep and; it would result in the negative effect on CAR in cortisol.

P12

Body composition of adults in rural Laos

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In Laos, commercialism has been opened in 1986, and after that, global trades were more active. As a result, rapid modernization proceeded, and now, these influences are seen all over the country, that is, not only in urban area, but also in rural area. Many previous literatures have shown that modernization led the changes of lifestyle, so that modernization affected the health status, especially nutritional status for the people. The process of modernization in Laos is more rapid than that of the other country. Therefore, it is important to describe the nutritional status for the people in order to conduct the sufficient health care undergoing rapid modernization. Then, we conducted the survey at the Lahanum district, Savannakhet province, Laos. Measurement items were (1) stature, body weight, (2) circumferences of chest, an upper arm and a calf, (3) triceps and subscapular skinfold thickness, (4) bone density estimated with an ultrasound bone densitometer (SENSA-MARK8800), and (5) blood pressure. The birth dates of the subjects were also recorded and 184 subjects were measured during the investigation. The mean \pm standard deviations of age were 44.1 ± 15.2 for women, and 44.7 ± 16.1 for men. We found the significant correlation between age and bone density for men, but we did not find the significant correlation between age and bone density for women.

P13

Physiological polymorphism of arteriosclerosis: Nagasaki Goto Islands Study
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We have been doing research concerning a physiological polymorphism of arteriosclerosis in Goto Islands, Nagasaki Prefecture in Japan. It has been clarified that the difference of the lifestyle that exceeds the gene polymorphism has taken part in the plasma homocysteine level up, and the difference of the lifestyle takes part in a physiological polymorphism of adiponectin blood level exceeding the gene polymorphism. Moreover, it was suggested that the folic acid intake was related to the difference of plasma homocysteine level that influenced arteriosclerosis. The folic acid in the red blood corpuscle (RBC) assumed to show the folic acid intake of the past 2-3 months in average. The influence that folic acid gave to a physiological polymorphism of the homocysteine as followed in the present study. CIMT and CAVI were measured as an index of arteriosclerosis. Both folic acid in plasma and folic acid in RBC reversely correlated to the blood homocysteine level. Moreover, folic acid in plasma and folic acid in RBC admitted a strong, positive correlation. As for folic acid in RBC, the relations are admitted only in the plasma homocysteine level and folic acid in plasma, but the folic acid in plasma admits the relations in BMI, the abdominal circumference, the neutral fat, and HbA1C. It was thought that the folic acid in RBC was able to become an index of the folic acid intake level that was appreciable not being influenced from the physique and the serum lipid.

P14

Central nervous system response to different types of mental stress

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Mental stress can be categorized into two different types. One is emotional stress, which is common to human beings and other animals, and is caused by environmental stimuli such as noise. The other one, called intellectual stress, is peculiar to human beings, and can be induced experimentally by a mental arithmetic task. The purpose of the present study was to investigate the central nervous system responses to different types of mental stress by examining P300 event-related potential (EPR), which provides a neurophysiological means of investigating higher cerebral function. It is known that P300 is related to the amount of cognitive resources available for the evaluation of stimuli (latency) and allocation of attention (amplitude). We presented a 20-min mental arithmetic task (MA) and a 20-min white noise exposure (WN) to 8 healthy males. Before and after the task (or exposure), the P300 was recorded at Fz, Cz, Pz, F7 and F8 (international 10-20 system). Paired t-test was conducted to examine the change caused by tasks. As for the results, MA task increased P300 amplitude at F7 ($p < 0.1$) but the P300 latency was not changed. On the other hand, WN exposure decreased the P300 latency at F7 ($p < 0.05$) but the P300 amplitude was not changed. In conclusion, the central nervous system showed different response pattern to different types of mental stress, especially in the left prefrontal. The intellectual stress increased the allocation of cognitive resources but the emotional stress decreased the evaluation time of stimuli.

P15

Effect of prolonged mental stress on nursing staff and careworkers on salivary cortisol and DHEA secretion

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In recent years, salivary biomarkers has attracted researchers' attention as an objective evaluation method for indicating distress. The relationship between salivary biomarkers and prolonged stress was examined in this study. The subjective stress level of medical staff (n=39), which consisted of nurses and caregivers, and desk workers (n=41) were evaluated during their working hours. The experiment was first conducted by taking a saliva sample from each participant. Second, STAI and PSS questionnaires were carried out as psychological evaluation. The results showed that DHEA and cortisol concentrations and cortisol/DHEA ratio had significant differences among participants ($p < 0.05$ for DHEA, $p < 0.01$ for cortisol, and $p < 0.001$ for cortisol/DHEA, respectively). In conclusion, the salivary biomarkers cortisol and DHEA, known as objective physiological indication index could be used for evaluating prolonged stress on nursing staffs and careworkers.

P16

Influence of natural solar exposure for 3 hours on immunological parameters and heart rate variability in humans

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Many researchers have studied very well on the influences of severe ultraviolet (UV) irradiation to the health condition in skin and eyes using artificial light resource. It is necessary for many people to pay attention to a lot of studies for UV protection. This study aims to make it clear how the exposure to natural solar radiation including UV can influence immunological parameters and heart rate variability in humans. Twenty healthy Japanese male students (mean: 22.2 years old) showing skin type 2 participated in this study. They were randomly divided into two groups which consisted of exposure group (EXP) and protected one (PRO). The back of PRO participants was covered with cotton clothing during sun exposure. They stayed outside for 3 hours between 11:30 to 14:30. Cortisol levels tended to decrease after the exposure only in PRO group ($0.05 < p < 0.1$). IL-6 level was maintained in PRO group, whereas that tended to increase in EXP group ($0.05 < p < 0.1$). Participants in EXP group felt fatigue after solar exposure significantly with higher frequency compared with PRO one ($p < 0.05$). Change of skin color (ΔE) in PRO group was significantly lower than EXP one ($p < 0.01$). The parasympathetic function in EXP group tended to be lower than that of PRO one ($0.05 < p < 0.1$). Solar exposure even for the short time of 3 hours may influence the physiological perspective in human. The clothing or sunscreen on the back seems to be effective for protecting human health from the attack of UV included in severe solar radiation.

P17

Physical fitness and nutritional status of urban and rural school children in Indonesia

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Decreasing physical fitness level in connection with increasing prevalence of overweight/obesity in children is a worldwide health issue. The objectives of this study were to: 1) compare body size and body composition of urban children and adolescents with their rural counterparts in Central Java, Indonesia; 2) compare physical fitness performance of urban children and adolescents with their rural counterparts and 3) examine the relationship between indices of physical fitness and obesity. Cross-sectional data were obtained from urban and rural elementary school children ($n = 156$, aged 9-10) and junior high school children ($n = 152$, aged 12-13). Anthropometric measurements and a physical fitness test battery were conducted. Most of the rural children were classified as 'underweight' or 'normal', whereas more than a quarter of the urban subjects were classified as 'overweight' or 'obesity' based on BMI cutoff values. The rural subjects performed significantly better than their urban counterparts in almost all the fitness tests. Compared with data from nationwide surveys in Indonesia, the United States and Japan, the urban subjects tended to be more obese and their physical fitness performance was poor. On the other hand, the rural children had a small body size and poor physical fitness performance when compared to the reference data from the other countries. The poor physical fitness performance of the rural children may be due to growth retardation rather than a lack of fitness *per se*. However, this is not the case for the urban children, who tended to be overweight or obesity and unfit.

P18

Red visor-cap prevents melatonin suppression by light during simulated night work

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Bright light at night improves alertness of night workers. Melatonin suppression by light at night is, however, reported to be possible risk factor of cancer. Red visor-cap is expected to prevent melatonin suppression by blocking off short wavelength light having strong impact on melatonin suppression, with no change of color and brightness of visual field. The purpose of this study was to investigate the effects of red visor-cap on melatonin suppression and alertness during simulated night work. Eleven healthy male students (mean age: 21.2 ± 0.9 yr) volunteered to participate in this study. First day, subjects spent in dim light (<15lux) from 20:00 to 3:00 to measure baseline data of nocturnal change in salivary melatonin concentration. Second day, subjects were exposed to light for 4h from 23:00 to 3:00 with no visor (500lux), red visor (150~170lux) and blue visor (150~170lux). The salivary melatonin sample, subjective sleepiness, performance of vigilance task, and pupil size were measured. The percentage of suppression of melatonin secretion of red visor-cap was significantly lower than that of non visor. The red visor-cap had no negative impact on performance of the vigilance task, although the subjective sleepiness tended to increase by the red visor-cap. These results suggest that the red visor-cap can prevent melatonin suppression without decrease in the vigilance performance.

P19

Effects of the intensity of monochromatic light on physiological and psychological functions

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Light can elicit acute physiological and psychological responses in human beings. The magnitude of responses depends on the timing, intensity, wavelength components and duration of light exposure. In the previous study, we found the activation in central nervous system based on the evidence of P300 event related potential. The latency of P300 under the red-light exposure was shorter than the blue-light. That is in concern with the results of time-production tests of 180-s. In this study, we composed the power of monochromatic lights as illuminance (red, green and blue I) and irradiance (red and blue II) to verify the difference of both units. We examined the activities of the central nervous system by electroencephalography (EEG) and P300. And we examined the activities of autonomic nervous system by finger photoplethysmography (PTG) and electrocardiography (ECG). And we measured the time sense by 180-s and 600-s production tests. Our results indicated that the amplitude of P300 was significantly smaller and the latency of P300 was significantly longer after the light exposures. The amplitude of P300 tended to be bigger under the blue II light condition than the others. EEG alpha band ratio was significantly smaller under the red-light condition than the blue II-light. We found a sympathetic nervous activity and the second differential calculation of PTG (SDPTG) during the blue II-light condition was significantly lower than blue I-light. The time sense of 180-s and 600-s time interval produced in red-light condition was significantly shorter than that in the green and blue-light condition.

P20

Effects of light reflected from wall on melatonin suppression at night-time

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Our purpose was to examine if the reflected light from wall affected light-induced melatonin suppression at night. It is because that little is known how the indirect lighting elicits non-visual effects. Two different wall papers, white and light-orange color, were examined. White paper selected here was most likely to suppress melatonin secretion among wall papers available in the ordinary market in Japan. Subjects were five young adults aged 21–26 years (average = 22.8 ± 2.2 years). They were exposed to the indirect light (170 lx at the cornea) from the wall in a lighting box for 90 minutes from 0:00 to 1:30. Their chin was put on a rest mounted near the front of the box, ensuring constant light stimulation in each paper condition. The light source was the white LED with the peak band of 450 nm. It was shown that there was no significant difference in the light-induced melatonin suppression between two kinds of wall paper. It was suggested that melatonin suppression might not be influenced by the indirect lighting from the ordinary wall in the condition of this study. This result was supported by the previous study.

P21

Effects of different light intensities on dim light melatonin (DLMO) in the morning within one day

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The present study evaluated how exposure to light intensity in the morning affected phase of dim light melatonin onset (DLMO). The tested light intensities were 750 lx, 1500 lx, 3000 lx, 6000 lx, and 12000 lx (horizontal illuminance level at cornea). Eleven healthy males (aged 21–31) participated in 2-day experiments for each light condition. On the first experimental day (day 1), subjects were exposed to dim light condition (<30 lx) for 3 h in the morning (09:00–12:00). On the same day, saliva samples were taken in dim light (<30 lx) every 30 min from 21:00 h to 01:00 h, to determine DLMO phase. The subjects were allowed to sleep from 01:00 to 08:00. On the second experimental day (day 2), the subjects were exposed to the light condition for 3 h in the morning. Light conditions were created by using commercial fluorescent lamps of 5000 K. The experimental schedule after light exposure was the same as on day 1. On comparing day 2 with day 1, significant phase advances of DLMO were obtained at 3000 lx, 6000 lx, and 12000 lx. These findings indicate that exposure to low-intensity light in the morning within one day can advance DLMO phase.

P22

Influence of nocturnal light on melatonin and estradiol secretion in the different menstrual phases

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Breast cancer risk for women working late at night is considered to correlate with their working period. Breast cancer patients are high on estradiol. Melatonin controls sexual hormone including estradiol. Melatonin secretion is inhibited by nocturnal light and it is assumed that this causes inadequate suppression of estradiol secretion by melatonin and eventually increases estradiol. This research investigated reactions of melatonin and estradiol under nocturnal light in the different menstrual phases and its relevance. The subjects were seven female university students with stable life styles, menstrual periods, and hormone rhythms as confirmed in advance. The subjects stayed quietly from 18:00 h under 50 lux lighting environment during their luteal and follicular phases, and then stayed under two lighting conditions (bright light at 2500 lux and dim light at 50 lux) for two hours before going to bed at their normal bedtime. Their saliva was collected before the experiment, one hour after the start of the experiment, and at the end of the experiment, and melatonin and estradiol concentrations were analyzed by ELISA. Melatonin secretion was significantly inhibited under the bright light condition both in the luteal and follicular phases, and no difference was observed between two phases. Estradiol behavior showed no significant difference under the different light conditions and menstrual phases. However, when the total amounts of melatonin and estradiol secretions in the luteal and follicular phases were compared, a significant negative correlation was found in the luteal phase: the more melatonin secretion decreased, the more estradiol secretion increased.

P23

Effects of color temperature of LED light sources on nocturnal melatonin suppression

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The aim of this study was to investigate the effect of 2300K of light-emitting diode (LED) on melatonin suppression, subjective sleepiness and cortical arousal level. The LED with 2300K has spectral composition in which small band of short wavelength was filtered out and the effect was compared with that of 5000K LED. 10 healthy males were exposed to 2300K, 5000K and dim light conditions in each for 1.5h from 1:00 to 2:30. The vertical illuminance at eye level was kept at 200lx. The saliva melatonin levels were measured before and after exposure to each lighting condition. At the same time, cortical arousal level (CFF; critical flicker frequency), subjective sleepiness (VAS; visual analogue scale, SSS; Stanford sleepiness scale) were taken. As a result of comparisons between melatonin secretion obtained before (MLB) and after (MLA) exposure to the lighting conditions, MLA significantly increased under dim light and tended to increase under 2300K when compared with MLB, respectively. However there was no significant difference between MLA and MLB under 5000K. There was significant increase in melatonin secretion ($\Delta(\text{MLA-MLB})$) during dim light exposure compared with that during 5000K light exposure while the comparison between $\Delta(\text{MLA-MLB})$ obtained under dim and 2300K conditions showed no significant difference. This result supported the previous study which employed fluorescent lamp as light sources in the same color temperature conditions. In this study, there were no effects of color temperature conditions of LED on subjective sleepiness and cortical arousal level.

P24

Comparison of melatonin rhythm among Japanese and Swedish under natural and artificial light condition

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Melatonin is the primary hormone of the pineal gland, and exhibits a circadian rhythm with the highest levels at night. The previous researches suggest that melatonin secretion depends on environmental factors, mainly lighting conditions. However, few studies were reported about relation between melatonin secretion and lighting condition in daily life. The purpose of this study was to investigate the annual variations of melatonin secretion of subjects and of their surrounding light conditions in Japan and Sweden. Subjects were 25 Japanese and 15 Swedish. The research was carried out in the field 12 times during the course of a year. The experimental period was from Monday to Friday in each month. The amount of light exposure during normal daily life was measured every 1 min by a portable illuminance and activity monitor (Actiwatch-L). The data were then used to calculate summed exposure during four periods: morning, daytime, evening and nighttime. Melatonin was analyzed in saliva samples which were collected every 3 hours from 10:00 h on Thursday to 07:00 on Friday. The maximum amount of melatonin secreted and the time of maximum secretion were calculated by spline interpolation. The result showed the differences on melatonin secretion among Japanese and Swedish subjects. The melatonin secretion at Japanese subjects was higher than at subjects of Swedish. We compared them with surrounding light condition.

P25

The process of getting wet of clothing in natural or simulated rainfall

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Most mammals dislike getting wet especially in the cold condition. The rainfall wet our body and clothing gradually. Thus the authors believe that the observation of process of getting wet is meaningful. The rain conditions were the natural and simulated rainfall using a siphon phenomenon. Adult females and mannequins put on two clothing conditions, namely mode T and mode S. The former was composed of t-shirts, short pants, shorts, socks, brassiere and hat. The latter was added sweat suit. Three types of rain gauge such as container, bottle inserted funnel and cylindrical towel were examined. The horizontal projection areas of clothing were measured by photographs and planimeter. We will show the relations among the amount of wetting, rainfall condition, clothing condition, exposure time, posture, etc.

P26

A communication perspective to support investigation of user multimedia interactions

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This study was aimed at examining the application of a communication perspective to investigate user multimedia interactions. This study also relates to how human can interact with technological instrument/tools influenced by their knowledge and experience about such instruments/tools including their socio-cultural background. This is important to investigate as the usual measure of the effectiveness of interactive operations on multimedia texts and related tools, such as navigational buttons and pointing devices, is usability. However, this evaluation cannot tell us users' potential meaning-making, especially if the users have different social backgrounds. For investigating this meaning-making, a communication perspective was applied to a case study of multimedia courseware interactions by Arts & Design students at *Institut Teknologi Bandung*, Indonesia. Data in this study were collected through a range of methods (questionnaires and focus groups with the users, interviews with course leaders and multimedia courseware designers, and observations of users' activities) focusing on how the users interact with the multimedia text/tools. The investigation shows that the communication perspective is a valuable tool to examine ways in which users construct meaning from the text, and to investigate different meaning-making processes according to the users' social backgrounds. The importance of applying the communication perspective in this study is that it is useful to broaden such an analysis conducted by usability criteria and might provides multimedia developers a much richer analytical and developmental tool which can then be related to the discussion of technological adaptability.

P27

Changes and whole-body coordination in circulatory system during mental work Lee H-J¹⁾, Senda A¹⁾, Liu X²⁾, Tsunetsugu Y³⁾, Nakanishi M¹⁾, Iwanaga K¹⁾

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The purpose of this study is to demonstrate the whole-body coordination of circulatory system during mental work. In the experiments, physiological reactions including blood pressure (BP), pulse wave (PW), heart rate (HR) and cerebral hemodynamics (CHD, change in O₂Hb concentration measured from prefrontal area by NIRS) were measured during short term memory (STM) and recall task. There were two experiment sets. In the first experiment, mental works with and without STM were compared. In the condition of with STM, information needed to be memorized was presented on a computer screen before recall task. In another condition of without STM, information was presented through a head mounted retinal imaging display (RID) along with recall task. There were significant larger increases in HR, CHD and PW in with STM than without, though there was no significant difference in BP. In the second experiment, effects of stepwise increase in memory information quantity on physiological indices were studied. Four different levels of memory task were set up. Task performance and subjective evaluation of task difficulty showed significant stepwise changes corresponding to memory information quantity. HR and CHD tended to show stepwise changes, though there were no significant changes in any physiological indices corresponding to memory information quantity. According to these results, whole-body coordination of circulatory system during mental work was discussed.

P28

Effects of parametric speaker sound on the autonomic nervous system during a mental task

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A parametric speaker is the sound system that can keep very sharp directivity using ultrasonic waves. In recent years, parametric speakers have been used in various circumstances. However, the safety of parametric speakers for the human body has not yet been revealed. Therefore, we studied the effects of parametric speaker sound on physiological functions. Nine male subjects participated in this study. They completed three consecutive sessions: a 20-min quiet period as a baseline, a 45-min mental task period with conventional speaker or parametric speaker, and a 20-min recovery period. We evaluated electrocardiography (ECG), photoplethysmography (PTG), electroencephalography (EEG), blood pressure (BP), baroreflex sensitivity (BRS) and salivary cortisol and CgA. To examine the effects of the parametric speaker, two-way repeated measures ANOVA (speaker factor and time factor) was conducted. In the results, we found that sympathetic nervous activity and the second differential calculation of PTG (SDPTG) during the parametric condition were significantly lower than those during the general condition in both periods (task period, recovery period). Parasympathetic nervous activity during the parametric condition tended to be lower than that during the general condition in both periods (task period, recovery period). Furthermore, the cortisol concentration during the parametric condition was lower than that during the general condition. These results suggested that the burden of parametric speaker sound is lower than that of conventional speaker sound on physiological functions. In addition, we verified that the reaction time with a parametric speaker was shorter than that with a conventional speaker.

P29

Effect of working memory task and a cognitive judgment task on P300 component of event-related brain potentials.

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The latency and amplitude of P300 component of the event-related brain potential (ERP) waveform provide a good measure of human attention. The P300 is generally elicited with an auditory oddball paradigm. For the present study, we used an auditory task, a working memory task (n-back test) and a cognitive judgment task (Stroop test) in an oddball paradigm and measured the P300 during each task in order to evaluate human attention. As these tasks have never been studied in an oddball paradigm, examination of P300 component represents a novel approach to measuring subject attention. To use the P300 measured with the working memory task and cognitive judgment task as an index, we initially compared the wave forms recorded during each task. Then, we examined the P300 before and after task performance and recorded the P300 from a standard auditory task in order to clarify the effects of each task in detail. Our results showed that during the n-back and Stroop tests, the P300 elicited were of larger amplitude and longer latency compared to those obtained from auditory stimuli. Changes in the P300 before and after each task revealed characteristic differences between the n-back and the Stroop test, while the auditory task also elicited different P300 characteristics.

P30

The effects of several environmental conditions of firefighter clothing on wearer mobility

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The purpose of this study was to compare wearer mobility in several conditions of firefighting environment. For the analysis of clothing mobility, we measured static range of motion (ROM) and electromyography (EMG) while firefighter clothing and associated gear was worn. Also, subjective evaluation of wearing comfort and mobility was obtained. This study was conducted using a 3D motion analysis program for analysis of mobility, examining seven experimental motions. Experimental ensembles were prepared for four experimental conditions; 1) CO: inner uniform + firefighter clothing and gear, 2) HP: inner uniform with half pants + firefighter clothing and gear, 3) SC: inner uniform + firefighter clothing and gear + self contained breathing apparatus (SCBA), 4) MO: wet inner uniform + firefighter clothing and gear. The half-length pants (HP) had no effect on increasing ROM. However, subjects felt comfortable and easy to move in HP. In the ROM results of SC, SCBA restricted whole body motions by almost 13.1%. While wearing the wet inner uniform with firefighter clothing (MO), decrement of lower body mobility (13.4%) was bigger than upper body mobility (4.5%). For the results of MO, decreasing of whole body ROM was 8.3%. For all conditions, no significant differences in EMG results were found. In this study, it was demonstrated that weight of SCBA and friction of wet clothing had significant influence on the decreasing of mobility in firefighter clothing conditions.

P31

Changes in P300 and simple reaction time in waking during REM and non-REM sleep in healthy young women

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It has generally been recognized that good falling asleep period, an adequate length and depth of sleep, and a good wakening are very important for maintaining high quality sleep. However, the ideal conditions for waking up have not been clarified. Therefore we performed this present study to determine which is better; to wake during the REM period or the non-REM period of sleep. Fifteen healthy young women (aged 20-24 years old) with no sleep disorders were recruited. We conducted three one-night studies, which were individually performed with one week between studies. The first night was a dummy study to allow subjects to adjust to the environment. The second and third nights were compared in the present experiment. Polisomnography (PSG), which included EEG, was checked during sleep. We forcibly woke the subjects by lightening the room and calling subjects names during REM and non-REM periods the following morning. After waking up, we measured P300 and simple reaction time (SRT) by button pushing and jumping exercises. Sleep questionnaires were also performed before and after sleep. P300 latency in waking at the non-REM period was significantly prolonged than that in waking during the REM period. SRT by pushing buttons tended to have a similar change to P300. On the other hand, SRT measured by jumping, showed no significant difference. These results suggest that waking during the REM period is better for task performance than waking during non-REM sleep.

P32

Visualization of arterial calcification by X-ray computed tomography

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Arterial calcification is commonly associated with aging, and progress of the calcification shows variation depending environments. Therefore, quantitative analysis of calcium accumulation in artery is helpful to understand adaptation of the cardiovascular system to the environments. X-ray computed tomography (CT) is a convenient method to detect calcification site in arterial wall. However, accuracy of CT image analysis for calcification has been unclear. In this study, we examined the accuracy of the CT image analysis, and visualized distribution of arterial calcification. For accuracy assessment of the CT image analysis, calcium contents in arteries that were dissected from cadavers were measured by atomic emission spectrometry and compared with CT value of same sample. Measured calcium content and CT value had linear correlation, and CT value was successively calibrated to relative calcium content. Thereby, we determined calcium content in the carotid arteries extirpated from Japanese and Thai, and discussed site-dependency, age-dependency and racial difference of calcium accumulation. By comparison in a bifurcation of artery, calcium was highly accumulated in the branching site. In both of Japanese and Thai, calcium contents of arteries were increased with age. The increase of calcium in Thai was shown in younger sample than Japanese. The method we developed has possibilities for *in vivo* measurement with X-ray CT, and will provide useful information for understanding human aging and adaptation of the cardiovascular system.

P33

Variation of technological adaptability evaluated by the prefrontal brain activity measurement and behavior while driving and operating a driving simulator

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The purpose of this study is to investigate variation of technological adaptability evaluated by the prefrontal cerebral activity and behavior of young adults during driving and operating a driving simulator. The procedure of the experiment was explained to the subjects and informed consent was obtained from them. Twenty male subjects (21-23yrs) operate a driving simulator and drive a passenger car around our campus. Subjects were divided into two sub groups depending on their driving experience. Non-invasive measuring of regional cerebral blood flow was estimated by measuring deoxygenated haemoglobin, oxygenated haemoglobin, and total haemoglobin using the time resolved spectroscopy (TRS) and near-infrared spectroscopy (NIRS). Behavior of subjects during experiments was recorded using a video camera. Temperature and relative humidity in a car were 23-26 degrees Centigrade and 40-55%RH respectively. Experienced subjects showed little changes in prefrontal cerebral activity than that of less experienced subjects while driving and operating a driving simulator. Experienced subjects observed left side more carefully and showed higher changes in prefrontal cerebral activity when passing through T-shaped junction than that of less experienced subjects in driving and operating a driving simulator. Results of these experiments showed similar trends between driving and operating a driving simulator. In this paper we discussed the possibility of physiological evaluation for technological adaptability by means of recording prefrontal cerebral activity and behavior.

P34

Effect of high carbohydrate meal intake on heart rate variability assessed by power spectral analysis using a fast Fourier transformation and autoregressive model

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Power spectral analysis of heart rate variability (HRV) using a fast Fourier transformation (FFT) is widely used to assess diet related changes in cardiac autonomic balance. Although there are various HRV spectral analysis methods, no study compared the different HRV spectral analysis methods to evaluate diet related cardiac autonomic balance. The aim of this study was to evaluate effect of high carbohydrate meal intake on HRV assessed by FFT and AR in healthy normal subjects. Ten healthy young male subjects aged 22-25 years old participated in this study. After recording baseline R-R intervals, further recordings were made continuously for 120 min after a test meal. We calculated the following frequency parameters of HRV: very low frequency power (VLF: 0.01-0.04 Hz), low frequency power (LF: 0.04-0.15 Hz), high frequency power (HF: 0.15-0.4 Hz), and LF/HF ratio. A consecutive 1,024-sec time series of R-R interval data obtained every 10 min interval from baseline was used to calculate HRV parameters. To compare the two different power spectral analysis methods, we examined intra-class correlation coefficients (ICC) and their 95% confidence intervals (CI). Statistical analysis was carried out using SPSS 15.0J. Mean ICC were high in 4 HRV parameters. Mean lower ICC 95% CI in all HRV parameters except for VLF power were > 0.75. Our results suggest that there were little differences in LF power, HF power and LF/HF ratio between FFT and AR in young male subjects. Further study is needed to confirm our results.

P35

Observation of human action and mirror neuron system: influence of body parts, sex, and object/non-object actions on mu wave suppression of EEG.

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The human mirror neurons systems (hMNS) are activated both when one does something and when one observes somebody else doing the same thing. It is considered to play an important role for cognition of others' behaviors. The mu wave suppression of electroencephalogram (EEG) in the area of primary motor cortex has been said to reflect part of the hMNS. However, the feature of mu wave suppression, including topographic distribution, has not been well understood. We investigated the differences of mu wave suppression topography: 1) between the observation of the movements of the different body parts (hand, foot, and mouth), 2) between the observation of the body action with the objects (transitive action) and non-objects (intransitive action), and 3) between sexes of observers. The participants were twenty young adults (10 men and 10 women). Significant mu wave suppressions during observation of all actions were found in the area of central sulcus. When the subjects observed the movements of different body parts, the topographic distributions of mu wave suppression reflected the brain's map of the body to some extent. The mu suppression while observing the transitive action of the foot was significantly larger than that while observing the intransitive action. The mu suppression in females was larger than that in males. These results suggest that the mu suppression of EEG and its topographic distribution could reflect part of the features of hMNS that has been uncovered by fMRI studies.

P36

Correlation between subjective sleep feeling and heart rate variability of power spectral densities

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This study investigated the correlations between subjective sleep assessed by the Ogri-Shirakawa-Azumi (OSA) sleep inventory and objective indices based on electrocardiogram data obtained during sleep. Twenty-one sets of data were collected from 10 healthy women. As objective indices, total sleep time, sleep period time, sleep latency, and waking after sleep onset were assessed from polysomnogram data, and the averages of the power spectral indices of heart rate variability (HRV) — low frequency [LF: 0.04 - 0.15Hz], high frequency [HF: 0.15 – 0.4Hz], ratio of LF to HF [LF/HF], and ratio of HF to the sum of LF and HF [HF/(LF+HF)] — were calculated. HF/(LF+HF) showed positive correlations with four OSA factors: factor I (sleepiness), factor II (sleep maintenance), factor III (anxiety), and factor IV (soundness of sleep). Negative correlations were found between LF/HF and factors II, III, and IV. Although factor V (sleep initiation) had a negative correlation with length of sleep latency, no power spectral indices were correlated with this factor. The results suggest that some aspects of subjective sleep can be assessed by means of HRV power spectral indices. Therefore, the ECG data, which can be obtained non-invasively and relatively easily from people who are not capable of answering sleep inventory, might be a good tool for the assessment of subjective feelings of sleep.

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